

**VOLUME 15
NUMBER 1**

JUNE 2026

ISSN: 2226-6771

GRADUATE INSTITUTE OF INTELLECTUAL PROPERTY, NATIONAL
TAIPEI UNIVERSITY OF TECHNOLOGY

NTUT Journal of Intellectual Property Law and Management

The NTUT Journal of Intellectual Property Law and Management is published twice a year by the National Taipei University of Technology (“Taipei Tech.”), a national university located in Taipei City, Taiwan. The Journal is run by the Graduate Institute of Intellectual Property, an educational organization of Taipei Tech. The address of Taipei Tech. is No. 2, Sec. 3, Chung-hsiao E. Rd., Taipei City 10608, Taiwan.

Copyright © 2026 by the National Taipei University of Technology

EDITORIAL TEAM

Editor-in-Chief

Dr. Kuang-Cheng Chen, Director and Professor, Graduate Institute of Intellectual Property, National Taipei University of Technology

Executive Editor

Dr. Yii-Der Su, Associate Professor, Graduate Institute of Intellectual Property, National Taipei University of Technology

Associate Editors (Listed alphabetically by surname)

Ms. Yi-Jun Lin, Secretary, Graduate Institute of Intellectual Property, National Taipei University of Technology

Ms. Min-Yu Huang, Graduate Student, Graduate Institute of Intellectual Property, National Taipei University of Technology

Ms. Yu-Rou Lin, Graduate Student, Graduate Institute of Intellectual Property, National Taipei University of Technology

Editorial Members (Listed alphabetically by surname)

Dr. Lennon Chang, Senior Lecturer, Monash University (Australia)

Dr. Frank Hammel, Professor, TFH Wildau University (Germany), Head of Chinese-German IP Law Institute at Nanjing Normal University (China)

Dr. Can Huang, Professor, School of Management, Zhejiang University (P.R.China)

Dr. Eric James Iversen, Senior Researcher, NIFU–Nordic studies in Innovation, Research and Education (Norway)

Dr. Chung-Hsi Lee, Professor, Graduate Institute of Health and Biotechnology Law,

Taipei Medical University (Taiwan)

Dr. Su-Hua Lee, Professor, National Taiwan University (Taiwan)

Dr. Maria Ananieva Markova, Professor, Department and Institute of Creative Industries and Business, University of National and World Economy (Bulgaria)

Dr. Avv. Marco Ricolfi, Professor, University of Turin (Italy)

Dr. Huang-Chih Sung, Professor and Chair, Inst. of Technology Innovation & Intellectual Property Management, National Chengchi University (Taiwan)

Dr. Kyoko Takada, Associate Professor, Department of Intellectual Property, Osaka Institute of Technology (Japan)

Dr. Chih-Hong (Henry) Tsai, Division-Chief Judge, Taiwan Shilin District Court (Taiwan)

Dr. Van Ngoc VU, Lecturer in Law, National Economics University (Vietnam)

Dr. Szu-Yuan Wang, Assistant Professor, Graduate Institute of Intellectual Property and Communication Technology Law, Shih Hsin University (Taiwan)

Dr. Wei-Lin Wang, Professor and Chair, Department of Financial Law, Ming Chuan University (Taiwan)

Dr. Chung-Han Yang, Adjunct Assistant Professor, Department for Environmental and Cultural Resources, National Tsing Hua University (Taiwan)

Ms. Jamie C. Yang, Attorney-at-Law, Partner, Innovatus Law (Taiwan)

Advisory Committee
(Listed alphabetically by surname)

Mr. Jen-Ping Chang, Section Chief, Section 5 of the Third Patent Division, Taiwan
Intellectual Property Office

Yuan-Chen Chiang, J.D., Legal Counsel, Delta Electronics, Inc.

Dr. Ming-Jye Huang, Professor, College of Law, National Taiwan University

Dr. Shang-Jyh Liu, Professor, Institute of Technology Law, National Chiao Tung
University

Dr. Ming-Yan Shieh, Justice, Constitutional Court R.O.C. (Taiwan)

Hon. Judge Dr. Huei-Ju (Grace) Tsai, Taiwan Intellectual Property and Commercial
Court

Chia-Sheng Wu, J.D., Professor, Department of Law, National Taipei University

The **NTUT Journal of Intellectual Property Law and Management** is published twice a year by the National Taipei University of Technology (“Taipei Tech.”), a national university located in Taipei City, Taiwan. The Journal is run by the Graduate Institute of Intellectual Property, an educational organization of Taipei Tech. The address of Taipei Tech. is No. 1, Sec. 3, Chung-hsiao E. Rd., Taipei City 10608, Taiwan.

EDITORIAL NOTE ON VOLUME 15, NUMBER 1, 2026

Editorial Note

Dr. Yii-Der Su

Associate Professor,

Graduate Institute of Intellectual Property,

National Taipei University of Technology

As the Executive Editor of this issue, I am deeply grateful to all authors, reviewers, and editorial colleagues for their dedication, expertise, and collaborative efforts throughout the publication process. Their contributions have been invaluable in maintaining the high academic standards of this journal.

This issue brings together three articles that reflect the continuing evolution of intellectual property law in response to technological innovation and creative industries. Drawing on perspectives from East and Southeast Asia, the authors examine contemporary IP issues through comparative, empirical, and doctrinal analyses.

We hope that the contributions in this issue will inspire further discussion and research, while offering valuable perspectives for both scholars and practitioners interested in the development of intellectual property law across the Indo-Pacific region and beyond.

With sincere gratitude,

Executive Editor

Dr. Yii-Der Su

CALL FOR PAPERS

NTUT Intellectual Property Law and Management is a multidisciplinary journal which concerned with legal, economic and social aspects of IP issues. This journal is included in the SCOPUS, WESTLAW, WESTLAW HK, LAWDATA, AIRITI LIBRARY citation databases, and it welcomes contributions to address IP topics at national, regional and international level.

Submission:

1. A manuscript has to follow the citation format of The Bluebook: A Uniform System of Citation. If the citation format for a particular reference is not provided, please give a citation in a form: [Author], [article title], [volume number] [Journal Title] [first page] (publication year), for instance, Zvi Griliches, Patent Statistics as Economic Indicators: A Survey, 8 Journal of Economic Literature 1661, 1661- 707 (1990). If your article relates to management or business, pin-point citation is not required. For all manuscripts, a list of references is not required.
2. A regular manuscript is expected to be **7000-9000 words** in length, including the main text and footnotes. Potential authors are encouraged to contact editor team, i.e. iipjournal@ntut.edu.tw, for a manuscript template.
3. A regular manuscript has to include an abstract of at most 300 words and at most five keywords.
4. The authors are responsible for the factual or legal accuracy of their papers. No payment is for contribution. Two copies of the journal will be supplied to the authors free of charge.
5. Manuscripts must be typewritten in English. Electronic submissions are preferred. Please provide Microsoft Word files and email to iipjournal@ntut.edu.tw.

Review:

In general, all submissions will be subject to a peer-review process.

Publication Fee:

If the manuscript “passes” the peer-review, the author(s) should pay a publication fee of US\$ 100 per article since May 1, 2025. Manuscripts that fail to make this payment will not be considered for finishing published process.

Copyrights:

By submitting manuscripts, all authors shall grant to the National Taipei University of Technology a non-exclusive license to disseminate their papers through the instruments of the National Taipei University of Technology or other affiliating entities.

Publication Ethics and Malpractice Statement:

This journal is committed to maintain ethics and quality standard of publication. Authors, editors, reviewers, and staff are required to follow general standards of ethical behaviors. Authors shall submit their original works without infringing intellectual property rights of others. Editors and reviewers shall evaluate manuscripts according to their academic values. Reviewers shall not take advantage of the original ideas drawn from the reviewed manuscripts. Reviewers shall keep the reviewed content confidential until it is published.

TABLE OF CONTENTS

Editorial Note

Dr. Yii-Der Su, *Associate Professor, Graduate Institute of Intellectual Property, National Taipei University of Technology*, 15. 1 NTUT J. OF INTELL. PROP. L. & MGMT. (2026).

Research Article

Dr. Tsu-Sung Hsieh *Aesthetics in Fashion Designs from Perspectives of Intellectual Property Law: A Comparative Study and Suggestions Thereof*, 15.1 NTUT J. OF INTELL. PROP. L. & MGMT. (2026).

Dr. Tasya Safiranita, S.H., M.H. & Haipa Nisrina Sayyidah, S.H. & Yoan Shevila Kristiyenda & S.H., Dr. Zainal Muttaqin, S.H., M.H. & Dr. Dadang Epi Sukarsa, S.H., M.H. & Prof. Dr. Ramalingam Rajamanickam *Legal Protection of Copyright Against Cybercrimes: The Case of Electronic Book Piracy in Indonesia*, 15.1 NTUT J. OF INTELL. PROP. L. & MGMT. (2026).

Mr. Jin-Ching Shen & Dr. Kuang-Cheng Chen & Ms. Pei-Ying Chen *Assessing the Potential for Trademarks to be Confused or Misrecognized by Using a Vision Transformer Algorithm to Evaluate the Similarity Calculation of Images*, 15.1 NTUT J. OF INTELL. PROP. L. & MGMT. (2026).

Aesthetics in Fashion Designs from Perspectives of Intellectual Property Law: A Comparative Study and Suggestions Thereof

Dr. Tsu-Sung Hsieh

Professor, Department of Law, Ming Chuan University, R.O.C.
Juris Doctor, School of Law, University of New Hampshire, U.S.A.

Abstract

For maintaining a fair competition environment, channeling devices are mandated by intellectual property law to separate utility or function from ornamental or aesthetic attribute of fashion designs. These channeling devices consist of copyright law's "physical and conceptual separability"; trademark law's "utilitarian and aesthetic functionality"; and design patent law's "ornamentality". However, these channeling devices are not able to provide clear guidelines due to the involvement of "aesthetics" in functionality mechanism.

Fashion designs are considered aesthetic or at least contain aesthetic ingredients. Customers purchasing clothing, cosmetics, handbags, jewelries, or footwear, etc., to some degree, are motivated by their aesthetically pleasing appearances. It is found that "aesthetics" is multi-faceted in intellectual property law arena when aesthetic-related terms can be found in statutes and case laws, and in essence entangled with creativity and functionality mechanism.

This article suggests an overarching channeling device based on the dual-nature functionality doctrine to provide guidelines and clear current chaos. Further, legal interpretation of aesthetics has been very confusing, and invites many problems. Terms such as "ornamental" in U.S. Patent Act is very troublesome because it is obscure and indefinite. Instead, aesthetics-neutral terms, e.g., "visual appeal" in R.O.C. Patent Act are preferable, and this article suggests that we shall advocate this statutory term.

Although contemporary art, e.g., bioart, is a significant variant in patent regime, some believe that it is the future of fashion industries. Their patents are utility rather than design ones, it raises a question about whether they can be eligible to remain in design patent realm. This article suggests that, before design patents granted to them, they are not in design patent regime yet according to the current intellectual property regulations.

Keywords: Fashion, Aesthetics, Functionality, Ornamentality, Contemporary art

I. Introduction

For maintaining a fair competition environment, channeling devices are mandated by intellectual property law to separate utility or function from ornamental or aesthetic attribute of fashion designs. These channeling devices consist of copyright law's "physical and conceptual separability"; trademark law's "utilitarian and aesthetic functionality"; and design patent law's "ornamentality". However, these channeling devices are not able to provide clear guidelines due to the involvement of "aesthetics" in functionality mechanism. So, a discussion in this regard should be conducted because it will affect the eligibility of protection to the fashion designs.

Fashion designs are considered aesthetic or at least contain aesthetic ingredients. Customers purchasing clothing, cosmetics, handbags, jewelries, or footwear, etc., to some degree, are motivated by their aesthetically pleasing appearances.¹ It is found that "aesthetics" is multi-faceted in intellectual property law arena when aesthetic-related terms can be found in statutes and case laws, and in essence entangled with creativity and functionality mechanism.

Since so many issues are under influence of the underlying "aesthetics", thus what impacts will the aesthetics render to fashion designs is worthy to be discussed. However, scholars had avoided addressing this issue by categorizing it being adjacent to metaphysic sphere and thus out of scope of legal studies, as a result, there are not very many articles discussing these related issues.

Even a few articles with related titles can be found domestically, but the nature or characteristics of aesthetics is not actually discussed.² Relatively more related articles are published in U.S. but without showing clear solutions thereof. Thus, this article targets U.S. articles for purpose of conducting a comparative study and strive to provide some solutions to these issues.

After this introduction, Part II discusses issues regarding separability requirement and functionality, including copyright law's physical and conceptual separability, trademark law's utilitarian and aesthetic functionality, and design patent law's ornamentality; Part III addresses the multi-faceted "aesthetics" issue, wherein the nature of aesthetics is discussed, and legal interpretation of aesthetics is illustrated; Part IV provides analyses and suggestions; and Part V is the conclusion.

II. Regarding Separability Requirement and Functionality

The doctrine of functionality developed because of a judicial desire to limit the protection afforded product features under the law of unfair competition.³ So, functionality is generally utilized as a channeling device to separate utility, preventing functional features from being used as trademarks and last forever, or copyright to enjoy longer periods of protection.

¹ Jason J. Du Mont & Mark D. Janis, *Functionality in Design Protection Systems*, 19 J. INTELL. PROP. L. 261, 266 (2012).

² Tzu-Chen Hsu, *Beauty in Design: Explanation and Influence of Aesthetic Character in Design Laws*, Vol. 55, *Fu Jen Law Review* (2017); Hsin-Lan Hu, *Under My IP Umbrella ? IPR Protection to Fashion Design in US*, *Tunghai University Law Review*, Vol. 57 (2019); Hsin-An Yao, *Theory and Practice of Functionality Doctrine in Copyright Law*, *Fu Jen Law Review*, Vol. 61 (2021); Pin-Hua Hsu, *Fighting for Colors : Aesthetic Functionality Doctrine in Trademark Law - Focusing on Christian Louboutin S.A. v. Yves Saint Laurent America Holding*, *Chung-Cheng Financial Law Review*, Vol. 10 (2015).

³ Note, *Unfair Competition and the Doctrine of Functionality*, 64 Colum. L. Rev. 544, at 551-552 (1964).

Functionality is applicable to trademark and design patent regimes, and copyright regime as well but with different terminology “separability”.

A. Physical and Conceptual Separability in Copyright Regime

To acquire copyright protection, a fashion design merely equipped with originality and creativity is not sufficient, it needs to further separate or channel the subject matter from utility for fulfilling the mandate of a fair competition.

The copyrightable subject matter regulation can be found in 17 U.S.C. §102(b) which provides that: “in no case does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work”.⁴ 17 U.S.C. §102(b) is intended, among other things, to make clear that the expression adopted by the programmer is the copyrightable element in a computer program, and that the actual processes or methods embodied in the program are not within the scope of the copyright law.⁵ And, R.O.C. Copyright Act §10-1(II) provides very similar language as well.⁶

The 17 U.S.C. §101 mandates the separability regulation wherein the, “useful article” is an article having an intrinsic utilitarian function that is not merely to portray the appearance of the article or to convey information.⁷ The useful article doctrine has a channeling function which would separate works away from the copyright realm and toward patent law, the public domain, or some other form of protection.⁸ If the work is a useful article, the court will look at whether or not it is applied art or industrial design.⁹ The separability requirement becomes important in deciding whether a work is an industrial design or whether it is applied art.¹⁰ If the design which is sought to be copyrighted is not part of a useful object, then the “applied art” test does not arise.¹¹

A painting is a vendible fine art and in performing a decorative function, is certainly useful.¹² In *Jovani Fashion v. Fiesta Fashions*,¹³ the plaintiff did not pass the separability test because the Second Circuit said that decorative aspects of clothes serve a decorative function, which is useful and functional, and therefore un-copyrightable.¹⁴

Clothing itself can have various styles, and it is not unusual to see a bridal dress incorporating lace. In *Eve of Milady v. Impression Bridal*,¹⁵ the court held that, although

⁴ 17 U.S.C. §102(b). (In no case does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work.)

⁵ Melville B. Nimmer & David Nimmer, 1 Nimmer on Copyright §2A.06 (2022).

⁶ R.O.C. Copyright Act, §10-1 (Protection for copyright that has been obtained in accordance with this Act shall only extend to the expression of the work in question, and shall not extend to the work's underlying ideas, procedures, production processes, systems, methods of operation, concepts, principles, or discoveries.)

⁷ Leonard D. DuBoff, What Is Art - Toward a Legal Definition, 12 Hastings Comm. & Ent. L.J. 303, 315 (1990).

⁸ Viva R. Moffat, The Copyright/Patent Boundary, 48 U. Rich. L. Rev. 611, 621 (2014).

⁹ DuBoff, *supra* note 7, at 305.

¹⁰ *Id.*, at 313.

¹¹ *Id.*, at 314.

¹² Michael Blakeney, Contemporary Art and Patents, 9 Queen Mary J. Intell. Prop. 245, 246 (2019).

¹³ *Jovani Fashion, Ltd. v. Fiesta Fashions*, 500 F. App'x 42 (2d Cir. 2012).

¹⁴ Guillermo C. Jimenez & Barbara Kolsun, Fashion Law: Cases and Materials 94 (2016). (ISBN-10: 161163489X; ISBN-13: 978-1611634891)

¹⁵ *Eve of Milady v. Impression Bridal, Inc.*, 957 F. Supp. 484 (S.D.N.Y. 1997).

clothing cannot be copyright protected, lace design is because it incorporated into clothing.¹⁶ The reasoning is in fact based on the separability principle. This decision had left doubt about whether lace design would meet minimum standard of originality when it is usually monochrome, and typically composed of traditional repeating elements, such as plaited net, loops, etc.¹⁷

The separability test has traditionally discriminated against certain "modern" designs such as the light fixture in *Esquire v. Ringer*. Recent case law in New York and California, however, has substantially broadened the concept of separability, allowing the inclusion of objects such as the *Esquire* light if the intent of the artist was to create a work of applied art.¹⁸

However, some U.S. case laws had rendered certain arguable decisions. For example, referring to *King Feature Syndicate Inc. v. Fleischer*,¹⁹ the copying of both the features of doll and its clothing as set forth in sketch might be held infringed, while copying same clothing for humans might not.²⁰ The underlying rationale to different protections upon clothing for dolls and the same for humans is the utility which shall be separated from the fashion design. Therefore, the former can be protected while the latter cannot.

Further, elements that physically or conceptually can be identified as separable from the utilitarian aspects of a useful article. A useful article that is conceptually, though not physically, separable from its utilitarian elements is copyrightable.²¹

The *Mazer* rule is codified that if the shape of an article is "dictated solely by a utilitarian function of the article that embodies it," the design element cannot be protected under copyright law. This means that designs *per se* are not protected but pictorial, graphic, or sculptural works which are physically or conceptually separable from the design - such as a textile print or ornamental embellishment - are protectable.

Conceptual separability exists where there is substantial likelihood that even if the article had no utilitarian use it would still be marketable to some significant segment of the community simply because of its aesthetic qualities. As illustrated in *Kieselstein-Cord v. Accessories by Pearl, Inc.*,²² buckle could be viewed as an art collectible or pendant even if it lacked its usability as a belt buckle.²³ Conceptual separability element is difficult for designers to fulfill and often, designs are not separable from the overall physical clothing.²⁴

In the *Brandir International, Inc. v. Cascade Pacific Lumber Co.* case,²⁵ the "ribbon" bicycle rack at issue is described as "elegant" and "functional" by the Industrial Designers Society of America, however Professor Viva Moffat criticized that these terminology cannot be physically separated due to its aesthetically functional nature.²⁶ In *Brandir*, the Second Circuit, among the variety of tests that had been used, ultimately adopted a test proposed by Professor

¹⁶ Jimenez & Kolsun, *supra* note 14, at 65.

¹⁷ 957 F. Supp. at 484.

¹⁸ DuBoff, *supra* note 7, at 305, 314.

¹⁹ 299 F.2d 533 (1924).

²⁰ Jimenez & Kolsun, *supra* note 14, at 58.

²¹ DuBoff, *supra* note 7, at 315.

²² *Kieselstein-Cord v. Accessories by Pearl, Inc.*, 632 F.2d 989 (2d Cir. 1980).

²³ Kaitlyn N. Pytlak, *The Devil Wears Fraud-a: An Aristotelian-Randian Approach to Intellectual Property Law in the Fashion Industry*, 15 Va. Sports & Ent. L.J. 273, 281 (2016).

²⁴ *Id.*

²⁵ *Brandir Int'l, Inc. v. Cascade Pac. Lumber Co.*, 834 F.2d 1142 (2d Cir. 1987).

²⁶ Moffat, *supra* note 8, at 613.

Robert Denicola in a 1983 law review article.²⁷

However, as shown in *Star Athletica, LLC v Varsity Brands, Inc.*, although the “arrangement of stripes, chevrons, zigzags, and color-blocking in the garment designs” simultaneously has expressive and utilitarian aspects,²⁸ the U.S. Supreme Court (USSC) nevertheless held that only design features that can be separated from a garment or other utilitarian or useful item qualify for copyright protection in the U.S.²⁹ The USSC pointed out that 17 U.S.C.S. §101 has afforded limited protection for these artistic elements by providing that pictorial, graphic, or sculptural features of the design of a useful article are eligible for copyright protection as artistic works “if those features can be identified separately from, and are capable of existing independently of, the utilitarian aspects of the article”.³⁰ The R.O.C. Copyright Act does not have similar regulations in this regards.

Some scholars argue that there are conceptual shortcomings of *Star Athletica*,³¹ because that the inconsistent treatment of clothing being of utilitarian use or separable may create significant unpredictability.³²

B. Utilitarian and Aesthetic Functionality in Trademark Regime

To acquire trademark protection, a fashion design merely equipped with distinctiveness is not sufficient, a further showing of being separated from the utility or functionality is needed, to ensure that trademark law is not used to enable claimants acquiring competitive advantage unduly. Accordingly, the R.O.C. Trademark Act §30(I)(1) mandates that a trademark shall not be registered if it is “exclusively necessary for the goods or services to be functional”.³³ On the other hand, the U.S. trademark case law refuses to render protection to functional trademarks and trade dress. However, the functionality is not defined in the U.S. trademark law, while the proponent of an unregistered trade dress must prove its absence.³⁴

Functionality is very important, because the separating or channeling device in trademark regime is based on functionality mechanism.³⁵ The U.S. Trademark doctrine categorizes two kinds of functionality concepts, i.e., the “utilitarian functionality” and the “aesthetic functionality.” Both are set forth to prevent trademark owners from using trademarks to gain advantages unduly. The former could also occur if the mark extended to cover useful product features where competitors were prohibited from producing. It could also occur if the mark extended to product features that consumers desired to purchase irrespective of their source

²⁷ *Id.*, at 614.

²⁸ Christopher Buccafusco and Jeanne C. Fromer, *Fashion's Function in Intellectual Property Law*, 93 Notre Dame L. Rev. 51, 86 (2017).

²⁹ *Star Athletica, LLC v Varsity Brands, Inc.*, 580 U.S. 405; 137 S. Ct. 1002 (2017).

³⁰ 17 U.S.C.S. §101. (...the design of a useful article, as defined in this section, shall be considered a pictorial, graphic, or sculptural work only if, and only to the extent that, such design incorporates pictorial, graphic, or sculptural features that can be identified separately from, and are capable of existing independently of, the utilitarian aspects of the article.)

³¹ Buccafusco and Fromer, *supra* note 28, at 85.

³² Andrew Beckerman-Rodau, *The Problem With Intellectual Property Rights: Subject Matter Expansion*, 13 Yale J. L. & Tech. 35, 79.

³³ R.O.C. Trademark Act, §30, para.1 cl.1. (A trademark shall not be registered in any of the following: (1) being exclusively necessary for the goods or services to be functional).

³⁴ 15 U.S.C. §1125(a)(3) (2012).

³⁵ Deborah J. Krieger, *The Broad Sweep of Aesthetic Functionality: A Threat to Trademark Protection of Esthetic Product Features*, 51 Fordham L. Rev. 345 (1982).

identifying function.³⁶ The safest trademarks and trade dress, then, will be those that are merely ornamental or are arbitrarily related to the product. However, many aspects of clothing design will have some degree of trade dress functionality.³⁷

Monopoly concerns existed inherently in early trademark infringement cases. Later, these concerns materialized in the doctrine of aesthetic functionality in trade dress protection.³⁸ Courts have developed the doctrine of "aesthetic functionality" to prevent trade dress from imposing these costs.³⁹

In *Christian Louboutin v. Yves Saint Laurent America*, the issue arose of whether a single color may serve as a legally protected trademark. The district court said the red sole is aesthetically functional, and therefore ineligible for protection, while the Second Circuit decided to the opposite.⁴⁰ There are cases creating certain grey areas which render the distinctiveness hard to identify. For example, in *Qualitex*, the court held that a single color, almost never inherently distinctive, would have come to identify and distinguish the goods.⁴¹

Features of clothing design that make the wearer look "thinner, bigger, taller, or curvier" should be treated as functional if that they confer an unfair competitive advantage. It is decided by *Brunswick Corp. v. British Seagull Ltd.*,⁴² that "objects colored black appear smaller than they do when they are painted other lighter or brighter colors," because purchasers often desire motors to look smaller. However, whether functionality is better labeled "utilitarian" or "aesthetic" should be subject to the recognition that design can have functional effects.⁴³

In *TraFFix Devices, Inc. v. Mktg. Displays, Inc.*, the USSC addressed the definition of functionality in trade dress context.⁴⁴ In this case, Marketing Displays, Inc. (MDI) sued TraFFix Devices, Inc. (TraFFix) claiming that TraFFix manufactured and sold the dual-spring upright support signs copied from MDI under the Trademark Act for trade dress infringement. The district court ruled against MDI on, *inter alia*, functionality. The Second Circuit reversed based on a modified aesthetic functionality test drawn from the new Restatement (Third) of Unfair Competition, holding that a design is "functional because of its aesthetic value only if it confers a significant benefit that cannot practically be duplicated by the use of alternative designs."⁴⁵ The USSC ruled that the dual-spring support is a functional feature for which there is no trade dress protection, and MDI's claim is barred.⁴⁶

However, the TraFFix case had left lower courts struggling with functionality generally and aesthetic functionality in particular.⁴⁷ In *Au-Tomotive Gold, Inc. v. Volkswagen of America*,

³⁶ Buccafusco and Fromer, *supra* note 28, at 94-95.

³⁷ *Id.*, at 96.

³⁸ Xiaoren Wang, Aesthetic Functionality at A Crossroads: What A Troublesome Doctrine Can Learn From Its Past, 19 Chi.-Kent J. Intell. Prop. 357, 359 (2020).

³⁹ Buccafusco and Fromer, *supra* note 28, at 95.

⁴⁰ *Christian Louboutin S.A. v. Yves Saint Laurent Am. Holding, Inc.*, 696 F.3d 206 (2d Cir. 2012).

⁴¹ *Qualitex Co. v. Jacobson Products Co.*, 514 U.S. 159, 162-63 (1995).

⁴² *Brunswick Corp. v. British Seagull Ltd.*, 35 F.3d 1527 (Fed. Cir. 1994).⁴³ Buccafusco and Fromer, *supra* note 28, at 96-97; 1202.02(a)(vi), TMEP, USPTO.

⁴³ Buccafusco and Fromer, *supra* note 28, at 96-97; 1202.02(a)(vi), TMEP, USPTO.

⁴⁴ *TraFFix Devices, Inc. v. Marketing Displays, Inc.*, 532 U.S. 23 (2001).

⁴⁵ Graeme B. Dinwoodie, The Death of Ontology: A Teleological Approach to Trademark Law, 84 Iowa L. Rev. 611 (1999).

⁴⁶ *TraFFix*, *supra* note 44, at 28-35.

⁴⁷ Andrew F. Halaby, "The Trickiest Problem with Functionality" Revisited: A New Datum Prompts A Thought Experiment, 63 N.Y.U. Ann. Surv. Am. L. 151, 168-169 (2007).

Inc.,⁴⁸ Au-Tomotive Gold, Inc. (Auto Gold) sold marquee license plates bearing authentic Volkswagen badges purchased from Volkswagen company (Volkswagen) and Audi company (Audi). Auto Gold sued Volkswagen and Audi, seeking a declaratory judgment that it did not constitute, *inter alia*, trademark infringement.

The district court found for Auto Gold, and explained that VW and Audi logos are used not because they signify the designation of origin, but because there is an aesthetic quality to the marks that purchasers are interested in having.⁴⁹ The Ninth Circuit followed the *Inwood* formulation that a feature is functional if it is essential to the use or purpose of the article or affects its cost or quality;⁵⁰ and, if a feature is functional under *Inwood* formulation, the inquiry ends and it cannot be protected under trademark law.⁵¹ The court added aesthetic functionality has been limited to product features that serve an aesthetic purpose wholly independent of any source-identifying function.⁵² Therefore, the Ninth Circuit reversed and remanded this case.⁵³

After these cases, courts and practitioners still struggle with the concept of "aesthetic functionality."⁵⁴ Halaby citing Posner, noted that the problem with functionality is "aesthetic" as distinct from "utilitarian" functionality,⁵⁵ while Beckerman-Rodau pointed out that inconsistent treatment of clothing creates significant unpredictability.⁵⁶

C. Ornamentality in Patent Regime

For a fashion design to acquire the design patent protection, merely equipped with novelty and nonobviousness is not sufficient, a showing of being separated from the utility is needed.

A good interpretation to the separation is that the design is "not to the design of the article, and but to design for the article". It means that in a design patent application, the subject matter which is claimed is the design embodied in or applied to an article of manufacture and not the article itself.⁵⁷ The channeling device in patent law is still based on the functionality mechanism. However, the statutory terms used in this regard are rather counterintuitive. For example, the R.O.C. Patent Act §121 provides that a design is creation made in respect of shape, pattern, color, or any combination thereof, of an article as a whole or in part by "visual appeal".⁵⁸ The corresponding 35 U.S.C. §171(a) provides that an "ornamental" design for the article of manufacture may be granted protection under patent law.⁵⁹

The enacting of this seemingly odd term "ornamental" is conducted based on historical events. While seeking to eliminate confusion caused by the term "useful" in the U.S. Patent Law, the then Patent Commissioner Allen requested the insertion of "ornamentality" which was added by Congress in 1902.⁶⁰ Commissioner Allen viewed this term as an important channeling device to ensure the design patent law would provide protection to, *inter alia*,

⁴⁸ Au-Tomotive Gold, Inc. v. Volkswagen of America, Inc., 457 F.3d 1062, 1067 (9th Cir. 2006).

⁴⁹ *Id.*, at 1066.

⁵⁰ *Id.*, at 1067.

⁵¹ *Id.*, at 1071.

⁵² *Id.*, at 1073.

⁵³ *Id.*, at 1078.

⁵⁴ Moffat, *supra* note 8, at n214.

⁵⁵ Halaby, *supra* note 48, at 152; Buccafusco and Fromer, *supra* note 28, at 95.

⁵⁶ Beckerman-Rodau, *supra* note 32, at 79.

⁵⁷ 1 Chisum on Patents §23.03.

⁵⁸ R.O.C. Patent Act §121, para.1.

⁵⁹ 35 U.S.C. §171(a).

⁶⁰ Du Mont, *supra* note 1, at 264-265.

“objects of new and artistic quality pertaining to commerce, but not justifying their existence upon functional utility”.⁶¹

Early cases equated ornamentality with aesthetic appeal.⁶² Aesthetic appeal was measured assessing “the designer’s subjective intent” by checking if designer had generated features with “ornamentation or embellishment”;⁶³ and whether a purchaser would have been motivated to buy the article based on the “aesthetic appeal of the design”.⁶⁴ In fact, one court invalidated a design on the ground of lacking in symmetry and wanting in grace.⁶⁵

Other decisions attempted to equate ornamentality with visibility in situations where designs that were hidden or obscured in use would not be capable of promoting progress in the visual arts due to their appearance could not be a “matter of concern” to consumers. And, in *Rowe v. Blodgett & Clapp Co.*, the court invalidated the design patent for horseshoe calk because it was “a mere bit of iron or steel, not intended for display, but for obscure use, and adapted to be applied to the shoe of a horse for use in snow, ice, and mud.” Other invalidation decisions included insulation plugs for electrical lines and internal belt-fastener plates.⁶⁶

There is criticism utters that it would eliminate certain product classes from protection altogether, even if products displayed a high degree of design excellence.⁶⁷ And, in determining whether a design is primarily functional or primarily ornamental the claimed design is viewed in its entirety, i.e., for the ultimate question is not the functional or decorative aspect of each separate feature, but the overall appearance of the article.⁶⁸

Like what we have enacted in the R.O.C. Patent Act §124(I)(2),⁶⁹ fine arts itself are not protectable under patent law. However, the ornamental subject matter shall be attached to a useful subject matter to be protected by the patent law. That is, only ornamental elements of a functional design receive design patents. For this reason, footwear, handbags, and belts are eligible, but clothing is not.⁷⁰

Like what we have enacted in the R.O.C. Patent Act §124(I)(1),⁷¹ the U.S. patent case law provides that a design patent shall not be granted if the shape of an article solely dictated by its function,⁷² It is an idea analogous to the utility concept restrained in copyright law. And to some degree, analogous to the one in trademark law. Therefore, designers should ensure the subject matter designed is ornamental without having any functionality.

In *L.A. Gear v. Thom McAn*,⁷³ the defendant argued that patented design element was part of upper that serves that functional purpose of holding the foot in place, and therefore not protected under the patent law. However, the court reasoned that plaintiff’s protected subject

⁶¹ S. Rep. No. 57-1139, at 3 (1902).

⁶² Du Mont, *supra* note 1, at 265-269.

⁶³ *Id.*, at 266.

⁶⁴ *Id.*

⁶⁵ *Id.*, at 267.

⁶⁶ *Id.*, at 264, 269.

⁶⁷ *Id.*, at 269-270.

⁶⁸ Pytlak, *supra* note 23, at 285.

⁶⁹ R.O.C. Patent Act §124, para.1 cl.2. (A design patent shall not be granted in respect of any of the following: 2. fine arts).

⁷⁰ Pytlak, *supra* note 23, at 285.

⁷¹ R.O.C. Patent Act §124, para.1 cl.1. (A design patent shall not be granted in respect of any of the following: 1. the shape of an article solely dictated by its function).

⁷² *L.A. Gear, Inc. v. Thom McAn Shoe Co.*, 988 F.2d 1117, 1123 (Fed. Cir. 1993).

⁷³ *Id.*, at 1117.

matter is not functional because its primary objective of the design was instead an ornamental one. In determining whether a fashion design is primarily functional or primarily ornamental, claim to design is viewed in its entirety, with question being whether claimed overall design of article is dictated by utility and purpose of article. When there are several ways to achieve the function of article of manufacture, design of article is more likely to serve primarily ornamental purpose and thus be patentable.⁷⁴

Determining whether a fashion design is primarily functional or primarily ornamental is, to some degree, similar to the identifying of aesthetic functionality in trademark regime, as previous-shown in *Au-Tomotive Gold*,⁷⁵ which also remind us the *Star Athletica* in copyright regime.⁷⁶ This common finding demonstrates the involvement by “aesthetics” in functionality mechanism, which caused lacking of a common guideline for providing feasible references and standards.

III. Regarding the Multi-Faceted “Aesthetics”

Fashion designs are considered aesthetic or at least contain aesthetic ingredients. customers purchasing clothing, cosmetics, handbags, jewelries, or footwear, etc., to some degree, are motivated by their aesthetically pleasing appearances.⁷⁷

Due to its metaphysics nature, “aesthetics” has been ambiguous for centuries despite of various thoughts trying to explain it. Neither have the nature of aesthetics nor meaning of these aesthetics-related terms been clarified in intellectual property laws, because they were deemed beyond the scope of legal studies.⁷⁸

In fact, “aesthetics” is multi-faceted in intellectual property law arena because aesthetic-related terms can be found in statutes and case laws, and in essence entangled with creativity and functionality mechanisms. Since so many issues are under influence of “aesthetics”, there is a need to discuss it.

A. The Nature of Aesthetics

There are schools of thoughts seeking to answer the inquiry of “what is aesthetic”. Greek philosophers responded to it as the sensibility or “responsiveness to stimulation of the senses”.⁷⁹ And Hutcheson describes it as “an idea caused by the feature of uniformity amidst variety”.⁸⁰ These blurring responses to the straightforward inquiry does not seem to provide clear answers, rather mysterious ones.

For consideration of aesthetics related to fashion designs instead of beauty of nature, the scope of discussion should be narrowed down to the inquiry of artistic beauty, e.g., fine art, work of art or good art, etc.

⁷⁴ *Id.*, at 1123.

⁷⁵ See *supra* note 49 and accompanying texts.

⁷⁶ See *supra* note 29 and accompanying texts.

⁷⁷ Du Mont, *supra* note 1, at 266.

⁷⁸ Anya Jenkins Ferris, Real Art Calls for Real Legislation: An Argument Against Adoption of the Design Piracy Prohibition Act, 26 Cardozo Arts & Ent. L.J. 559, 577-578 (2008).

⁷⁹ Blakeney, *supra* note 12, at 246.

⁸⁰ Ulianov Montano, *Explaining Beauty in Mathematics: An Aesthetic Theory of Mathematics*, Springer (2014), at 25. (ISBN(s): 9783319034522, 3319353810, 3319034529, 3319034510)

In fact, artistic beauty is more accessible to us than the beauty of nature.⁸¹ Specifically, “fine art” is usually taken to include those arts which are “the product of human intellectual activity which seek expression through beautiful or significant modes, as painting, sculpture, music and other aesthetic creations”.⁸² Alternatively, it is suggested that a “work of art” is a thing expressive of beauty.⁸³ When answering what is “good art”, Baumgarten characterized aesthetics as “an issue of taste, in which good taste was an evaluation of objective beauty”.⁸⁴

Artistic beauty had been interpreted by either objective aspects or subjective aspects. Greek philosophers exercised their attention on the objective aspects, while modern scholars adopt subjective aspects in the first phrase,⁸⁵ but return to objectivism currently.⁸⁶ For example, current scholars believe that beauty can be expressed in mathematics,⁸⁷ and there are methods for measuring art.⁸⁸

Further, there is an empirical example regarding Chinese calligraphy, a traditional form of aesthetics,⁸⁹ which may show support to objective theory. When trying to introduce beauty of Chinese calligraphy, Professor Qi Gong, who is also a famous calligrapher, inadvertently indicating that the ratio of these words’ segments is 8:5,⁹⁰ a figure essentially equivalent to the Golden Ratio 1.62.⁹¹

On the other hand, Kant and Herder criticized Baumgarten by questioning whether aesthetics could be subject to rules or principles.⁹² McAllister rejects objectivism either, arguing that beauty should not be interpreted as an objective property.⁹³

Among these various interpretations, scholars also seek to verify them based on aesthetic experience. Any psychological definition of art is assumed to encompass some class of experiences called “aesthetic experiences”.⁹⁴ Both Monroe Beardsley and George Schlesinger have similar opinions in this regard. For Beardsley, he defined that artwork is “either an arrangement of conditions intended to be capable of affording an experience with marked aesthetic character or an arrangement belonging to a class or type of arrangements that is

⁸¹ Maurice de Wulf, *Art and Beauty*, Routledge (2017), at 38. (ISBN-13: 978-1351273909)

⁸² Blakeney, *supra* note 12, at 246.

⁸³ Wulf, *supra* note 82, at 36.

⁸⁴ Blakeney, *supra* note 12, at 246.

⁸⁵ Wulf, *supra* note 82, at 39-40.

⁸⁶ *Id.*, at 174-178.

⁸⁷ Nick Riggle, *Explaining Beauty in Mathematics: An EAesthetic Theory of Mathematics by Ulianov Montano*, *The Journal of EAesthetics and Art Criticism*, Fall 2016, Vol. 74, No. 4, pp. 418-420 (Fall 2016).

⁸⁸ Cotter, K. N., Chen, D. F., Christensen, A. P., Kim, K. Y., & Silvia, P. J., *Measuring Art Knowledge: Item Response Theory and Differential Item Functioning Analysis of the EAesthetic Fluency Scale*, *Psychology of EAesthetics, Creativity, and the Arts*, 17(3), 358-368 (2023). <http://dx.doi.org/10.1037/aca0000397> (last visited: 2026/03/11) (DOI:10.1037/aca0000397)

⁸⁹ See Ming Dong Gu, *Patterns of Tao (Dao): The Birth of Chinese Writing and EAesthetics*, *The Journal of EAesthetics and Art Criticism*, The American Society for EAesthetics, SPRING 2016, Vol. 74, No. 2, pp. 151-163 (Spring 2016), Wiley.

⁹⁰ Qi Gong's Classroom of Chinese Calligraphy (啓功講座 啓功講書法).

<https://www.youtube.com/watch?v=ztkJvlfCm50>. (last visited: 2026/03/11)

⁹¹ Mario Livio, *The Golden Ratio: The Story of Phi, The World's Most Astonishing Number* (Broadway Books, 2002). ISBN-10: 0767908155; ISBN-13: 978-0767908153.

⁹² Blakeney, *supra* note 12, at 246.

⁹³ Montano, *supra* note 81, at 31.

⁹⁴ Douglas J. Dempster, *Esthetic Experience and Psychological Definitions of Art*, *The Journal of Aesthetics and Art Criticism*, Winter, 1985, Vol. 44, No. 2, at 154 (Winter, 1985).

typically intended to have this capacity”.⁹⁵ Schlesinger defined that a work of art is “an artifact which under standard conditions provides its percipients with aesthetic experience”.

B. Legal Interpretation of Aesthetics

“Aesthetics” is multi-faceted in intellectual property law arena because aesthetic-related terms can be found in various statutes and case laws.

For the statutes in patent law arena, they can be found in patent laws, e.g., “aesthetic appeal” in P.R.C. Patent Act,⁹⁶ and “aesthetical creation” in U.K. Patent Act;⁹⁷ other similar yet rather neutral terms, e.g., “visual appeal” in R.O.C. Patent Act §121(I),⁹⁸ and “ornamental” in U.S. Patent Law.⁹⁹ Although none of them was set forth in copyright or trademark law, issues related to nature of aesthetic or beauty are concurrently exist in these two intellectual property laws as well.

For the case law in copyright arena, it is found when the USSC in *Feist* held that there must be some injection of independent “aesthetic” or “artistic” judgment in the decisions of whether the party possess the requisite “minimum level of creativity”.¹⁰⁰ Moreover, in *Brandir*, courts and scholars have struggled with the conceptual separability issue when seeking to categorize the scope of “aesthetic”, “art” or “artistic” to solve this problem.¹⁰¹

In the trademark arena, the Court of Customs and Patent Appeals (CCPA) appeared to reject the doctrine of aesthetic functionality in *In re DC Comics, Inc.*¹⁰² Although the USSC later referred to aesthetic functionality as a valid legal concept in *TrafFix*,¹⁰³ confusion is essentially exist. The USPTO explains that the confusion is derived from misuse of the term “aesthetic functionality” in cases involving ornamentation issues, where some courts had mistakenly expanded the category of “functional” marks to encompass matter that is solely ornamental.¹⁰⁴

In design patent arena, the U.S. design patent provisions mandate designs to be ornamental to obtain protection, however the term “non-functional” does not exist. In some cases, courts have attempted to assess ornamentality directly.¹⁰⁵

The history of “ornamentality” in U.S. patent law can be traced back to the nineteenth century. The 1870 Design Act requires only novelty to design. However, commissioner Leggett

⁹⁵ Michael J. Wreen & Donald M. Callen (eds.), *The Aesthetic Point of View: Selected Essays of Monroe C. Beardsley* (Cornell University Press, Ithaca, 1982). M.C. Beardsley, “Redefining Art,” in *ibid.*, 298–315. ISBN: 0801412501, 0801498805.

⁹⁶ Article 2 of the PRC Patent Act (2008). (For the purposes of this Law, invention-creations mean inventions, utility models and designs. Designs mean, with respect to a product, new designs of the shape, pattern, or the combination thereof, or the combination of the color with shape and pattern, which are rich in an aesthetic appeal (美感) and are fit for industrial application.)

⁹⁷ Blakeney, *supra* note 12, at 246.

⁹⁸ Article 121, paragraph 1 of the ROC Patent Act. (Design means the creation made in respect of the shape, pattern, color, or any combination thereof, of an article as a whole or in part by visual appeal (視覺訴求)).

⁹⁹ 35 U.S.C. §171(a).

¹⁰⁰ Howard B. Abrams, “Originality and Creativity in Copyright Law,” 55 *Law & Contemporary Problems* 3–44 (Spring 1992).

¹⁰¹ Moffat, *supra* note 8, at 614.

¹⁰² *In re DC Comics, Inc.*, 689 F.2d 1042, (C.C.P.A. 1982).

¹⁰³ *TrafFix*, *supra* note 44, at 1006.

¹⁰⁴ 1202.02(a)(vi), TMEP, USPTO.

¹⁰⁵ Du Mont, *supra* note 1, at 264.

in *Ex parte Weinberg*,¹⁰⁶ a case with issue of whether color changes in surface ornamentation alone could form the proper subject of a design patent, held that design patents were then carried to a higher standard than utility patent, which somehow measured by their aesthetic effect.¹⁰⁷ In 1902, the ornamentality was set forth in U.S. design patent regulation.

“Ornamentality” criterion is deemed as a channeling device to protect objects of new and artistic quality pertaining to commerce but not justify their existence upon functional utility.¹⁰⁸ Early cases deemed ornamentality as aesthetic appeal, which was measured either by assessing the designer’s subjective intent, or purchasers’ motivation objectively caused by aesthetic appeal of the design.¹⁰⁹

Courts other than CCPA had exercised artistic judgments. For example, “lacking in symmetry, wanting in grace, and destitute of any appeal to the senses or emotions”. On the other hand, the CCPA commented that “the beauty and ornamentation requisite in design patents is not confined to such as may be found in the ‘aesthetic or fine arts’”. So, the threshold for beauty seemed to be quite low.¹¹⁰

In *Bliss v. Gotham Indus., Inc.*, the court held that the design must “appeal to the eye as a thing of beauty”;¹¹¹ an aesthetical or ornamental subject matters is not a thing of beauty if it “does not relate more to appearance and to matters of ornament than to utility and does not appeal to the aesthetic emotion”.¹¹² In *Blisscraft of Hollywood v. United Plastics Co.*, the court held that “to be patentable, a design, in addition to being new and inventive, must be ornamental. This means that it must be the product of aesthetic skill and artistic conception...”¹¹³

Moreover, the objective theory can be found in, e.g., *Star Athletica* wherein the “arrangement of stripes, chevrons, zigzags, and color-blocking in the garment designs” may make wearer “look thinner, bigger, taller, or curvier”;¹¹⁴ *Brunswick*, wherein objects colored black appear smaller.¹¹⁵ And, similar to traditional ways of finding the nature of aesthetics, as above-mentioned, there are studies conducted through psychological lens, e.g., Hughes proposes that the aesthetic functionality cases are actually about cognitive or psychological responses in consumers,¹¹⁶ not aesthetics *per se*.¹¹⁷

IV. Analyses and Suggestions

A. Seeking an Overarching Channeling Device

Intellectual property protection should be given by examining not only creativity but also, for fulfilling the requirement of fair competition, functionality is utilized as a channeling device

¹⁰⁶ *Ex parte Weinberg*, 1871 Dec. Comm’r Pat. 244 (1871).

¹⁰⁷ Jason J. Du Mont, A Non-Obvious Design: Reexamining the Origins of the Design Patent Standard, 45 Gonz. L. Rev. 531, 568-569 (2010).

¹⁰⁸ Du Mont, *supra* note 1, at 265.

¹⁰⁹ *Id.*, at 265-266.

¹¹⁰ *Id.*, at 267.

¹¹¹ *Chisum*, *supra* note 58, at 12.

¹¹² *Bliss v. Gotham Indus., Inc.*, 316 F.2d 848 (9th Cir. 1963).

¹¹³ *Blisscraft of Hollywood v. United Plastic Company*, 294 F.2d 694, 131 USPQ 55 (2d Cir. 1961).

¹¹⁴ See *supra* note 29 and accompanying texts.

¹¹⁵ See *supra* note 42 and accompanying texts.

¹¹⁶ Justin Hughes, *Cognitive and Aesthetic Functionality in Trademark Law*, 36 Cardozo L. Rev. 1227, 1230 (2015).

¹¹⁷ *Id.*, at 1251.

to prevent functional features used as trademarks from being lost forever, or copyright to enjoy longer periods of protection.

Channeling is needed, but functionality had been applied aimless and inconsistent, so how to achieve the goal is challenging.¹¹⁸ Moreover, when terms, i.e., “conceptual” separability to copyright, “aesthetical” functionality to trademark and “ornamental” to design patent were involved, the task is even more challenging, wherein multiple examples are as follows.

In copyright regime, the legislative history considers *Mazer's* decision as follows: “works of art which are incorporated into the design of useful articles, but which are capable of standing by themselves as art works separate from the useful article, are copyrightable.”¹¹⁹ But the USSC did not seem to provide a clear concurring opinion in that case, neither did the Second Circuit in *Brandir* case to provide a guideline to conceptual separability.¹²⁰ Until the USSC ruled on separability in *Star Athletica*, Congress and lower courts recognized physical and conceptual separability that could form the basis of valid copyrights.¹²¹ According to the dual nature mentioned above, there are conceptual shortcomings of *Star Athletica*, and the core problem is the conceptual separability.

Professor Moffat suggests adapting trademark's functionality doctrine for solving the channeling problem in copyright regime,¹²² he believes, in so doing, a bright line between copyright and patent systems can be drawn.¹²³ The functionality test asks whether a product feature is “essential” to the use or purpose of the item.¹²⁴ It may not receive protection if it is. The same apply to situations where the product feature affects the cost or quality of the article.¹²⁵ Both inquiries exclude usefulness, leaving them in the public domain unless they would acquire patent protection.¹²⁶

In the trademark regime, aesthetic functionality is confusing,¹²⁷ and Richard Posner particularly expressed doubt that any “simple rule” could be used to decide aesthetic functionality cases.¹²⁸ And Professor Hughes doubts whether aesthetic functionality is able to respond to valorization of trademarks because that would wipe out much of modern marketing, branding, and trademark law.¹²⁹

In view of the problem in the trademark regime, Krieger suggests applying the traditional utilitarian standard to aesthetic product features.¹³⁰ Halaby suggests producing an alternative definition, by which a product feature is “functional” if it supplies what the consumer wants besides the mere identification of the product's source. Applying that definition, a product feature whether utilitarian, aesthetic, or both, would be deemed functional whether the feature also serves a source-identifying role.¹³¹

¹¹⁸ Buccafusco and Fromer, *supra* note 28, at 83.

¹¹⁹ H.R. Rep. No. 94-1476, at 50 (1976).

¹²⁰ Moffat, *supra* note 8, at 614.

¹²¹ Buccafusco and Fromer, *supra* note 28, at 68.

¹²² Moffat, *supra* note 8, at 660-664.

¹²³ *Id.*, at 615.

¹²⁴ *Qualitex Co. v. Jacobson Prods. Co.*, 514 U.S. 159, 165 (1995).

¹²⁵ *Id.*

¹²⁶ Moffat, *supra* note 8, at 653-62.

¹²⁷ *Du Mont*, *supra* note 1, at 281.

¹²⁸ *W.T. Rogers Co., Inc. v. Keene*, 778 F.2d 334, 340 (7th Cir. 1985).

¹²⁹ Hughes, *supra* note 117, at 1284-1285.

¹³⁰ Krieger, *supra* note 35, at 378.

¹³¹ Halaby, *supra* note 48, at 153.

In design patent regime, the design patent law calls for designs to be ornamental in order to be protected, but does not treat the "ornamentality" requirement as an affirmative condition that designs be aesthetically pleasing, rather the law has long seen this threshold requirement to mean that designs simply be "non-functional", treating it as the converse of ornamentality.¹³² However, the term "non-functional" does not exist in statute.¹³³

In view of the problem in design patent regime, although the distinctiveness does not seem to be involved with aesthetic issues mentioned earlier, Professor Dratler suggests abandoning the "aesthetic functionality" doctrine, instead using "aesthetic distinctiveness" as a test for design patent, for purpose of resolving the channeling problem in design patent regime.¹³⁴

However, these are merely solutions for individual regime's problems, there is a need to find a channeling device which can serve all three intellectual property regimes. This article suggests taking dual-nature functionality doctrine, which would provide a common guideline across the board as an overarching channeling device advocated by Professors Buccafusco and Fromer.¹³⁵

According to his doctrine, a fashion design can be categorized as being: (1) only pictorial, graphic, or sculptural (or "expressive"); (2) only utilitarian (or functional); or (3) both expressive and utilitarian.¹³⁶ The third one is recognized as the dual-nature component.¹³⁷

The first two categories are straightforward. They encompass design features that are either purely expressive or purely utilitarian, respectively. For example, a cartoon character screen-printed on the front of a T-shirt is likely to be purely expressive, while the shape of an internal part of an automotive engine is purely functional. The existence and content of the third category may seem less clear,¹³⁸ for example, the design of pockets on a pair of trousers may be stylish, but they also provide usefulness because the pockets allow the wearer placing a wallet. Dual-nature design features, however, should not be protected by copyright law because these features cannot be treated as separable under any test for separability.¹³⁹

Professors Buccafusco and Fromer point out that the doctrine applies to two other laws because there is significant relationship between functionality and trademark;¹⁴⁰ and design patent law ought to take account of these dual-nature design features in fashion as well.¹⁴¹ This article further concludes that dual-nature functionality doctrine shall be adopted for serving all three laws because the dual-nature functionality doctrine perhaps is the best option the fashion law can have from the perspective of legal regulation.

B. Adopting Aesthetics-Neutral Terms

Finding of the true meaning of aesthetic is a task adjacent to metaphysics, there are

¹³² Buccafusco and Fromer, *supra* note 28, at 100.

¹³³ Du Mont, *supra* note 1, at 264.

¹³⁴ Jay Dratler, Jr., *Trademark Protection for Industrial Designs*, 1988 U. Ill. L. Rev. 887, ~~3, 56, 61~~890, 896, 901 (1988).

¹³⁵ Buccafusco and Fromer, *supra* note 28, at 99.

¹³⁶ *Id.*, at 67-68.

¹³⁷ *Id.*, at 54.

¹³⁸ *Id.*, at 68.

¹³⁹ *Id.*, at 83.

¹⁴⁰ *Id.*, at 99.

¹⁴¹ *Id.*, at 107.

scholars suggest that it may surpass our legal competency.¹⁴² As above-mentioned, courts and academics in the intellectual property legal systems never intended to find out the true meaning of “aesthetics”, but rather used that term exclude utility or functionality. Unfortunately, given the current chaotic situation, this goal is not reached either.

Indeed, the U.S. design patent provisions mandate designs to be ornamental to be protected. However, design patent law does not require designs be aesthetically pleasing, rather the law has long required that designs simply be “non-functional”,¹⁴³ but the term “non-functional” does not exist in statute.¹⁴⁴ It is no wonder that Judge Learned Hand remarked that “in aesthetics there are no standards”.¹⁴⁵

Since the insertion of ornamentality into U.S. design patent regulation in 1902, the practical benefits are minimal by witnessing two unattractive results. First, ornamentality had entangled judicial speculation with artistic merit, triggering a search for limiting guidelines, the same problem that annoy the functionality doctrine. Second, ornamentality had devolved into a demands of visibility. Both situations have room for improvement.¹⁴⁶

Early cases deemed ornamentality as aesthetic appeal,¹⁴⁷ so the terms “ornamentality” and “aesthetics” are, during that period, arguably interchangeable. However, the chaotic entanglements between aesthetics and creativity and functionality mechanisms were created and had not faded away.

Entanglement of aesthetics with creativity mechanism can be shown in several cases, e.g., in *Feist*, the USSC pointed out the existence of a relationship between aesthetic and creativity; in *Qualitex*, the court held that a single color, although not inherently distinctive, but would have come to identify and distinguish the goods.¹⁴⁸

Moreover, entanglements of aesthetics with functionality mechanism can be shown in the *Star Athletica* in copyright regime;¹⁴⁹ *Au-Tomotive Gold* in trademark regime;¹⁵⁰ and *L.A. Gear* in design patent regime.¹⁵¹

Although this article suggests that aesthetics does exist, and objectively exist, as shown in Professor Qi Gong case, however others support that psychological reaction is a subjective acceptance of aesthetics, as shown in *Star Athletica* case. Nevertheless, it is difficult to define, discern or verify in most cases. whether functionality is better labeled “utilitarian” or “aesthetic” should be subject to the recognition that design can have functional effects,¹⁵² so “aesthetics”-related terms shall be avoided and abolished, or replacing by an aesthetics-neutral term to avoid above-mentioned problems.

It is noted that the EU does not require ornamentality or aesthetics operating in either the validity or scope context,¹⁵³ so it does not seem to have associated problem. On the other hand,

¹⁴² Wulf, *supra* note 82, at 39, 174; see Montano, *supra* note 81.

¹⁴³ Buccafusco and Fromer, *supra* note 28, at 100.

¹⁴⁴ Du Mont, *supra* note 1, at 264.

¹⁴⁵ H.C. White Co. v. Morton E. Converse & Son Co., 20 F.2d 311, 312 (2d Cir. 1927).

¹⁴⁶ *Id.*, at 264.

¹⁴⁷ *Id.*, at 265-266.

¹⁴⁸ *Qualitex Co. v. Jacobson Products Co.*, 514 U.S. 159, 162–63 (1995).

¹⁴⁹ See *supra* note 29 and accompanying texts.

¹⁵⁰ See *supra* note 49 and accompanying texts.

¹⁵¹ See *supra* note 73 and accompanying texts.

¹⁵² Buccafusco and Fromer, *supra* note 28, at 97.

¹⁵³ Du Mont, *supra* note 1, at 287.

as above-mentioned, the term “ornamental” in U.S. Patent Act is obscure and indefinite, obviously inviting many problems, and therefore this article does not suggest including it. Several aesthetics-neutral terms can be found in various legal systems, e.g., “visually perceptible” in TRIPS,¹⁵⁴ and “visual appeal” in R.O.C. Patent Act. This article suggests recognizing and maintaining our statutory language.

C. New Challenge by Contemporary Art

The contemporary art is a significant variant in patent regime, and some suggest that it is the future of fashion.¹⁵⁵ The relationship between contemporary art and patenting was established by, e.g., Richard Buckminster Fuller, who shown ideas in his inventions, “artifacts”. These works of art and inventions reflect the complexity of lived experience and confront misconceptions about the ambiguity of space and time.¹⁵⁶

Contemporary art can be patented due to its utility element is predominantly presented, e.g., an artistic method is claimed by filing a utility patent.¹⁵⁷ It is worthy to consider that whether contemporary art would be treated differently so it falls outside of exclusion from patentability of fine art.¹⁵⁸ In fact, the contemporary art is in essence differently from fine art, especially when drafting the method claim(s).¹⁵⁹ For example, in 2003 several contemporary art patent applications include “Method and Apparatus for Finding Love” by Catherine Richards and W Martin Snelgorove filed with the USPTO.¹⁶⁰

In the same token, another kind of contemporary art, bioart, including DNA-related subject matters, may be granted a utility patent, but not a design patent.¹⁶¹ Many patents had been granted to bio-technology related inventions, wherein green fluorescent proteins (GFP) alone have been granted patents amounted to tens of thousands. The GFP Bunny is a famous bioart, a work produced in 2000 by Eduardo Kac.¹⁶²

It is likely that contemporary art, along with visual fashion, will be part of fashion industries.¹⁶³ The protectability of these new subject matters shall be put into consideration, including virtual fashion’s functionality,¹⁶⁴ and virtual fashion’s nonobviousness.¹⁶⁵ However, their patent rights are seemingly utility patents rather than design patents,

It may bring challenges to application of “aesthetics” upon these contemporary arts and raises a question about whether they are eligible to be subject matters in design patent realm. It is imaginable that customers may acquire senses of “aesthetics” from, e.g., claims of “Method and Apparatus for Finding Love” and/or GFP Bunny.¹⁶⁶ These situations may further

¹⁵⁴ TRIPS §15. 1...Members may require, as a condition of registration, that signs be visually perceptible.

¹⁵⁵ Gibson, Johanna, “When games are the only fashion in town: Covid-19, Animal Crossing, and the future of fashion,” *Queen Mary Journal of Intellectual Property* 11(2) (2021): 117 – 123.DOI: 10.4337/qmjip.2021.02.00 • ISSN : 2045-9815 (Online)

¹⁵⁶ Blakeney, *supra* note 12, at 249.

¹⁵⁷ *Id.*, at 259-260.

¹⁵⁸ *Id.*, at 248.

¹⁵⁹ *Id.*, at 259.

¹⁶⁰ *Id.*, at 254.

¹⁶¹ *Id.*, at 255.

¹⁶² *Id.*, at 255.

¹⁶³ Jason J. Du Mont and Mark D. Janis, *Virtual Designs*, 17 STAN. TECH. L. REV. 107 (2013).

¹⁶⁴ *Id.*, at 173-175.

¹⁶⁵ *Id.*, at 167.

¹⁶⁶ Aesthetics covers varieties of beauties, e.g., a poignant scene and sublime, etc.

complicate the already troublesome “aesthetics”-related events.

It is noted that, although contemporary art may be part of fashion industries, before design patents granted to them, they are not in design patent regime yet according to the current intellectual property regulations.

However, if they satisfy requirements, e.g., “aesthetic appeal” in P.R.C. Patent Act,¹⁶⁷ and “aesthetical creation” in U.K. Patent Act; “visual appeal” in R.O.C. Patent Act §121(I), and “ornamental” in U.S. Patent Law, they will have design patents been granted pursuant to current regulations.

V. Conclusion

For maintaining a fair competition environment, channeling devices are mandated by intellectual property law to separate utility or function from ornamental or aesthetic attribute of fashion designs. These channeling devices consist of copyright law’s “physical and conceptual separability”; trademark law’s “utilitarian and aesthetic functionality”; and design patent law’s “ornamentality”. However, these channeling devices are not able to provide clear guidelines due to the involvement of “aesthetics” in functionality mechanism. So, a discussion in this regard shall be conducted because it will affect the eligibility of protection to the fashion designs.

Fashion designs are considered aesthetic or at least contain aesthetic ingredients. Customers purchasing clothing, cosmetics, handbags, jewelries, or footwear, etc., to some degree, are motivated by their aesthetically pleasing appearances. It is found that “aesthetics” is multi-faceted in intellectual property law arena when aesthetic-related terms can be found in statutes and case laws, and in essence entangled with creativity and functionality mechanism.

This article suggests an overarching channeling device based on the dual-nature functionality doctrine to provide a common guideline and clear current chaos. Further, legal interpretation of aesthetics has been very confusing, and invites many problems. Terms such as “ornamental” in U.S. Patent Act is very troublesome because it is obscure and indefinite. Instead, aesthetics-neutral terms, e.g., “visual appeal” in R.O.C. Patent Act are preferable, and this article suggests that we shall advocate this statutory term.

Although contemporary art, e.g., bioart, is a significant variant in patent regime, some believe that it is the future of fashion industries, and contemporary art, along with visual fashion, will be part of fashion items. Their patents are utility rather than design ones, it raises a question about whether they can be eligible to remain in design patent realm.

This article suggests that, although contemporary art may be part of fashion industries, before design patents granted to them, they are not in design patent regime yet according to the current intellectual property regulations. And the above-mentioned overarching channeling device and aesthetics-neutral terms are still applicable to these contemporary arts if they do have design patents been granted.

¹⁶⁷ Article 2 of the PRC Patent Act (2008). (For the purposes of this Law, invention-creations mean inventions, utility models and designs. Designs mean, with respect to a product, new designs of the shape, pattern, or the combination thereof, or the combination of the color with shape and pattern, which are rich in an esthetic appeal (美感) and are fit for industrial application.)

References

- Abrams, Howard B., Originality and Creativity in Copyright Law, 55 Law & Contemp. Probs., 3 (1992).
- Blakeney, Michael, *Contemporary art and patents*, Queen Mary Journal of Intellectual Property, Vol. 9 No. 3 (2019).
- Buccafusco, Christopher and Fromer, Jeanne C., *Fashion's Function in Intellectual Property Law*, 93 Notre Dame L. Rev. 51 (2017).
- Chen, Cotter, K. N., Christensen, D. F., Kim, A. P., K. Y., & Silvia, P. J., *Measuring Art Knowledge: Item Response Theory and Differential Item Functioning Analysis of the Esthetic Fluency Scale*. Psychology of Esthetics, Creativity, and the Arts, 17(3), 358–368 (2023). <http://dx.doi.org/10.1037/aca0000397> (last visited: 2026/03/11) (DOI:10.1037/aca0000397)
- Dempster, Douglas J., *Esthetic Experience and Psychological Definitions of Art*, The Journal of Esthetics and Art Criticism, Winter, 1985, Vol. 44, No. 2 (Winter, 1985).
- Dratler, Jr., Jay, *Trademark Protection for Industrial Designs*, 1988 U. Ill. L. Rev. 887 (1988).
- DuBoff, Leonard D., What Is Art - Toward a Legal Definition, Hastings Communications and Entertainment Law Journal, Volume 12, Number 3 (1990).
- Ferris, Anya Jenkins, Real Art Calls for Real Legislation: An Argument Against Adoption of the Design Piracy Prohibition Act, 26 Cardozo Arts & Ent. L.J. 559 (2008).
- Gibson, Johanna, *When Games Are the Only Fashion in Town: Covid-19, Animal Crossing, and The Future of Fashion*, Queen Mary Journal of Intellectual Property, Vol. 11 No. 2 (2021).
- Gu, Ming Dong, *Patterns of Tao (Dao): The Birth of Chinese Writing and Esthetics*, The Journal of Esthetics and Art Criticism, The American Society for Esthetics, SPRING 2016, Vol. 74, No. 2 (Spring 2016), Wiley.
- Halaby, Andrew F., *"The Trickiest Problem with Functionality" Revisited: A New Datum Prompts A Thought Experiment*, 63 N.Y.U. Ann. Surv. Am. L. 151 (2007).
- Hsu, Pin-Hua, Fighting for Colors : Aesthetic Functionality Doctrine in Trademark Law - Focusing on Christian Louboutin S.A. v. Yves Saint Laurent America Holding, Chung-Cheng Financial Law Review, Vol. 10 (2015).
- Hsu, Tzu-Chen, Beauty in Design: Explanation and Influence of Aesthetic Character in Design Laws, Vol. 55, Fu Jen Law Review (2017); Xin-Lan Hu, Under My IP Umbrella ? IPR

- Protection to Fashion Design in US, Dong Hai Law Study, Vol. 57 (2019).
- Hughes, Justin, *Cognitive and Esthetic Functionality in Trademark Law*, 36 Cardozo L. Rev. 1227 (2015).
- Jimenez, Guillermo, and Kolsun, Barbara, *Fashion Law - Cases and Materials*, Carolina Academic Press (2016). (ISBN-10: 161163489X; ISBN-13: 978-1611634891)
- Krieger, Deborah J., The Broad Sweep of Esthetic Functionality: A Threat to Trademark Protection of Esthetic Product Features, 51 Fordham L. Rev. 345 (1982).
- Livio, Mario, *The golden ratio and esthetics, The Story of Phi, the World's Most Astonishing Number*, BROADWAY BOOKS New York (2002). <https://plus.maths.org/content/golden-ratio-and-esthetics>. (last visited: 2026/03/11) (ISBN-10: 0767908155; ISBN-13: 978-0767908153)
- Moffat, Viva R., The Copyright/Patent Boundary, 48 U. Rich. L. Rev. 611 (2014).
- Mont, Jason J. Du, A Non-Obvious Design: Reexamining the Origins of the Design Patent Standard, 45 Gonz. L. Rev. 531 (2010).
- Mont, Jason J. Du, & Janis, Mark D., *Functionality in Design Protection Systems*, 19 J. INTELL. PROP. L. 261 (2012).
- Mont, Jason J. Du, and Janis, Mark D., *Virtual Designs*, 17 STAN. TECH. L. REV. 107 (2013).
- Montano, Ulianov, *2.2 McAllister's Approach, Explaining Beauty in Mathematics: An Esthetic Theory of Mathematics*, Springer (2014). (ISBN(s): 9783319034522, 3319353810, 3319034529, 3319034510)
- Pytlak, Kaitlyn N., *The Devil Wears Fraud-a: An Aristotelian-Randian Approach to Intellectual Property Law in the Fashion Industry*, 15 Va. Sports & Ent. L.J. 273 (2016).
- Riggle, Nick, *Explaining Beauty in Mathematics: An Esthetic Theory of Mathematics by Ulianov Montano*, The Journal of Esthetics and Art Criticism, Fall 2016, Vol. 74, No. 4 (Fall 2016).
- Unfair Competition and the Doctrine of Functionality*, 64 Colum. L. Rev. 544 (1964).
- Yao, Hsin-An, Theory and Practice of Functionality Doctrine in Copyright Law, Fu Jen Law Review, Vol. 61 (2021).
- Wang, Xiaoren, Esthetic Functionality at A Crossroads: What A Troublesome Doctrine Can Learn From Its Past, 19 Chi.-Kent J. Intell. Prop. 357 (2020).

[2026] Vol.15, No.1 NTUT J. of Intell. Prop. L. & Mgmt

Wreen Michael J., and Callen,Donald M., eds., *"Redefining Art"*, in *The Esthetic Point of View*,
(Ithaca, 1982). (ISBN(s): 0801412501, 0801498805) (ISBN(s): 0801412501, 0801498805)

Wulf, Maurice de, *Art and Beauty*, Routledge (2017). (ISBN-13: 978-1351273909)

**Legal Protection of Copyright Against Cybercrimes:
The Case of Electronic Book Piracy in Indonesia**

Dr. Tasya Safiranita, S.H., M.H.

Center for Cyber Law and Digital Transformation Studies, Faculty of Law,
Universitas Padjadjaran

Haipa Nisrina Sayyidah, S.H.

Center for Cyber Law and Digital Transformation Studies, Faculty of Law,
Universitas Padjadjaran

Yoan Shevila Kristiyenda, S.H.

Center for Cyber Law and Digital Transformation Studies, Faculty of Law,
Universitas Padjadjaran

Dr. Zainal Muttaqin, S.H., M.H.

Faculty of Law, Universitas Padjadjaran

Dr. Dadang Epi Sukarsa, S.H., M.H.

Faculty of Law, Universitas Padjadjaran

Prof. Dr. Ramalinggam Rajamanickam

Faculty of Law, Multimedia University (MMU), Malaysia

Abstract

Copyright grants creators exclusive rights, comprising moral and economic rights. Economic rights are transferable, whereas moral rights are permanent. Although copyright protection applies automatically upon creation, registration is recommended to establish proof of ownership. In the digital era, e-books have become a popular alternative to printed books, offering enhanced accessibility and portability. However, technological advancements also pose challenges, such as e-book piracy, which frequently occurs through online platforms. This piracy significantly harms authors and publishers financially, jeopardizes the sustainability of the publishing industry. Addressing these challenges requires strengthened law enforcement and collaborative efforts to protect copyright and foster innovation in the e-book industry. This research finds that: First, Indonesia's Copyright Law (Copyright Law 2014) protects e-books, despite not explicitly addressing digital formats. Licensing agreements serve as an effective legal tool to safeguard e-book copyrights. Second, copyright infringement has become increasingly prevalent in the digital era, necessitating more robust and coordinated law enforcement. Enhanced public awareness, policies aligned with technological advancements, and continuous education are essential to create a fair ecosystem for creators. Thus, creators can continue to innovate without the threat of piracy.

Keywords: copyright protection, cybercrime, digital publishing, e-book piracy, law enforcement

I. Introduction

Intellectual Property refers to the right to economically exploit the results of intellectual creativity. This includes works arising from human thought, imagination, or creativity.¹⁶⁸ In Indonesia, Intellectual Property protection is evident through various national laws, including: Law Number 28 of 2014 concerning Copyright; Law Number 20 of 2016 concerning Marks and Geographical Indications; Law Number 13 of 2016 concerning Patents; Law Number 31 of 2000 concerning Industrial Design; Law Number 32 of 2000 concerning Integrated Circuit Layout Design; Law Number 29 of 2000 concerning the Protection of Plant Varieties; and Law Number 30 of 2000 concerning Trade Secrets.

According to the Preamble of the Law of the Republic of Indonesia Number 28 of 2014 on Copyright, intellectual property rights are a form of state recognition and appreciation for the efforts and creativity of individuals who produce new works or inventions, granting them exclusive rights as well as legal protection. The Law of the Republic of Indonesia Number 28 of 2014 on Copyright explicitly stipulates that copyright encompasses two fundamental components, namely economic rights and moral rights.¹⁶⁹ Moral rights and economic rights are the two types considered exclusive. Unlike moral rights, economic rights can be transferred, whereas moral rights remain non-transferable. However, upon the creator's death, moral rights can be transferred to heirs only through a will or as permitted by law.¹⁷⁰

Copyright protection is essential; its absence creates legal uncertainty and harms the investment climate in the creative sector. Creators will hesitate to invest time, energy, and resources in new works without guaranteed legal protection. Thus, copyright serves as the foundation for the innovation ecosystem, particularly in research institutions and universities. Copyright protection incentivizes academics to produce high-quality works, such as scientific publications, books, and software¹⁷¹.

Copyright protection does not require registration due to its declarative system (first to use), as rights are obtained automatically once a work is expressed in a tangible form.¹⁷² Nevertheless, registration is still recommended to strengthen the author's legal standing in the event of a dispute. This registration can provide strong proof of ownership if a legal dispute arises in the future.¹⁷³ This means that if there is a dispute in court regarding a creation, the parties concerned can prove its authenticity, and the judge can determine the actual creator based on the evidence. Despite established Intellectual Property regulations, violations persist. Violations often occur in scientific works, particularly books.

In the rapidly developing digital era, advances in information and communication technology offer significant benefits, including easier distribution and access to information.

¹⁶⁸Niru Anita Sinaga, *Pentingnya Pelindungan Kekayaan Intelektual Bagi Pembangunan Ekonomi Indonesia*, 6(2) Jurnal 146, 146 (2020).

¹⁶⁹Article 4 Law Number 28 of 2014 on Copyright (Indonesia).

¹⁷⁰Atiekah Achmad & Kholis Roisah, *Status Hukum Ghostwriter dan Pemegang Hak Cipta dalam Plagiarisme Menurut Undang-Undang Hak Cipta*, 9(2) Jurnal Magister Hukum Udayana (Udayana Master Law Journal) 429-447, 437 (2020).

¹⁷¹Saidin, *Aspek Hukum Hak Kekayaan Intelektual (Intellectual Property Rights)* 33 (Jakarta: Rajawali Press 1995).

¹⁷²Tasya Safiranita Ramli, *Hak Cipta dalam Media Over The Top* 9 (Bandung: PT Refika Aditama 2022).

¹⁷³Dina Widya, *Perlindungan Hak Cipta, Hak Terkait, dan Desain Industri*, 22(2) Mimbar Hukum 270, 270 (2010).

This development has transformed interactions with knowledge and entertainment sources, opening opportunities in sectors like publishing. One concrete example is the emergence of electronic books (e-books), a popular alternative to physical books. E-books are digital publications presenting text and images in electronic format, accessible via devices like computers, tablets, or smartphones.¹⁷⁴ Their digital format offers flexibility and portability, enabling readers to carry hundreds or thousands of books on a single tablet, smartphone, or e-reader, greatly enhancing access and reading comfort.

Along with massive digital transformation and broad information accessibility, unavoidable challenges arise, namely cybercrime, especially e-book piracy. Book piracy in cybercrime encompasses unlawful activities such as the unauthorized downloading, uploading, and distributing digital copies through the internet. Such practices are commonly facilitated through platforms such as file-sharing websites, social media, and online forums, which enable the broad dissemination of pirated materials.¹⁷⁵ This phenomenon not only constitutes a violation of the author's economic rights under the copyright law but also causes significant financial losses for both authors and publishers, as illegal distribution of works deprives them of legitimate revenue. Consequently, authors are deprived of fair income from their intellectual creations, thereby diminishing their incentive to continue producing and innovating. Similarly, publishers suffer from reduced revenues, which limits their capacity to support authors and invest in the publication of new works.

It is relevant to Indonesia's positive law development and offers a novel analysis of e-book copyright protection and digital piracy enforcement challenges. In practice, the development of the book industry still faces serious obstacles due to the prevalence of piracy, both in print and digital form. A 2021 IKAPI survey of 130 publishers revealed that 75 percent reported pirated works sold on online marketplaces.¹⁷⁶ These practices cause losses of hundreds of billions of rupiah, impacting creators' economic and moral rights.

Previous studies, such as Cucu Santika's (2024) "The Legal Consequences of Piracy of Books in Electronic or PDF Form Sold on E-Commerce," have not examined e-book piracy as a form of cybercrime involving the unlawful use of electronic systems. In other words, the aspects of cybersecurity and the digital crime methods employed by perpetrators of e-book piracy have not been explored in depth. The existing research primarily focuses on the consequences of e-book piracy and the responsibilities of e-commerce platforms; however, it does not address the underlying challenges in combating e-book piracy as a form of cybercrime in Indonesia.

Futhermore, the study by Miftah Anggun Winanda, Saidin Saidin, and Tengku Keizerina Devi Azwar (2024) "Implementation of Book Copyright Protection under Copyright Law: A Case Study of Pirated Book Sales on the Shopee Marketplace" has mainly focused on the implementation of Law Number 28 of 2014 concerning Copyright in addressing cases of pirated book sales on digital marketplaces such as Shopee. These studies emphasized the

¹⁷⁴A. Tika, Sunardi & Djono, *Pemanfaatan Media Buku Digital Berbasis Kontekstual dalam Pembelajaran IPA*, 1 *Prosiding Seminar Pendidikan Nasional* 196, 196 (Surakarta 2017).

¹⁷⁵Muhammad Arya Azra, Harul Surya Fernanda, Irwan Triadi & Iwan Erar, *Perlindungan Hak Cipta Terhadap Pemegang Hak Cipta Aplikasi yang Diperjualbelikan Secara Ilegal di Internet*, 14(6) *Jurnal Hukum dan Kewarganegaraan* 3, 3 (2015).

¹⁷⁶Arda Pramesti, Hilman Nur & Aji Mulyana, *Perlindungan Hukum Terhadap Pencipta atas Pembajakan Buku Elektronik (E-Book) yang Disebarluaskan Secara Bebas Melalui Website*, 2(2) *Journal of Contemporary Law Studies* 130, 130 (2025).

ineffectiveness of monitoring and law enforcement mechanisms but remained limited to the platform-level enforcement of copyright law. However, there is still a lack of research examining how copyright protection for electronic books (e-books) is regulated comprehensively under Indonesian national law, and more importantly, how acts of e-book piracy can be categorized and addressed as cybercrimes within Indonesia's legal framework. Furthermore, earlier studies have not analyzed the challenges of enforcing copyright law in cyberspace, including issues of digital evidence and the technical capacity of law enforcement in dealing with digital piracy.

Zainul Arifin, Sri Walny, and Imam Jauhari's (2022) "Juridical Analysis of Piracy of Books Traded Through The Marketplace in the Perspective of Copyright Protection in Indonesia" emphasized legal steps for parties affected by marketplace book piracy. Previous research has been limited to the issue of physical book piracy in online marketplaces and has not extended its analysis to electronic books (e-books), which have become the primary form of literary distribution in the digital era. In fact, e-book piracy presents new legal dimensions, as it involves copyright infringement in digital formats and the unauthorized duplication and distribution of works through electronic systems across multiple platforms, raising complex challenges for copyright protection in cyberspace.

Based on the above background, this research formulates key problems to clarify crucial issues in copyright protection and enforcement against e-book piracy in Indonesia. Accordingly, the problems studied include:

1. How is copyright regulated for electronic books under Indonesian national law?
2. What are the challenges of enforcing laws against e-book piracy as cybercrimes in Indonesia?

II. Legal Framework of Copyright Protection and Cybercrime in Electronic Books

A. Theoretical Foundation of Copyright and Cybercrime

The concept of Intellectual Property Rights, as known today, is better understood through John Locke's theory¹⁷⁷. This prominent philosopher viewed intellectual works, whether ideas, discoveries, or other creations, tangible or intangible, as intrinsically tied to the individual as property rights. Locke believed that property rights, including intellectual property rights, serve as strong incentives to foster creativity and innovation. By granting exclusive rights to intellectual works, the government demonstrates respect and provides legal protection for creators. This can catalyze innovative works that positively contribute to society. The theory of intellectual property advanced by Hughes in "*The Philosophy of Intellectual Property*" encompasses multiple justifications, particularly the argument that creators deserve recognition on both moral and economic grounds. He emphasizes that while intellectual creations embody the personal expression of their authors, they simultaneously function as commodities capable of generating financial benefits, thereby encouraging further creativity and innovation. This dual rationale highlights that intellectual property serves both as a recognition of the intrinsic moral rights of creators and as a mechanism to stimulate social welfare through economic

¹⁷⁷John Locke, *Second Treatise of Civil Government* (Chapter 5: "Of Property"), *Harvard Law School Library Innovation Lab*, [opencasebook.org](https://opencasebook.org/casebooks/510-open-source-property/resources/3.2.4-john-locke-second-treatise-of-civil-government-ch-5/) (accessed November 1, 2025), available at <https://opencasebook.org/casebooks/510-open-source-property/resources/3.2.4-john-locke-second-treatise-of-civil-government-ch-5/>

reward. Conversely, reduced motivation to produce may hinder economic growth¹⁷⁸. In business, intellectual property protection prevents infringement while building reputation and public trust¹⁷⁹. Companies with strong intellectual property protection are generally seen as more innovative, credible, and competitively sustainable.

Furthermore, intellectual property theory emphasizes justice as the foundation for exploiting intellectual works. Through legal protection, it prohibits violations against the rights holder of an intellectual work. This aligns with the exclusive and absolute¹⁸⁰ nature of intellectual property, granting owners the right to commercially exploit their works. This right includes prohibiting unauthorized use by others and filing lawsuits for violations. In a broader context, intellectual property theory not only governs creator–creation relationships but also underpins scientific, technological, and economic development. By providing incentives for creators, it fosters an environment conducive to innovation and creativity. Thus, protecting intellectual property rights is a long-term investment that provides significant societal benefits.

The theory of personality rights, put forward by Immanuel Kant,¹⁸¹ places individual dignity and autonomy as fundamental pillars. According to Kant, every individual possesses inherent dignity requiring respectful and fair treatment. This dignity is realized through autonomy, which grants individuals the right to determine their life paths, maximize their abilities, and make morally rational decisions. In other words, personality rights enable individuals to live as free, independent moral subjects, pursuing happiness and well-being without harming others. Conversely, John Stuart Mill described rights to intangible objects, particularly intellectual property, as comprising two complementary aspects: individual moral rights and society's collective interests. Mill argued that individuals have moral and legal rights to their intellectual works, with legal protection recognizing their societal contributions. Additionally, legal protection of intangible rights, such as copyrights, trademarks, and patents, incentivizes innovation and creativity. Thus, it fosters lasting benefits for society through advances in science and technology.

Cybercrime refers to criminal acts utilizing digital infrastructure, particularly the internet, as a tool or target¹⁸². The increasingly complex dynamics of cyberspace have spurred new threats through cybercrime. Cybercrime is a complex phenomenon driven by multiple factors¹⁸³. Broad network accessibility creates a conducive environment for cybercriminals to operate globally. Common user errors, such as using weak passwords or clicking unverified links, are primary vulnerabilities exploited by perpetrators. Additionally, the low risk of detection and lack of public awareness drive increased criminal activity in cyberspace. Although cybercrime operates in cyberspace, its real-world implications demand robust legal responses. This aligns with the *lex digitalis* theory proposed by Stefan Kadelbach and Klaus Günther. Kadelbach and Günther define *lex digitalis* as a distinct normative order emerging within the digital sphere¹⁸⁴. This order consists of self-regulating norms governing cyberspace, operating independently of

¹⁷⁸J. Hughes, *The Philosophy of Intellectual Property*, 77 *Georgetown Law Journal* 287, 8 (1988).

¹⁷⁹Sudjana, *Hukum Kekayaan Intelektual* 115–116 (Tangerang: Universitas Terbuka 2021).

¹⁸⁰Muhammad Djumhana & R. Djubaedillah, *Hak Milik Intelektual (Sejarah, Teori, dan Praktiknya di Indonesia)* 22-23 (Bandung: PT Citra Aditya Bakti 1993).

¹⁸¹ R.F Bhanu Viktorahadi, “Human Life Obligations According To Immanuel Kant”, 4 (2) *International Journal Of Humanities Education And Social Sciences (IJHESS)* 901-911, 901, (2024).

¹⁸²Eliasta Ketaren, *Cybercrime, Cyberspace, dan Cyber Law*, 5(2) *Jurnal Times* 36, 36 (2016).

¹⁸³ *Ibid.*, p. 39.

¹⁸⁴Stefan Kadelbach & Klaus Günther, *Recht ohne Staat?*, in Stefan Kadelbach & Klaus Günther (eds.), *Recht ohne Staat? Zur Normativität nichtstaatlicher Normsetzung* 13–15 (Frankfurt/New York: Campus 2011).

state-based legal systems and deriving legitimacy from digital community practices, agreements, and platform interactions¹⁸⁵. *Lex digitalis* exemplifies a “postmodern legal order,” as described by the authors, a system of autonomous rules, similar to *lex mercatoria* in transnational commerce or *lex sportiva* in international sports law¹⁸⁶. This framework highlights that cyberspace creates its own normative structures, which, though not state-codified, function effectively as law in the digital environment¹⁸⁷.

Implementing *Lex Digitalis* aims to create a safe, fair, and trustworthy digital environment for all users. In the Industrial 5.0 era, Ahmad M. Ramli adapted developmental legal theory into the *transformative legal theory*, emphasizing the law's need to remain adaptive to dynamic technological developments¹⁸⁸. Law serves as an infrastructure facilitating social transformation driven by technological innovation. Implementing law as a transformative infrastructure demands strong synergy with public policy¹⁸⁹. Thus, law must accompany technological progress, serving as critical infrastructure for transformation¹⁹⁰.

B. Copyright Regulation for Electronic Books in Indonesian Law

Books, as collections of pages containing sentences, are significant repositories of knowledge. Human motivation to share ideas and discoveries has driven the mass production of books. Rapid technological advancements have transformed the form of literary works. While books were once only physical, e-books are now increasingly popular. This growing popularity stems from the ease of access e-books offer. Regardless of the format, books as products of human creativity require legal protection. According to Article 1 paragraph (3) of Copyright Law 2014, a “Creation” is any work in science, art, or literature produced through inspiration, skill, thought, imagination, or expertise and expressed in tangible form. Indonesia’s Copyright Law 2014 explicitly protects literary works, including books. Article 40, paragraph (1) explains the categories of protected works. Protected works, as outlined in Article 1 paragraph (1) of Law Number 28 of 2014 on Copyright, include works in science, art, and literature such as written works, performances, music, choreography, fine art, architecture, photography, maps, computer programs, and more.

Although the law does not explicitly mention “electronic books,” Article 40, paragraph (1)(n) provides a strong legal basis for interpreting e-books as protected works, as digital adaptations of printed texts. The explanation of Article 40, paragraph (1) defines “adaptation” as transforming a creation into another form. Article 40, paragraph (2) further confirms that such adaptations are protected as separate creations without affecting the original work. Copyright Law 2014 grants exclusive rights that automatically attach to creators once their work is realized in tangible form. This is known as the declarative principle. Copyright protection generally lasts for the author’s lifetime plus seventy years. Reproduction or commercial use of copyrighted works without authorization violates Article 9 of the law. This aligns with John Locke’s view on natural property rights.

¹⁸⁵ *Ibid.*, p. 16-18.

¹⁸⁶ *Ibid.*, p. 19.

¹⁸⁷ *Ibid.*, p. 20-22.

¹⁸⁸ Ahmad M. Ramli & Tasya Safiranita, *Hukum Sebagai Infrastruktur Transformasi Indonesia* 45–50 (Bandung: PT Refika Aditama 2022).

¹⁸⁹ *Ibid.*, p. 86-89.

¹⁹⁰ *Ibid.*

To prevent infringement, a license agreement serves as a legal instrument. Article 1 paragraph (20) defines a license as written permission from the copyright holder for another party to exercise economic rights under specific conditions. Through licenses, authors maintain control and receive royalties, while prohibiting unauthorized exploitation. Nevertheless, piracy persists. Article 1 paragraph (23) defines piracy as “illegal duplication of works and/or related rights products and widespread distribution... to obtain economic benefit.” E-book piracy often occurs on e-commerce platforms and illegal websites. Such acts violate creators’ economic rights and impact the national economy.

Dispute resolution mechanisms include arbitration, mediation, and litigation through the Commercial Court. Article 99 allows copyright owners to sue for damages, while Article 113 provides criminal sanctions up to ten years’ imprisonment or fines up to four billion rupiah for piracy. Furthermore, Article 56 authorizes administrative sanctions such as content removal or access blocking. In addition, Government Regulation No. 80 of 2019 on Electronic Trading (PP PMSE) prohibits the distribution of illegal goods, imposing sanctions on platforms failing to control such activities. Law No. 1 of 2024 amending Law No. 11 of 2008 on Electronic Information and Transactions (ITE Law) criminalizes manipulation or unauthorized use of electronic information under Article 35, with penalties of up to twelve years and fines up to twelve billion rupiah under Article 51(1).

C. The Interrelation between E-Book, Copyright, and Cybercrime

E-book piracy exemplifies the intersection between intellectual property and cybercrime. Unlike traditional copyright infringement, digital piracy involves transnational networks, encryption, and anonymization technologies. The ease of duplicating and distributing digital content has transformed copyright violations into cyber-enabled crimes. E-book piracy uses methods such as torrenting and peer-to-peer file sharing, allowing mass distribution through multiple servers, often beyond national jurisdictions. These practices exploit the gaps between intellectual property law and cyber law enforcement. The absence of direct procedural coordination between copyright authorities and cybersecurity agencies such as BSSN weakens preventive mechanisms.

Hence, the protection of digital works must be integrated with cybersecurity governance. Preventive strategies include Digital Rights Management (DRM) technologies and watermarking to authenticate digital ownership, Artificial Intelligence-based content tracing to detect illegal uploads, cross-border legal cooperation as seen in the Budapest Convention on Cybercrime, and platform accountability that requires digital service providers to implement monitoring systems and takedown protocols. This integrative approach aligns with the transformative legal theory, viewing law as an infrastructure that adapts to technological advancement. Protecting e-books thus contributes not only to copyright enforcement but also to digital sovereignty and national cyber resilience.

D. Synthesis

The protection of electronic books under Indonesian law illustrates the convergence of copyright and cybersecurity. While existing regulations (Copyright Law, ITE Law, PP PMSE) provide substantial protection, their implementation faces challenges related to anonymity, cross-border jurisdiction, and limited public awareness. Therefore, strengthening the legal framework requires harmonizing copyright enforcement with cybersecurity policies. Legal reform should incorporate technological instruments, interagency collaboration, and digital

literacy initiatives. By doing so, Indonesia can establish a robust and fair digital publishing ecosystem that safeguards creators' rights and promotes national resilience in cyberspace.

III. Law Enforcement Challenges Against Electronic Book Piracy Cybercrimes in Indonesia

Nowadays, technology is inseparable from daily life, evolving into a fundamental need. Historically, technology was initially seen as a mere tool, but over time, it has permeated various aspects of life. Protecting creative works, such as e-books, through intellectual property rights in cyberspace presents complex challenges, particularly in law enforcement. In the digital era, creative works can be distributed quickly and easily, but this also enables copyright violations, such as e-book piracy and unauthorized distribution.

E-books represent a new intersection between creative expression and digital infrastructure¹⁹¹. Unlike traditional printed works, they exist as both intellectual creations and electronic data within cyberspace, making their protection inherently linked to cybersecurity. Therefore, e-book piracy should be recognized not only as a copyright violation but also as a form of content-based cybercrime that exploits digital systems to infringe intellectual property rights¹⁹².

The state must provide robust legal protection for e-book authors to minimize intellectual property violations, particularly piracy. This protection is crucial to safeguard authors' rights, enabling them to create and publish without fear of misuse or illegal distribution. Thus, strong synergy among the government, law enforcement, and society is needed to foster an ecosystem that protects intellectual property rights and ensures creators can innovate without piracy threats. However, enforcing Intellectual Property Rights (IPR) laws faces significant challenges that are difficult to overcome.

In practice, however, copyright enforcement alone is insufficient¹⁹³. Digital book piracy operates within cyberspace, utilizing electronic systems, peer-to-peer networks, and cloud storage that are also subject to cybersecurity regulations. This overlapping nature of violations forms what can be described as a dual-layer infringement, where one act simultaneously breaches copyright law and cybercrime provisions. Yet, Indonesia's current legal framework still treats these domains separately, weakening overall enforcement¹⁹⁴.

The following are challenges in enforcing laws against e-book piracy in Indonesia:

A. Technological Facilitation of Piracy

In the digital era, e-book piracy is faster and easier, enabling perpetrators to copy e-books instantly with minimal effort. This creates significant legal challenges in preventing and stopping piracy. Torrenting, the practice of illegal file sharing, is a common form of digital

¹⁹¹ Islambek Rustambekov, Said Gulyamov & Anna Ubaydullaeva, *Intellectual Property in the Digital Age* 41–43 (Roma: Roma Tre-Press 2024).

¹⁹² Hervina Puspitosari, *Cybercrime in the Field of Decency (Information Technology and Morality)* 7 (Nas Media Pustaka 2020).

¹⁹³ Feri Satria Wicaksana Effendy & Mujiono Hafidh Prasetyo, *Law Enforcement Effectiveness on Copyright Piracy: Case of Indonesia*, 7(3) *International Journal of Multidisciplinary Research and Analysis* 929 (2024).

¹⁹⁴ Zuliarti Wa Ode & Fitriah Faisal, *Uncharted Water: Indonesia's Copyright Challenges in the Digital Age*, 4(1) *International Journal of Law in Changing World* 105 (2025).

content piracy. A torrent file, a small file containing download information, can be accessed using software like BitTorrent, Vuze, or uTorrent. Torrents use a peer-to-peer (P2P) download system, where files are sourced from interconnected computer networks via a torrent client application, a process known as torrenting.¹⁹⁵ *Torrenting is not inherently illegal*. However, torrenting becomes illegal when users share copyrighted material.¹⁹⁶ This phenomenon demonstrates that copyright infringement in e-books is not merely about economic loss but also about the vulnerability of digital systems. Weak digital rights management (DRM), the absence of encryption, and ineffective authentication systems make e-books easy to duplicate and redistribute illegally¹⁹⁷. Therefore, copyright protection in cyberspace must be complemented by cybersecurity measures that secure data integrity, authenticity, and distribution rights¹⁹⁸.

B. Lack of Public Awareness of Copyright Law

Many internet users remain unaware that distributing or downloading pirated e-books violates copyright law 14. Public understanding of the legal implications of piracy remains limited, with many unaware of its consequences. Users often perceive digital piracy as harmless or a 'right' to access paid content for free. A primary cause of this low awareness is insufficient education on copyright and the importance of respecting intellectual works. Insufficient copyright education leads creators and the public to undervalue copyright regulations. This also increases the risk of intellectual property infringement and piracy due to ignorance of legal consequences.¹⁹⁹ Consequently, many fail to realize that e-book piracy not only financially harms authors and publishers but also constitutes a punishable legal violation. Additionally, the public's belief that digital content should be free worsens this issue. This 'free' culture stems from easy access to pirated content via unauthorized websites, social media, and messaging apps. Users may assume that easy, widespread access justifies piracy, unaware that they are committing copyright infringement. Moreover, low digital and cybersecurity literacy aggravates this problem, as many still view e-book piracy as an economic shortcut rather than a cybercrime involving the unlawful use of electronic systems²⁰⁰.

C. Anonymity in Cyberspace and Challenges in Law Enforcement

The Internet allows digital pirates to operate with a high degree of anonymity. Using techniques like VPNs, proxies, and Tor networks, perpetrators can conceal their location and

¹⁹⁵ Bayu Prihantoko, *Perlindungan Hak Cipta atas Film dengan Format Video Cam pada Warnet di Surakarta (Studi Kasus Warnet di Wilayah Surakarta)* 14 (Muhammadiyah University of Surakarta 2019).

¹⁹⁶ Ruth Yemima Exaudia Gintings, Reni Windiani & Fendy E. Wahyudi, *Upaya Korea Selatan dalam Melindungi Hak Cipta Korean Wave dari Pembajakan Konten Digital*, 9(2) *Journal of International Relations* 29, 29 (2023).

¹⁹⁷ Benjamin Watts, *E-Book Piracy: Beyond the Nielsen Report*, 11 *The Journal of Publishing Culture* 5 (2022).

¹⁹⁸ Rifa Elvaretta Khansa & Tasya Safiranita, *Optimizing the Implementation of Digital Rights Management to Strengthen Copyright Protection in Digital Streaming Services in Indonesia*, 5(4) *Journal of Law, Politic and Humanities* 2712 (2025).

¹⁹⁹ Rayhan Satrio Wibisono & Rani Apriani, *Penegakan Hukum Hak Cipta Terhadap Praktik Pembajakan Film Beserta Sanksi dan Dampak yang Terjadi*, 20(1) *Supremasi Hukum* 29, 29 (2024).

²⁰⁰ Musaddag Elrayah & Saima Jamil, *Impact of Digital Literacy and Online Privacy Concerns on Cybersecurity Behaviour: The Moderating Role of Cybersecurity Awareness*, 17(2) *International Journal of Cyber Criminology* 169 (2023).

identity.²⁰¹ This significantly hinders law enforcement's ability to trace piracy activities. This anonymity gives perpetrators a sense of security, believing they are unlikely to be caught or prosecuted. Even if perpetrators are identified, unclear identity information often hampers law enforcement efforts. This characteristic of cyber anonymity complicates copyright enforcement, requiring advanced digital forensics and cyber-tracing capabilities that remain limited in Indonesia²⁰².

D. Limited Resources and Institutional Constraints in Copyright Enforcement

Not all publishers or copyright holders possess sufficient resources to pursue legal action against piracy, particularly in the digital era, where copyright infringements can occur on a massive scale and involve numerous perpetrators across multiple jurisdictions. This creates significant law enforcement challenges, as victims, such as publishers, authors, and copyright holders, often lack the financial capacity, time, or access to combat piracy effectively. This lack of victim support weakens law enforcement, exacerbates piracy, and undermines copyright protection. An integrated institutional approach involving the Direktorat Jenderal Kekayaan Intelektual (DGIP), the Ministry of Communication and Informatics, and the Badan Siber dan Sandi Negara (BSSN) is therefore essential to align copyright enforcement with cybercrime regulation²⁰³.

E. Economic Appeal of Pirated Content and Its Cybersecurity Risks

Another challenge lies in the appeal of pirated books, which are often significantly cheaper or even free, thereby attracting readers who prefer downloading or purchasing pirated e-books instead of legitimate ones²⁰⁴. Yet, behind this convenience and low cost are several negative consequences: pirated books typically have poor quality, pose risks of malware, and undermine the development of a healthy literacy ecosystem. By consuming pirated books, readers indirectly harm authors and publishers while contributing to the overall decline in the quality of available content. Additionally, pirated e-books distributed online often contain malicious software or phishing links, creating cybersecurity risks that extend beyond copyright violations²⁰⁵.

F. Digital Divide and the Need for Integrated Cybersecurity Infrastructure

Additionally, Indonesia faces a significant digital divide, though this remains debated. The digital divide refers to disparities in access, use, and benefits of information and communication technology (ICT) among individuals, groups, or regions. Addressing the digital divide requires a national cybersecurity strategy based on four pillars supporting technological progress: hardware and software development, content management, telecommunications and

²⁰¹Nur Witdi Yanto, Heru Sukoco & Shelve Nidya Neyman, *Pemodelan Proxy Anonim Menggunakan Algoritme Expectation Maximization dengan Data Balancing*, 12(1) *Journal of Computer Science and Business* 61, 61 (2021).

²⁰²Wandi Hartono *et al.*, *Challenges of Criminal Investigation Cyber Crime*, 7(1) *Awang Long Law Review* 14 (Nov. 2024).

²⁰³Muhammad Taufik Rusydi, *Cyber Law Policy Development: Indonesia's Response to International Cybercrime Threats*, 3(1) *Journal of Progressive Law and Legal Studies* 73–82 (2025).

²⁰⁴Carmen Camarero, Carmen Antón & Javier Rodríguez, *Technological and Ethical Antecedents of E-Book Piracy and Price Acceptance: Evidence from the Spanish Case*, 32(4) *The Electronic Library* 7 (2014).

²⁰⁵Łukasz Tomczyk, *Evaluation of Digital Piracy by Youths*, 13(11) *Future Internet* 5 (2021).

networking, and IT infrastructure and internet commerce development. Given rapid technological advancements, cybersecurity resource management must be integrated into business processes to minimize risks and costs. This is critical because cybersecurity is costly and evolves rapidly. Integrating infrastructure development into business management can minimize losses from technological advancements²⁰⁶. The absence of such integration weakens the protection of digital intellectual property. Thus, safeguarding e-books should be part of a broader cybersecurity framework that treats creative digital content as a component of national cyber resilience²⁰⁷.

The phenomenon of electronic book piracy in Indonesia has caused substantial losses, impacting the economy, society, and the sustainability of the national publishing industry. According to available data, more than half of the approximately 2,000 members of the Indonesian Publishers Association (IKAPI) have produced e-books, with an estimated 1,000 publishers, or 50 percent of total members, engaging in this sector. This digitalization is fundamentally a positive step, as it expands distribution reach, facilitates reader access, and drives the transformation of the creative industry toward the digital era. However, this development also introduces new challenges, notably the widespread increase in electronic book piracy. A 2021 Ikapi survey revealed that 75 percent of publishers, or approximately 975 out of 1,300 surveyed respondents, experienced piracy of their published works, which were subsequently sold illegally in various local markets and online platforms²⁰⁸. This situation not only causes financial losses for publishers and authors but also weakens the overall publishing ecosystem by diminishing authors' motivation to create, reducing the potential for innovation in the creative industry, and eroding public trust in copyright protection in Indonesia.

Beyond these economic and industrial impacts, the phenomenon also demonstrates a deeper legal and technological problem, the transformation of copyright infringement into a cybercrime issue. E-book piracy relies on digital infrastructure such as cloud storage, encrypted communication channels, and peer-to-peer systems to facilitate the unauthorized distribution of copyrighted works²⁰⁹. Consequently, illegal duplication and distribution of e-books can no longer be viewed solely as violations of copyright law but must also be categorized as acts of cyber intrusion and data manipulation under the framework of cybercrime. This intersection between digital copyright and cybersecurity highlights the need for an integrated approach where the protection of e-books involves not only legal ownership but also digital security architecture²¹⁰.

A concrete example of digital book piracy in Indonesia is the case of Stephen King's novel *Mr. Mercedes*. This work was illegally sold as an e-book on the social media platform Instagram for Rp2,000, significantly lower than its original price of Rp148,500. Similar practices occur

²⁰⁶Muhammad Hafid, Favian Zhuhri Firjatullah & Billyco Windy Pamungkaz, *Tantangan Menghadapi Kejahatan Cyber dalam Kehidupan Bermasyarakat dan Bernegara*, 7(2) *Tambusai Education Journal* 7, 7 (2023).

²⁰⁷Nacem Allahrakha, *Cybersecurity Regulations for Protection and Safeguarding Digital Assets (Data) in Today's World*, 8(1) *Lex Scientia Law Review* 406–424 (2025).

²⁰⁸Sekretariat IKAPI, *Pembajakan Buku Membunuh Kreativitas* (2023), available at <https://www.ikapi.org/2023/05/20/pembajakan-buku-membunuh-kreativitas/> (accessed March 19, 2025).

²⁰⁹ Livia Fajarisalfa, Cewi Mayang Arum, & Ikhwan Aulia Fatahillah, "Law Enforcement Against the Distribution of Pirated Digital Books Under Law No. 28 of 2014 on Copyright", 1 (1), *Anthroposia: Journal of Social and Human Development* 46-59, 46 (2026).

²¹⁰ Ichsan Anwary, *Evaluating Legal Frameworks for Cybercrime in Indonesian Public Administration: An Interdisciplinary Approach*, 17(1) *International Journal of Cyber Criminology* 18–20 (2023).

on Facebook, where accounts openly offer services to source and provide e-books on demand for approximately Rp10,000. These practices clearly demonstrate the ease of accessing pirated books in the digital space while highlighting the lack of oversight regarding the circulation of illegal content in cyberspace. The ease of this illegal digital trade reflects a systemic weakness in cyber copyright governance, where digital marketplaces operate without effective verification systems to detect and remove infringing content²¹¹.

This phenomenon is not unique to Indonesia but is also evident internationally, as illustrated by a case involving Chinese authors suing Apple. In that case, Wang Guohua, a Beijing-based lawyer representing Chinese authors, stated that three separate lawsuits were filed against Apple by 12 authors who claimed that 59 of their book titles were sold without permission through Apple's online store. As reported by Siliconvalley.com, the authors sought compensation of USD 3.5 million. Han Han, a novelist and race car driver, was among the authors who filed the lawsuit. In response, Carolyn Wu, Apple's spokesperson in Beijing, stated that the company respects intellectual property rights and is committed to addressing complaints promptly. Although Apple removed some books following the lawsuits filed in January, several works reportedly reappeared because they were uploaded by developers selling applications through the Apple Store²¹².

This international case mirrors the challenges faced in Indonesia, where digital platforms function as intermediaries of both commerce and cybercrime²¹³. It reinforces the argument that copyright enforcement in the digital environment must evolve to include cybersecurity principles, such as automated detection systems, digital rights management (DRM), and cross-platform coordination for content takedown. Thus, e-book piracy exemplifies a convergence between intellectual property violations and cyber vulnerabilities.

Beyond economic losses, digital book piracy has serious moral and psychological impacts on authors. Many authors, particularly young writers starting their careers, lose motivation and enthusiasm to create because they feel their hard work, creativity, and dedication are not valued by society. This situation fosters frustration, disappointment, and distrust in the legal system meant to protect their copyrights. Furthermore, this phenomenon risks creating a crisis in the regeneration of authors, as aspiring writers may hesitate to express their creative ideas in written works due to fears of piracy and unauthorized distribution. If left unaddressed, this could hinder the development of national literacy, reducing the production of high-quality original works and diminishing public appreciation for intellectual and creative endeavors. Thus, book piracy not only causes material losses but also weakens the literacy ecosystem, which should serve as a foundation for developing knowledgeable and competitive human resources.

From a legal perspective, the phenomenon of digital book piracy highlights the weak enforcement of copyright-related laws in Indonesia. Despite the existence of Copyright Law 2014 and ITE Law, enforcement against digital copyright violations is often ineffective. Low public legal awareness, limited capacity of law enforcement agencies to address cybercrimes, and the difficulty of tracking anonymous perpetrators in the digital realm exacerbate this issue.

²¹¹ Fatemeh Asadi *et al.*, *Digital Platforms and Intellectual Property Infringement: Exploring Legal Liability for User-Generated Content in the Context of Digital Media*, 2(1) *Legal Studies in Digital Age* 40 (2022).

²¹²R. Sobirin, *Perlindungan Hukum terhadap Hak Ekonomi Pencipta e-Book atas Proses Pendistribusian e-Book berdasarkan UU No. 28 Tahun 2014 tentang Hak Cipta dikaitkan dengan UU No. 11 Tahun 2008 tentang Informasi dan Transaksi Elektronik*, 7(1) *Jurnal Hukum Media Justitia Nusantara* (2017).

²¹³ World Intellectual Property Organization (WIPO), *Advisory Committee on Enforcement*, Geneva 9 (2025) (accessed November 9, 2025).

As a result, perpetrators feel secure from legal consequences, while victims authors and publishers continue to suffer losses without adequate protection.

From the perspective of societal reading culture, the prevalence of electronic book piracy fosters unhealthy consumerist behavior. Many readers, especially the younger generation, become accustomed to obtaining reading materials for free or at very low costs through illegal channels, cultivating a mindset that undervalues intellectual works. If allowed to persist, this not only reduces the public's willingness to purchase legitimate literacy products but also risks creating a generation of readers indifferent to the ethics of consuming creative works. This situation contradicts the efforts of the government and educational institutions to enhance national literacy as a key indicator of a nation's progress.

Therefore, digital book piracy must be viewed as a multidimensional issue encompassing economic, legal, social, moral, and cultural aspects. Addressing it requires synergy among the government, law enforcement, publishers, authors, and the public as consumers. The government must strengthen regulations and enhance law enforcement effectiveness, publishers should develop safer digital distribution strategies, and the public needs to increase awareness of the importance of valuing intellectual works. Through a comprehensive approach, it is hoped that piracy can be significantly reduced, enabling Indonesia's digital publishing industry to thrive sustainably and compete globally.

IV. Conclusion

In Indonesia, Law Number 28 of 2014 on Copyright provides comprehensive protection for books, including e-books, by safeguarding creators' rights through the recognition of exclusive rights and the availability of dispute resolution mechanisms. However, despite this legal framework, e-book piracy remains a serious copyright infringement issue in the digital era. The ease of internet access, coupled with low public legal awareness, has contributed significantly to the proliferation of piracy. Moreover, perpetrators often operate anonymously in cyberspace, making law enforcement efforts more difficult, while victims frequently face challenges in pursuing legal action due to limited resources. The existence of a digital divide further exacerbates these issues. Therefore, addressing e-book piracy in Indonesia requires a comprehensive and multisectoral approach involving strong synergy among the government, law enforcement agencies, copyright holders, and society. Strengthening law enforcement mechanisms, enhancing public awareness of copyright protection, and developing secure digital infrastructure are essential to establish a sustainable and fair creative ecosystem in Indonesia.

References

- Achmad A. & Roisah K., Status Hukum Ghostwriter dan Pemegang Hak Cipta dalam Plagiarisme Menurut Undang-Undang Hak Cipta, 9(2) Jurnal Magister Hukum Udayana 437 (2020).
- Ahmad M. Ramli & Tasya Safiranita, Hukum Sebagai Infrastruktur Transformasi Indonesia 45–50 (Bandung: PT Refika Aditama 2022).
- Article 4 Law Number 28 of 2014 on Copyright (Indonesia).
- Azra M.A., Fernanda H.S., Triadi I. & Erar I., Perlindungan Hak Cipta Terhadap Pemegang

Hak Cipta Aplikasi yang Diperjualbelikan Secara Ilegal di Internet, 14(6) Jurnal Hukum dan Kewarganegaraan 3 (2015).

Bayu Prihantoko, Perlindungan Hak Cipta atas Film dengan Format Video Cam pada Warnet di Surakarta (Studi Kasus Warnet di Wilayah Surakarta) 14 (Muhammadiyah University of Surakarta 2019).

Benjamin Watts, E-Book Piracy: Beyond the Nielsen Report, 11 The Journal of Publishing Culture 5 (2022).

Dina Widya, Perlindungan Hak Cipta, Hak Terkait, dan Desain Industri, 22(2) Mimbar Hukum 270 (2010).

Djumhana M. & Djubaedillah R., Hak Milik Intelektual (Sejarah, Teori, dan Praktiknya di Indonesia) 142–143 (Bandung: PT Citra Aditya Bakti 1993).

Eliasta Ketaren, Cybercrime, Cyberspace, dan Cyber Law, 5(2) Jurnal Times 36 (2016).

Fatemeh Asadi et al., Digital Platforms and Intellectual Property Infringement: Exploring Legal Liability for User-Generated Content in the Context of Digital Media, 2(1) Legal Studies in Digital Age 40 (2022).

Feri Satria Wicaksana Effendy & Mujiono Hafidh Prasetyo, Law Enforcement Effectiveness on Copyright Piracy: Case of Indonesia, 7(3) International Journal of Multidisciplinary Research and Analysis 929 (2024).

Gintings R.Y.E., Windiani R. & Wahyudi F.E., Upaya Korea Selatan dalam Melindungi Hak Cipta Korean Wave dari Pembajakan Konten Digital, 9(2) Journal of International Relations 29 (2023).

Hafid M., Firjatullah F.Z. & Pamungkaz B.W., Tantangan Menghadapi Kejahatan Cyber dalam Kehidupan Bermasyarakat dan Bernegara, 7(2) Tambusai Education Journal 7 (2023).

Hervina Puspitosari, Cybercrime in the Field of Decency (Information Technology and Morality) 7 (Nas Media Pustaka 2020).

Hughes J., The Philosophy of Intellectual Property, 77 Georgetown Law Journal 287 (1988).

Ichsan Anwary, Evaluating Legal Frameworks for Cybercrime in Indonesian Public Administration: An Interdisciplinary Approach, 17(1) International Journal of Cyber Criminology 18–20 (2023).

IKAPI Secretariat, Pembajakan Buku Membunuh Kreativitas (2023). URL: <https://www.ikapi.org/2023/05/20/pembajakan-buku-membunuh-kreativitas/> (accessed

March 19, 2025)

Islambek Rustambekov, Said Gulyamov & Anna Ubaydullaeva, *Intellectual Property in the Digital Age* 41–43 (Roma: Roma Tre-Press 2024).

J. Locke, *Second Treatise of Civil Government* (Chapter 5: “Of Property”), Harvard Law School Library Innovation Lab, opencasebook.org. URL: <https://opencasebook.org/casebooks/510-open-source-property/resources/3.2.4-john-locke-second-treatise-of-civil-government-ch-5/> (accessed November 1, 2025).

Kadelbach S. & Günther K., *Recht ohne Staat?*, in Kadelbach S. & Günther K. (eds.), *Recht ohne Staat? Zur Normativität nichtstaatlicher Normsetzung* 13–15 (Frankfurt/New York: Campus 2011).

Łukasz Tomczyk, *Evaluation of Digital Piracy by Youths*, 13(11) *Future Internet* 5 (2021).

M. Saidin, *Aspek Hukum Hak Kekayaan Intelektual (Intellectual Property Rights)* 33 (Jakarta: Rajawali Press 1995).

Musaddag Elrayah & Saima Jamil, *Impact of Digital Literacy and Online Privacy Concerns on Cybersecurity Behaviour: The Moderating Role of Cybersecurity Awareness*, 17(2) *International Journal of Cyber Criminology* 169 (2023).

Naccm Allahrakha, *Cybersecurity Regulations for Protection and Safeguarding Digital Assets (Data) in Today’s World*, 8(1) *Lex Scientia Law Review* 406–424 (2025).

Pramesti A., Nur H. & Mulyana A., *Perlindungan Hukum Terhadap Pencipta atas Pembajakan Buku Elektronik (E-Book) yang Disebarluaskan Secara Bebas Melalui Website*, 2(2) *Journal of Contemporary Law Studies* 130 (2025).

R. Sobirin, *Perlindungan Hukum terhadap Hak Ekonomi Pencipta e-Book atas Proses Pendistribusian e-Book berdasarkan UU No. 28 Tahun 2014 tentang Hak Cipta dikaitkan dengan UU No. 11 Tahun 2008 tentang Informasi dan Transaksi Elektronik*, 7(1) *Jurnal Hukum Media Justitia Nusantara* (2017).

Rayhan S.W. & Apriani R., *Penegakan Hukum Hak Cipta Terhadap Praktik Pembajakan Film Beserta Sanksi dan Dampak yang Terjadi*, 20(1) *Supremasi Hukum* 29 (2024).

Rifa Elvaretta Khansa & Tasya Safiranita, *Optimizing the Implementation of Digital Rights Management to Strengthen Copyright Protection in Digital Streaming Services in Indonesia*, 5(4) *Journal of Law, Politic and Humanities* 2712 (2025).

Sudjana, *Hukum Kekayaan Intelektual* 115–116 (Tangerang: Universitas Terbuka 2021).

[2026] Vol.15, No.1 NTUT J. of Intell. Prop. L. & Mgmt

Tasya Safiranita Ramli, Hak Cipta dalam Media Over The Top 9 (Bandung: PT Refika Aditama 2022).

Tendai Patricia Tsikira, Digital Piracy and Unauthorised Content Use: Challenges to Copyright Protection in the Digital Age – A Comparative Study of the United States and India, 13(5) International Journal of Creative Research Thoughts (IJCRT) 845 (May 2025).

Tika A., Sunardi & Djono, Pemanfaatan Media Buku Digital Berbasis Kontekstual dalam Pembelajaran IPA, 1 Prosiding Seminar Pendidikan Nasional 196 (Surakarta 2017).

Wandi Hartono et al., Challenges of Criminal Investigation Cyber Crime, 7(1) Awang Long Law Review 14 (Nov. 2024).

Witdi Yanto N., Sukoco H. & Neyman S.N., Pemodelan Proxy Anonim Menggunakan Algoritme Expectation Maximization dengan Data Balancing, 12(1) Journal of Computer Science and Business 61 (2021).

World Intellectual Property Organization (WIPO), Advisory Committee on Enforcement, Geneva 9 (2025) (accessed November 9, 2025).

Zuliarti Wa Ode & Fitriah Faisal, Uncharted Water: Indonesia's Copyright Challenges in the Digital Age, 4(1) International Journal of Law in Changing World 105 (2025).

**Assessing the Potential for Trademarks to be Confused or Misrecognized by
Using a Vision Transformer Algorithm to Evaluate the Similarity
Calculation of Images^{**}**

Mr. Jin-Ching Shen^{*}

PhD student, College of Artificial Intelligence,
National Yang Ming Chiao Tung University, Taiwan

Dr. Kuang-Cheng Chen^{**}

Professor & Director, Graduate Institute of Intellectual Property,
National Taipei University of Technology, Taiwan

Ms. Pei-Ying Chen^{***}

AI Application Consultant,
Prospective Consultant Company, Taiwan

^{**} This article was originally presented under the title “Trademark Confusion and Misrecognition Evaluation System Based on ViT Algorithm for Image Similarity Calculation” at the International Academic Symposium on Education and Social Sciences, held in Hokkaido, Japan, on December 24, 2024. The authors gratefully acknowledge the valuable comments and suggestions provided by the conference participants. This revised version incorporates recent literatures on the ViT algorithm, trademark confusion, and misrecognition evaluation systems. In addition, this study was supported by the “2024 MOE Teaching Practice Research Program: A Teaching Practice Program about Flipped Classroom and Practical Case of Trademark Law” (Research Program No.: MOE-113-TPRSL-0025-001Y1).

^{*} The first author.

^{**} The second author/corresponding author.

^{***} The third author.

Abstract

This study proposes a method for assessing trademark confusion that measures trademark similarity using a misrecognition evaluation system based on the Vision Transformer (ViT) architecture. The proposed approach aims to enhance the objectivity and accuracy of trademark similarity evaluation, which has traditionally relied heavily on subjective human judgment and lacks unified standards. With the advancement of artificial intelligence, particularly in terms of image processing capabilities, ViT models provide a powerful tool for evaluating the visual similarity of novel graphic designs to existing trademarks. The proposed ViT model is based on a transformer architecture that captures both global and local features of images using self-attention mechanisms. Input images are divided into fixed-size patches that are processed through linear and positional embeddings and then passed through multiple transformer encoder layers. The resulting high-dimensional feature representations of the images are used to compute similarity scores between trademarks.

The proposed system first initializes a trained ViT model to extract features from input images. It then compares target trademark graphics with registered trademarks in a training dataset and ranks the results according to user-defined similarity thresholds. Experimental results demonstrate that the system successfully identified visually similar registered trademarks, displaying the top 200 candidates for each query. When the similarity threshold was set above 80%, the system exhibited high accuracy and practicality.

The contributions of this study are summarized as follows. First, the ViT model reduces the influence of individual judgement by learning statistical patterns from large-scale data. Second, it significantly increases the efficiency with which trademarks can be examined and thus reduces the human labor required to examine a given set of graphic designs for potential infringement. Third, the system can help trademark applicants in identifying potential infringement risks prior to registration, thereby minimizing legal disputes. Finally, the system provides computational and quantitative evidence to support claims of trademark confusion in legal proceedings. These results demonstrate the potential of artificial intelligence to enhance trademark examination and protection.

Keywords: Trademark confusion, Trademark similarity, Vision transformer (ViT), Misrecognition evaluation system, Trademark examination process

I. Introduction

Trademarks are used to identify the origin of products and the quality of services and thus serve as a cornerstone of trust among participants in social and economic activities. Trademark applicants carefully cultivate their brands, and trademark examiners thoroughly review the similarities among trademarks. In infringement disputes, trademark owners often engage in litigation to demonstrate that infringing marks are likely to cause consumer confusion with registered trademarks and are therefore misleading. However, existing trademark databases currently include more than three million entries, and this number is increasing annually by 950,000 to 970,000. Thus, comparing each entry individually imposes a significant workload for all three types of stakeholders mentioned earlier.

In intellectual property infringement lawsuits, determining trademark confusion or misleading similarities often relies on human judgment, and quantifiable evaluation criteria are not typically applied. However, with the advancement of artificial intelligence tools, the capability of computational models to process image data has improved significantly. Thus, artificial intelligence may have the potential to address intellectual property issues. The present study aims to explore this potential.

Since Vaswani et al. (2017) introduced the attention mechanism and transformer architecture, new applications of transformer models in image analysis have emerged¹. Subsequently, Dosovitskiy et al. (2020) proposed the vision transformer (ViT) model and outlined its architecture and performance in image-classification tasks². Ruan et al. (2021) introduced the contrastive language-image pre-training (CLIP) model based on the transformer architecture as a method to combine text and image representations for similarity calculations³. Xie et al. (2021) used a transformer model for self-supervised learning and demonstrated its effectiveness in learning image representations⁴. Ruan et al. (2022) comprehensively summarized the applications of ViT in various image processing tasks including image classification, object detection, semantic segmentation, and image similarity assessment and discussed its advantages and limitations⁵.

In summary, using ViT models to evaluate the similarity between trademark images offers several advantages of note.

A. Self-attention mechanism: ViT models include a self-attention mechanism that effectively captures both global and local features of images, which is crucial in evaluating the similarity of different images⁶.

B. Efficient processing of large images: ViT models can efficiently process large images by

¹ ASHISH VASWANI ET AL., *Attention is All you Need*, in NeurIPS'17: PROCEEDINGS OF THE 31ST INTERNATIONAL CONFERENCE ON NEURAL INFORMATION PROCESSING SYSTEMS 6000, 6009 (I. Guyon and U. Von Luxburg, S. Bengio, H. Wallach, R. Fergus, S. Vishwanathan, R. Garnett, eds., 2017).

² Alexey Dosovitskiy et al., *An Image is Worth 16x16 Words: Transformers for Image Recognition at Scale* (2020), <https://doi.org/10.48550/arXiv.2010.11929> (last visited Feb. 7, 2026).

³ ALEC RADFORD ET AL., *Learning Transferable Visual Models From Natural Language Supervision*, in INTERNATIONAL CONFERENCE ON MACHINE LEARNING 8748, 8756 (2021).
<https://doi.org/10.48550/arXiv.2103.00020>

⁴ Zhenda Xie et al., *Self-Supervised Learning with Swin Transformers* (2021), <https://doi.org/10.48550/arXiv.2105.04553> (last visited Feb. 7, 2026).

⁵ Bo-Kai Ruan et al., *Vision Transformers: State of the Art and Research Challenges* (2022), <https://doi.org/10.48550/arXiv.2207.03041> (last visited Feb. 7, 2026).

⁶ Vaswani et al., *supra* note 1, at 6009.

dividing them into fixed-size patches while maintaining the spatial structure of the image, enabling a more accurate comparison of image similarity⁷.

C. Strong feature extraction capability: Building on the success of transformers in natural language processing, ViT models inherit powerful feature extraction capabilities that enable them to capture subtle differences in images⁸.

D. Availability of pre-trained models: Numerous models pretrained on large datasets are available. These can provide high-quality feature representations and thus reduce training costs and improve performance⁹.

E. Flexibility: ViT architectures are relatively flexible and can be fine-tuned to suit different application scenarios such as trademark similarity assessments. Thus, these models can be adjusted based on specific needs¹⁰.

II. Literature Review of the ViT Architecture

In this study, we investigated a ViT model as a tool to evaluate image similarity. ViT applies the transformer architecture to perform image classification based on its success in natural language processing (NLP). The model divides input images into patches of fixed sizes and processes the resulting patches sequentially.

A. Main Steps of ViT

Following Dosovitskiy et al. (2020), the steps used in processing images with ViT models are as follows¹¹.

1. Image Segmentation: The input image is divided into fixed-size patches (e.g., 16×16 pixels). These patches are flattened and transformed into vectors to form sequences.

2. Linear Embedding: Each image patch undergoes a linear transformation (linear embedding) to be mapped onto a higher-dimensional space. These embedded vectors serve as inputs for the transformer model.

3. Positional Embedding: The relative positional information between image patches is retained by adding positional embeddings to each embedded vector. These positional embeddings are fixed and indicate the location of each patch within the image.

4. Transformer Encoder: After embedding and positional encoding, the resulting sequence of vectors is input into a series of transformer encoder layers. Each encoder layer comprises a multi-head self-attention mechanism and a feedforward neural network.

5. Classification Head: The output of the final transformer layer is used for image classification. Typically, a classification token is used to aggregate sequence information, and classification is performed through a fully connected layer.

⁷ Radford et al., *supra* note 3, at 8756.

⁸ *Id.*

⁹ Xie et al., *supra* note 4.

¹⁰ Ruan et al., *supra* note 5.

¹¹ Dosovitskiy et al., *supra* note 2.

B. ViT Computation Methods

According to Vaswani et al. (2017) and Dosovitskiy et al. (2020), the mathematical equations related to the attention mechanism, Transformer, and ViT consist of the following components¹².

1. Image Patch Embedding

The image patch embedding process in the ViT model comprises the following steps. The image is divided into N patches, denoted as x_i . Each image patch x_i undergoes a linear transformation E to convert it into a high-dimensional vector $x_i E$. These transformed vectors $x_1 E ; x_2 E ; \dots ; x_N E$ are combined into a sequence with positional embeddings E_{pos} added to preserve the positional information of each patch.

$$z_i^0 = [x_1 E ; x_2 E ; \dots ; x_N E] + E_{pos} \dots\dots (1)$$

where x_i is the i -th image patch, E is the embedding matrix, and E_{pos} is the positional embedding matrix (Vaswani et al., 2017)¹³.

2. Self-Attention Mechanism

The computation of the attention mechanism involves several variables, including a query vector Q , representing a new trademark image, a key vector K , representing the data on registered trademarks, and a value vector V , which represents the similarity between an input trademark graphic and each registered trademark. The dimension of the key vector d_k , corresponds to a particular feature when assessing similarity (e.g., color, where $d_k = 3$) for red, green, and blue as three distinct values.

The specific process is executed as follows.

- a. Compute the dot product of Q and the transpose of K to measure the similarity, and then scale the result by dividing by $\sqrt{d_k}$.
- b. Apply the softmax function to the result to convert it into a probability distribution.
- c. Multiply these probabilities by the value vector V to obtain the final attention vector¹⁴.

$$\text{Attention}(Q \cdot K \cdot V) = \text{softmax}\left(\frac{QK^T}{\sqrt{d_k}}\right) * V \dots\dots (2)$$

3. Multi-Head Self-Attention

¹² Vaswani et al., *supra* note 1, at 6009; Dosovitskiy et al., *supra* note 2.

¹³ Vaswani et al., *supra* note 1, at 6009.

¹⁴ *Id.*

The multi-head attention mechanism involves concatenating the results of all the attention heads. In simple terms, the outputs of multiple attention heads ($head_1 \cdot head_2 \cdot \dots \cdot head_h$) are combined and passed through a linear transformation W^o to obtain the final attention output. Each head can focus on different features to capture richer information, and the linear transformation matrix W^o maps the concatenated results back to the original dimensions as follows.

$$\text{MultiHead}(Q \cdot K \cdot V) = \text{Concat}(head_1 \cdot head_2 \cdot \dots \cdot head_h)W^o \dots\dots\dots (3)$$

where $head_i$ represents the output of the i th attention head. The attention mechanism is represented by “attention,” and W_i^Q , W_i^K , and W_i^V are the linear transformation matrices for the query (Q), key (K), and value (V) of the i -th attention head, respectively. QW_i^Q denotes the query vector Q after transformation by the query weight matrix W_i^Q of the i -th head. Similarly, KW_i^K and VW_i^V respectively represent the key and value vectors, after transformation by their respective weight matrices W_i^K and W_i^V . For each attention head $head_i$, the query, key, and value vectors are linearly transformed by W^o , and the attention mechanism is applied to compute the result. Each attention head has its own weight matrices, which allows it to focus on different features¹⁵.

$$head_i = \text{Attention}(QW_i^Q \cdot KW_i^K \cdot VW_i^V) \dots\dots\dots (4)$$

This part details the mathematical computations underlying the ViT model and its mechanisms, thus providing a foundation to understand the process by which the similarity of images is evaluated. The system informs each head if additional adjustments or clarifications are required.

4. Feed-Forward Neural Network

A feed-forward neural network (FNN) performs two linear transformations and one nonlinear transformation (a rectified linear unit (ReLU) activation function) on the input vector x to produce the final output. This process helps the model to learn complex feature representations.

$$\text{FFN}(x) = \max(0 \cdot xW_1 + b_1)W_2 + b_2 \dots\dots\dots (5)$$

where x is the input vector, W_1 and W_2 are weight matrices, b_1 and b_2 are bias vectors, and $\max(0 \cdot \cdot)$ represents the ReLU activation function, which sets all negative

¹⁵ *Id.*

values to zero while preserving positive values¹⁶.

5. Transformer Layer

The core concept of a transformer is based on a self-attention mechanism that captures long-range dependencies by calculating the relationship between every position in a sequence and every other position. This enables simultaneous computation across all positions in the sequence, thereby improving training efficiency. Multiple attention heads are used to focus on different features simultaneously to enhance the model's ability to represent input data and capture global information. Although transformer models were initially developed for NLP, they are now widely used in image processing, speech analysis, and other domains. The specific steps are described as follows.

a. Layer Normalization and Multi-Head Attention Mechanism Combination:

For an input vector x , layer normalization *LayerNorm* is commonly used to normalize the input. Combined with the multi-head attention mechanism *MultiHead*, this helps the model learn better feature representations and stabilizes the training process. In simple terms, the input vector x is first processed using the multi-head attention mechanism $\text{MultiHead}(x)$. The result is added to the original input x . Finally, layer normalization is applied to the sum.

$$\text{LayerNorm}(x + \text{MultiHead}(x)) \dots\dots (6)$$

This combination enables the model to learn robust features while maintaining training stability¹⁷.

b. Layer Normalization and Feed-forward Neural Network Combination:

The input vector x is first passed through a feed-forward neural network (FNN) for a nonlinear transformation $\text{FNN}(x)$. The result is then added to the original input vector x and layer normalization is applied to the sum.

$$\text{LayerNorm}(x + \text{FFN}(x)) \dots\dots (7)$$

This combination helps the model to learn better feature representations while stabilizing the training process¹⁸. In this part, we outline the mathematical foundations of the transformer and its components and highlight their roles in enhancing the performance of the model for evaluating the similarity of input images to those in a given training dataset.

III. Application of Trademark Confusion and Misrecognition Assessment

¹⁶ Vaswani et al., *supra* note 1, at 6009; Dosovitskiy et al., *supra* note 2.

¹⁷ Dosovitskiy et al., *supra* note 2.

¹⁸ *Id.*

In this chapter, we describe the process of using the multi-head attention mechanism to evaluate the similarity of a given trademark to existing marks. The calculation involves the use of query (Q), key (K), and value vectors (V). We considered three examples of trademark images. Images 1–3 depict a red circular mark, a blue square mark, and a green triangular mark, respectively. Our goal was to identify the image most similar to a given input image from a database of registered trademarks.

A. Variables Learning

The variables Q (query), K (key), and V (value) are learned using a neural network. The neural network is trained on a dataset of trademark images and adjusts its weights to optimize the representations of Q, K, and V such that the similarity assessments align with the desired outputs (e.g., correctly identifying which trademarks are most similar to the applied trademark). This learning process involves backpropagation and gradient descent to minimize a loss function, which can be based on measures such as cross-entropy or mean squared error depending on the specific objective of the similarity evaluation.

By training a neural network to model these vectors, the architecture can dynamically adjust to various features and patterns in the data for more accurate and adaptable similarity assessments. These are defined as follows.

1. Feature Vectors

To assess trademark similarity based on two feature dimensions, “color” and “shape,” we define the following vectors.

Color: Red = [1, 0, 0], Blue = [0, 1, 0], Green = [0, 0, 1]

Shape: Circle = [1, 0, 0], Square = [0, 1, 0], Triangle = [0, 0, 1]

2. Query Vector (Q)

To find the trademark most similar to the “red circular trademark,” the query vector Q represents this red circular trademark specifically.

$Q_{color} = [1 \cdot 0 \cdot 0]$ (Red) and $Q_{shape} = [1 \cdot 0 \cdot 0]$ (Circle)



Application

Figure 3.1: Trademark application under review

3. Key Vector (K)

The key vectors represent the feature vectors of the approved trademarks in the dataset.

$K_{color} : K_1 = [1 \cdot 0 \cdot 0]$ (Red), $K_2 = [0 \cdot 1 \cdot 0]$ (Blue), $K_3 = [0 \cdot 0 \cdot 1]$ (Green)

$K_{shape} : K_1 = [1 \cdot 0 \cdot 0]$ (Circle), $K_2 = [0 \cdot 1 \cdot 0]$ (Square), $K_3 = [0 \cdot 0 \cdot 1]$ (Triangle)



Figure 3.2: Approved and published trademarks*

This setup establishes a basis to calculate the similarity between a given input graphic and registered trademarks using the multi-head attention mechanism.

4. Value Vector (V)

The value vector also represents the registered trademarks and is used to retain information related to these trademarks that may be relevant to the similarity calculation. It is typically obtained using the same neural network as the key vector. Notably, the key vectors are used to compute similarity, whereas the value vectors are used to weigh the contribution of each registered trademark to the final attention result.

5. Calculating Attention

In the multi-head attention mechanism design, the dimension d_k of the key vector is usually determined by the overall structure of the model. Typically, a transformer model has a fixed input dimension d_{model} , which is distributed among h attention heads. Each head has a key vector dimension $\frac{d_{model}}{h}$. For example, if the input dimension $d_{model} = 512$ and the model focuses on eight features (e.g., color and shape), the key vector dimension is $d_k = \frac{d_{model}}{h} = \frac{512}{8} = 64$. In general, a larger value of d_k can be selected to capture more subtle differences in the data. In this case, we assume that the dimensions of the key vector $d_k = 3$ for simplicity.

6. Color Attention Head (Head 1)

To calculate the dot product of Q_{color} and K_{color}^T using Equation (2), the dot product measures the projection between two vectors; a higher projection length indicates greater similarity between the two vectors.

a. Compute the Dot Product $Q_{color} \cdot K_{color}^T$

This measures the similarity in color features between the input graphic and each registered trademark in the dataset.

$$Q_{color} \cdot K_{color}^T = [\text{red} \quad \text{blue} \quad \text{green}]_{1 \times 3} \cdot \begin{bmatrix} \text{red} \\ \text{blue} \\ \text{green} \end{bmatrix}_{3 \times 1} = [1 \quad 0 \quad 0]_{1 \times 3} \cdot \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}_{3 \times 1} = 1$$

This result shows the color similarity score between the applied trademark and each registered trademark.

b. Scale by $\sqrt{d_k}$:

To obtain a stable probability value, divide by $\sqrt{d_k}$.

$$\frac{Q_{color} \cdot K_{color}^T}{\sqrt{d_k}} = \frac{1}{\sqrt{3}} = 0.58$$

When the dimensions of Q and K are large, the dot product QK^T can become very large, which causes the output of the softmax function to be close to 0 or 1. This can lead to a very small gradient and cause problems due to the gradient vanishing. Dividing by $\sqrt{d_k}$ helps limit the values to a smaller range to ensure stable gradient changes and prevent gradient vanishing or explosion.

c. Apply the Softmax Function to Convert the Input Vectors to Probabilities:

The softmax function transforms the input vector $z = [z_1 \cdot z_2 \cdot \dots \cdot z_n]$ into a probability distribution $p = [p_1 \cdot p_2 \cdot \dots \cdot p_n]$, where $p_i = \frac{e^{z_i}}{\sum_{j=1}^n e^{z_j}}$ indicates $\text{Softmax}(z_i) = \frac{e^{z_i}}{\sum_{j=1}^n e^{z_j}} \in [0 \cdot 1]$.

For example, $z_0 = 0.66$, $z_1 = 0.58$, $z_2 = 0$, and $z_3 = 0$, where z_0 represents the similarity score of the new application. The attention weights are calculated as follows.

$$\text{Softmax}(0.66) = \frac{e^{0.66}}{e^{0.66} + e^{0.58} + e^0 + e^0} = \frac{1.34}{1.934 + 1.786 + 1 + 1} = 0.3382$$

$$\text{Softmax}(0.58) = \frac{e^{0.58}}{e^{0.66} + e^{0.58} + e^0 + e^0} = \frac{1.786}{1.934 + 1.786 + 1 + 1} = 0.3122$$

$$\text{Softmax}(0) = \frac{e^0}{e^{0.66}+e^{0.58}+e^0+e^0} = \frac{1}{1.934+1.786+1+1} = 0.1748$$

$$\text{Softmax}(0) = \frac{e^0}{e^{0.66}+e^{0.58}+e^0+e^0} = \frac{1}{1.934+1.786+1+1} = 0.1748$$

$$\text{Softmax}(0.66) + \text{Softmax}(0.58) + \text{Softmax}(0) + \text{Softmax}(0) = 1$$

d. Calculate the Attention Vector:

If the value vectors of the new application and each registered trademark are given as

$$V_0 = \begin{bmatrix} 3 \\ 2 \\ 3 \end{bmatrix}_{3 \times 1}, V_1 = \begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix}_{3 \times 1}, V_2 = \begin{bmatrix} 1 \\ 3 \\ 2 \end{bmatrix}_{3 \times 1}, V_3 = \begin{bmatrix} 3 \\ 1 \\ 2 \end{bmatrix}_{3 \times 1},$$

then $\text{Attention}(Q \cdot K \cdot V) = \text{Softmax}\left(\frac{QK^T}{\sqrt{d_k}}\right) * V$ is used along with Equation (2) to calculate the attention output as follows.

$$\begin{aligned} \text{Attention}_{color} &= 0.3382 \begin{bmatrix} 3 \\ 2 \\ 3 \end{bmatrix}_{3 \times 1} + 0.3122 \begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix}_{3 \times 1} + 0.1748 \begin{bmatrix} 1 \\ 3 \\ 2 \end{bmatrix}_{3 \times 1} + \\ 0.1748 \begin{bmatrix} 3 \\ 1 \\ 2 \end{bmatrix}_{3 \times 1} &= \begin{bmatrix} 2.3382 \\ 1.6878 \\ 2.0260 \end{bmatrix}_{3 \times 1} \end{aligned}$$

This result indicates that the output vector is generated by the attention mechanism through a weighted average of the four input vectors according to their respective attention weights. Each value represents a different component of the final output vector: 2.3382, 1.6878, and 2.0260 correspond to the first, second, and third components, respectively. These values reflect the weighted contribution of each component to the overall attention weights. This demonstrates how the model allocates attention resources based on the importance of the input features.

7. Shape Attention Head (Head 2)

Similarly, for calculating the shape attention head, let us assume the result as follows:

$$\text{Attention}_{shape} (Q \cdot K \cdot V) = \begin{bmatrix} 1.1613 \\ 2.8868 \\ 3.6786 \end{bmatrix}_{3 \times 1}$$

8. Conceptual Example of the Multi-Head Attention Mechanism (A Simplified Illustration for Pedagogical Purposes)

To intuitively demonstrate the weighted aggregation process of the multi-head attention mechanism, this section constructs a numerical example using **highly simplified, hand-crafted features (color and shape)**. In ViT, the input consists of raw image pixels, which are divided into fixed-size patches and linearly projected into patch embeddings; all features are learned end-to-end by the model, rather than being provided as pre-defined color/shape vectors as in this example.

(1) Example Setup

For ease of illustration, suppose the model has two attention heads, focusing on two feature dimensions: “color” and “shape.”

The query trademark (query vector Q) is a “red circle,” and the three registered trademarks in the database (key vectors K, value vectors V) are:

- Trademark 1: red circle
- Trademark 2: blue square
- Trademark 3: green triangle

Following Equation (2), the attention weights for each head are computed, and the weighted sum of the value vectors yields the output of each head:

- **Head 1 (color) output:** $\begin{bmatrix} 2.3382 \\ 1.6878 \\ 2.0260 \end{bmatrix}_{3 \times 1}$

- **Head 2 (shape) output:** $\begin{bmatrix} 1.1613 \\ 2.8868 \\ 3.6786 \end{bmatrix}_{3 \times 1}$

These two output vectors themselves do NOT directly represent “color similarity” or “shape similarity.” Rather, they are **hidden representations** produced by each attention head in its respective representation subspace. To aid reader comprehension, we **approximately interpret** the magnitude of each output value as the degree of matching in the feature dimension that head focuses on a higher value indicates greater similarity to the corresponding registered trademark in that feature dimension. For example, in Head 1, the first dimension (2.3382) is the highest, corresponding to the highest color match with Trademark 1 (red circle); in Head 2, the third dimension (3.6786) is the highest, corresponding to the highest shape match with Trademark 3 (green triangle).

(2) Concatenation of Multi-Head Outputs

The output vectors of the two heads are concatenated to form the complete multi-head attention output vector:

$$\text{MultiHead}(Q, K, V) = \begin{bmatrix} 2.3382 \\ 1.6878 \\ 2.0260 \\ 1.1613 \\ 2.8868 \\ 3.6786 \end{bmatrix}_{6 \times 1}$$

This vector is then fed into subsequent layers (e.g., the feed-forward network) to learn more abstract feature combinations. The concatenation operation allows the model to preserve information extracted by different heads from various perspectives, thereby integrating multi-dimensional visual features.

(3) Fundamental Differences Between This Example and a Real ViT Model

It must be reiterated that **the actual workflow of a real trademark similarity evaluation system differs fundamentally from the example above:**

- a. **Input Format:** The input to ViT consists of raw pixels of the trademark image, divided into fixed-size patches (e.g., 16×16 pixels) and linearly projected into patch embeddings. **It is by no means** based on manually encoded color/shape vectors.
- b. **Target of Attention Mechanism:** ViT employs **self-attention**, where the query (Q), key (K), and value (V) are **all derived from different patches within the same image**. The purpose is to capture global and local dependencies among patches; **it does not** compute cross-image attention directly between a “query trademark” and “database trademarks.”
- c. **Similarity Evaluation Method:** The actual workflow of the system developed in this study is as follows:
 - Use a pre-trained ViT model to extract **global feature vectors** (typically the output of the [CLS] token) for both the query trademark and each registered trademark.
 - Compute the **cosine similarity** between the query feature and each database feature.
 - Rank the results by similarity and output the top 200 most similar registered trademarks.

The system does NOT directly produce “similarity scores” from the

attention layers; all query results presented in Table 5.1 and related sections are the outcomes of this feature-matching and ranking process.

- d. Function of Attention Heads:** In a real model, the features each head focuses on (e.g., contour, texture, color distribution, font structure) are **automatically learned from data, not manually assigned**. Different heads may have overlapping focuses, and their attention patterns can adapt dynamically; it is neither possible nor necessary to pre-assign specific heads to specific features.

(4) Value and Limitations of This Example

Despite the significant differences between the above example and the actual system, this illustration still helps convey the **core idea** of the multi-head attention mechanism:

Processing input information in parallel through different representation subspaces and then integrating multi-faceted features via weighting and concatenation.

This capability enables ViT to effectively handle complex visual comparisons involving multiple elements such as color, shape, texture, layout, and typography in trademark similarity assessment tasks—**far surpassing traditional human examination that often relies on a single feature (e.g., color or shape) alone**.

The empirical results presented in Chapter V will further demonstrate that a system based on ViT feature extraction and cosine similarity retrieval can stably and objectively identify potentially confusing trademarks from databases containing hundreds of thousands or even millions of entries, significantly improving both efficiency and accuracy of trademark examination.

IV. Research Process

Based on the principles of ViT explained in Chapter II and the practical application of trademark confusion and misrecognition assessment detailed in Chapter III, a system to evaluate trademark confusion and misrecognition based on a ViT architecture is developed. This work involved five main steps, including i) importing packages, ii) conducting “trademark similarity” judgments based on the “ViT algorithm”, iii) user input to establish similarity threshold and model options, iv) loading a pretrained ViT model and an image processor, and v) training, validating, and testing the trademark similarity model.

In the third step, interactive input was used to allow the user to determine the desired similarity threshold value. In the fourth step, a pretrained model was established to ensure that the user does not need to retrain the model for subsequent use, thereby saving time. The fifth step involved entering the training and test dataset information. Finally, the system filters the registered trademark database to identify trademarks that meet the similarity requirements (Figure 4.1).

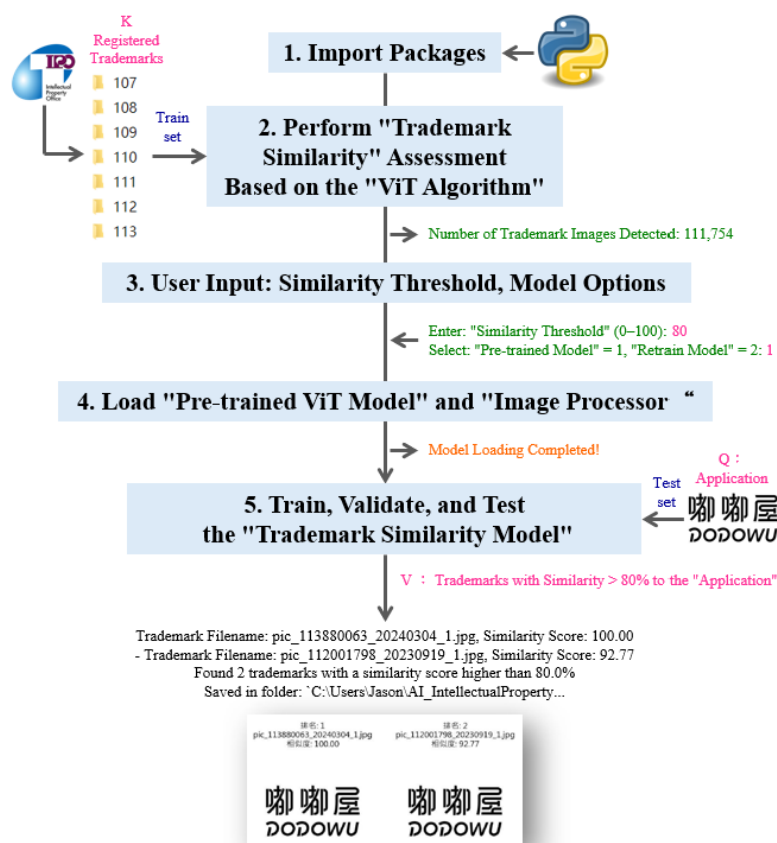


Figure 4.1: Analysis process of the Trademark Confusion and Misrecognition Evaluation System Based on the ViT Algorithm¹⁹

V. Empirical Results

As of August 6, 2024, the “Trademark Application Image Database” from the Intellectual Property Office’s “Patent and Trademark Open Data Download” contained 3,181,661 approved and published trademarks²⁰.

A. "Published Trademark Database" Used for Training

Trademark data were extracted from a database of trademarks published between 2018 and 2024, yielding 111,754 entries that were used as the training set (Figure 5.1). In practical trademark application scenarios, applicants may consider displaying their trademarks on different packaging, which can lead to various designs that are similar or even nearly identical in appearance (hereinafter referred to as "derivative applications"). Examples include the trademarks in Figure 5.2(a) "Jianhong," Figure 5.2(b) "Formosa PP Fiber," and Figure 5.2(c) "Formosa All-PP Material Apparel (Right)."

¹⁹ See Taiwan Intellectual Property Office, Trademark Application Database, <http://tipo.gov.tw> (last visited Feb. 7, 2026).

²⁰ *Id.*



Figure 5.1: Portion of the training set data²¹



Figure 5.2(a): Trademarks nearly identical in appearance: Jianhong²²



Figure 5.2(b): Trademarks nearly identical in appearance: Formosa PP Fiber²³

²¹ *Id.*

²² *Id.*

²³ *Id.*



Figure 5.2(c): Trademarks nearly identical in appearance: Formosa All-PP Material Apparel²⁴

B. "New Applications" Used for "Query"

To account for the repetitive application of similar or identical images, as shown in Figures 5.2(a) to 5.2(c), we selected black-and-white text trademarks as examples to avoid the potential subjective bias caused by color and graphical interference. For the "new applications" used for "query," we chose trademarks that have extremely similar repeated applications in the "Published Trademark Database" (e.g., pic_1180063 and pic_1180064). One of these trademarks (pic_1180064) was used as a query example and was removed from the training data to examine whether the model could identify trademarks that were likely to cause confusion or misrecognition, as shown in Figure 5.3(a).



**Figure 5.3(a): "New Application" used for "Query": Derivative Application
(The image on the right is used as the new application for the query)²⁵**

In addition, some trademarks did not have simultaneously applied trademarks with similar

²⁴ *Id.*

²⁵ *Id.*

appearances. The trademark "Fussy Cat" was selected as an example (Figure 5.3(b)).

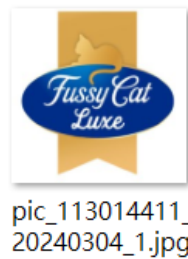


Figure 5.3(b): "New Application" Used for "Query": Non-Derivative Application²⁶

Furthermore, a new trademark was designed to test whether the model was applicable to entirely new applications. For the reasons mentioned regarding Figure 5.3(a), a black-and-white text design was used (Figure 5.3(c)).



Figure 5.3(c): "New Application" used for "Query": Completely new application²⁷

C. Model Performance

The ViT model used in this study was trained using the provided data. As the number of training epochs increased, the error rate gradually decreased, indicating that the model approached optimal performance (Figure 5.4).

²⁶ *Id.*

²⁷ *Id.*

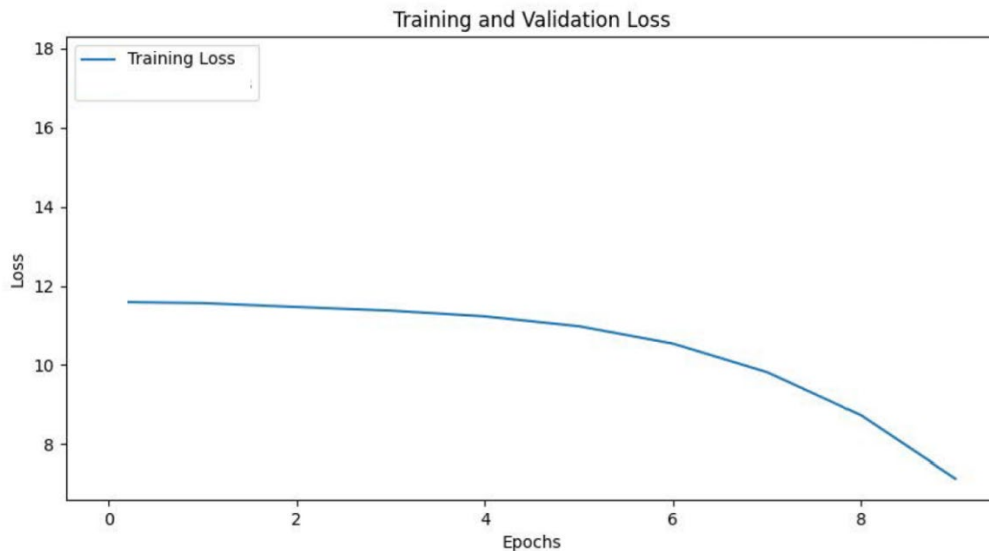


Figure 5.4: Model performance

D. Recommendation Results

For the new application, the ViT model lists all the published trademarks that satisfy the similarity threshold value input by the user. According to search results from the Intellectual Property Office's database, evidently, after the 100th result, the trademarks are significantly different and would not cause confusion, even without AI tools. Therefore, this study only lists the "top 200 published trademarks that meet the user's input similarity threshold." For new applications, such as those shown in Figures 5.3(a)–(c), the number of trademarks retrieved varied as the similarity threshold decreased from 90% to 10% (Table 5.1). Based on these findings, the recommended user similarity threshold is 60% or higher for more practical use; hence, this study uses a similarity threshold of 80% for further analysis.

Table 5.1: Query results for "New Applications": Number of queries sorted by similarity

	90%	80%	70%	60%	50%	40%	30%	20%	10%
Fig 5.3(a)	2	2	5	100	200+	200+	200+	200+	200+
Fig 5.3(b)	12	123	200+	200+	200+	200+	200+	200+	200+
Fig 5.3(c)	6	98	200+	200+	200+	200+	200+	200+	200+

1. Derivative Application

After normalizing the similarity scores using Equations (6) and (7), the query results showed relative similarity. In other words, among all published trademarks, the "most similar published trademark to the new application" has a similarity score of 100%. Therefore, the normalized similarity score essentially serves as an indicator of the "ranking of similarity to the new application."

For the derivative application shown in Figure 5.3(a) (original number: pic_113880064), the model identified the most similar published trademark as pic_113880063 (Figure 5.5, left).

This trademark was submitted for application in the same year as the new application, with almost no differences in their design.

The second most similar trademark was Pic_112001798, an application submitted by the same applicant the previous year. A closer comparison with the new application revealed extremely subtle differences in proportions, as shown in Figure 5.6. The model successfully identified these trademarks from a database of more than 110,000 entries and provided high-quality similarity evaluations, demonstrating the robustness of its performance.



Figure 5.5: Trademarks likely to cause confusion: Repeated applications²⁸



Figure 5.6: Confusion comparison: New Application (Gray) vs. pic_112001798 (Black)²⁹

2. Independent Application

For the independent application shown in Figure 5.3(a) (original number pic_113014411), the trademark features include a blue oval shape, white English lettering inside, and a yellow decorative ribbon on the outside. Consequently, the model was particularly sensitive to four characteristics: curved lines, blue blocks, white text, and yellow blocks.

Among the top 20 similar trademarks selected by the model (see Figure 5.7, arranged from left to right in the same row and continuing to the next row), most shared some of the four characteristics. For example, the first trademark shown, "21 TO GO," has a circular outline,

²⁸ *Id.*

²⁹ *Id.*

blue color blocks, text font, and yellow lines.

For trademark examiners, this model can be used to first filter out trademarks with visual features similar to the "new application," such as the top 200 published trademarks, for a detailed comparison. This approach avoids the need to compare trademarks individually from millions of entries, thereby significantly reducing the workload, shortening the examination process, and improving administrative efficiency.



Figure 5.7: Trademarks likely to cause confusion: Independent application³⁰

3. Completely New Application

The above tests, based on trademarks extracted from the database, are equivalent to verifying the labeling work. The results showed that the ViT model used in this study can produce stable and objective results. Combined with the subjective experience and judgment of examiners, this could considerably enhance the efficiency of trademark examinations.

Based on this, a completely new example trademark graphic was designed for testing (Figure 5.3(c)). The trademark features include a white background and black text. According to the query results, the top 20 most similar published trademarks largely matched these characteristics, as shown in Figure 5.8. Examiners can prioritize reviewing the "top 200 trademarks with the highest similarity" filtered by the model, thereby avoiding the need to

³⁰ *Id.*

compare each trademark individually from a very large database.



Figure 5.8: Trademarks likely to cause confusion: Completely new application³¹

VI. Conclusion

To address the challenges faced by trademark applicants, trademark examiners, parties in trademark infringement lawsuits, and courts concerning the quantification of trademark similarity, this study contributes a computational system to evaluate the possibility of confusion or misrecognition among trademark graphic designs using a vision transformer model.

First, the proposed system enables trademark applicants to import the design of their intended trademark application as a test set into the ViT system for querying and listing the top 200 most similarly registered trademarks. This enables applicants to determine whether their proposed trademark is likely to be identical to or similar to an already registered trademark. If similarities exist, applicants can efficiently revise their trademark designs to avoid litigation.

Second, for trademark examiners, manually comparing the similarity of trademarks individually is not only inefficient but may also lead to oversights due to fatigue, potentially resulting in approvals that could cause disputes in the future. Using the ViT system, examiners can list the top 200 most similar registered trademarks, reducing the number of comparisons from three million to 200. This approach enables examiners to focus on assessing the similarity

³¹ *Id.*

between a new application and the 200 registered trademarks, thereby improving examination efficiency. In addition, with the assistance of the system in pre-filtering the database based on similarity, combined with the examiners' rich experience and professional judgment, the accuracy of trademark examinations can be significantly enhanced.

Third, for parties involved in infringement lawsuits, providing quantitative information to establish the possibility of confusion or misrecognition between infringing and infringed trademarks often requires an extensive survey to achieve statistical significance. The survey process is subject to various errors such as measurement errors (due to inaccurate measurement tools or recording mistakes), response errors (due to memory mistakes, misunderstanding, or deliberate misinformation by respondents), coverage errors (arising from incomplete coverage of the population, such as omitting certain groups), non-response errors (resulting from non-participation of some respondents, such as refusal to answer or inability to contact), and processing errors (occurring during data entry, coding, or analysis). In contrast, the ViT system proposed in this study provides a robust and reliable assessment of the similarity of graphic designs used as trademarks based on a rigorous algorithm and a very large database of existing trademarks. This can assist parties in evaluating litigation strategies and serves as a reference to support the court's discretionary judgment.

References

- Alexey Dosovitskiy et al. An Image is Worth 16x16 Words: Transformers for Image Recognition at Scale (2020). <https://doi.org/10.48550/arXiv.2010.11929> (last visited Feb. 7, 2026).
- Alec Radford et al. Learning Transferable Visual Models from Natural Language Supervision. in International Conference on Machine Learning (2021). <https://doi.org/10.48550/arXiv.2103.00020>
- Bo-Kai Ruan et al. Vision Transformers: State of the Art and Research Challenges (2022). <https://doi.org/10.48550/arXiv.2207.03041> (last visited Feb. 7, 2026).
- Ashish Vaswani et al. Attention is All you Need. in NeurIPS'17: Proceedings of the 31st International Conference on Neural Information Processing Systems (I. Guyon and U. Von Luxburg, S. Bengio, H. Wallach, R. Fergus, S. Vishwanathan, R. Garnett, eds., 2017).
- Zhenda Xie et al. Self-Supervised Learning with Swin Transformers (2021). <https://doi.org/10.48550/arXiv.2105.04553> (last visited Feb. 7, 2026).
- Taiwan Intellectual Property Office. Trademark Application Database. <https://cloud.tipo.gov.tw/S220/opdata/detail/TmarkPics> (last visited Feb. 7, 2026).

<u>Author, Title</u>	<u>Page</u>
Dr. Tsu-Sung Hsieh <i>Aesthetics in Fashion Designs from Perspectives of Intellectual Property Law: A Comparative Study and Suggestions Thereof</i>	9
Dr. Tasya Safiranita, S.H., M.H. & Haipa Nisrina Sayyidah, S.H. & Yoan Shevila Kristiyenda & S.H., Dr. Zainal Muttaqin, S.H., M.H. & Dr. Dadang Epi Sukarsa, S.H., M.H. & Prof. Dr. Ramalinggam Rajamanickam <i>Legal Protection of Copyright Against Cybercrimes: The Case of Electronic Book Piracy in Indonesia</i>	29
Mr. Jin-Ching Shen & Dr. Kuang-Cheng Chen & Ms. Pei-Ying Chen <i>Assessing the Potential for Trademarks to be Confused or Misrecognized by Using a Vision Transformer Algorithm to Evaluate the Similarity Calculation of Images</i>	46