

The rise of CreAltives: Using AI to enable and speed up the creative process

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Abstract The ancient Greeks invented the concept of the muse goddess to be a vessel that would enter a human's life and spark long-desired creativity. The Greek gods did not want to give humans credit for coming up with creativity; however, humans may have invented something as good as a muse — artificial intelligence (AI). Today, AI, machine learning (ML), deep learning (DL) and natural language processing (NLP) could be taking up that 'muse role' as well as becoming the workhorse for many a visual artist's grunge work, and possibly even their creative work as well. In this paper, we will look at how modern creative AI technologies can be viewed through the lens of five groups. We will also explore how recent advances in creative AI offer users the ability to create images, compose music, animation and even video in ways never before possible — and then wrap up with final takeaways on the future of artistic creativity in the era of AI.

KEYWORDS: artificial intelligence, personalisation, machine learning, deep learning, natural language processing, text-to-image, generative AI, customer relationship management, behavioural marketing, personalisation, creativity, visual art, music, animation, video, video gaming, images

CREATIVITY

The ancient Greeks believed creativity came from the gods, even inventing the concept of the muse, a goddess who enters an artist's life and sparks creativity. Many a blocked writer, painter, musician, filmmaker and artist has longed for a visit by the mythical muse to set their imagination alight. Today,

we may have found a new muse in artificial intelligence (AI). In their article, 'Artificial intelligence in the creative industries: A review',¹ Anantrasirichai and Bull contend AI has increasingly

'been associated with human creativity and artistic practice. As it has demonstrated

abilities to “see”, “hear”, “speak”, “move”, and “write”, it has been applied in domains and applications including: audio, image and video analysis, gaming, journalism, script writing, filmmaking, social media analysis and marketing.²

Anantrasirichai and Bull believe the maximum benefit from AI can be derived when it augments, rather than replaces, human creativity.³ They argue creativity demands a high level of innovation and routine behaviour is almost antithetical to the creative process.⁴ ‘While AI accomplishments rely heavily on conformity of data, creativity often exploits the human imagination to drive original ideas which may not follow general rules’, contend Anantrasirichai and Bull.⁵ Albert Einstein would agree, as he famously once said, ‘Creativity is seeing what others see and thinking what no one else ever thought’. Creatives can build upon their experience, which enables them to think ‘outside the box’ while asking ‘What if’ questions not easily addressed by constrained learning systems, say Anantrasirichai and Bull.⁶

For Anantrasirichai and Bull, creative AI technologies can be broken down into the following five groups: (1) content creation; (2) information analysis; (3) content enhancement and post-production workflows; (4) information extraction and enhancement; and (5) data compression (see Table 1).⁷

AI can now read, understand and translate text on smart devices and computers. Virtual assistant technology can listen to voices, respond to questions as well as trigger events, such as playing music, ordering food, or buying products and services online. AI can view images and recognise objects in them; however, there is no creative thought in any of these endeavours.

‘There is a clear expectancy that technology should be there to serve the creative’, states Pfeiffer Reports in its ‘Creativity and technology in the age of AI’.⁸ Given the complexity of the modern media

landscape, creative projects almost always include many phases of complex iteration, adaptation and process management that are usually cited as the most tedious part of the creative work. Whether managing image, video or text files, which can contain dozens of layers, or coordinating the transfer of innumerable assets from one system to another or to and from the cloud, the flow from creative intent to the final product is a complex and challenging one — one that could do with more optimisation.⁹

The iterations in marketing content that are coming in the next few years will make the complexity of today’s advertising landscape look like child’s play. Admittedly, some creatives enjoy these repetitive tasks, as Pfeiffer Reports discovered.¹⁰ For some creatives, working through the repetitive steps needed to execute a creative project is seen as useful and necessary.¹¹ As one designer put it, ‘Not everything should be made too easy. The trial-and-error process linked to technology is actually important for the creative process. Errors are important, don’t take them away.’¹² There is, however, a large portion of creatives who would rather spend their valuable time on the endeavours requiring inspiration rather than perspiration.

‘Art is the elimination of the unnecessary’, Pablo Picasso once claimed. This is an idea that is much more relevant in today’s complicated marketing world than it was in the simpler time of Picasso. It is a quote many creatives would agree with, especially when it comes to the most tedious parts of the creative process. AI could be at the forefront of eliminating those unnecessary tasks: the monotonous, time-consuming manual operations most creatives would gladly hand off to someone else, even if that someone else was an AI bot. AI is not just for eliminating tasks, however; it could offer a little creativity of its own.

In their paper, ‘Artificial Intelligence in music and performance: A subjective, art-research inquiry’,¹³ Caramiaux and Donnarumma argue artists are usually the

Table 1: Creative AI technologies

Category	Sub-category
Creation	Content generation for text, audio, video and game
	Animation
	Augmented reality (AR)/virtual reality (VR)
	Deepfakes
	Content and captions
Information analysis	Text categorisation
	Ads/film analysis
	Content retrieval
	Fake detection
	Recommendation
Content	Contrast
Enhancement and post-production	Colourisation
	Super-resolution
	Deblurring
	Denoising
	Dehazing
	Turbulence removal
	Inpainting
	Visual effects (VFX)
Information extraction	Segmentation
	Recognition
	Tracking
	Suspension of disbelief (SOD)
	Fusion
Data compression	3D reconstruction

early ones to adopt technology, often using it in ways that disrupt society. AI, machine learning (ML) and deep learning (DL) will be no exception.¹⁴ On the one hand, many artists already use ‘ML to enrich the way they work with their preferred media. On the other, some artists use ML, and in particular, AI, to shed light onto certain facets of these same tools which can be invisible or taken for granted by public opinion, media, or institutions’, claim Caramiaux and Donnarumma.¹⁵

When asked which type of assistant creatives would prefer, the clear favourite was an assistant that reduced drudgery and the

repetitive tasks of the work, with 89 per cent of respondents expressing interest in such a system (see Figure 1).¹⁶ Pfeiffer Consulting reports:¹⁷

‘For creative professionals working frequently with stock images, or other materials such as fonts found on the web, AI and ML-based help with these tasks would be very welcome: 81% of respondents indicated strong interest for such an assistant.’

Teaching assistants that could explore new features in the software also received

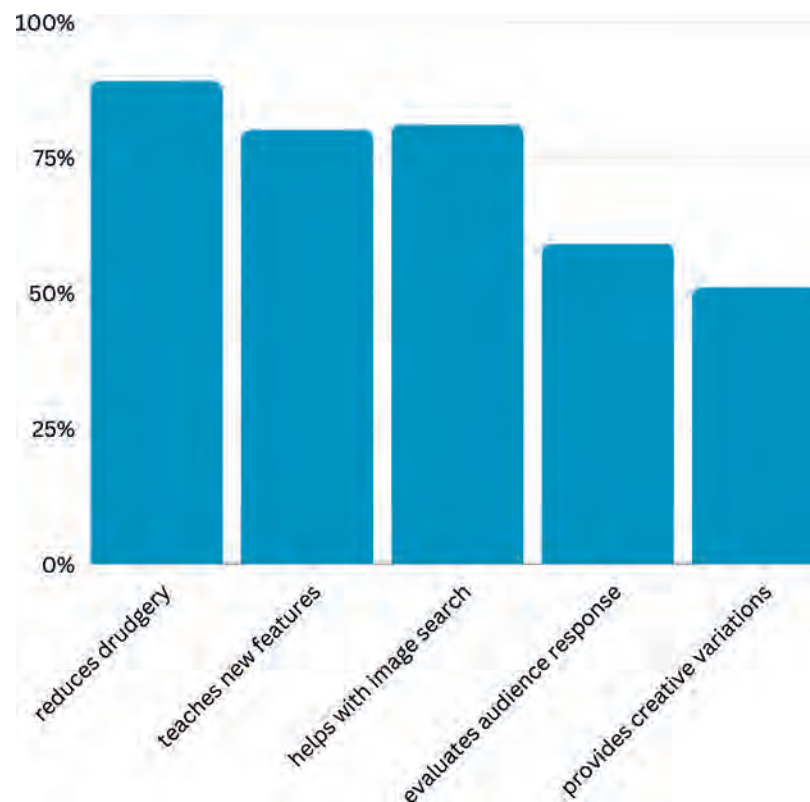


Figure 1: Which AI- or ML-based assistant system would creatives be interested in?¹⁸

strong approval ratings;¹⁹ however, assistants providing creative variations based on a project at hand only received 51 per cent approval. Many interviewees expressed interest in trying such an assistant, but they did not expect to rely on it, since they preferred to stay in control of their creative process.²⁰ This sentiment is certainly a justified one.

One creative assistant suggestion that drew the most interesting comments was a system that would help anticipate different types of audience reactions to a given project, based on ML.²¹ ‘While some respondents (almost 18%) had spontaneous strong negative reactions to this type of assistant, over 59% stated strong or extremely strong approval’, according to Pfeiffer Consulting.²² The type of information the respondents wanted to receive using such an assistant was particularly interesting, with several designers mentioning they would like to test the uniqueness of a design.²³ Some video and

motion graphics creatives were also interested in testing when a viewer’s level of attention dropped while watching a clip.²⁴ User experience (UX) designers also welcomed testing the logic and intuitiveness of a user interface design.²⁵

TRANSCENDENT BEAUTY AS A SERVICE

In ‘The Art in the Artificial: AI and the creative industries’,²⁶ Davies *et al.* see AI within the creative industries breaking down into three categories: AI involving media/ domains relevant to creative industries; AI research directly applied to a creative industry-related activity; creative/generative content, such as generative adversarial networks (GANs), which imitate artists and artistic styles. The latter, like DALL-E and MidJourney, has already produced some impressive and compelling work.

The first category relates to images, audio and text:

‘The raw material of the creative industries: language, imagery and sound can all be digitized and converted into data. As machine learning algorithms are often applied to these, AI research of this nature could have future implications for the creative industries, although it may not necessarily be directly analysing creative content.’²⁷

The second category uses AI to animate a character in a computer game or, like in Adobe’s Character Animator software, generates a visual effect in an image, a video or even on a livestream. The third category, creating generative content as well as the ability to mimic an artist’s style, has grown rapidly in the past few years.

Style transfer is a process allowing a style from one medium to be transferred to another.²⁸ For example, on AI text-to-image tools like DALL-E and MidJourney, users add prompts like ‘abstract expressionist’ or ‘in the vein of Warhol’ to utilise a famous or even not-so-famous artist’s style to their work. As noted by Davies *et al*:

‘An example of an artistic application is Gene Kogan’s Cubist Mirror where a viewer standing in front of a screen finds their recorded image alternatively transformed into the styles of different artists such as Klimt, Munch and Hokusai.’²⁹

Caramiaux *et al*.³⁰ discovered AI in the current media and creative industries could be found in three areas: creation, production and consumption. Although technology lets creatives realise the potential of their vision, it also defines the boundaries of engagement by providing an ever-increasing number of distribution channels and platforms a creative professional must accommodate, says Pfeiffer Consulting.³¹ This means a creative

must focus ‘less on the details of the actual outcome of a creative project, and much more on the multi-layered engagement processes necessary to reach and touch’ an audience, argues Pfeiffer Consulting.³² They contend:

‘Understanding the client’s needs and dreams, and putting themselves in the shoes of the client’s target audience is essential for creative professionals. This is what shapes their creative vision, and helps find inspiration. But the creative project is also shaped by technology: Technology defines what it is possible to create — and also what it is possible to deliver to the audience.’³³

Today’s creative professionals must balance their creative vision within the given technological framework they are working with, while juggling the increasingly complex demands of multi-format, multi-device content delivery, which can both enable and constrain an artist.³⁴

IMAGES AND AI

In early 2021, OpenAI unveiled its picture-making neural network, DALL-E, with a string of surreal and cartoonish images produced on demand that would probably have made the service’s namesake artist, Salvador Dali, immensely proud. As Will Douglas Heaven explains in his article, ‘This horse-riding astronaut is a milestone on AI’s long road towards understanding’.³⁵ ‘DALL-E’s avocado armchairs had the essential features of both avocados and chairs; its dog-walking daikons in tutus wore the tutus around their waists and held the dogs’ leashes in their hands.’³⁶ An AI system getting these and other important details right was truly cutting-edge.

To explore how AI can have an impact on the creation of images with AI, the authors of this paper tested out MidJourney, a text-to-image service calling itself ‘An

independent research lab. Exploring new mediums of thought. Expanding the imaginative powers of the human species.' The self-assessment is lofty, as many corporate slogans often are, but MidJourney's catchphrase contains quite a bit of truth.

Experimenting with this service as the persona of a novelist, ie someone who paints with words rather than with images, using MidJourney was extraordinarily liberating. In my experiments, verbal prompts created palettes of moody, smog-filled and noir-inspired streets of 1950s Singapore (see Figure 2) or mythical heroes in epic compositions (see Figure 3) in less than a minute.

Text-to-image systems work by using ML algorithms instead of human intelligence; they try different combinations of words until they come up with something that looks like an image or sounds like human speech. They also need lots and lots of examples (known as training data) so they can learn how language works in general before being asked questions about specific

texts. The more training data to pull from, the better these systems become at recognising patterns and making sense of them.

Ilya Sutskever, cofounder and chief scientist of OpenAI, describes the DALL-E 2 system as 'Transcendent beauty as a service'. OpenAI believes DALL-E 2 will help inspire artisans of all kinds, including painters, graphic designers, architects, book illustrators, costume designers, storyboard artists as well as many simple amateur artists looking to improve their craft. These text-to-image solutions can simplify an artist's or designer's life, if only in the art discovery, sampling and collage phase of the creative process.

A simple prompt of '/imagine' triggers MidJourney, telling it to pull images from the web and then, according to any provided text instruction, build accordingly. The system starts by providing the user with four images, any of which can be used as a jumping-off point for more images. An image the user likes can be created in high resolution.



Figure 2: MidJourney text-to-image landscape prompted by the following text prompts: noir Singapore alley in 1950, smog, dark, street lights, rule of thirds, cityscape, matte, VHS aesthetic, smoke coming from ground, amber lights, highly detailed, extra details, clean, trending on ArtStation (ArtStation.Com is an online platform for creative collaboration and creative showcases)



Figure 3: MidJourney text-to-image portrait prompted with: Epic composition, a boy fights atop a mountain, highly detailed, torchlight, night, fog, rain, lit windows, night, shape language, bounce light, cool colours, reflections, rim light, complementary colours, volumetric light, shadow shapes, rule of thirds, concept art, atmospheric perspective, cinematic, octane-render, photo-real, CryEngine, V-ray, 8k, micro details, in the style of Peter Mohrbacher, Edmund Dulac, Greg Rutkowski, muted color scheme::0, by simon bisley::0, by greg rutkowski::0, by lee bermejo::0, by alphonse mucha::0, by enki bilal::0, by frank frazetta::0, by alex ross::0, by frank miller::0, by todd mcfarlane::0, by dave mckean::0, by ayami kojima::0, by shinkiro::10000, by masamune shirow::0, by hirohiko araki::0, by takehiko inohue::0, by luis royo::0

To produce Figure 3, we experimented as the persona of a visual artist. We input a list of artists we wanted the work to be inspired by, along with mood settings, ray tracing information and more. Some prompts, like ‘boy fights atop a mountain’, were completely ignored, but there is enough in the image for me to use as an inspiration for a character sketch. The prompt contained

a whole paragraph of instructions and the results proved impressive. Of course, a close-up inspection reveals eyes that do not look quite right, but this is nit-picking. Images like these can trigger a whole host of new ideas for a character or a book or movie plot. A text-to-image AI system can capture the essence of what a writer or an artist is looking for in a character or in marketing

collateral with only a text and/or an image prompt, all in average time of less than 60 seconds.

By applying techniques such as style transfer and other ML-trained methods to generate visuals that would have been very time-consuming to produce even for a skilled professional, AI can lower the barrier of entry to an extent that may lead to the devaluation of skills and expertise of creatives. These technologies will likely improve significantly in the future and could have a distinct impact on the way creatives express and manifest their talents.³⁷ The user can freely create anything their imagination desires, in any chosen artistic style they fancy, from the standard styles of Art Nouveau, Cubism, Expression and Modernism to Post-Impressionism. The palette can go from Afrofuturism to Ziggurat, with anything and everything in between. With MidJourney and DALL-E, the world of art and the style of any known artist, even highly obscure ones, are available at the click of a button. Because MidJourney works on a Discord server, everyone's work is accessible to all who are logged onto that server, so collaboration can be a part of the process. Anyone can whip off a variation of a piece they see in the render cue. Watching the generated art is like seeing the history of art playing out on an hourly basis. Using MidJourney reminds one that art is, above all else, a collaborative process, owned by anyone and everyone — at least the generated art of the digital kind.

All MidJourney renderings start with the prompt '/imagine'. As a request is typed in, the system's promise that 'There are endless possibilities ...' pops up and that line certainly rings true. One's imagination is the only limiter, although the system can go off on confusing and nonsensical tangents every now and then. If it is available as an image on the Internet or you can describe it well enough in a text prompt, while adding enough artistic qualifiers, weights and styles, something that at least vaguely resembles what was in

the mind of the user should pop up. If not, well, there is always a tweak of the prompt and then another 60-second wait for several newly rendered images that might just capture what you were looking for in your prompt.

One does have to trust in the system, however. 'The creative process is a process of surrender, not control', Bruce Lee once said. That is a motto to keep in mind while working with MidJourney, which effortlessly seduces you down a rabbit hole of creativity that is highly addictive and endlessly creative. It does not decipher dreams, but it sure lets your imagination run wild. Some control must be relinquished, but as OpenAI's Sutskever asserts, every now and then MidJourney generates something that just makes you gasp.

In his article, 'AI-generated imagery is the new clip art as Microsoft adds DALL-E to its Office suite',³⁸ James Vincent explains that 'Microsoft is adding AI-generated art to its suite of Office software with a new app named Microsoft Designer'. The app works like other AI text-to-image tools, with user prompts generating a variety of designs with minimal effort.³⁹ 'Designer can be used to create everything from greeting cards and social media posts to illustrations for PowerPoint presentations and logos for businesses', says Vincent.⁴⁰ Designer will have a free standalone app as well as a more feature-rich version available to paying Microsoft 365 subscribers.⁴¹

Depending on how the style transfer feature is implemented, 'it could have wide-ranging ripple effects in the creative community', warns Pfeiffer Consulting.⁴² They further contend:

'Making style transfer available as a push-button option could have a considerable impact on how creatives format multiple elements requiring a consistent style, thus speeding up their workflow — yet in the process running the risk of reducing the kind of creative accident that is often seen as a positive force in the creative process.'⁴³

The feature could also facilitate plagiarism, a concern repeatedly brought up in the research interviews;⁴⁴ however, a style transfer feature would allow for improvised creative experimentation unavailable without the help of AI.⁴⁵ One designer put it rather succinctly: ‘Creativity does not necessarily mean using a tool for its intended purpose.’⁴⁶ ‘Subverting tools and letting creativity run rampant in ways unintended by the developers is likely to lead to results we would have a hard time imagining now’, argues Pfeiffer Consulting.⁴⁷

MUSIC AND AI

Near the end of the 2010s, one of the authors of this paper walked through a Manila (Phillipines) casino and listened to a casino executive explain how the songs we were listening to was part of a soundtrack customised for the patrons on the floor. Using data collected from their patron loyalty cards, the casino figured out the average age of the people filling their floor, then adjusted the soundtrack accordingly, playing hits from whatever generation was most representative on the floor. It was a subtle but clever way to use patron data to make the customers more amenable to gambling their money away.

Today, applications of AI in music are much more sophisticated than building soundtracks based on age averaging. ML algorithms can analyse data to find musical patterns, then make suggestions for newly composed melodies that might inspire an artist.⁴⁸ In his article ‘A beginner’s guide to AI: Neural networks’,⁴⁹ Tristan Greene explains the process of making music with AI:

‘Let’s imagine an AI that generates original musical compositions based on human input. If you play a note the AI tries to “hallucinate” what the next note “should” be. If you play another note, the AI can further anticipate what the song should sound like. Each piece of context provides information for the next step,

and a RNN continuously updates itself based on its continuing input – hence the recurrent part of the name.’

Examples of AI music software systems include Flow Machines by Sony, Google AI’s NSynth and Jukebox by OpenAI, which currently includes over 7,000 songs that mimic artists such as Frank Sinatra, 2Pac, Katy Perry and Bruno Mars. When listening to the songs, one gets the musical intention. Other AI applications in music include assisting sound design and searching through large databases to find the most appropriate musical match for a particular application.⁵⁰

VIDEO AND AI

Anantrasirichai and Bull see AI enhancing and helping video postproduction with colourisation, super-resolution, deblurring, denoising, dehazing, turbulence removal and inpainting, as well as with visual effects.

For Matt Cimaglia, an award-winning creative director and entrepreneur, it does not stop there. In his article ‘The Future of Video Advertising is Artificial Intelligence’,⁵¹ Cimaglia claims, ‘We are witnessing a moment in video marketing history where human editors are becoming obsolete’. Cimaglia envisions an advertising landscape completely different from our own. In this world, advertisers do not shoot a single video, they shoot multiple iterations of it. In one, the actor changes shirts. In another, the actor is an actress of Asian descent. In another, she is African American. After finishing the shoot, the agency passes the footage to an algorithm, not a human editor.⁵²

Instead of taking hours or even days to cut a new ad, the AI algorithm can compile hundreds of videos in a few minutes, each tailored to a specific viewer based on highly detailed user data.⁵³ Cimaglia contends:

‘As the video analytics flows in, the algorithm can edit the video in real-time,

too—instead of waiting a week to analyze and act on viewer behavior, the algorithm can perform instantaneous A/B tests, optimizing the company’s investment in a day.⁵⁴

Human editors are going extinct, says Cimaglia.⁵⁵

This is personalisation marketing on a scale never seen before, only available because of AI. Content is tailored to the subjective individual, not the general, barely understood mass. Video marketing will be surgically striking highly relevant offers to a market of one, not firing a shotgun blast of promotions to the uninterested many.

Savvy advertising agencies need to embrace AI today. The same logic backing programmatic banners and search advertising supports ML and chatbots; computers can just do some things faster, cheaper and more accurately than their human counterpart.⁵⁶ ‘In this future of data-driven dynamic content, viewers’ information is siphoned to AI that determines aspects of the video based on their data’, explains Cimaglia.⁵⁷

The options for customisation do not just stay with user data. If it is raining where the viewer is, it could be raining in the video, which is easily done by the agency plugging in a geolocating weather script.⁵⁸ Cimaglia is correct when he contends, ‘this customization model of video production is more effective than the current model of creating a single video for the masses’.⁵⁹ Although he argues there is always a place for the multimillion-dollar, 30-second Super Bowl mini-film, marketers need to get more sophisticated when it comes to marketing to the individual.

It is not just in the editing room where AI will make a big difference. AI systems are now turning single images into talking head videos. As Loz Blain explains in his article, ‘Samsung AI brings the Mona Lisa (or any other picture) to life’,⁶⁰ Samsung’s AI Center in Moscow uses adversarial learning to take a single image of a person and turn it into a

talking head. The system took several images of a person, ran them through an off-the-shelf ‘face landmark tracker’ to decipher where the eyes, eyebrows, nose, lips and jawline were, then did the same for another ‘driving’ source video, this time tracking the motion frame by frame.⁶¹ Blain explains:

‘These networks start out really bad at their jobs, but as they perform their jobs millions of times, they begin to improve, and the competition between the two networks is what drives both to continue getting better. The Discriminator network isn’t looking for the same things a human fake-spotter might be looking for, but it doesn’t matter – whatever it’s looking for, it keeps getting better at discriminating, so the Generator network has to keep getting better to keep fooling it.’⁶²

Meta (née Facebook) is also getting into the text-to-video game. On 29th September, 2022, Meta announced Make-A-Video,⁶³ ‘a new AI system that lets people turn text prompts into brief, high-quality video clips’. Facebook has been one of the leaders in AI these past few years and its Make-A-Video builds upon its past work in generative technology research, which it believes has the potential to open new opportunities for creators and artists alike.⁶⁴ ‘With just a few words or lines of text, Make-A-Video can bring imagination to life and create one-of-a-kind videos full of vivid colors, characters, and landscapes’, says Meta.⁶⁵ The system generates videos from images or takes existing videos and creates similar ones.⁶⁶ Meta is open-sourcing its generative AI research to build a supportive community, whom they hope will provide useful feedback to improve their product. This is a common procedure with AI tools.

ANIMATION AND AI

AI has been widely used in the gaming industry. Immersive VR and mixed reality

(MR) experiences require good quality, high-resolution, animated worlds, which pose new problems for data compression and visual quality assessment.⁶⁷ AI technologies have been used to make this immersive content more exciting and realistic. It helps robustly track and localise users and the objects they see and interact with inside a virtual environment.⁶⁸ For example, Meta's Oculus Insight uses AI to generate real-time maps and position tracking.⁶⁹ 'Combining audio and visual sensors can further improve navigation of egocentric observations in complex 3D environments', say Anantrasirichai and Bull.⁷⁰

Recently, AI has been used to make the animation process faster, simpler and more realistic than in the past.⁷¹ ML is particularly good at creating models of motion from captured real motion sequences.⁷² Google research has created software for pose animation based on PoserNet and FaceMesh that turns a human pose into a cartoon animation in real time.⁷³ 'Get into character', asserts the Adobe tagline for its Character Animator software, a solution that allows a user to create a 3D character animation that replicates their moves.⁷⁴ The software, which synchronises 'live-performance animation with automatic lip sync and face and body tracking', has been embraced by Hollywood studios as well as many livestreaming content creators.⁷⁵ Facebook's Reality Labs has also 'employed ML-AI techniques to animate realistic digital humans, called Codec Avatars, in real time using GAN-based style transfer technology'.⁷⁶

Beyond animation, gaming 'could be considered as an "all in-one" AI platform, since it combines rendering, prediction and learning', say Anantrasirichai and Bull.⁷⁷ It has supported design, decision making and interactivity,⁷⁸ helped with interactive narrative builds,⁷⁹ assisted in generating procedural content⁸⁰ and deep reinforcement learning has been employed for in-gaming personalisation.⁸¹ As Anantrasirichai and Bull explain:

'AI Dungeon is a web-based game that is capable of generating a storyline in real-time, interacting with player input. The underlying algorithm requires more than 10,000 label contributions for training to ensure that the model produces smooth interaction with the players.'⁸²

Modern games often incorporate 3D visualisation, AR and VR in an attempt to make play more realistic and immersive.⁸³ Some games even generate synthetic 3D gaming environments with the help of deep neural networks trained on real video cityscapes.⁸⁴ DL technologies have also been used in VR/AR game design⁸⁵ and emotion detection has even been added to improve a game's immersive experience.⁸⁶ 'Recently AI gaming methods have been extended into the area of virtual production, where the tools are scaled to produce dynamic virtual environments for filmmaking', contend Anantrasirichai and Bull.⁸⁷

When it comes to rendering objects and scenes, AI has also proven instrumental for gaming, helping with the synthesis of 3D views from motion capture, ray-tracing lighting, character and scene shading,⁸⁸ dynamic texture synthesis⁸⁹ and multiple depth sensors.⁹⁰

FINAL TAKEAWAYS ON CREATIVITY AND AI

'The threat some see in the impact of AI and machine learning on human creativity is not new. The history of computer-based visual creation is shaped by the democratization of tools, making the production of sophisticated designs ever easier and more accessible', says Pfeiffer Consulting.⁹¹

Starting with the simple page layout and vector design tools of the 1980s and 1990s, the evolution has been extremely liberating, but its has left many creative professions in its wake.⁹² Currently, there is a widespread fear that AI will have a leveling effect on creative output, leading to a homogenised, machine-driven

mediocrity that allows almost anyone to produce impressive, ad-ready results.⁹³ The question is, will this make the differentiation between machine-produced output and the work a creative professional provides harder to perceive, especially to the untrained eye?⁹⁴ ‘AI will shift the designer to be a creative director. That will shift the focus from creating to decision-making — but no AI will supplant human decision-making’, believes Evan Abrams, a Motion Designer and Instructor.⁹⁵

The act of creation has always been one of seeking out inspiration so that we can tell a narrative that elicits powerful emotions in a receptive audience. Novelists do it with words, painters with colour, photographers with lights and lenses, composers manipulate it with music and silence, actors with voices, expressions and movement, filmmakers do it with all of the above and more. With AI, new tools have been added to the creative’s arsenal that will help them illuminate and disseminate their message.

We are a long way off from AI producing anything consequential as ground-breaking art, as much as GANksy (AI program trained on Banksy’s street art)⁹⁶ might want to try, but AI can act as a graphic designer’s mood board, an artist’s sketch pad, a costume designer’s lookbook, a book cover illustrator’s outliner or a film director’s storyboard artist. At the very least, it is a wonderful tool for any budding artist who wants to learn about the concepts, themes and history of art, photography and/or cinema. There is a stream-of-consciousness exuberancy about the tool that provokes the imagination in ways both wonderful and enriching.

Anantrasirichai and Bull conclude:

‘[And] these are also the core aspects that will thrive as AI and ML progress in the creative space: Creatives are aware of what they can achieve. Those core human attributes of creativity have always been their strongest asset: Now we can expect these qualities of vision, connection and empathy to become the key component

of what creatives need to demonstrate ever more strongly: That they, unlike the machine, can fully focus on the WHY of a project, while the machine can only produce the WHAT.’⁹⁷

The ancient Greeks gave the gods too much credit when discussing creativity and maybe our current generation, a few years down the line, will be giving too much credit to AI. Seeing what is available with the tools now, however, it boggles the mind to think about what the future holds. The American author, Dorothy Parker, once said, ‘Creativity is a wild mind and a disciplined eye’. Humans keeping the wild while handing off the discipline to AI sounds like a deal most creatives would give an arm and a leg to take. But maybe the American author, Jack London, had a point too when he said, ‘You can’t wait for inspiration, you have to go after it with a club’. Perhaps, today, there is an easier way to catch that creative spirit — just follow the muse that goes by the name of ‘AI’.

References

1. Anantrasirichai, N. and Bull, D. (July 2021), ‘Artificial intelligence in the creative industries: A review’, Springer, available at <https://link.springer.com/content/pdf/10.1007/s10462-021-10039-7.pdf> (accessed 9th October, 2022).
2. *Ibid.*
3. *Ibid.*
4. *Ibid.*
5. *Ibid.*
6. *Ibid.*
7. *Ibid.*
8. Pfeiffer Consulting (2008), ‘Creativity and technology in the age of AI’, ResearchGate, available at https://www.researchgate.net/publication/338840672_Creativity_and_technology_in_the_age_of_AI (accessed 14th October, 2022).
9. *Ibid.*
10. *Ibid.*
11. *Ibid.*
12. *Ibid.*
13. Caramiaux, B. and Donnarumma, M. (July 2020), ‘Artificial Intelligence in Music and Performance: A Subjective, Art-Research Inquiry’, available at <https://arxiv.org/pdf/2007.15843.pdf> (accessed 14th October, 2022).
14. *Ibid.*
15. *Ibid.*

16. Pfeiffer Consulting, ref. 8 above.
17. *Ibid.*
18. *Ibid.*
19. *Ibid.*
20. *Ibid.*
21. *Ibid.*
22. *Ibid.*
23. *Ibid.*
24. *Ibid.*
25. *Ibid.*
26. Davies, J., Klinger, J., Mateos-Garcia, J. and Stathoulopoulos, K. (June 2020), 'The Art in the Artificial: AI and the creative industries', Nesta, available at <https://cdn2.assets-servd.host/creative-pec/production/assets/publications/PEC-and-Nesta-report-The-art-in-the-artificial.pdf> (accessed 14th October, 2022).
27. *Ibid.*
28. *Ibid.*
29. *Ibid.*
30. Caramiaux, B., Lotte, F., Geurts, J., Amato, G., Behrmann, M., Falchi, F., Bimbot, F., Garcia, A., Gibert, J., Gravier, G., Holken, H., Lefebvre, S., Liutkus, A., Perkis, A., Redondo, R., Turrin, E., Vieville, T. and Vincent, E. (2019), 'AI in the media and creative industries', available at <https://arxiv.org/pdf/1905.04175.pdf> (accessed 14th October, 2022).
31. Pfeiffer Consulting, ref. 8 above.
32. *Ibid.*
33. *Ibid.*
34. *Ibid.*
35. Heaven, W. D. (April 2022), 'This horse-riding astronaut is a milestone on AI's long road towards understanding', MIT Technology Review, available at <https://www.technologyreview.com/2022/04/06/1049061/dalle-openai-gpt3-ai-agi-multimodal-image-generation/#:~:text=Artificial%20intelligence-,This%20horse%20riding%20astronaut%20is%20a%20milestone%20on%20AI's%20long,what%20we%20mean%20by%20intelligence.&text=When%20OpenAI%20revealed%20its%20picture%20making%20neural%20network%20DALL%20E> (accessed 15th October, 2022).
36. *Ibid.*
37. Pfeiffer Consulting, ref. 8 above.
38. Vincent, J. (October 2022), 'AI-generated imagery is the new clip art as Microsoft adds DALL-E to its Office suite', The Verge, available at <https://www.theverge.com/2022/10/12/23400270/ai-generated-art-dall-e-microsoft-designer-app-office-365-suite> (accessed 16th October, 2022).
39. *Ibid.*
40. *Ibid.*
41. *Ibid.*
42. Pfeiffer Consulting, ref. 8 above.
43. *Ibid.*
44. *Ibid.*
45. *Ibid.*
46. *Ibid.*
47. *Ibid.*
48. Anantrasirichai and Bull, ref. 1 above.
49. Greene, T. (July 2018), 'A beginner's guide to AI: Neural networks', TNW, available at <https://thenextweb.com/news/a-beginners-guide-to-ai-neural-networks> (accessed 5th October, 2022).
50. Anantrasirichai and Bull, ref. 1 above.
51. Cimaglia, M. (December 2018), 'The Future of Video Advertising is Artificial Intelligence', Entrepreneur, available at <https://www.entrepreneur.com/article/323756> (accessed 15th October, 2022).
52. *Ibid.*
53. *Ibid.*
54. *Ibid.*
55. *Ibid.*
56. *Ibid.*
57. *Ibid.*
58. *Ibid.*
59. *Ibid.*
60. Blain, L. (May 2019), 'Samsung AI brings the Mona Lisa (or any other picture) to life', Newatlas, available at <https://newatlas.com/samsung-ai-mona-lisa-photo-talking/59828/> (accessed 16th October, 2022).
61. *Ibid.*
62. *Ibid.*
63. Facebook (September 2022), 'Introducing Make-A-Video: An AI system that generates videos from text', available at <https://ai.facebook.com/blog/generative-ai-text-to-video/> (accessed 17th October, 2022).
64. *Ibid.*
65. *Ibid.*
66. *Ibid.*
67. Anantrasirichai and Bull, ref. 1 above.
68. *Ibid.*
69. *Ibid.*
70. *Ibid.*
71. *Ibid.*
72. *Ibid.*
73. *Ibid.*
74. Adobe, 'Animate in real time. Really', available at <https://www.adobe.com/products/character-animator.html> (accessed 17th October, 2022).
75. Anantrasirichai and Bull, ref. 1 above.
76. *Ibid.*
77. *Ibid.*
78. Justesen, N., Bontrager, P., Togelius, J. and Risi, S. (2020), 'Deep learning for video game playing', *IEEE Trans Games*, Vol. 12, No. 1, pp. 1–20
79. Riedl, M. and Bulitko, V. (2012), 'Interactive narrative: A novel application of artificial intelligence for computer games', 16th AAAI Conference on Artificial Intelligence.
80. Héctor, R. (2014), 'MADE – massive artificial drama engine for non-player characters', FOSDEM VZW, TIB AV-Portal, available at <https://av.tib.eu/media/32569> (accessed 16th October, 2022).
81. Wang, P., Rowe, J., Min, W., Mott, B. and Lester, J. (2017), 'Interactive narrative personalization with deep reinforcement learning', International Joint Conference on Artificial Intelligence, available at <https://www.ijcai.org/proceedings/2017/0538.pdf> (accessed 16th October, 2022).
82. Anantrasirichai and Bull, ref. 1 above.

83. *Ibid.*
84. *Ibid.*
85. Zhang, G. (2020), 'Design of virtual reality augmented reality mobile platform and game user behavior monitoring using deep learning', *International Journal of Electrical Engineering & Education*, available at <https://doi.org/10.1177/0020720920931079> (accessed 16th October, 2022).
86. Quesnel, D., DiPaola, S. and Riecke, B. (2018), 'Deep learning for classification of peak emotions within virtual reality systems', *International SERIES on Information Systems and Management in Creative Media*, pp. 6–11.
87. Anantrasirichai and Bull, ref. 1 above.
88. Nalbach, O., Arabadzhyska, E., Mehta, D., Seidel, H. P. and Ritschel, T. (2017), 'Deep shading: Convolutional neural networks for screen space shading', *Computer Graphics Forum*, Vol. 36, No. 4, pp. 65–78.
89. Tesfaldet, M., Brubaker, M. A. and Derpanis K. G. (2018), 'Two-stream convolutional networks for dynamic texture synthesis', *The IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*.
90. Guo, K., Lincoln, P., Davidson, P., Busch, J., Yu, X., Whalen, M., Harvey, G., Orts-Escolano, S., Pandey, R., Dourgarian, J., DuVall, M., Tang, D., Tkach, A., Kowdle, A., Cooper, E., Dou, M., Fanello, S., Fyffe, G., Rhemann, C., Taylor, J., Debevec, P. and Izadi, S. (2019), 'The relightables: Volumetric performance capture of humans with realistic relighting', *ACM Transactions on Graphics*, Vol. 38, No. 36, Art. 217.
91. Pfeiffer Consulting, ref. 8 above.
92. *Ibid.*
93. *Ibid.*
94. *Ibid.*
95. *Ibid.*
96. Azarello, N. (October 2020), 'AI software GANksy was shown street art, and learned to draw like banksy', *Designboom*, available at <https://www.designboom.com/art/ai-software-ganksy-banksy-learned-10-28-2020/> (accessed 17th October, 2022).
97. Anantrasirichai and Bull, ref. 1 above.