**Ethics, Issues, and Limitations of Generative AI**

Introduction

Concerns about innovation are nothing new. We’ve always debated the pros and cons of each new thing. Articles from the 1940s asked if machines would displace us. We considered the promises and perils of automation. We announced that robots are after your job. When early computers started to gain traction, there was no shortage of predictions of what this meant for society. And this is not just about computer innovation. When paint in tubes arrived in the early 1800s, there was debate between established systems of art education and the artists who now had access to more colors and an easy way to paint outside. It’s not hard to imagine that impressionism as a style would not have existed without the paint tube. Photography was challenged by painters. The first time one painter saw a photograph around 1840, he announced from today painting is dead. A bit dramatic looking back. We did it again with the creation of the spray can. It was embraced by writers of the ‘70s. And today, we continue to debate what’s art and what’s vandalism. In the 1980s, we panicked over the mouse and a pixel replacing the brush. Digital art was embraced by some like Andy Warhol, but dismissed by others. So, I feel comfortable saying we’re good at this. And most of the time, we do it for a good reason. That’s to say we’re concerned for the welfare of society. And when something new comes into existence, we want to know is this good for us or is this bad for us? What kind of decisions about this new thing should be made? Our motivations are based on the ideas of what is right and what is wrong. This is the core of ethics. And look, I get it. When someone says ethics, you might involuntarily grimace, roll your eyes, or start looking around the room for a path of escape. But I promise I’ll keep this relevant. So let’s stay focused on the digital. With early computing, we were concerned with accuracy and reliability, which is still a reasonable concern with AI. The internet of the ‘60s and ‘70s had us concerned with the misuse of interconnected systems. Personal computers highlighted concerns of software piracy and viruses. The early web had us concerned with privacy, data collection, and a growing digital divide between generations. Social media gave us concerns around cyber bullying, echo chambers, and the spread of fake news. Tech giants begin to control the narrative. Big data analytics added concerns of consent, data ownership, and surveillance capitalism to the conversation. And today, we find ourselves concerned with the rapid growth in artificial intelligence and machine learning, the dawn of generative AI. Computer‑generated content brings to the surface several concerns. It sometimes generates text that’s misleading or outright false or images that are unintentionally biased, further perpetuating stereotypes. Beyond that, who owns what’s created? Is it original? Can it be copyrighted? How does this affect artists, writers, and workers whose work is used to train these systems? How do we safely implement these systems and do our day‑to‑day and should we? And these are only some of the concerns. It’s a lot to think about. And most of these issues are already being challenged, and you should know about the current efforts to address them. Look at some of the solutions to the most pressing problems and current projects that focus on ethical AI development. By knowing the issues, we can work to avoid the downfall of humanity or hopefully just how to live with the latest new thing. Welcome to Ethics, Issues, and Limitations of Generative AI.

Understanding the Model

To understand what issues are presented by generative AI, we first have to understand a little bit about how these systems work. Today’s gen AI systems are the result of machine learning. Where normally we create systems through explicit programming, machine learning is a process where systems learn from looking at data, lots of data. The learning part is commonly called training. This data is paired with some base instructions on how to use that data to perform a specific task. As the system iterates through the data multiple times, it refines its understanding, gradually improving its predictions and decisions, which is somewhat the same as how humans learn from experience. A common machine learning example is email spam filtering. For training, lots of email examples are provided. And each are given one of two labels, spam and not spam. This allows the system to learn, distinguishing between the emails you want and the emails you don’t by recognizing subtle patterns characteristic of spam emails. Now, for generative AI as in text or image generation, the way they’re trained has nuance and each is unique. But generally speaking, it learns by example and then uses what was learned to generate something new when prompted by you. Text generation models have looked at a lot of text, and image generation models have looked at a lot of images. This text and these images were created by us, by humans. And depending on when that content was created, certain ideas, social norms, cultural concepts, biases, and prejudices come along for the ride. And this unfortunately can show up in what’s generated. It’s also important for you to understand how it’s generated. How do we get from the training data to the actual creation of something new? Text generation uses something called next token prediction. Tokens are how the model chops up language in order to analyze it. Generalizing a bit, let’s consider a token to be a word. That way I could say next word prediction. For example, if we were to say what a beautiful and then ask the model to tell us what’s next, it will generate the next word based on what it’s seen in the train data. The model decides this using probability as in given the words what a beautiful and nothing else, the most probable next word is day with a probability of around 99.9% followed by sight, view, scene, moment, or any number of words that could work but have a much lower probability. But if we say we are in a hot air balloon and then say what a beautiful, it uses the new context, the extra tokens, to make a different prediction of the next word. It generates by predicting what’s next based on everything that’s come before it, based on context. Image generation, on the other hand, sometimes starts with random pixels and then reforms those pixels over and over, trying to get them to mimic features found in the training data. Cats have these features in this general area in relation to other cat features. Where we see an ear, a set of eyes, a whisker, the model sees patterns of pixels. Both of these, text generation and image generation, are attempting to create new text or new images at your request based on what they’ve learned from the training data. I’ll admit all of this is a gross oversimplification of some very complex ideas, and how these models work today may not be the way they work in the future. Okay, so here’s what I want you to keep in mind going forward. Everything we’ve created can be fed into these systems for them to learn. And these systems will use that data to generate something new. Everything that’s us, the good and the bad, can be ingested and could come through in what’s created. These models of us are powerful, but they have no concept of what’s real and what’s not, what’s true and what’s false. So, it’s very possible for it to give you information that looks correct but isn’t true or a photorealistic image that isn’t real, which means it’s up to us to determine what’s true, what’s real. These systems are evolving, getting better, improving. But for now, it’s up to us.

Hallucinations

It’s important to understand based on what we know about how these models work is that they don’t always get it right. And sometimes AI models provide results that are not real. This can be a wrong answer to a question, a made‑up source an image that’s not what you expect. We call this a hallucination. In the context of generative AI, hallucinations refer to instances where an AI model generates false or nonsensical output that doesn’t line up with your request. This can happen because the AI is trying to mimic a pattern learned during training. It’s like the AI is dreaming or imagining things that aren’t really accurate or real. Now, this is not malicious or intentional. It’s just the natural result of issues in the training data, the refinement process, lack of context, or a struggle to understand your request. With images, it’s really easy to see the hallucinations. Humans are great at pattern recognition, so we easily spot issues in an image. Let’s look at a few images that are clearly hallucinations. Now, I did cheat a little here. I know image generation models right now are not great with hands, so I provided prompts to highlight this. Here’s a first person view of someone navigating with a compass, and they’re down one finger. Here, I asked for some hands on a keyboard. This one gets more unnerving the longer you spend with it. I’ll give you a second. Okay, that’s enough. Now, two people arm wrestling. Ignoring the man’s obnoxiously oversized arm, check out the woman’s arm and hand. It’s a right hand on the left arm, and the left arm is being used to wrestle instead of the right arm. Okay, so as funny as these are and as easy as it was to see the issues, you knew going into this you were looking at AI‑generated images. What happens when you don’t know and you just glance at an image? Now, when it comes to hallucinations in text, that’s harder to spot. Maybe you ask for a historical timeline of a subject and it skips an era. Let’s say it tells you something you find interesting, but you want to double‑check that it’s true. So you ask for a source, and it gives you one, one that looks plausible, but in reality doesn’t exist. It might give you a title that does exist but the wrong author or the wrong publisher, and it’s not the actual source of the information. This can be a real challenge to spot, especially if you’re not aware that it’s possible or if you’re not fact‑checking what you’re given. Here’s one example from not understanding how these systems work. A lawsuit was filed in Manhattan against an airline. But it had been some time since the incident, so the airline asked for the case to be thrown out due to the statute of limitations. The opposing law firm pushed back, filing a brief citing several relevant court decisions. The issue, none of the cited cases existed. A lawyer at the firm had used ChatGPT for the research and to write the brief. When this came to light, the lawyer said he had never used ChatGPT before and was unaware of the possibility that its content could be false and that he even asked the AI if the cases were real and it confirmed that they were. Apparently, it was very convincing. There were quotes, dates, districts, judge names, but they all were hallucinations. There’s several possible reasons behind this behavior. It could be that the AI had been trained on a limited, biased, or factually incorrect data. Or it’s been overfitted to the training data, meaning the AI has learned too much from the specific examples it was trained on without gaining a broader understanding. Sometimes it’s due to a lack of the context provided by us in the prompt or how we communicate our request, causing the model to struggle with the intent of our expressions or our use of sarcasm. The implications of this can be broad. Hallucinations in generative AI raise questions about the reliability and trustworthiness of AI. Inaccurate or misleading outputs can have serious ethical implications, especially when used in news media or decision‑making. It’s important to remember, this is the worst it’s going to be. These systems are already improving through enhanced training, data model, refinements, manual reviews by the creators, and ongoing research. But for today and in the future, part of this will always be up to you. You have to look closer at what you get back, make your request in different ways, and always, always fact‑check the results.

Ethics

Look, I get it. You often encounter the subject of ethics as a requirement, some bit of compliance at work or maybe in university. When you hear the word ethics, it could cause a gut reaction followed by a string of thoughts. You might think ethics is an abstract, philosophical concept that’s highly subjective, that it’s just about rules and restrictions. Maybe you see it as a bit pretentious. Well, you’re not wrong. It can be all of these things at some level, but that’s not where I’m going to take this. This is more about how ethics crosses paths with generative AI, dilemmas that challenge our current ideas around creativity, truth, and fairness. You might not want to hear this, but humans are biased. It’s a natural part of cognition. We all have biases from our experiences, culture, upbringing, and society’s influences. So, everything we create or have created comes with some level of bias built in. This is not to say we don’t strive to avoid bias. I like to think we’re actively working towards a world with less bias, but it still exists. Now, generative AI models are trained on existing works, works of fiction and non fiction, art of every style, and these have bias in them. So it’s no surprise that these models also contain bias when they create. Look at these AI‑generated images and the request that goes along with each. You’ll start to see what I mean. This is a hero, a heroine, a business executive, an influencer. This is a modern man, a modern woman, a professor, a school teacher. This is an attractive man and an attractive woman. You can instantly see the stereotypes, the lack of ethnic and cultural diversity. This is not the intention of the model, but it’s learned from the training data. Addressing these concerns is crucial. We must guide the model intentionally to work against this when we prompt. AI image generation has also enabled the creation of hyper realistic but entirely fake content called deep fakes, enabling misinformation and the manipulation of reality. For example. Okay, so these images are fake. But what if you chose a different subject, a different location with the intention to create social tension? Using AI to blur the lines between reality and fiction can have dire consequences. Businesses are growing more concerned about damage to reputation and legal repercussions. What about the carbon footprint of AI technologies? The energy consumption of data centers and AI training is massive. Okay, now that you’re sufficiently sad, let’s move towards the light. How do we begin to deal with this? When it comes to deep fakes, several options already exist. Some AI tools are adding visible watermarks and digital watermarks that computers can see, helping us to determine what’s AI‑generated. But detection of deep fakes by machines can’t be our only solution. We have to fine‑tune our critical thinking skills to determine for ourselves what’s fiction and what’s reality? For bias, we need to design our models with mechanisms to identify and correct for those biases, continuing to build more diverse teams, helping to bring varied perspectives and reduce inherent biases. And it wouldn’t hurt to learn more about our own bias and how to correct for those as we create with AI. Remember, you decide what gets put out into the world. As any technology evolves and it changes our society, we have to change along with it as a whole. We can encourage collaboration between governments, businesses, and educational institutions to make these changes work for us, not against us. As some roles decline, others will rise and once again shift our mindset. With responsible use of these tools, we can do a lot. We’re just beginning to see what they’re capable of. But the responsibility lies on both the creators and the users, and I’m hopeful for what we can achieve.

Intellectual Property

Okay, so to talk about intellectual property or IP, we have to get a little picky on how we define it. Here are some of the ways it’s currently defined. Property that derives from the work of the mind or intellect, a work or invention that’s the result of creativity, rights to intangible assets created through intellectual creativity, category of intangible rights protecting products of the human intellect, something that a person or business has invented or created that is protected by law. Look closer at the words here, the mind, human intellect, person, result of creativity, protected by law. Now, this becomes more interesting when we talk about content generated through AI. Generative AI relies on existing images and text for training. This raises questions about derivative works and the use of copyrighted material in training datasets. Determining whether the use of copyrighted material in training AI falls under fair use or constitutes infringement is complex. This depends on factors like the nature of use, the amount of the original material used, and the effect of the market value on the original work. AI tools learn from ingesting, breaking down and iterating on existing works. But in a way, so do we. Traditionally, authorship rights are attributed to humans. This is based on the idea that creativity and originality are inherently human attributes. Has this changed? What’s the limit of tool use when creating? Is there a threshold that determines the creator? In generative AI, distinguishing between the AI as a tool used by a human creator and the AI as an autonomous creator is not easy. If AI is considered a tool, both the tool user or the developer of the tool might claim authorship. But if AI is viewed as an autonomous creator, the question arises, can AI own copyright? Granting IP rights to AI‑generated works could devalue human creativity or lead to economic and professional implications for artists, writers, and other creators. On the other hand, recognizing some form of IP for AI‑generated works could incentivize further exploration. What about using generative AI to make money? Commercial use is typically defined by each tool where most allow for wide use cases, but this doesn’t define if a work can be assigned a copyright, copyright being a subset and outcome of IP where protections and rights to a creative work are defined and can be enforced. US copyright law currently states when an AI technology determines the expressive elements of its output, the generated material is not the product of human authorship. As a result, that material is not protected by copyright. Most current copyright laws don’t recognize AI as capable of holding IP rights. Copyrights as of now are only granted to human authors for their original works. This creates a gray area for works generated by AI without direct human involvement. There’s ongoing debate whether laws should evolve to recognize AI‑generated works. Some argue for a new category of copyright for AI creations, possibly with a shorter protection period or a different allocation of rights. But the decision is nuanced and is still being explored. The final outcome has yet to be decided. We’re in the early stages of this. We have no concrete answers. For now, it’s the Wild West, the frontier of lawless land.

Implementation Issues

I want to take a moment to talk directly to all the leaders out there, the idea folks, anyone ready to apply generative AI to all that you do. Take a moment, take a deep breath, center yourself, and realize a great truth. Integrating generative AI into your product is easier said than done. Think about this. Why take this massive evolution and natural language processing and create a chatbot? The short answer, when a chatbot makes a mistake, you can easily shrug it off, overlook it, maybe laugh about it. Chatbots are, historically speaking, really bad. You always knew when you were talking to one. So this exponential improvement feels really good, even if we really didn’t need a better chatbot. That means mistakes, they don’t matter as much. But is this the same for what you’re creating? Will your customers tolerate mistakes? What happens when you apply a language model that has access to your data and it maybe gives a little too much information or the wrong information? Can your business tolerate that risk? So, it’s really important to consider the implications of integration. The solution, ask your developers. Ask the experts about the risks of integration. And if they tell you it’s hard, believe them. Legal issues around these mistakes are already happening. Recently, gen AI was used for a customer service agent and was asked about a refund policy. Unfortunately, the answer given was not the same as the actual policy of the company. The customer was denied the refund and decided to take it to court. The company said that since the integration was an experiment, they could not be held responsible for the inaccuracy of the AI response. Well, the courts disagreed, ruling in favor of the customer and setting a legal precedent of companies being held legally responsible for their integration of AI. Now, there’s more to consider here outside of mistakes in content generation. These models, especially advanced ones, may have specific technical requirements like the need for high computational power or specific hardware that can be challenging to integrate with your existing infrastructure. These systems need large datasets for training and operation. Ensuring compatibility and seamless integration with existing data management can be complex. As demand or workload increases, these systems need to scale, bringing up challenges and maintaining performance and quality. In applications requiring real‑time responses like gaming or online content generation, you have to think about latency. Systems you create should be able to handle errors or unexpected inputs gracefully. These models create another vector for attacks or misuse. Okay, here are some basic ideas on how you could address these issues. One is to continually evaluate these technologies, not just for performance but also for potential harms. Allow your teams to use these systems and encourage open feedback. Diverse insights are invaluable. Think about generative AI with safety and oversight systems in mind from the start. Be exhaustive before implementation. The concept of safety by design will help avoid the chaos from only being reactive to issues after they show up. Think iteratively. Start small, test, gather feedback, and then scale up, expanding availability as systems prove effective and safe. This walk before you run approach allows for issues to surface when the risks are lower. There’s so much that can be done with this technology, but integration should be done mindfully, avoiding a race to the bottom.

Food for Thought

So, I’ve been going on about issues, limitations, concerns, more of what could be considered negatives and not positives, exposing a lot of darkness without holding up much of a light. I really hope to increase your awareness, showing you things to consider, to think about further, not really giving you solutions. New problems don’t always come with obvious answers. The first step is to slow down long enough to consider all the implications. Every technology, in my opinion, should be mindfully adopted, and generative AI is no different. This is not to say that we’re not being mindful. A lot of really smart people are on this, and progress is being made. I feel like current research in two areas are very promising. These are explainability and interpretability. These are both critical for research and practice. Interpretability refers to the extent which we can understand the cause of a decision made by an AI model. In complex models, like those used in generative AI, the decision‑making process can be opaque where even the creators of these systems can’t look behind the curtain and easily understand how decisions are made. Interpretability is the effort to change that, making the models transparent to the creators, enabling ethical alignment through deeper understanding. Now, explainability is how we explain both the processes and the results of AI in a way that all of us can understand. It’s broader than interpretability, covering the entire process of model development, deployment, and decision‑making. It includes not just the model’s decisions but also its purpose, its behavior, and its potential biases. Currently, there’s researchers developing models that inherently provide explanations for their predictions with a focus to create explanations that match the end user’s level of expertise and to match the context of how the AI is being applied. Overall, it’s vital for accountability and governance in AI, ensuring that decisions made by AI systems are justifiable and fair, crucial for compliance where explanations are needed in order to make decisions. Interpretability and explainability are about making AI more transparent, trustworthy, and aligned with human values and understanding. As AI becomes more prevalent, which it will, and influential, which it already is, both of these will be foundational to ethical progress. Right now, it’s all about the collaborative effort between businesses, governments, and society at large to promote more ethical AI practices. So the question is, what role will you play in this?

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