Artificial Intelligence & Generative AI for Beginners

Artificial Intelligence & Generative AI for Beginners, by David M. Patel. Independently published in July 2023. ISBN: 979-8850705527, 144 pages (paperback).

Reviewed by DAVID GUGIN

"As it has been said 'You are not going to be replaced by AI, you are going to be replaced by a human using AI.' Don't be that person!" (Patel 94).

I am not yet persuaded, nor is it likely that I ever will be, that the above quotation is 100% accurate. However, it does provide an entry point into David Patel's recent, timely guidebook to artificial intelligence (AI) and specifically generative artificial intelligence (GAI). I am also normally somewhat suspicious of self-publications (and this book contains more than a few typographical errors), but Patel is described on Amazon as an "author, educator, and self-taught technologist with more than 15 years of experience" in the AI industry. He holds an MS in Computer Science from Cornell University and appears to be a much in demand "author, speaker, and consultant" on all things GAI. He is therefore a strong proponent of GAI technology, though to his credit he does devote a certain amount of time to its disadvantages and indeed dangers (what he calls risks.) In fact, what I like most about the book is that it works at two levels. First of all, as the title indicates, Patel himself intends it as a how-to guide for anyone new to the field who is interested in learning about and utilizing various GAI models. But in doing so, the book also raises a whole host of questions. For both of those reasons, I would recommend it.

Part I "Artificial Intelligence for Beginners" does a good job on the basics of AI in general, starting off with an informative history of AI, from Alan Turing's seminal 1950 paper "Computing Machinery and Intelligence," which contained the famous Turing Test to determine a machine's ability to replicate intelligent (human) behavior, to the so-called "Deep Learning Revolution" of the early 2010s. Patel concludes Chapter 1 with a key distinction. Narrow or Weak AI ("weak" is not used

pejoratively in this case), is the far more common type of AI – for example, personal assistants like Siri and Alexa, capable of an impressive variety of tasks, but not capable of moving beyond their original programming, of learning new tasks on their own. Narrow AI is contrasted with the newer, still largely theoretical General or Strong or Artificial General Intelligence (AGI), a level of machine intelligence that according to Patel "can fully emulate a human being's intelligence," possessing "the capability to understand, learn, apply knowledge, and improve itself autonomously across a broad range of tasks" (16). In other words, AGI, unlike Narrow AI, will be able to move beyond its specific programming.

In the subsequent chapters 2-6 of Part I Patel introduces the five principal components of AI: Machine Learning, Natural Language Processing (NLP), Robotics, Computer Vision (image and object recognition), and Expert Systems. Chapter 3 then focuses on the role of data, both quantitative and qualitative, the information that AI uses to make decisions, and algorithms, "the rules that AI follows to process data and learn from it" (29). He writes that algorithms, like Machine Learning itself, can be divided into (1) supervised learning algorithms, where the model identifies patterns and makes predictions on data that has already been classified (labeled) manually; (2) unsupervised learning algorithms, where the model can work on its own, with unclassified (unlabeled) data; and (3) reinforcement learning algorithms, which operate through a system of rewards and penalties for various machines or software. In chapter 4 the author returns to a more in-depth discussion of Machine Learning as a prelude to his analysis of neural networks and deep learning in chapter 5. He concludes with a renewed emphasis in chapter 6 on NLP, Computer Vision, and Robotics, since for Patel this is "where AI truly shines, demonstrating its capacity to understand human language, interpret visual information, and interact with the physical world" (49). He provides an excellent overview of both tasks and applications of all three of these major AI fields, noting as well how rapidly their capabilities and usages are expanding.

As the title of the book indicates, Patel is targeting (though not exclusively) relative newcomers to the AI world, so for most readers (including me) Part I is probably the most opaque section of the book, especially given the unfamiliarity of much of the jargon. However, the

material is well-organized, and Patel uses repetition effectively to assist and reinforce understanding of the main concepts. Also when encountering unusual terminology the reader should be patient because Patel will often introduce a word and then develop its meaning and importance more fully later. For instance, he first mentions "backpropagation" on page 13 but does not fully define it until page 44. Still, a working grasp of the basics of AI is important to lay the groundwork for the rest of the book, and more broadly, it seems to me that at least an awareness of what AI is and how it works is pertinent for anyone in this day and age. In addition, knowing these basics strikes me as particularly necessary for those of us who are inclined to be skeptical of AI technology, even outright hostile to it. It is difficult to criticize, challenge, modify, regulate or devise effective policies (personal, professional, institutional, national, international) about what we do not understand.

That being said, Patel begins to get into the heart of the matter in Part II "Introduction to Generative AI." In chapter 7 he offers what he calls "the 10,000 feet overview," describing Generative AI (GAI) as "a type of artificial intelligence that uses machine learning models to produce outputs, such as texts, images, or music, that are new and unique." Thus GAI enables computers to produce creative content that looks like it was produced by humans. These AI systems "generate new data or content, rather than simply analyzing or processing existing data [so] in a sense generative AI is about teaching machines to become creators" (55). The distinction Patel makes here is between (1) discriminative models, which are great for classification tasks because they are taught to answer questions such as to what class does this data point belong? and (2) generative models, which can generate new data from existing data sets because they are taught to answer questions such as follows: Given this class, what would a new data point look like? In short, GAI is based on different types of generative algorithms that allow it to learn "the underlying patterns in data and [use] this data to generate new data" (56). Though Patel does not make the analogy, what emerges in GAI is a fundamental sense of the productive power (and dangers) of textual patterns and conventions, of genre itself.

Chapter 7 ends with a brief listing and description of the seven types of GAI and examples of each: text-to-text or T2T (GPT-4, Google Bard,

Jasper); text-to-audio or T2A (Google's Tacotron, Amazon's Polly); text-to-image or T2I (DALL-E from OpenAI or MidJourney); text-to-video or T2V (still in the developmental stage); text-to-music or T2M (Open AI's MuseNet); audio-to-text or A2T (Amazon's Alexa, Apple's Siri); and text-to-code or T2C (GitHub Copilot). Characteristically, in chapter 8, Patel proceeds to a much more detailed examination of all seven types, including their training and generation phases, functionality, and specific applications of each. He also provides several real-world case studies of companies that have utilized these various types of GAI to expand their businesses, maximize profits, and actually add employees to their workforce. It should be noted, however, that Patel does not provide real-world case studies where GAI reduced the total number of employees. In fairness though chapter 9, the last chapter of Part II, does focus on the present and future benefits and downsides of GAI. For that reason, I will be returning to it later in this review.

In many ways I found Part III "Practical Applications and Future Directions" the most interesting, eye-opening section of the book. Here he focuses on what he calls the "fun part" of GAI – its practical applications, which as he says is probably why most people bought the book in the first place (85). In chapter 10 he walks the reader through very specific explanations of the most commonly used GAI programs: the famous (infamous?) ChatGPT, as well as Google Bard, Adobe Firefly, MidJourney, GitHub CoPilot, GenCraft, and MusicLM. Each explanation begins with a history of the program, the technology behind it, applications and use cases, type, price, the access link, and step-by-step instructions of how to use. For instance, ChatGPT, the world's most popular AI chatbot, was introduced in December 2022 and in just a little over six months had acquired around 170 million users. It is based on a neural network called transformers, discussed previously by Patel in chapter 7. This allows ChatGPT "to learn the relationships between words and sentences in a text," and with further refinement using a technique known as reinforcement learning from human feedback (RLHF), the ChatGPT model is able to "learn from its own interactions with users and improve over time" (85-86). Chat GPT has a wide range of applications in education, entertainment, information retrieval, creative content, and

communication. For better or for worse, it initiated the mainstreaming of GAI, what Patel refers to as "the generative AI revolution."

Chapter 11 branches out to various fields and industries that are being transformed by GAI. I should mention too that "transform" is a word, along with "potential," that Patel uses throughout the book, always with some kind of positive connotation. But there are many people who at least right now would disagree with Patel, arguing instead that the transformative potential of GAI is not creative but destructive. Furthermore, one problem I have with the book is that Patel tends to rely heavily on modals and adverbs of possibility (could, might, may be, should be able to, eventually, potentially) and therefore he is unclear at times about what GAI is actually doing now vs. what it is capable of doing in the future. Nevertheless, and for example, according to Patel, in health care GAI-enabled molecular design can be used to develop new therapeutic drugs much more rapidly, to customize (personalize) treatment plans, and to read medical images (X-rays) faster and more accurately than the human eye. The GAI presence is also increasing quickly in entertainment, fashion and retail, architecture and design, the automotive industry (self-driving cars), agriculture and food production, education (GAI tutors), journalism and media, hiring and recruiting (ZipRecruiter), sales, law services (facial recognition), and personal sports coaching. As the above examples show, a main purpose of the book overall, and chapter 11 in particular, is to illustrate how "this technology can provide new solutions and opportunities [and to] give a glimpse of the possible applications and benefits of Generative AI" (113). What these examples also show is that GAI is not going away. The genie cannot be put back in the bottle. For Patel of course this is a good thing.

Whereas Part II ended with a chapter on the advantages as well as possible disadvantages of GAI, chapter 12 opens Part IV "Conclusion and Looking Forward" with further "ethical considerations." I will return to that topic shortly. Chapter 13, however, continues the "how to use GAI" theme with a variety of useful links and resources. Patel provides AI and GAI news websites, YouTube influencers and channels to follow, along with AI and GAI podcasts as well as other helpful websites for anyone interested in expanding and improving their GAI skill sets. In Part V "Appendix" he takes his argument to its logical conclusion and finishes

with how to build your own GAI system. Chapter 14 summarizes useful tools for GAI development, especially Python, "a high-level, interpreted programming language that has become the de facto language for AI and machine learning" (131). This is apparently the current go-to code for GAI programming. Chapter 15 then concludes with a tutorial on the actual construction of a GAI model: mastering the fundamental concepts, choosing the correct tools, collecting and preparing data, training the model, and testing and refining the model.

As stated earlier, Patel makes his living as a GAI consultant, so he is obviously an advocate of GAI propagation. There is nothing inherently wrong in this and he does spend some time on the potential problems, disadvantages, and dangers of the widespread emergence of GAI technology. In chapters 9 and 12 he discusses "downsides" as he articulates a vision of what directions GAI might take in the near and long-term future. Without using the actual phrase, he also provides a necessary reminder about avoiding the pitfalls of so-called "technological determinism" in any debate about any new or existing technology or delivery system. The point being that all these technologies and their platforms or applications were and are in themselves neutral, neither good nor bad, ethical or unethical, moral or immoral. What determines their use-value, their strengths and weaknesses, are users, i.e., people. Social media, for instance, can be used in all sorts of positive ways, but it can also be used (or abused) in all sorts of negative ways. The same is true of AI in general and GAI specifically. However, the idea that AI and GAI models can essentially think like and thus "replace" humans in a growing number and variety of tasks and situations is unnerving to many people, a legitimate emotional response that Patel (and other proponents) tend to dismiss too quickly.

One big strength of GAI is its ability to generate new content. The risk here is content manipulation, since "deepfake" technology can be used to "create realistic yet falsified images, videos or audio recordings, *potentially* leading to misinformation, identity theft, or fraud" (my emphasis 83). Safe to say, content manipulation is no longer a potential problem, but a very real and growing problem. In addition, all GAI models have to be trained, which means they are data dependent. But if they are trained on flawed or biased input data then their outputs will be flawed or

biased, which can be especially harmful in "sensitive areas like law enforcement or credit scoring, where biased AI models *could* reinforce societal biases" (my emphasis 83). Best to delete the "could" here, since evidence is emerging that on-line job recruiters like LinkedIn, Indeed, and ZipRecruiter are identifying best matches for employers based on AI algorithms that are skewed in favor of white males. Moreover, facial recognition software has already been shown to be unreliable (it has difficulty with darker skin tones) and racially biased against people of color, especially black males. Setup and maintenance costs for GAI are also high, often exorbitant, which undermines the alleged egalitarian or "democratization" value of the technology. If not everyone can afford it (and not everyone can), what emerges is an even more elitist, bifurcated world of those who have GAI access and those who do not, those who control GAI and those who are controlled by it.

Privacy is a major issue with GAI. Patel realizes that "it *might* also infringe on privacy when it uses real user data for personalization purposes [and] there are *potential* risks of data misuse or breach, which *could* compromise personal information (my emphasis 83). Based on my reading of the news and current events, we can delete "potentially" and substitute "will" for "might" and "could." Patel knows too that human over-reliance on GAI is a danger, which contradicts his quote that I began this review with. He correctly argues throughout the book that human oversight of GAI is vital, but at the same time he acknowledges that oversight is often missing. Furthermore, this over-reliance on GAI inevitably leads to what he euphemistically calls "job displacement," what the striking Writers Guild of America calls "job elimination." Patel is aware that "while AI can create new job opportunities, it can render certain roles obsolete, leading to employment concerns" (83). Making "certain roles obsolete" is an interesting phrase and "leading to employment concerns" is, I think, putting it a bit mildly. There will be significant social costs to unchecked, unregulated GAI proliferation.

As a corollary to "deepfake" content manipulation, Patel recognizes that GAI can be used maliciously. Ironically, although spam and phishing identification is now a very useful application of GAI technology, that same technology can also generate the spam and phishing attempts which it is then identifying. Even more concerning, it can automate "cyber attacks, or

produc[e] inappropriate or harmful content." The ever increasing availability of GAI models means they are becoming more and more accessible to more and more bad actors (84). A concurrent problem is that legal systems worldwide never anticipated the sudden appearance of GAI (though maybe they should have), so all sorts of legal issues are now emerging. Patel points out that with GAI it is "challenging to attribute created content to a particular individual or entity." This immediately raises copyright questions: "Who owns AI-generated art or music, for instance?" (84). A good question, one that Patel leaves to others to answer. Finally, a lack of transparency is a problem with GAI models, since it can be difficult to understand their decision-making processes, a serious problem "in fields where accountability and interpretability are crucial, like health care or the legal sector" (94). A serious problem in education I would add.

Patel is not an academic nor does he claim to be. But he does devote a section of chapter 11 to how GAI "holds the promise of making education more personalized, adaptive, and engaging, potentially transforming how students learn and educators teach" (107). It does appear that GAI could be very good at customizing educational content to the needs and proficiency levels of individual students. By creating "individual learning pathways" centered on adaptive content generation, adaptive assessment, and an adaptive testing approach, GAI could, if used properly, very well significantly improve student learning experiences. Because of its ability to so rapidly analyze performance and identify learning patterns, it can tailor instruction to a student's learning style, a student's unique context. It could optimize learning outcomes in a way that is not realistically possible for teachers, given the time and resource constraints they typically work under. Although Patel does not specifically say so, it seems to me that GAI would be especially helpful for special education teachers at all levels of instruction: pre-school, elementary, secondary, and post-secondary.

However, there are problems, which Patel does not directly address. As a professor of literature in the English Department here at the University of Guam I can say that the sudden appearance of GAI has caused quite a stir among faculty and administrators, Chat GPT being the main culprit. Plagiarism is I believe the most immediate issue. It has, of course,

been around forever, but GAI models like Chat GPT and Adobe Firefly have opened up a Pandora's box of possibilities for students (and to be honest, faculty and administrators) to create written and visual texts that in traditional definitions of plagiarism are not their own. Patel is always careful to refer to the benefits of GAI in "first draft writing" and the role of humans in reviewing and revising those first drafts into final drafts. But in my recent experience with student writing assignments, it is clear that those students who may be using Chat GPT are simply submitting the text it has produced for them, without making any changes. Historically, assigning and grading out-of-class writing assignments (essays and research papers) has been the principal means of evaluating student performance and success in most literature classrooms. GAI makes those kinds of writing assignments increasingly problematic. Some interesting, foundational pedagogical questions then arise. Do I want to spend most of my limited time "policing" GAI plagiarism? Do I want to teach less poems, stories, and novels in a particular class in order to focus on a multi-draft writing process that would probably reduce plagiarism but definitely be time-consuming? Or after over 20 years of reasonably successful university teaching do I want to re-think how I teach and what I grade? As appropriate, do I want to incorporate GAI into the overall learning experience, both for my students and for me? Again, for better or for worse, the landscape of higher education has changed dramatically.

I know my own personal answers to the above questions. I know what directions I intend to go in in the remainder of my teaching career. But my larger point in this review is that, if they have not already, it might me a good idea for all educators, including university faculty and administrators, to at a minimum familiarize themselves with GAI, what it is, what it is not, its strengths and weaknesses, its benefits and risks. Since we do tend to fear the unknown perhaps it would be helpful to learn more about a technology that is not going away, a technology that the current generation of students are comfortable with, a technology that all future generations of students will grow up with. Like most proponents of GAI, Patel usually just assumes that the problems with GAI will somehow eventually resolve themselves. I do not share that assumption. In my view, solving or addressing those problems will not necessarily be impossible, but it will be challenging. Still, we must start somewhere and a basic

understanding of GAI is the place to begin. Whether you just wish to learn more about GAI, or you want to use it, or you are ready to build your own GAI program, David Patel's *Artificial Intelligence & Generative AI for Beginners* is a book worth reading.

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