**AI for Dummies:**

Ever since computers were invented, they've really just been glorified calculators, machines that execute the exact instructions given to them by the programmers. But something incredible is happening now: computers have started gaining the ability to learn and think and communicate just like we do. They can do creative intellectual work that previously only humans could do. We call this technology generative AI, and you may have encountered it already through products like GPT. Basically, intelligence is now available as a service, kind of like a giant brain floating in the sky that anyone can talk to. It's not perfect, but it is surprisingly capable, and it is improving at an exponential rate. This is a big deal; it's going to affect just about every person and Company on the planet, positively or negatively. This video is here to help you understand what generative AI is all about in practical terms, beyond the hype. The better you understand this technology as a person, team, or company, the better equipped you will be to survive and thrive in the age of AI.

So here's a silly but useful mental model for this: you have Einstein in your basement. In fact, everyone does. And by Einstein, I really mean the combination of every smart person who ever lived. You can talk to Einstein whenever you want. He has instant access to the sum of all human knowledge and will answer anything you want within seconds, never running out of patience. He can also take on any role you want—a comedian, poet, doctor, coach—and will be an expert within that field. He has some human-like limitations, though. He can make mistakes, he can jump to conclusions, he can misunderstand you. But the biggest limitation is actually your imagination and your ability to communicate effectively with them. This skill is known as prompt engineering, and in the age of AI, this is as essential as reading and writing.

Most people vastly underestimate what this Einstein in your basement can do. It's like going to the real Einstein and asking him to proofread a high school report or hiring a world-class five-star chef and having him chop onions. The more you interact with Einstein, the more you will discover surprising and powerful ways for him to help you or your company.

Okay, enough fluffy metaphors, let's clarify some terms. AI, as you probably know, stands for artificial intelligence. AI is not new. FS like machine learning and computer vision have been around for decades. Whenever you see a YouTube recommendation or a web search result, or whenever you get a credit card transaction approved, that's traditional AI in action. Generative AI is AI that generates new, original content rather than just finding or classifying existing content. That's the G in GPT. For example, large language models, or LLMs, are a type of generative AI that can communicate using normal human language. Chat GPT is a product by the company OpenAI. It started as an LLM, essentially an advanced chatbot, using a new architecture called the Transformer architecture, which by the way is the T in GPT. It is so fluent at human language that anyone can use it. You don't need to be an AI expert or programmer, and that's kind of what triggered the whole revolution.

So how does it actually work? Well, a large language model is an artificial neural network, basically a bunch of numbers, or parameters, connected to each other, similar to how our brain is a bunch of neurons or brain cells connected to each other. Neural networks only deal with numbers. You send in numbers, and depending on how the parameters are set, all the numbers come out. But any kind of content, such as text or images, can be represented as numbers. So let's say I write "dogs are." When I send that to a large language model, that gets converted to numbers, processed by the neural network, and then the resulting numbers are converted back into text. In this case, the word "animals." Dogs are animals. So yeah, this is basically a guess-the-next-word machine. The interesting part is if we take that output and combine it with the input and send it through the model again, then it will continue adding new words. That's what's going on behind the scenes when you type something in chat GPT. In this case, for example, it generated a whole story, and I can continue this indefinitely by adding more prompts.

A large language model may have billions or even trillions of parameters. That's why they're called large. So how are all these numbers set? Well, not through manual programming. That would be impossible. But through training, just like babies learning to speak. A baby isn't told how to speak; she doesn't get an instruction manual. Instead, she listens to people speaking around her, and when she's heard enough, she starts seeing the pattern. She speaks a few words at first, to the delight of her parents, and then later on, full sentences. Similarly, during a training period, the language model is fed a mindboggling amount of text to learn from, mostly from internet sources. It then plays guess-the-next-word with all of this over and over again, and the parameters are automatically tweaked until it starts getting really good at predicting the next word. This is called back-propagation, which is a fancy term for "Oh, I guessed wrong. I better change something."

However, to become truly useful, a model also needs to undergo human training. This is called reinforcement learning with human feedback, and it involves thousands of hours of humans painstakingly testing and evaluating output from the model and giving feedback, kind of like training a dog with a clicker to reinforce good behavior. That's why a model like GPT won't tell you how to rob a bank. It knows very well how to rob a bank, but through human training, it has learned that it shouldn't help people commit crimes. When training is done, the model is mostly frozen, other than some fine-tuning that can happen later. That's what the P stands for in GPT, pre-trained. Although in the future, we will probably have models that can learn continuously, rather than just during training and fine-tuning.

Now, although chat GPT kind of got the ball rolling, GPT isn't the only model out there. In fact, new models are sprouting like mushrooms. They vary a lot in terms of speed, capability, and cost. Some can be downloaded and run locally; others are only online. Some are free or open source; others are commercial products. Some are super easy to use, while others require complicated technical setup. Some are specialized for certain use cases; others are more general and can be used for almost anything. And some are baked into products in the form of co-pilots or chat windows. It's the Wild West. Just keep in mind that you generally get what you pay for, so with a free model, you may just be getting a smart high school student in your basement rather than Einstein. The difference between, for example, GPT 3.5 and GPT 4 is massive.

Note that there are different types of generative AI models that generate different types of content. Text-to-text models like GPT-4 take text as input and generate text as output. The text can be natural language, but it can also be structured information like code, JSON, HTML. I use this a lot myself

to generate code when programming. It saves an incredible amount of time, and I also learn a lot from the code it generates. Text-to-image models will generate images. Describe what you want, and an image gets generated for you. You can even pick a style. Image-to-image models can do things like transforming or combining images. And we have image-to-text models which describe the contents of a given image. And speech-to-text models create voice transcriptions, which is useful for things like meeting notes. Text-audio models, they generate music or sounds from a prompt. For example, here is some sound generated from the prompt "people talking in a busy." Okay, guys, enough. Stop now. Thank you. And there are even text-to-video models that generate videos from a prompt. Sooner or later, we'll have infinite movie series that auto-generate the next episode tailored to your tastes as you're watching. Kind of scary if you think about it.

One trend now is multimodal AI products, meaning they combine different models into one product, so you can work with text, images, audio, etc., without switching tools. The chat GPT mobile app is a good example of this. Just for fun, I took a photo of this room and I asked where I could hide stuff. I kind of like that it mentioned the stove but warned that it could get hot there. When I have things to figure out, such as the contents of this video, I like to take walks using chat GPT as a sounding board. I start by saying "Always respond with the word okay unless I ask you for something." That way, it'll just listen and not interrupt. After I finish dumping my thoughts, I ask for feedback. We have some discussion, and then I ask it to summarize in text. Afterwards, I really recommend trying this. It's a really useful way to use tools like this. Turns out, Einstein isn't stuck in the basement after all. You can take him out for a walk.

Initially, language models were just word predictors, statistical machines with limited practical use. But as they became larger and were trained on more data, they started gaining emergent capabilities, unexpected capabilities that surprised even the developers of the technology. They could roleplay, write poetry, write high-quality code, discuss company strategy, provide legal and medical advice, coach, teach—basically, creative and intellectual things that only humans could do previously. It turns out that when a model has seen enough text and images, it starts to see patterns and understand higher-level concepts, just like a baby learning to understand the world. Let's take a simple example. I'll give GPT-4 this little drawing that involves a string, a pair of scissors, an egg, a pot, and a fire. "What will happen if I use the scissors?" The model has most likely not been trained on this exact scenario, yet it gave a pretty good answer, which demonstrates a basic understanding of the nature of scissors, eggs, gravity, and heat.

When GPT-4 was released, I started using it as a coding assistant, and I was blown away. When prompted effectively, it was a better programmer than anyone I've worked with. Same with article writing, product design, workshop planning, and just about anything I used it for. The main bottleneck was my prompt engineering skills, so I decided to make a career shift and focus entirely on learning and teaching how to make this technology useful, hence this video.

Now let's take a step back and look at the implications. For 300,000 years or so, we homosapiens have been the most intelligent species on Earth, depending on, of course, how you define intelligence. But the thing is, our intellectual capabilities aren't really improving that much. Our brains are about the same size, same weight as they've been for thousands of years. Computers, on the other hand, have been around for only 80 years or so, and now with generative AI, they are suddenly capable of speaking human languages fluently and carrying out an increasing number of intellectual, creative tasks that previously only humans could do. So we are right here at the crossing point where AI is better at some things, and humans are better at some things, but AI's capabilities are improving at an exponential rate, while ours aren't. We don't know how long that exponential improvement will continue or if it will level off at some point, but we're definitely entering a new world order.

Now, this isn't the first revolution we've experienced. We tamed fire, we learned how to do agriculture, we invented the printing press, steam power, telegraph—these were all revolutionary changes. But they took decades or centuries to become widespread. In the AI revolution, new technology spreads worldwide almost instantly. Dealing with this rate of change is a huge challenge for both individuals and companies.

I've noticed that people and companies tend to fall into different kinds of mindset categories when it comes to AI. On one side, we have denial: the belief that AI cannot do my job, or we don't have time to look into this technology. This is a dangerous place to be. A common saying is "AI might not take your job, but people using AI will," and this is true for both individuals and companies. On the other side of the scale, we have panic and despair: the belief that AI is going to take my job no matter what, AI is going to make my company go bankrupt. Neither of these mindsets are helpful, so I propose a middle ground: a balanced, positive mindset. AI is going to make me, my team, my company insanely productive. Personally, with this mindset, I feel like I've gained superpowers. I can go from idea to result in so much shorter time. I can focus more on what I want to achieve and less on the grunt work of building things, and I'm learning a lot faster too. It's like having an awesome mentor with me at all times. This mindset not only feels good, but it also equips you for the future, makes you less likely to lose your job or your company, and more likely to thrive in the age of AI, despite all the uncertainty.

So, one important question is: is human role X needed in the age of AI? For example, are doctors needed, developers, lawyers, CEOs, whatever? So this question becomes more and more relevant as the AI capabilities improve. Well, some jobs will disappear for sure, but for most roles, I think we humans are still needed. Someone with domain knowledge still needs to decide what to ask the AI, how to formulate the prompt, what context needs to be provided, and how to evaluate the result. AI models aren't perfect. They can be absolutely brilliant sometimes, but sometimes also terribly stupid. They can sometimes hallucinate and provide bogus information in a very convincing way. So when should you trust the AI response? When should you double-check or do the work yourself? What about legal compliance, data security? What information can we send to an AI model, and where is that data stored? A human expert is needed to make these judgment calls and compensate for the weaknesses of the AI model.

So I recommend thinking of AI as your colleague, a genius but also an oddball with some personal quirks that you need to learn to work with. You need to recognize when your genius colleague is drunk. As a doctor, my AI colleague can help diagnose rare diseases that I didn't

Artificial Intelligence (AI) is a broad field of study, encompassing various subfields and technologies. Machine Learning (ML) is a significant subfield of AI, focusing on creating systems that learn from data to make predictions or decisions without being explicitly programmed for specific tasks.

Deep Learning is a subset of ML, utilizing artificial neural networks inspired by the human brain. These networks are capable of learning from vast amounts of data, leading to advancements in various applications, including natural language processing, image recognition, and more.

Machine Learning models are categorized into supervised and unsupervised learning:

Supervised Learning models are trained on labeled data, learning to predict outcomes for new data based on past examples.

Unsupervised Learning models work with unlabeled data, identifying patterns or structures within the data without explicit instruction.

Deep Learning can further be categorized into discriminative and generative models:

Discriminative models focus on classifying input data into predefined categories.

Generative models, like those behind ChatGPT and Google Bard, learn the patterns in data to generate new, similar data. This category includes Large Language Models (LLMs), which are trained on extensive datasets and fine-tuned for specific tasks.

The course emphasizes the importance of understanding the hierarchy within AI, from the broad study of AI down to specific technologies like LLMs and generative AI. This knowledge is crucial for effectively utilizing AI tools and understanding their capabilities and limitations.

Practical applications of AI and ML are vast, ranging from natural language processing, image and video generation, to specific industry applications like healthcare diagnostics, retail forecasting, and more.

The course also highlights the importance of data—both labeled and unlabeled—in training ML models. The quality and quantity of data significantly impact the effectiveness of AI applications.

Lastly, an essential skill for working with AI and ML technologies is prompt engineering or crafting effective prompts to generate useful outcomes from AI models, particularly generative AI like ChatGPT.

This summary captures the essence of Google's AI course, providing a foundation for understanding artificial intelligence, machine learning, and their subcategories, along with the skills needed to navigate and apply these technologies effectively.