Digital Communication

Editorial

In an era of abundant information and fleeting attention spans, the ability to communicate complex scientific concepts quickly and effectively has never been more important. Given our innate attraction to visuals, they are undoubtedly a powerful tool in science communication. Visuals don't just simplify concepts; they leave lasting impressions that text alone cannot achieve, as evident during the COVID-19 pandemic. As digital tools evolve, the capacity to create impactful visual content is increasingly within reach. Yet, many medical writers may feel daunted by the specialised skills required to produce high-quality visuals. This is where artificial intelligence (AI), specifically Microsoft's Copilot, steps in.

Freelance medical writer Jacqueline Bersano explores how AI is revolutionising the creation of scientific visuals, with key insights from experts on the topic. Whether you're a seasoned professional or new to the field, this article offers valuable perspectives on leveraging AI to enhance your science communication toolkit, making it easier than ever to engage and inform diverse audiences with eye-catching, precise visual content. Happy reading!

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Exploring the role of Microsoft's Copilot in visual communication: Current use and considerations through science communicators' lens

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Ninety percent of the information our brains receive is visual.[1,2] This natural attraction to visual elements allows us to process images at a speed 60,000 times faster than text. In science communication, we often leverage this natural affinity to visuals to render complex scientific content more accessible – engaging the reader with informative yet appealing images, illustrations, diagrams, infographics, and other visual content.[3,4] By doing so, important scientific information can reach larger audiences, avoid misinterpretation, and have a powerful impact on how we absorb and remember complex concepts. For instance, if we never saw the double-helix structure of DNA illustrated in detail, would we have been able to understand and study it as we do today?[5]

In today's fast-paced world, where information is abundant, it becomes essential to create attention-grabbing images capable of conveying messages quickly while leaving a lasting impression. A prime example could be seen in the COVID-19 pandemic. As the world grappled with a novel virus, clear and effective communication was crucial, and visuals played an important role.[6,7] From infographics to animations, visuals were used to explain, for example, how vaccines work, the importance of epidemiology and clinical trials, how the virus spreads, or why social distancing measures were necessary. Additionally, through visuals, the benefits of wearing a mask could be communicated effectively, reinforcing the message that masks are a simple yet powerful tool in reducing the spread of the virus.[6–11]

It's clear that pursuing accurate, clear, and engaging scientific visual content is essential in creating effective medical or science communications.

It's clear that pursuing accurate, clear, and engaging scientific visual content is essential in creating effective medical or science communications.[3,5] Digital tools for this purpose have become indispensable in a medical writer's repertoire, providing a wide range of features and functionalities that make it easier and faster to create visualisations.[12,13] However, not every medical writer may feel comfortable or capable of taking on this task. Creating visual assets requires specialised knowledge and skills, not to mention the time to acquire them. Or does it? This article explores how artificial intelligence (AI) can support novices and even experts in developing eye-catching visuals that hit their mark.

AI for visual communication in science

The use of AI to create different visuals is an attractive solution, adding to the plethora of possibilities that AI tools provide to science communication.[14–17] With the use of AI, machine learning, and neural networks, textual descriptions (or prompts) are converted into digital images, thus improving the accessibility and speed with which visual elements are created.[18]

AI models for text generation use sophisticated natural language processing models, i.e., large language models (LLMs), that analyse large datasets of text to determine patterns in words and phrases. By identifying these patterns, LLMs can produce a new text similar in style and content to the training data. They learn the structure of the sentences and how often certain words follow each other, but also complex aspects like context.[19] On the other hand, AI models for visual generation are trained on an extensive amount of text that is translated into numerical formats with the use of a natural language processing (NLP) model. These numerical representations are guidelines for the

AI image generators that help them interpret the text and eventually visually represent text prompts.[18] In both cases, AI models do not "understand" the content of the text. Instead, they predict content based on patterns observed in the training data.[18,20,21]

Today, AI is largely used to generate attractive images in an increasing number of fields, not excluding science communication. Newspapers like *The New York Times* and *The Washington Post* have used AI-generated content to create visuals that tracked the COVID-19 virus spread or informative maps and charts, respectively. Similarly, NASA's Mars rover utilises AI algorithms to analyse data from the rover to create sophisticated images (3D models and topographical maps) of the surface of Mars.[22] In advertising and marketing, several campaigns have been created using AI with great success, such as those of big brands across various sectors like Nutella, BMW, and Nike.[23–25]

While in other sectors like finance and education, AI applications (apps) have been created for data visualisation or creating educational material, private companies and tech giants like IBM and Google have naturally also leveraged AI, developing tools to produce interactive visualisations of complex data sets.[26] IBM's Watson Analytics is a data analysis tool that utilises AI algorithms to create charts, maps, and graphs to analyse trends and insights, while Google's TensorFlow Data is a group of tools that can be used to produce histograms, scatter plots, and heat maps that enable more in detail data analysis.[22]

In science communication or medical writing, AI tools are beneficial in a variety of ways, including accelerating our creation of, for example, slide decks, infographics, conference posters, illustrations for articles or educational purposes, graphical abstracts, diagrams, or images to illustrate methods and concepts in scientific articles. Several online services already provide AI-powered tools to create different types of visuals for academic institutions and biotech companies.[27,28] However, rising concerns about how these constantly-evolving tools are being used to create scientific content have sparked necessary discussions regarding the accuracy of AI in representing scientific notions. Another topic of debate is the intellectual property ownership that must be attributed to the original artists and illustrators.[29] Microsoft 365 Copilot is an evolving AI tool that not only promises to significantly advance AI-driven workplace tools, but could also help overcome some of these concerns.

(Co)piloting visual content creation with Microsoft 365

When Microsoft first launched Copilot in March 2023, it was only available to specific enterprises for testing.[30,31] Since January 2024, Copilot has been available to businesses of all sizes, as well as personal and family subscribers (called Copilot Pro).[32] It has been adopted by over 75 million devices worldwide, with the number of paying Office 365 users surpassing 400 million.[33] Favourably, reports indicate that 70% of Copilot's early adopters increased their efficiency by 29% across a range of tasks, including searching, writing, and summarising.[33] ChatGPT was listed as one of the top AI tools in 2023 and 2024, and given that Copilot is powered by ChatGPT, these statistics suggest that Copilot is among the most used AI tools today.[34,35] Indeed, since its launch, Copilot has rapidly advanced in the functions and features it offers, becoming one of the best AI-image generator tools available online.[36–38]

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Copilot is straightforward to use and can create very detailed, highly resolute images with a variety of styles.[36,38] "Designer" is Copilot's AI tool capable of creating images from prompts with the use of DALL-E, the text-to-image generator developed by Open AI, which converts text descriptions generated by Copilot into visual elements.[39] DALL-E 3 is the last version released in October 2023, which increased the number of image generation boosts from 15 to 100 per day and aims at providing more accurate results.[38,40]

Advantages and disadvantages of using Microsoft 365 Copilot

Advantages

Copilot's most attractive quality is its integration with apps we already use every day, like Microsoft Word, Excel, PowerPoint, Outlook, OneNote, and Teams, providing real-time support and a level of ease of use and accessibility that perhaps other AI tools do not.[41] This integration allows users to utilise Copilot's features within their preferred Microsoft 365 app without the need to switch between different tools.[37,42,43] For instance, Copilot can create a PowerPoint presentation with a collection of slides starting from the content of a Word document and can also enhance the overall appearance of the presentation by suggesting layouts and designs.[44,45] Copilot was also added to Whiteboard, Microsoft 365's collaborative digital canvas app for brainstorming, where its content can be used to create images, while in Excel, it can make illustrations from tables of data.[43]

Additionally, Copilot addresses one of the top concerns with AI use in the medical communications/scientific field, privacy, by adhering to Microsoft 365's privacy and security policies.[41] Copilot's business licence ensures safety and confidentiality to organisations: clients' data are protected, prompts created by a user are not shared with other users within the same business environment, and Copilot can't use information in SharePoint and OneDrive unless permitted by the end user.[46,47] With the assurance of privacy, Copilot can, without a doubt, dive into your Microsoft 365 environment with ease to enhance productivity and work across your existing apps, assisting in multiple daily activities.

Another positive aspect of Copilot is its ability to improve its tailoring of content to each user over time. Its integration into Microsoft 365 allows Copilot to have access to an individual user's emails, documents, chats, calendars, meetings, and contacts, learn from all this information, and provide contextualised, accurate results related to a specific user or organisation.[41,46,48] As with other AI tools, LLMs for Copilot are trained on large publicly available datasets. Based on these data, LLMs summarise, predict, and generate content. In the free version of Copilot, results are created based on this publicly available information. What differentiates Copilot is "Microsoft Graph", which is similar to a huge database of all user content, able to create answers more tailored to the user.[41]

Disadvantages

Copilot's top limitations are the time to be invested in trial and error before achieving the desired results and the word character limit (Copilot can process 18,000 to 20,000 words for a single query or prompt).[48,49] Moreover, the user must be aware of the risk of creating "deep-fake" images and the data that are shared while using AI tools. It must also be taken into account that advanced features are not accessible for free but only with the premium account.[36]

Comparison with other AI tools for graphics

Table 1 highlights the key features of some of the most used AI image-generator tools: DALL-E (Copilot's graphic generator), Midjourney, Stable

Diffusion, and Canva. The intent of this summary is not to determine which is the best AI image-generator tool since they are all rapidly evolving and have distinctive strengths that could meet users' needs differently. The key features of each tool are insights taken from popular AI-focused websites.[36,50–53]

User insights on Copilot in science communication

Interviews with professionals who work in science communication provided valuable insights into user experiences with Copilot for visual communication (Table 2 and Table 3), enabling a better understanding of the advantages and challenges Copilot can bring to visual communication in science.

Recent updates and future directions

In April 2024, future updates for Copilot Microsoft 365 were announced.[40] These updates will be available for users with Copilot Pro and Copilot for Microsoft 365 licences. Firstly, the number of chats per day and the length of conversations won't be limited anymore. Regarding privacy and safety, Microsoft specified that commercial data protection will also cover the web context, thus ensuring that a user's data won't be used to train their models. Of note, the number of images we can generate will increase from 15 to 100 daily.[40]

As Copilot and other AI tools are evolving so quickly, it's easy to imagine that innovative developments and improvements are yet to come and will potentially revolutionise how visual content is created.

However, we have to remain cautious of when they are applicable to use. The rapid advancement of AI-generator tools, particularly in terms of quality and data protection, raises questions about when we will see similar progress in ensuring appropriate copyright regulations, privacy, and a reduced risk of inaccurate scientific fake images with AI tools used for developing visual communication. Tracing the sources of data and images used by AI tools is not yet possible, and generating falsified, manipulated, or scientifically incorrect data is considered a major threat to scientific integrity, especially among those in the scientific community.[18,54–56] In fact, the *Nature* journal recently announced that it will not publish visual content generated with the assistance of AI, except for articles published in their AI section.[57] Nevertheless, it is crucial for the scientific community to take proactive measures to uphold scientific accuracy and integrity. Copilot and AI technology, in general, offer a wide range of applications across many different fields, including medical communication. As they continue to evolve swiftly, medical communicators must face the current challenges these innovative tools bring to exploit their potential and apply the correct regulations simultaneously.

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Table 1. Key features of some of the most popular AI image-generators

AI image-generator	Model	Features	Free trial?
DALL-E (Copilot)	Integrated with ChatGPT	• Easy to use, ideal for beginners • Advanced ability to convert text to images • High variety of image styles • High-resolution, realistic, and detailed images • Fast image production	Yes
Midjourney	Proprietary machine learning model	• Abstract and artistic style • Extensive customisation • High range of resolutions and editing tools • Abstract and artistic imagery • Intuitive user experience, user-friendly interface • Connected to an active community of users	Yes
Stable Diffusion	Open source	• Extensive customisation • Fast and efficient in creating high-quality images • Consistent and reliable results • User-friendly interface • Most suitable for users with technical knowledge • Less creative	Yes
Canva	Web-based design service	• Simple and intuitive • Rich set of features • Limitations in replicating complex designs • Limit of 100 AI-generated images per day • Flexibility in editing images	Yes

Table 2. Q&A with Noelle Ochotny (medical writer) and Mario Morel (Principal, Copilot, and Microsoft 365 Services), both of Foremost Medical Communications

Questions by: Jacqueline Bersano	Answers from: Noelle Ochotny and Mario Morel
Q: What do you use Copilot for?	**A:** We have used Copilot graphic generation and graphic recognition capabilities for four use cases: 1. **Graphic/diagram legends**: We asked Copilot to write a legend for diagrams or graphical illustrations. Truly, we have been blown away! Copilot was so good at identifying what's going on in an illustration and providing a relevant description that we can use as a legend. 2. **Promotional material**: As freelancers, we need to conduct frequent promotional campaigns. Since we have Copilot, it has created all of our promotional illustrations. 3. **Creating project logos for the engagements with our clients**: It is certainly important to maintain a professional and dynamic "look" with our clients. For each engagement, we create a dedicated and secure team in Microsoft Teams where we run our project and develop deliverables. We create a special logo for each project. This is important for our branding. Now, virtually all of our logos are generated by Copilot. Figure 1 is a logo we created for a research paper in regenerative medicine in the first quarter of 2024. The logo shows DNA and lab equipment. The colours, light blue above and darker blue below, suggest the innovative "before/after" flow of the research. 4 **Graphical abstracts:** For this use case, I think Copilot is still a work in progress. We tried hard to create different prompts to make Copilot understand what we needed, but the results have been mixed at best. We will keep trying as Copilot gets better over time. Maybe one day, Copilot will get it.
Q: Why do you think Copilot has more difficulties creating graphical abstracts than other material?	**A:** I think that DALL-E is stubborn. When providing an abstract and prompting for a graphical illustration, DALL-E will come up with a surprisingly sophisticated image. However, no matter how we adjust our prompt thereafter, DALL-E would just stick to its initial concept. In one of our attempts, DALL-E produced an image that looked like an infographic, but we wanted the format of a graphical abstract. DALL-E just would not budge. Based on our trials, I am thinking of two possible reasons why creating graphical abstracts with Copilot is still challenging: the first is that we cannot use "grounding"[1] with DALL-E through Copilot. For example, we wanted to use a graphical abstract template as a reference file for grounding, but DALL-E just wouldn't accept it. The second reason has to do with what Copilot was trained for. Among the millions of pictures available on the internet used for training DALL-E, there are far more infographics than graphical abstracts. For example, try googling images for both. Chances are you won't find many good graphical abstracts. Therefore, I think that DALL-E hasn't been trained to specifically generate graphical abstracts.
Q: Do you have any experience creating presentations by integrating Copilot into PowerPoint?	**A:** Yes, we have created many presentations with Copilot within PowerPoint. We are quite impressed with the results. For example, we created an ad for presenting a poster at a conference, and Copilot did it all by itself in PowerPoint. Another example was a manuscript summary in PowerPoint where Copilot produced the structure, the slides, and the pictures.
Q: What other kinds of scientific material for visual communication do you think we'll be able to create with Copilot in the future?	**A:** I am sure Copilot will get to create graphical abstracts eventually. It can already produce infographics and I am sure they will get better and better over time. I think that Copilot will be able to create molecules, cells, proteins, "test" X-rays (that can be used for education), body organs with a focus on a mechanism of action and illustrated guides for how to administer a treatment. I think there is no limit.
Q: In your opinion, what advantages does Copilot have compared to other AI tools?	**A:** I think the most dominant advantage is that Copilot Microsoft 365 understands a user's business context. Copilot can access users' emails, files on OneDrive, pages in SharePoint, etc. It uses this data as part of preparing its responses. This makes Copilot able to produce images that are far more relevant to the user than any other AI tool that doesn't have such comprehensive access to the user's data.
Q: What did you use before Copilot was launched, and how does it compare in terms of resources needed?	**A:** Before Copilot, we were doing the work mostly manually with limited automation, such as with PerfectIt™. The reason we were limiting our use of automation tools was due to confidentiality and privacy. We did not want to submit any sensitive material to a third-party tool outside of our environment. Now, thanks to Copilot being integrated into our environment, no sensitive data leaves our environment (i.e., our Microsoft 365 tenant), so we can use the full power of AI and automation confidentially.

1. "Grounding is the process of using large language models (LLMs) with information that is use-case specific, relevant, and not available as part of the LLM's trained knowledge. It is crucial for ensuring the quality, accuracy, and relevance of the generated output".[60]

Figure 1. Logo created with Copilot using the prompt: "Create a logo emphasising the [core innovation]".

Table 3. Q&A with Tania Sultana (medical writer) and Serena Diana Ghezzi (freelance scientific graphic consultant)

Questions by: Jacqueline Bersano (JB)	Answers by: Tania Sultana (TS) and Serena Diana Ghezzi (SDG):
JB: What do you use Copilot for in the context of visual communication?	**TS:** I use Copilot to get inspiration for images and illustrations I need for my YouTube channel and books. Copilot can create basic PowerPoint presentations and infographics, but I don't create scientific illustrations with any AI tool. They are not advanced enough for this yet. **SDG:** So far, I have been using Copilot to create images for my LinkedIn posts, infographics, and PowerPoint presentations. It helps me generate introductory and general images (Figure 2), for example, when I need to introduce a scientific topic to students, but it can't create specific scientific visualisations as I show in Figures 3 and 4.
JB: What AI tool do you prefer or use the most for graphics?	**TS:** Midjourney is the AI tool I use the most to create my content. It's fast, and at the moment, I prefer it compared to Copilot. **SDG:** From a technical point of view, Midjourney is my favourite AI tool to generate images. With a properly detailed prompt and the right settings, I can get the desired image. Midjourney is a great tool for generating very detailed images, but unlike Copilot, it does not prevent the creation of controversial images.
JB: What are your personal opinions on the use of Copilot and other AI tools for visual science communication?	**TS:** Copilot can help to brainstorm ideas for images as a starting point, but for more sophisticated images, the time I spend tweaking the prompt is not worth it. Indeed, we need to invest time in prompts before we get what we want; that's why, for now, I rather use other AI tools dedicated to image generation to create the content I need. I use Midjourney if I have to create something from scratch, but first, I try to find good images in Canva and Freepik. **SDG:** Copilot, like the other AI image generator tools, can´t be used for creating precise and accurate scientific content for peer-reviewed journals or in other contexts where scientific accuracy is fundamental. It can provide context or a reference point, but the time when we can use it for data visualisation is not here yet. However, I´m impressed by the rapidity with which Copilot and other AI tools are evolving. As a scientific graphic designer who has been exploring their features and uses, I think they have great potential. DALL-E allows you to customise settings and get highly tailored images. We can enter instructions that will be automatically added to our prompts without having to repeat them. We can generate a series of images with a certain objective style without repeating the same basic commands every time. Besides, a key difference of DALL-E from the other AI tools is the possibility to dialogue directly with ChatGPT to create our images, without the need to enter the image generator program. This means that ChatGPT creates the prompt for us and submits it to DALL-E. How ChatGPT translates our request into a prompt for DALL-E is very interesting because it can be much richer and more detailed than ours. Nonetheless, DALL-E needs very detailed, clear commands to create the desired image. Maybe, over the next few years, we will create more accurate scientific content with the use of AI. This would raise debates regarding ethical issues related to the use of artificially generated images in specialised scientific communication. Furthermore, addressing the longstanding issues with the peer review system will become more urgent, especially in light of the growing prominence of open-access publishing.

Figure 2. A, B, and C are images that were used for web pages of human health fundraising. a, b, and c, are respective images made with Copilot's DALL-E

Images **a** and **c** were created with the prompt: "Create an image of two hands holding a clod of earth from which two kidney-shaped seedlings are growing. Sky background. Backlit. Balanced **(a)** or precise **(c)** style." Image **b** was created with the prompt: "Create an image to be attached to a fundraising project for the study of a new drug to cure kidney disease. Balanced style."

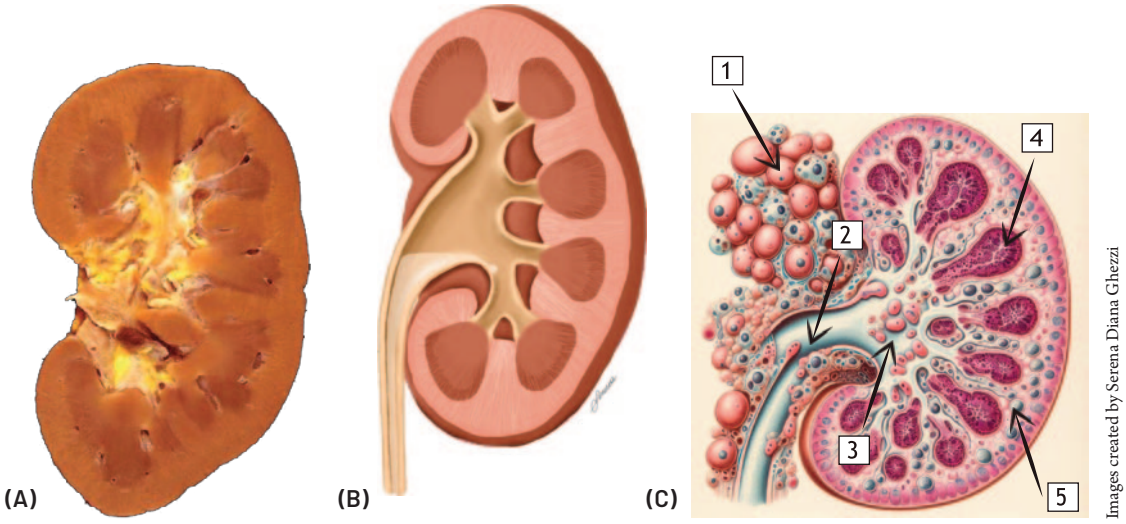

Figure 3. Comparison between a cross-section of a human kidney drawn by a scientific illustrator with the use of Clip Studio (B) and an illustration made by Copilot's DALL-E (C).

(A) is a real microscopic image from Renal pathology showing the section of a human kidney.[58] AI illustration **(C)** presents multiple mistakes: The external tissue around the kidney is adipose: in the picture it should be more regular, smaller, and homogenous (1). The ureter is not interrupted (2). The renal pelvis should be empty (3). The medullary (4) and cortical (5) stroma are characterised by rays structures (nephron ducts and tubules). Prompt used: "human kidney section".

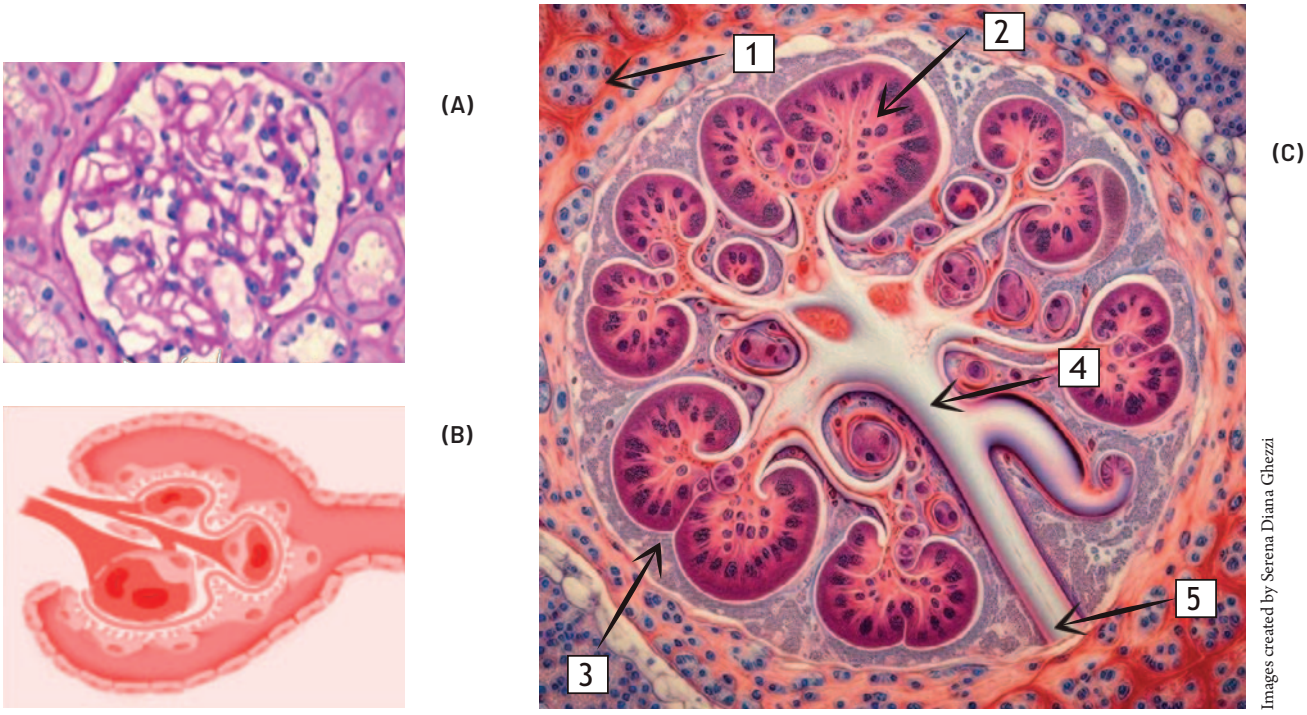

Figure 4. Comparison between a cross-section of a renal glomerulus drawn by a scientific illustrator with the use of Clip Studio (B) and an illustration made by Copilot's DALL-E (C).

(A) is a real macroscopic image from Miller-Hodges et al., 2017, showing the section of a renal glomerulus.[59]

AI illustration **(C)** presents multiple mistakes:

1. External Bowman's capsule tissue is actually characterised by epithelial tubules.
2. The structure inside the glomerulus is one singular capillary boll, not several epithelial bean shapes.
3. Bowman's capsule must be empty.
4. The glomerulus has two exit points: the hilum for the blood system and the proximal tubule for urine collection.
5. The proximal tubule does not stop but continues to the collecting duct. Prompt used: "histological renal section with glomerulus rounded by podocytes."

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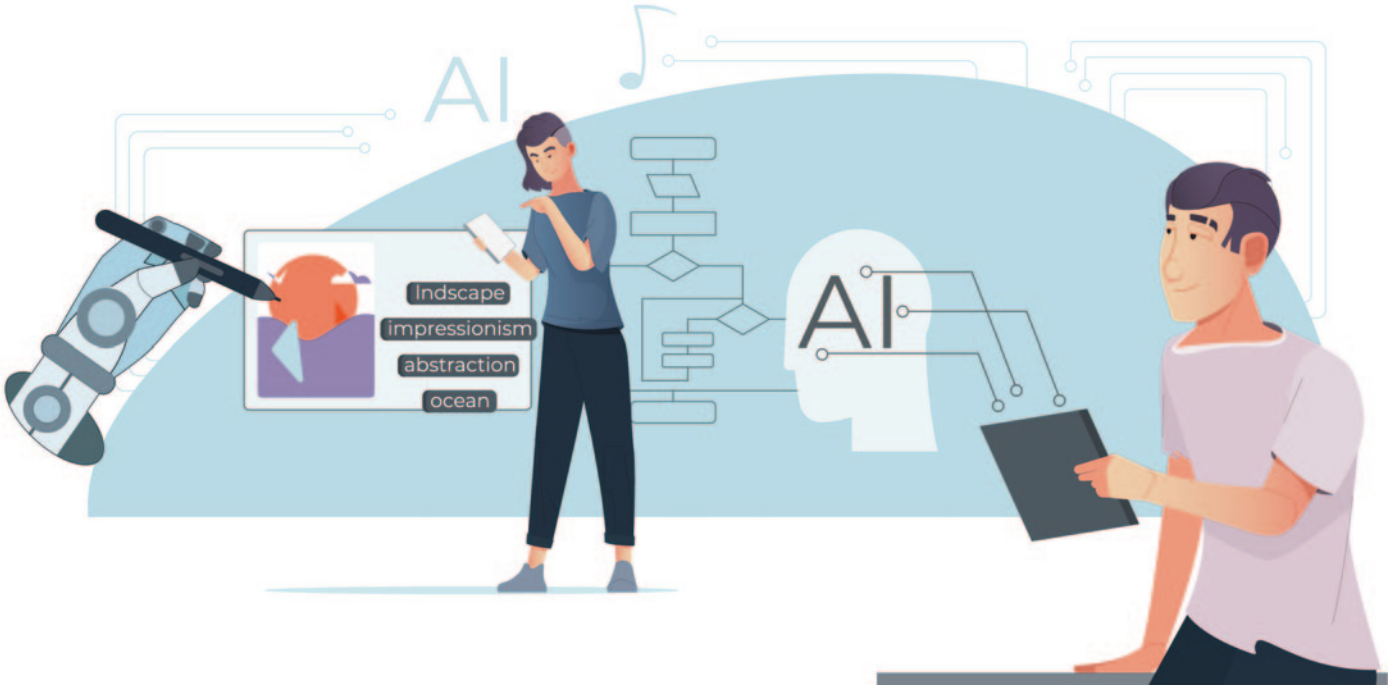

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