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UAB "PLANNER5D"

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

UAB "PLANNER5D" dba PLANNER 5D, Plaintiff, v. FACEBOOK INC., FACEBOOK TECHNOLOGIES, LLC, THE TRUSTEES OF PRINCETON UNIVERSITY, DOES 1-200, ABC CORPORATIONS 1-20, and XYZ UNIVERSITIES 1-20. Defendants.	**Case No.** **COMPLAINT FOR COPYRIGHT INFRINGEMENT** **DEMAND FOR JURY TRIAL**

UAB "Planner5D" (Planner 5D) sued Facebook, Inc., Facebook Technologies, LLC (together, Facebook), and The Trustees of Princeton University (Princeton or Princeton University) in a case entitled *UAB "Planner5D" v. Facebook et al.*, Case No. 3:19-cv-03132 WHO (N.D. Cal. June 5, 2019). The Court dismissed Planner 5D's copyright claims with leave to amend. (ECF 52.) The Court held that Planner 5D should re-file its copyright claims in a new lawsuit that would then be related to and consolidated with the original one. (ECF 59.) Planner 5D did so. (*See UAB "Planner5D" v. Facebook et al.*, Case No. 3:20-cv-02198-WHO (N.D. Cal. Mar. 31, 2020).) On July 24, 2020, the Court dismissed that case, again granting leave to amend. (ECF 90.) Under the Court's reasoning in its order requiring the filing of a separate lawsuit for the previously amended copyright claims, *see* ECF 59, Planner 5D has determined it likewise should file a new lawsuit for the present amended claims. Accordingly, for its new Complaint against Facebook and Princeton, Planner 5D now alleges as follows.

INTRODUCTION

1. This case arises from Princeton and Facebook's misappropriation and exploitation of Planner 5D's intellectual property, on a massive scale and without authorization, for their own advantage and profit.

2. Computer vision—the ability of computers to recognize three-dimensional scenes—is one of today's leading research fields. Whoever first masters this technology will forever change humankind's relationship with machines.

3. Scene-recognition technology will soon enable robots to care for home-bound patients, and to boost safety and productivity at offices, airports, hospitals, and factories. It will also revolutionize an array of applications outside of robotics. One product looks after elderly people in their homes, using computer vision to detect changes in their gait or behavior, and to recognize stumbles or falls. Other applications will usher in a new era in virtual reality. Virtual objects will be seamlessly integrated into the user's actual indoor environment, enhancing realism

for both industrial and recreational applications. Shipping giant DHL has already equipped its warehouse employees with "smart glasses" that use scene recognition to display where each item picked from the warehouse should be placed on the trolley for delivery. It's been estimated that the computer vision market will reach $48 billion by 2023, and $60 billion by 2025.

4. Yet even as scientists make great strides in this burgeoning research area, they have encountered a roadblock. Teaching machines to recognize three-dimensional settings requires feeding them large volumes of realistic, digitized samples of such places—digitized doors, walls, furniture, and the like, arranged into plausible interiors that are readable by machines. Creating lifelike digital scenes is extremely time- and labor-intensive, and requires the exercise of substantial human judgment, creativity, and expression. For truly realistic scenes, human modelers must personally craft each three-dimensional object, and human designers must arrange the objects in lifelike configurations. Large collections of these kinds of three-dimensional settings are thus exceedingly rare.

5. Yet such collections are vital to scene-recognition research. In a slide presentation posted online, a senior Princeton computer scientist asked, "What is the main roadblock for 3D scene understanding and research?" His answer: "Data!!" (*See* Thomas Funkhouser, *3D Data for Data-Driven Scene Understanding*, 8-9, https://www.cs.princeton.edu/~funk/VRWorkshop.pdf (last visited March 30, 2020).)

6. Planner 5D owns a collection of over a million human-designed, hand-crafted, digitized, and realistic three-dimensional objects and scenes, depicting a wide variety of household and office designs. To Planner 5D's knowledge, no other collection in the world numbers even in the tens of thousands. The company created and grew its collection over many years, at a cost of millions of dollars. It began by hiring modelers to fashion several thousand hand-crafted three-dimensional objects. These were lifelike models of furniture, appliances, plants, people, lighting, or other objects that could occupy the interior or exterior of a digitally depicted room or

structure. Millions of users of the company's design tool then dragged and dropped these virtual objects into floor plans, creating realistic three-dimensional interior designs, or "scenes." Each created design, or scene, was comprised of computer code stored on Planner 5D's own servers, for later access and use by Planner 5D and the user who created it. Planner 5D's collection of such scenes has mushroomed over the years to many millions of scenes. Users can designate their scenes for desired inclusion in Planner 5D's public gallery of designs. From these, Planner 5D personnel carefully select a subset of the most appealing, artistic, or diverse scenes, numbering in the tens of thousands, to display as the current public gallery. This curated public gallery contains the scenes that are visible to all users. The remaining scenes in Planner 5D's collection can be accessed or viewed only by Planner 5D or the users who created them.

7. Computer scientists at Princeton were eager to use Planner 5D's uniquely large, uniquely realistic collection of data. They decided to download the entirety of Planner 5D's then-existing public gallery of scenes, as well as all of Planner 5D's individual objects. Planner 5D will need discovery to determine the precise means by which Princeton did so. But on information and belief, the Princeton scientists or others acting at their behest used special software tools, including Princeton's own software, specially engineered for this purpose, to access the digital files underlying Planner 5D's objects and scenes. Without these special tools, users could only see and manipulate the on-screen images rendered from these computer files. For example, users could see an image of a sofa, and drag and position it onto a floor plan for a living room. But the computer code from which these images were rendered was always invisible, and wholly inaccessible, to users.

8. On information and belief, using software developer tools, Princeton or its agents monitored and intercepted communications activity between Planner 5D's software and its European servers. Using information extracted from these intercepted communications, together with data-harvesting software of its own

creation, Princeton determined the secret Internet addresses where the tens of thousands of Planner 5D's object and scene files were hidden. Princeton's computer code then crawled the location of each of the tens of thousands of addresses, scraping the files it encountered into its unauthorized collection.

9. In this way, Princeton downloaded over five *gigabytes* of Planner 5D data. It then used this data for its scene-recognition activities. Princeton researchers published multiple articles using the data. The authors confessed the data's provenance: "We use a collection of 3D scene models downloaded from the Planner5D website." (*E.g.*, Yinda Zhang, *et al*, *Physically-Based Rendering for Indoor Scene Understanding Using Convolutional Neural Networks 3 (*Proceedings of IEEE Conference on Computer Vision and Pattern Recognition, 2017*)* https://arxiv.org/pdf/1612.07429v2.pdf.) (last visited March 30, 2020).)

10. Princeton also made the stolen data available to an unknown number of researchers at a Princeton URL. Visitors to this URL would fill out a form and agree to certain terms in order to be approved for access to the dataset. Planner 5D will need discovery to determine exactly how many researchers applied to Princeton for access to the data, how many were accepted, who those researchers are, and whether and how their use of the data was restricted. Princeton labeled the stolen data the "SUNCG dataset."

11. Defendants Facebook, Inc. and its subsidiary, Facebook Technologies, LLC (together, Facebook) were also interested in Planner 5D's objects and scenes. Facebook Technologies runs "Oculus," the well-known virtual-reality brand Facebook acquired in 2014. Scene recognition is a vital component of virtual-reality products and services. As one example, "scene fusion"—the fusing of virtual objects with the user's actual surroundings—relies critically on scene-recognition technology.

12. Eager to tap the enormous commercial potential of scene recognition technology, Facebook assembled its own, internal, computer-vision team. This team then enlisted broader aid for its research.

13. Facebook joined with researchers at Princeton, Stanford, UC Berkeley, Georgia Tech, and other institutions to jointly organize and run an international scene-recognition competition called the SUMO Challenge (**S**cene **U**nderstanding and **MO**deling Challenge). Facebook served as the lead sponsor of the SUMO Challenge. (*See* THE 2019 SCENE UNDERSTANDING AND MODELING CHALLENGE, https://sumochallenge.org/ (last visited March 30, 2020).) The first SUMO Challenge was launched in late August, 2018; another was held in 2019.

14. SUMO Challenge entrants were encouraged to submit scene-recognition papers and algorithms. The SUMO Challenge organizers promised contest winners cash prizes and a speaking slot at a "SUMO Challenge conference." To facilitate contestants' work, beginning with the inaugural SUMO Challenge in mid-2018, Facebook and the other SUMO Challenge organizers created their own copy of the SUNCG dataset, and made it available to contestants who signed up for the contest to use for their submissions. These SUMO Challenge organizers published a link to the copied SUNCG dataset, at a URL belonging to Stanford University—itself a SUMO Challenge organizer. In return for their chance at cash prizes and the opportunity to present their winning submissions, SUMO contestants granted Facebook a "perpetual, royalty-free, no-cost license and right to use and otherwise exploit" the submitted materials, including Facebook's right to use the contest submissions "in any merchandising, advertising, marketing, promotion or for any other commercial or non-commercial purpose." Planner 5D will need discovery to determine how many contestants applied to the SUMO Challenge for access to the SUNCG dataset, how many were accepted, who those contestants were, and how, if at all, their use of the data was restricted. But on information and belief, enough

contestants were given access to the dataset to cause Planner 5D enormous economic damage.

15. The gigabytes of files Princeton, Facebook, and an unknown number of others have downloaded and used are the intellectual property of Planner 5D. Planner 5D's files were scraped, copied, and used without its knowledge or permission. The defendants' copying, use, and public disclosure and dissemination of Planner 5D's core asset has caused catastrophic and potentially permanent damage to the company.

JURISDICTION

16. This case arises under the United States Copyright Act, 17 U.S.C. §§ 101 *et seq.* Accordingly, this Court has subject matter jurisdiction under 28 U.S.C. § 1331.

17. The Court has personal jurisdiction over Facebook, Inc. and Facebook Technologies, LLC because each is headquartered in California.

18. The Court has personal jurisdiction over Princeton University because, on information and belief, Princeton, together with its current and former employees and students has engaged in the following acts:

- participated in and assisted with the SUMO Challenge in California, including as SUMO Challenge organizers and advisors;
- worked with Facebook and other California-based companies, individuals, and institutions involved with the SUMO Challenge;
- received "generous support"—presumably cash funding—for scene recognition work from Silicon Valley companies such as Facebook, Inc., Google LLC, and Nvidia Corporation.
- permitted the copying and storage in this district of the SUNCG dataset used in the SUMO Challenge;
- made its own copy of the SUNCG dataset generally available for download in California, an invitation that on information and belief at least some California residents accepted;

- co-authored articles with California residents about the SUNCG dataset, and specifically its origin as data downloaded from Planner 5D;
- consented to and enabled the current sabbatical here, at Google and Stanford, of Dr. Thomas Funkhouser, one of Princeton's leading computer-vision professors. Dr. Funkhouser co-authored articles dealing with Princeton's use of the Planner 5D data and serves as one of four members of the SUMO Challenge Advisory Board; and
- accepted Facebook's support of another of its key scene-understanding researchers, Dr. Shuran Song, via a "Facebook Fellowship."

19. The Court also has personal jurisdiction over all defendants because no defendant timely challenged personal jurisdiction in the previously-filed cases. The defendants thereby waived a jurisdictional challenge there, Fed. R. Civ. P. 12(h)(1), and, by extension, also here.

VENUE

20. Venue is proper in this district under 28 U.S.C. § 1400(a), because the defendants and their agents either reside or can be found in this district.

21. Venue is also proper in this district because no defendant timely challenged venue in the previously-filed cases. The defendants thereby waived a venue challenge there, Fed. R. Civ. P. 12(h)(1), and, by extension, also here.

INTRADISTRICT ASSIGNMENT

22. This is an intellectual property action subject to assignment on a district-wide basis. N.D. Cal. Civ. Local Rule 3-2(c). The previously-filed cases were assigned to the San Francisco Division, and this case is related to those cases, and will be consolidated with at least the first of them. Hence San Francisco is the proper intradistrict assignment.

PARTIES

23. Planner 5D is a private limited liability company organized under the laws of the Republic of Lithuania.

24. Facebook, Inc. is a Delaware corporation with headquarters in Menlo Park, California.

25. Facebook Technologies, LLC is a Delaware limited liability company headquartered in California. It is a subsidiary of Facebook, Inc.

26. The Trustees of Princeton University is a non-profit educational corporation and academic institution in New Jersey. In this complaint, "Princeton" refers to the university, its employees, agents, and others acting at its behest and direction.

27. Does 1-200 are individuals whose names and identities Planner 5D does not presently know, but who, on information and belief, committed or facilitated the copyright infringement or other acts or omissions alleged here. Planner 5D will add the names and identities of these Doe defendants when it learns them.

28. ABC Corporations 1-20 are business entities or unincorporated associations, whose names, states of organization or incorporation, and entity types Planner 5D does not presently know, but which, on information and belief, committed or facilitated the copyright infringement or other acts or omissions alleged here. Planner 5D will add the names and identities of these business entities or unincorporated associations when it learns them.

29. XYZ Universities 1-20 are academic institutions whose identities, or whose exact role in the events alleged here, Planner 5D does not presently know. On information and belief, some of these academic institutions committed or facilitated the copyright infringement or other acts or omissions alleged here. Planner 5D will add the names, identities, and roles of these academic institutions when it learns them.

30. On information and belief, in committing the acts or omissions alleged in this complaint, each defendant conspired with, aided and abetted, or acted in concert with each other, and each acted as the agent of each other. Under principles of *respondeat superior* and like principles, employer defendants are liable for the acts and omissions of their employees and agents.

GENERAL ALLEGATIONS

A. Planner 5D and Its Object and Scene Files

31. Planner 5D was founded in 2011 as a user-friendly home design tool that allowed anyone to quickly and easily create their own home, office, or landscape designs. Users select from thousands of available objects, from structural features (such as windows, arches, doors, and stairs), to furniture (such as sofas, beds, tables, chairs, and rugs), to kitchen and bathroom appurtenances (such as baths and sinks), to electrical appliances (such as lights, video equipment, and computers), to exterior features (such as paths, lawns, trees, plants, barbeques, and swimming pools). To create a design, users simply drag any of these objects onto or around a chosen floor plan. Once added to a design, these objects can be quickly and easily moved, rotated, tilted, re-sized, or otherwise manipulated to create the desired design. Users can easily toggle between two- and three-dimensional presentations of the design. In 3D, a design can easily be rotated and tilted to any desired perspective.

32. In the years since its founding, Planner 5D has become a leader in web-based interior design tools. It currently has almost 60 million users worldwide.

1. Planner 5D's Object Files

33. Planner 5D created its collection of realistic, digitized objects over a span of many years at a cost of millions of dollars. Planner 5D continues to add to this collection. At the time Princeton scraped Planner 5D's object files, which on information and belief was sometime on or after February 18, 2016, it scraped the entire then-existing collection, which numbered over 2,600 files of objects. Currently, Planner 5D owns a collection of over 4,500 individual object files.

34. Planner 5D's objects are original and creative works of authorship. First, human modelers' original and creative design choices govern the nature and appearance of the 3D objects, including how the objects are rendered on users' screens. Second, the computer files that generate these 3D images are themselves the product of creative human choices, with multiple digital configurations possible for a single design object.

a. Originality and Creativity of the Rendered Images

35. Concerning the first level of creative expression, the 3D images as rendered, Planner 5D's designers draw on their creative imagination in a number of different ways. First, some of Planner 5D's objects are not modeled on any particular reference image, but stem entirely from the designers' imaginations. Examples include 3D models of people, animals, flowers, and plants. Second, even where designers begin with a reference image, such as a drawing or a photograph, they never mechanically copy the reference. They never copy its measurements, for example, or use other mechanical or automated means of reproducing it. Their judgment and creative expression govern the models' dimensions, sizes, shapes, angles, proportions, relative placements, textures, and colors. These choices can be compared to a photographer's choices about the lighting, angles, highlights, shadows, and other features of photographic composition.

36. Many of these creative choices entail still further, subsidiary, choices. For example, modelers not only select two-dimensional textures to apply to the three-dimensional models, they also choose from a broad array of visual attributes those textures will possess. These choices govern not only the size of the texture and how it should be fitted to the surface—e.g. by stretching or tiling—but also how to mix and configure visualization attributes such as: UV mapping, specular intensity and color, transparency, translucency, blending, diffuseness color, and alpha channels.

37. Each attribute directly affects the appearance of the finished 3D models. UV mapping specifies the stretches and other reshaping the two-dimensional texture will undergo to fit the desired three-dimensional surface. Specular intensity refers to the degree of pure reflectivity of the model's surface. Adjusting this setting causes the finished model to have more or less mirror-like reflections. A related function controls the modelers' desired coloring of these reflections. Transparency and translucency are related but distinct further design choices. They govern whether and how much the textured surface appears to transmit light through itself, and whether that transmission is clear or blurred. Blending values are a related choice governing how light reflecting from a surface appears to be mixed with the light transmitting through it. Diffuseness color refers to a base color of the surface. Alpha channels control transparency on a point-by-point basis. Each of these creative choices is made by Planner 5D and its modelers. Each contributes significantly to the appearance of the finished product.

38. Modelers also use independent creative expression to create multiple distinct furniture pieces from a single reference image. For example, starting with a reference image of a chair, a designer might create not just his or her own version of that chair, but also a sofa, bench, or love seat, all inspired by the same original reference. Each new furniture piece entails its own design choices.

39. Moreover, Planner 5D authored and issued to its modelers guidelines for the models' appearance, adding another layer of creative input to the finished products' textures, lighting, materials, and colors.

40. Planner 5D's models are designed to look realistic. "Realistic" means *appearing* to exist in real-life. It does not mean *actually* existing in real life, in the sense of replicating an actual real-life object. Thus, as noted, many of Planner 5D's objects were created wholly from the modelers' artistic imaginations, with no reference object. These objects are "realistic" but have no real-world counterparts. Other Planner 5D objects *are* inspired by reference images. But these models' realism stems

from appearing as though they *could* exist, not from looking exactly like something that *does* exist. "Realism" does not imply fidelity to a particular original. It simply implies seeming real.

b. Originality and Creativity of Underlying Digital Object Files.

41. In addition to the expressive choices embodied in the design of Planner 5D's objects, there is a separate layer of human creativity and originality in the digital files that store those 3D objects. First, every design choice described above is translated into and thus reflected in the strings of text that comprise the digital files. In creating their original 3D models, Planner 5D's modelers are simultaneously creating original digital files whose text strings encode those creative choices. The result is a digital file that is itself entitled to copyright protection. Second, the digital files underlying every 3D object can be represented many different ways. The structure and organization of the digital files for each 3D object depends on the creative choices modelers make in how they create that particular object. These choices, as reflected in the underlying digital file structure, represent a separate and independent level of expressive content that is entitled to copyright protection.

c. Secrecy and Protection of Underlying Digital Object Files

42. Each of Planner 5D's object files was located at a unique, and secret, Internet address on Planner 5D's servers. These addresses are never shown to Planner 5D's users. Rather, users see only pictures of home-design objects that can be selected for inclusion in a floor plan. When a user clicks on and drags a picture of a desired object, Planner 5D's proprietary software will, operating in the background and invisibly to the user, fetch the corresponding data file from a secret Internet address. Identifying the secret address of the object, or accessing the underlying data file stored there, is impossible without circumventing Planner 5D's software and penetrating non-public addresses on its servers. Circumvention of these protections

requires, first, using software developer tools to monitor and intercept communications activity between Planner 5D's software and its European servers. Combining key information gleaned from these intercepted communications with specially-designed data-harvesting software, a hacker could determine the secret Internet address of each object file, and the full catalog of object files could be crawled and scraped.

43. Without tools and techniques of this kind, users of Planner 5D's website could not and cannot access the location or the content of even one of Planner 5D's over-2,600 object files.

44. Each of Planner 5D's over-2,600 object files is individually a trade secret belonging to Planner 5D. Separately, the *compilation* of over-2,600 object data files itself constitutes a trade secret belonging to Planner 5D.

2. Planner 5D's Scene Files

45. In addition to its collection of over 2,600 object files, Planner 5D also owns a much larger set of data files that contain floor plans, or "scenes." These scene files store configurations, or arrangements, of individual objects, that have been superimposed on a floor plan. Planner 5D's website includes a large public gallery of pre-existing scenes (floorplans) that have been carefully selected to showcase the program's capabilities, and to provide templates for users who don't want to start their floor plans from scratch. As with Planner 5D's object files, each scene file in this gallery was individually created by a human designer.

a. Originality and Creativity of Scene Compilation

46. Planner 5D is informed and believes that Princeton scraped Planner 5D's files on or after February 18, 2016. At that time, the company's publicly-available gallery of scenes numbered over 45,000 scenes. Each of these scenes was hand chosen by Planner 5D personnel for inclusion in the public gallery from a vastly larger collection of scenes. Their selection was based on criteria that included artistic value, variety, novelty, and suitability for a family-friendly service (*i.e.*, absence of

offensive or indecent content). Princeton scraped each and every one of these over-45,000 scene files then located in Planner 5D's public scene gallery. It thus copied the entire copyrighted compilation.

47. Planner 5D's scene files, like its object files, are "realistic." This means they are floor plans that resemble actual, plausible, interior and exterior designs that someone might design. As with the object files, "realistic" in this context does not mean that the floor plans were copied from actual floor plans somewhere. To the contrary, they are floor plans assembled from the imaginations of individual designers and reflect their creative choices.

b. Secrecy and Protection of Underlying Digital Scene Files

48. As with the data files defining objects, those defining scenes are each kept at a unique, and secret, Internet address on Planner 5D's servers. Neither these datafiles nor their secret Internet addresses are ever shown to Planner 5D's users. Rather, users see only pictures of pre-existing scenes, or floor plans, that they can build on to personalize their interior design. When a user clicks on a desired picture of a scene, Planner 5D's proprietary software will, operating in the background and invisibly to the user, fetch the data file for that scene from the secret Internet address at which it is stored. The software then renders the data file into a scene that is visible on the user's screen. Identifying the secret address of the scene, or accessing the underlying data file stored there, is impossible without circumventing Planner 5D's software and penetrating non-public addresses on its servers. Circumvention of these protections requires, first, using software developer tools to monitor and intercept communications activity between Planner 5D's software and its European servers. Combining key information gleaned from these intercepted communications with specially-designed data-harvesting software, a hacker could determine the secret Internet address of each scene file, and the full catalog of scene files could be crawled and scraped.

49. Without such tools and techniques, users of Planner 5D's website could not and cannot access the location or the content of even one of Planner 5D's over-45,000 scene files.

50. The data file underlying each individual scene, like those underlying each object, is a trade secret belonging to Planner 5D. Separately, the *compilation* of over 45,000 scene data files is a trade secret belonging to Planner 5D. The company spent years and significant sums of money creating and compiling these trade secrets.

B. Planner 5D's Terms of Service

51. When Princeton crawled and scraped Planner 5D's data files, its Terms of Service strictly limited users' use of the website and its materials, including a blanket prohibition on "access[ing]" or "acquir[ing]" Planner 5D's files. No user was permitted to

> collect, use, copy or distribute any portion of the Planner5D project or the Materials [defined as any materials found or created on the Planner 5D site]; resell, publicly perform or publicly display any portion of the Materials; modify or otherwise make any derivative uses of any portion of the Planner5D project, the Mobile applications or the Materials; use any "deep-link," "page-scrape," "robot," "spider" or other automatic device, program, algorithm or methodology which perform similar functions to access, acquire, copy, or monitor any portion of the Planner5D project; . . . download (other than page caching) any portion of the Planner5D project, the Materials or any information contained therein or use [of] the Planner5D project or the Materials other than for their intended purposes.

52. Because these Terms of Service prohibit even "access[ing]" or "acquir[ing]" the underlying data files, they protected the secrecy of Planner 5D's data files more completely than would a simple non-disclosure agreement. Non-disclosure agreements bind parties who have been shown confidential information not to disclose it to others. Planner 5D's Terms of Service go further. They prohibit users even from *seeing* (via "access[ing]" or "acquir[ing]") the information in the first place. Users cannot disclose information they have never seen. Because users always

see objects and scenes only as *rendered*, never as data files, Planner 5D's Terms of Service, which prohibit accessing and seeing the underlying files in the first place, protect those files more securely than if the files could be seen by users who then merely promised never to reveal them.

53. Because the Terms of Service prohibited visitors like Princeton from even *accessing* Planner 5D's underlying data files, and also prohibited them from acquiring or sharing the files in any manner (such as by "download[ing]," "distribut[ing]," or "resell[ing]" the files), the Terms of Service created a duty of confidentiality for Princeton to maintain these files' secrecy. Princeton breached that duty, as detailed elsewhere in this complaint.

54. Planner 5D is the successor-in-interest to the rights bestowed on "Farminers Limited" in the Terms of Service. Farminers Limited was an early investor in the business, but subsequently assigned all of its intellectual property rights, including all rights under the Terms of Service, to Planner 5D. Even before this assignment, Planner 5D was an express intended beneficiary of the Terms of Service.

C. Combined Effect of Structural and Legal Barriers

55. Acting together, the Planner 5D Terms of Service and the website architecture described above, where users are walled off from both the location and the content of Planner 5D's data files, create a rigorous barrier blocking access to, or even awareness of, the content of the underlying data files. Users see only renderings of objects that they can drag and drop into renderings of floor plans, *i.e.* scenes. Once users drop rendered objects into rendered scenes, the users can resize, reposition, or reorient the rendered objects. What they may never do is see or access, much less download or copy, the underlying data files from which those renderings are made.

56. Planner 5D's complete concealment of both the location and the content of its underlying data files distinguishes this case from ones in which website operators gave users "unfettered access" to each and every trade secret they later

complained had been misappropriated. *Cf. Broker Genius, Inc. v. Zalta*, 280 F. Supp. 3d 495, 521-22 (S.D.N.Y. 2017) (users given "unfettered access" to all trade secrets at issue). As described in detail above, Planner 5D consistently walls off both the location and the content of the trade secrets at issue here, and, under its Terms of Service, separately prohibits circumventing these protections via crawling, scraping, or otherwise accessing its data files.

D. Planner 5D's Business Evolves into AI and Scene Recognition.

57. As the importance and promise of scene-recognition technology grew in the years since Planner 5D's founding, the company's core business objective likewise evolved from providing home design tools to becoming a leader and innovator in computer scene recognition.

58. The market for AI-enhanced software is expected to grow to $60 billion by 2025. One of Planner 5D's key goals has become leveraging its unparalleled repository of three-dimensional object and scene files to develop first-of-its-kind scene-recognition technology. To that end, over the past several years Planner 5D has invested significantly in developing algorithms that capitalize on Planner 5D's catalog of three-dimensional files to achieve market-leading 3D recognition.

E. Defendants' Identification, Scraping, Copying, Display, Distribution, and Use of Planner 5D's Files

1. Princeton's Acquisition, Copying, Display, Distribution, and Use of Planner 5D's Object and Scene Files

59. On information and belief, sometime in or before 2016, scene-recognition scientists at Princeton determined that large sets of realistic, digitized, three-dimensional scene and object data were critical to their research. In a December 30, 2016 academic paper on scene understanding, they wrote that "[i]ndoor scene understanding is central to applications such as robot navigation and human companion assistance." (Yinda Zhang *et al.*, *Physically-Based Rendering for Indoor Scene Understanding Using Convolutional Neural Networks*, 1 (Proceedings of IEEE Conference on Computer Vision and Pattern Recognition, 2017),

https://arxiv.org/pdf/1612.07429v2.pdf (last visited March 30, 2020).) The Princeton scientists noted that "[o]ver the last years, data-driven deep neural networks have outperformed many traditional approaches thanks to their representation learning capabilities." (*Id.*)

60. Yet such successful data-driven methods had a built-in limitation: finding enough data. The Princeton researchers wrote: "One of the bottlenecks in training for better representations is the amount of available per-pixel ground truth data that is required for core scene understanding tasks." (*Id.*) As one of these authors separately wrote in a slide presentation he posted to a Princeton URL: "What is the main roadblock for 3D scene understanding and research?" "Data!!" (Funkhouser, *supra*, at 8-9.)

61. "To address this problem," the Princeton scientists observed in their December 2016 article, other researchers had proposed using synthetic data. Yet no one had shown where such synthetic data could be found. In their article, the Princeton authors solved this problem. Their solution: download all required data from Planner 5D. As the authors put it: "In this work, we introduce a large-scale synthetic dataset with 400K physically-based rendered images from 45K realistic 3D indoor scenes." The data came from a "a collection of 3D scene models downloaded from the Planner 5D website." (Zhang *et al.*, *supra*, at 1, 3.)

62. The Princeton authors explained that the downloaded Planner 5D dataset contained "45622 scenes with over 5M instances of 2644 unique objects among 84 objects categories." (*Id.* at 3.) Special surfaces provided by Planner 5D gave the objects a desirable "photo-realistic" appearance. (*Id.*) Another key feature of the Planner 5D dataset was that "indoor layouts, furniture/object alignment, and surface materials are designed by ***people***." (*Id.* (emphasis added)). Human-designed models and scenes were likely to be realistic. And realism was vital for accurate machine learning. (*Id.*)

63. Princeton called its collection of Planner 5D data the "SUNCG dataset." It offered this link for registering to download the dataset: http://suncg.cs.princeton.edu/ (now returning an error message). In the ensuing years, Planner 5D's data figured prominently in the Princeton's researchers' work, including in further articles they published on scene recognition. (*E.g.*, Shuran Song *et al.*, *Im2Pano3D: Extrapolating 360° Structure and Semantics Beyond the Field of View*, 8 (Proceedings of IEEE Conference on Computer Vision and Pattern Recognition, 2018), https://arxiv.org/pdf/1712.04569.pdf) (last visited March 30, 2020).) One co-author on these articles, Manolis Savva, is now a senior Facebook computer-vision researcher.

64. Planner 5D's data also became featured in the work of researchers at other institutions, including at Facebook. (*E.g.*, Abhishek Das *et al*, *Embodied Question Answering*, 4 (Computer Vision and Pattern Recognition Expo, 2018), https://embodiedqa.org/paper.pdf) ("We instantiate EmbodiedQA in House3D [1], a recently introduced rich, simulated environment based on 3D indoor scenes from the SUNCG dataset [8]. Concretely, SUNCG consists of synthetic 3D scenes with realistic room and furniture layouts, manually designed and crowdsourced using an online interior design interface (Planner5D [38]).").)

65. Another project relying on the SUNCG dataset was "PlanIT." A principal author of this project was Manolis Savva, the senior Facebook computer-vision researcher who co-authored the articles, discussed above, that described Princeton's downloading and use of Planner 5D's data.

66. Princeton's researchers have thus exploited, and continue to exploit, Planner 5D's core asset, and are doing so for the same purpose Planner 5D has set for itself: developing artificial intelligence applications featuring 3D scene recognition.

67. Planner 5D will need discovery to determine the precise means by which Princeton scraped Planner 5D's data files. But on information and belief, the Princeton researchers or others acting on their behalf executed a detailed, multi-step

plan to pierce Planner 5D's software protections and acquire its data. First, using software developer tools, Princeton or its agents monitored and intercepted communications activity between Planner 5D's software and its European servers. Through this monitoring and interception, Princeton extracted key information pointing it to the secret locations of all data files on Planner 5D's servers. Princeton then wrote its own data-harvesting software that drew on the stolen Internet address information to allow it to crawl and scrape the entirety of Planner 5D's then-existing data files.

68. The data scraping techniques Princeton used to acquire Planner 5D's data files violated clear prohibitions in the Terms of Service against using any "'page-scrape,' 'robot,' 'spider[,]' or other automatic device . . . to access, acquire, copy, or monitor any portion of the Planner5D project."

69. These Terms protected the secrecy of Planner 5D's data files one level more securely than a standard non-disclosure agreement. Standard NDAs prohibit users from disclosing secret information that is shared with them. Planner 5D's Terms prohibit the secret information even from being shared with them. There is thus nothing for users to promise not to disclose. Those never shown a secret recipe cannot sensibly promise not to reveal it.

70. Because Planner 5D's website hid the locations and contents of its data files, and because Princeton had to design and deploy hacking software to obtain this information, Princeton knew or should have known that Planner 5D intended for the data files to remain confidential.

71. Separately, Princeton's clear violation of the Terms of Service's prohibitions on scraping, crawling, and downloading Planner 5D's data, and its prohibitions on use of the data other than for its intended purpose of interior design, constituted improper means of acquiring the data.

72. Planner 5D had no indication of any of this until 2018, nor could it have. It did not canvass international academic literature on scene recognition.

Instead, having protected its digital files as described above, it attended to the day-to-day operations of its web-based design service. It also conducted its own, private, AI scene-recognition research. It was not until 2018, when a third-party mentioned having seen Planner 5D data at a Princeton URL, that Planner 5D had an indication, though even then an incomplete one, of the facts described above. Most recently, in 2019, Planner 5D determined that over 99.9% of the data in the files of the SUNCG dataset are identical to that of the object and public-gallery scene files Planner 5D possessed when Princeton did its scraping. On information and belief, the remaining .1% of the files are also downloaded Planner 5D data files, but ones whose underlying data has been slightly altered. Some of the SUNCG data files even continue to bear Planner 5D's registered trademark, <PLANNER 5D>.

2. Facebook's Involvement with Princeton and the SUNCG Dataset, Including the SUMO Challenge

73. Facebook, Inc. and Facebook Technologies, LLC have also been acutely interested in scene-recognition technology. They have created and funded their own, in-house team of scientists and engineers to research and develop scene and object recognition and understanding. This research team operates, on information and belief, within Facebook's "Facebook Reality Labs," a major AR/VR (augmented reality / virtual reality) research center with offices across the United States.

74. In 2018, Facebook Reality Labs joined with researchers at Princeton, Stanford, UC Berkeley, Georgia Tech, and other institutions to jointly organize the first Scene Understanding and Modeling (SUMO) Challenge. The primary sponsor of the SUMO Challenge was Facebook. The SUMO Challenge "targets development of comprehensive 3D scene understanding and modeling algorithms." (*See* Facebook Research, *Facebook Reality Labs Launches the Scene Understanding and Modeling (SUMO) Challenge*, FACEBOOK RESEARCH (MARCH 30, 2020, 6:40 PM), https://research.fb.com/facebook-reality-lab-launches-the-scene-understanding-and-modeling-sumo-challenge/.)

75. The SUMO Challenge was developed by a team of computer vision researchers at Facebook, with help from researchers at Stanford, Princeton, and elsewhere. (*Id.*) Current and former Stanford and Princeton researchers have also served as SUMO Challenge organizers, advisors, or program committee members.

76. SUMO Challenge contestants were "evaluated on their ability to consistently infer the correct geometry, pose, appearance and semantics of the elements" of scenes supplied by the SUMO Challenge organizers. (*Id.*) Winners were promised cash prizes and speaking spots at the SUMO Challenge conference.

77. Facebook directed SUMO Challenge participants to the SUNGC dataset to develop and hone their contest submissions. On information and belief, Facebook and the other SUMO Challenge organizers, including Stanford and Princeton, made a fresh copy of the Princeton SUNCG dataset sometime in or after 2018, and stored it at a Stanford URL. Facebook posted a link to this Stanford URL on its SUMO Challenge web page, encouraging contestants to access, download, and use the dataset for their work. On information and belief, dozens of copies or more of this copy of the SUNCG dataset have been downloaded and used by an unknown number of users.

78. In 2019, the Facebook defendants and other SUMO Challenge organizers launched another SUMO Challenge, the 2019 SUMO Challenge.

79. Starting in or after 2019, Facebook has also made other copies and other uses of the SUNCG dataset. It linked to one such copy in another of its object-recognition projects, the "House 3D environment." According to Facebook, House 3D "is a rich environment containing thousands of human-designed 3D scenes of visually realistic houses with fully labeled 3D objects, textures, and scene layouts." Once again, these thousands of scenes came from Planner 5D. Facebook got them by "extract[ing them] from the SUNCG dataset." (*See House3D*, FACEBOOK ARTIFICIAL INTELLIGENCE (March 30, 2020, 6:42 PM), https://ai.facebook.com/tools/house3d.)

80. Facebook also sponsors a scene-recognition project called AI Habitat, a new simulation platform that is designed to train machines to recognize interior scenes using photo-realistic, simulated three-dimensional environments. Facebook's AI Habitat project relies on the SUNCG dataset as a source of realistic three-dimensional environments.

81. Facebook maintains many close connections to Princeton and its researchers. On information and belief, Facebook has supported Princeton and its researchers financially. For example, Princeton's "Vision & Robotics" Department has publicly thanked Facebook (among others) for its "generous support" "for our research." Dr. Shuran Song, a Princeton Ph.D student and co-author of several of the articles describing Princeton's downloading of Planner 5D's data, has been a recipient of "a Facebook Fellowship," according to an article she and five other Princeton scientists authored. (Shuran Song *et al.*, *Semantic Scene Completion from a Single Depth Image* 9 (Proceedings of IEEE Conference on Computer Vision and Pattern Recognition 2017), https://arxiv.org/pdf/1611.08974v1.pdf (last visited March 30, 2020).)

82. Another scene-recognition researcher, Manolis Savva, who co-authored multiple articles with Princeton's Shuran Song discussing Princeton's harvesting of Planner 5D's data for use in the SUNCG dataset, is a visiting researcher at Facebook and a lead researcher at Facebook's AI Habitat computer-vision project. One of Facebook's leading scene-recognition researchers was thus a co-author of the very articles detailing Princeton's acquisition and harvesting of Planner 5D's data for use in the SUNCG dataset.

83. Further, and as noted above, the SUNCG dataset Facebook has been using so intensively includes files that still bear Planner 5D's registered trademark: <PLANNER 5D>.

84. Facebook's close association with so many of the Princeton scientists who scraped and downloaded Planner 5D's data without permission, including

Shuran Song and Manolis Savva; its "generous support" of Princeton's Vision & Robotics Department; its copying and extensive use of a dataset that still includes Planner 5D's registered trademark; and its co-sponsorship with Princeton of the SUMO Challenge, all strongly suggest that Facebook had actual knowledge, and at the very least reason to know, that the SUNCG dataset contained proprietary information belonging to Planner 5D, and that Princeton—which could not have shown Facebook any authorization for its use of that information, since it lacked any—had acquired the SUNCG dataset by improper means, and under circumstances giving rise to a duty to maintain the secrecy, and limit the use, of that data.

85. Indeed, on information and belief, researchers then affiliated with Facebook knew of, supported, participated in, and benefited from all of Princeton's research alleged above, including the scraping and exploitation of Planner 5D's data.

86. In addition, on information and belief, as an agent, partner, or joint venture of Princeton in the SUMO Challenge, Facebook also had imputed knowledge that Princeton misappropriated the SUNCG dataset from Planner 5D.

87. Finally, on information and belief, Facebook knew that Princeton acquired the SUNCG dataset from Planner 5D without Planner 5D's permission and in violation of the Terms of Service.

F. Defendants' Knowledge of the Terms of Service

88. On information and belief, Princeton and Facebook each in fact saw Planner 5D's Terms of Service, and thus are each bound by them.

89. Princeton also had constructive or inquiry knowledge of Planner 5D's Terms of Service, and thus is bound by them, because of its sophistication, because of its repeated interaction with Planner 5D's software and website, because data scraping without permission is, by its nature, likely to infringe copyrights and other intellectual property rights, and because Princeton's data-scraping required it to consciously pierce the barriers Planner 5D had erected to block public access to the

data files, all of which should have indicated to Princeton that data-scraping was likely not authorized by Planner 5D under its Terms of Service.

90. Facebook also had constructive or inquiry knowledge of Planner 5D's Terms of Service. It was funding Princeton's computer vision department, sponsoring its researchers, working closely with Princeton on the SUMO Challenge, and employing as a lead scene-recognition researcher one of the authors who violated those Terms by scraping and downloading Planner 5D's data. Facebook also has its own acute interest in commercially exploiting the SUNCG dataset, and knew or should have known to investigate the provenance of this valuable data, especially where data elements still bore Planner 5D's registered trademark.

91. In addition, and on information and belief, before sharing the SUNCG dataset with Facebook and the other SUMO challenge organizers, Princeton would have informed Facebook and the others that it acquired the SUNCG dataset from Planner 5D without its permission.

G. Defendants' Continuing Wrongdoing

92. Like Princeton, Facebook is exploiting the Planner 5D dataset for the same purpose Planner 5D set for itself: to train artificial intelligence applications to recognize 3D interior scenes. Worse, Facebook explicitly secured from SUMO Challenge participants the right to commercialize the fruits of their work. This strikes at the heart of Planner 5D's business objective.

93. In March 2019, Planner 5D wrote Facebook, Princeton, and others, demanding that they cease and desist infringement of Planner 5D's copyrights. Yet Princeton and Facebook, on information and belief, nonetheless continue to use the SUNCG dataset in their computer vision R & D efforts, and to allow or encourage others' use of infringing and misappropriated copies of Planner 5D's copyrighted and trade secret materials.

94. The defendants' copying, misappropriation, and especially public disclosure and dissemination of Planner 5D's data files threatens to destroy the

market for Planner 5D's core asset. It has inflicted catastrophic and potentially permanent damage on the company.

H. Entitlement to a Civil Action Under 17 U.S.C. 411(a)

95. On September 14, 2020, Planner 5D submitted two copyright applications to the Copyright Office: Planner 5D Objects (2016) (Objects Application) and Planner 5D Scenes (2016) (Scenes Application).

96. Each copyright application sought to register a computer program. Under the Copyright Act, a "computer program" is defined as a "set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result." 17 U.S.C. § 101. Planner 5D's object and scene files consist of lines of code that instruct a computer how to generate Planner 5D's three-dimensional objects and scenes in computer memory, permitting their display to users. The Objects Application sought to register the computer program consisting of all Planner 5D objects created through January 13, 2016. The Scenes Application sought to register all public gallery scenes created through February 17, 2016.

97. Planner 5D submitted the two applications through the Copyright Office's online application portal using the Office's standard application template. Planner 5D submitted deposit copies in support of each application, in a file format permitted for computer program registrations. Planner 5D submitted a proper expedited registration fee of $800 in support of each application.

98. On September 18, 2020, the Copyright Office issued a refusal of each application on the ground, among others, that the Office did not think the computer code submitted as deposit copies constituted "source code" within the meaning of applicable Copyright Office regulations. Soon after, on September 22, the Copyright Office's General Counsel wrote Planner 5D, informing it that the Copyright Office had decided to offer Planner 5D further guidance about registering its works and an opportunity to re-submit deposit copies of the works.

99. Planner 5D then engaged in further exchanges with the Copyright Office, including about the "source code" issue. Planner 5D explained that its works were written in a programming language called Java Script Object Notation, or JSON. It provided an affidavit from one of the world's leading computer scientists, the researcher widely credited with having created the Java programming language, explaining why Planner 5D's JSON files "unquestionably qualify as source code."

100. The Copyright Office said it did not question Planner 5D's assertion that its works constituted computer programs. Instead, the Office wrote, "what is at issue is whether . . . 'source code' has been deposited." Planner 5D explained to the Office that, since its works were *written* in the JSON programming language, the JSON code *was* source code; and, in any event, Planner 5D had nothing other than the JSON code to deposit with the Office.

101. Accordingly, on November 16, 2020, the Copyright Office issued new refusals for each of Planner 5D's applications. It again based the refusals on the source code issue, as well as an ancillary issue about the deposit of sample screen displays.

102. Notwithstanding the refusals, the Office made clear that Planner 5D's applications were submitted in proper form and that it had satisfied the requirement of 17 U.S.C. § 411(a) for entitlement to bring federal infringement action:

> Although the Registration Program Office has concluded that the deposits submitted with these applications do not meet the requirements for registering a work as a computer program, you have delivered to the Office a deposit, application, and fee required for registration of the computer programs 'in proper form,' as required to institute a civil action for infringement under 17 U.S.C. § 411(a).

CAUSE OF ACTION
(Copyright Infringement — Against All Defendants)

103. Planner 5D incorporates the prior paragraphs of this complaint as though fully set forth here.

104. Planner 5D is the sole owner of all right, title, and interest in the copyrights in its computer program comprised of object files created through January 13, 2016 (Objects Work). Planner 5D submitted its Objects Application for this work in proper form, as the Copyright Office recognized when it stated that "you have delivered to the Office a deposit, application, and fee required for registration of the computer programs 'in proper form,' as required to institute a civil action for infringement under 17 U.S.C. § 411(a)."

105. Planner 5D is the sole owner of all right, title, and interest in the copyrights in its computer program comprised of public gallery scene files created through February 17, 2016 (Scenes Work). Planner 5D submitted its Scenes Application for this work in proper form, as the Copyright Office recognized when it stated that "you have delivered to the Office a deposit, application, and fee required for registration of the computer programs 'in proper form,' as required to institute a civil action for infringement under 17 U.S.C. § 411(a)."

106. Attached as Exhibit A to this complaint are the Copyright Office's notices of its refusals. As required under 17 U.S.C. § 411(a), Planner 5D will be contemporaneously providing notice to the Register of Copyrights of the filing of this action, accompanied by a copy of this complaint.

107. By, among other things, reproducing, distributing, publicly displaying, and/or creating derivative works of the Objects Work and the Scenes Work (together, the Copyrighted Works), the defendants, and each of them, directly infringed Planner 5D's copyrights, in violation of the copyright laws of the United States, including 17 U.S.C. section 101 *et seq.*

108. The copyrightable elements of Planner 5D's objects and scenes that the defendants copied, distributed, publicly displayed, and created derivative works of are identified in Paragraphs 34–41 and 45-47 above, describing Planner 5D's creative and original choices in fashioning the Copyrighted Works.

109. The defendants have also contributorily and/or vicariously infringed Planner 5D's copyrights in the Copyrighted Works.

110. For example, Defendants committed contributory infringement by knowingly inducing and causing researchers, product developers, and SUMO Challenge contestants to make copies, distribute, publicly display and/or create derivative works from the Copyrighted Works, and by materially contributing to these activities.

111. In addition or in the alternative, the defendants vicariously infringed Planner 5D's copyrights. They had the right and the ability to supervise and control researchers', SUMO Challenge contestants', and others' access to and use of the Copyrighted Works, and to prevent such parties' copying, distribution, public display, or creation of derivative works from the Copyrighted Works. Further, on information and belief, Facebook and Princeton financially benefitted from these activities. For example, Facebook obtained unlimited rights to commercialize, market, and use the submissions of the SUMO Challenge contestants. Princeton's Computer Vision Group received "generous support"—presumably financial—from Facebook and other high-tech companies who benefitted from Princeton's sharing of its SUNCG dataset. Princeton stood to attract still further sponsorship through its continuing provision of resources, including the SUNCG dataset, to technology companies.

112. On information and belief, the defendants' acts of direct, contributory, and vicarious copyright infringement were intentional, willful, and malicious, and performed with knowledge that the works they or others were copying, distributing, publicly displaying, or creating derivative works from were copyrighted works whose copyright they did not own and for which they lacked authorization to act as they acted, all in disregard of Planner 5D's rights.

113. The natural, probable, proximate, and foreseeable result of the defendants' copyright infringement was to cause immense damage to Planner 5D,

and to secure profits, commercial advantage, and other benefits for themselves. And the defendants' copyright infringement in fact did cause Planner 5D immense damage.

114. Planner 5D is entitled to recover its actual damages and any additional profits of the defendants, all in an amount to be determined at trial. Planner 5D is also entitled to a permanent injunction prohibiting continuing or future infringement of its rights, and an order requiring destruction of all infringing copies.

PRAYER FOR RELIEF

Planner 5D prays for judgment on each cause of action against the defendants, and each of them, and for the following further relief:

a. for copyright damages, including Planner 5D's actual damages and for any (non-duplicative) profits of the defendants;

b. for pre- and post-judgment interest on all awards for which they are available;

c. for permanent injunctive relief prohibiting all defendants, their officers, agents, successors, and assigns, and all persons acting in concert with them, from further acts of direct or indirect copyright infringement;

d. for an order requiring the destruction of all infringing copies; and

e. for such other relief as the Court deems just and proper.

DEMAND FOR JURY TRIAL

Planner 5D demands a jury trial on all issues qualifying for one.

RESPECTFULLY SUBMITTED,

DATED: November 23, 2020

THE BUSINESS LITIGATION GROUP, P.C.

By: */s/Marc N. Bernstein*
Marc N. Bernstein
Attorneys for Plaintiff
UAB "PLANNER5D"