MATH-438 HW #2

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Articles

The Unreasonable Effectiveness of Data

- Data is more powerful than complex models: In many cases, using a large amount of data, even if it is imperfect, is better for tasks like language translation and speech recognition than trying to create complicated rules and models.

- Simple approaches work well with big data: For tasks like predicting the next word in a sentence or identifying objects in pictures, using simpler methods combined with massive amounts of data tends to give better results than more advanced techniques with less data.

- Natural language is complex: Since human language is constantly changing and has many variations, it's hard to capture all its rules with just a few general formulas. Instead, massive datasets of real-world language use help improve tasks like translation and speech processing.

A Few Useful Things to Know About Machine Learning

- Machine learning relies on data: Instead of manually creating rules, machine learning systems learn from data to solve problems like spam detection, fraud prevention, and product recommendations. The more data available, the more accurate the models can become.

- Choosing the right features is crucial: The success of a machine learning project depends heavily on selecting the right features (important characteristics) of the data. Good features make learning easier and lead to better results.

- Overfitting is a common problem: Overfitting happens when a model performs very well on training data but poorly on new, unseen data. To avoid this, machine learning algorithms need to balance learning patterns without memorizing every detail.

Artificial Intelligence and Illusions of Understanding in Scientific Research

- AI tools are promising but risky: AI can make research faster and more efficient, but scientists may believe they understand more than they actually do when relying too much on AI, which can lead to mistakes in research.
- Illusions of understanding: AI tools can give a false sense of certainty, making scientists think they are exploring all possible questions, but they might be missing important alternative approaches.

- Diversity in research is important: If AI tools dominate science, they could create a narrow focus on specific types of questions and methods, reducing innovation and limiting the variety of scientific understanding.

Videos

The Threat of AI Weapons

- Autonomous Weapons and AI in Warfare: Autonomous weapons, like drones and AI-controlled vehicles, are becoming a major factor in modern warfare. Many experts, including Elon Musk and Stephen Hawking, have warned about the dangers of AI-driven weapons, but the world's largest military powers have resisted banning them. These weapons could lead to devastating, large-scale attacks and might eventually become available to terrorists.

- Military and AI Development: Several countries, including the U.S. and Russia, are developing unmanned and AI-controlled weapons, such as drones, tanks, and submarines. AI technology has proven to be more effective than humans in some military simulations, leading to concerns about AI's potential dominance in combat. Military officials worry about keeping up with private AI advancements, which are outpacing military technology.

- Risks and Future Threats: While AI weapons may reduce human error in battle, they also pose serious risks, such as being used for assassinations or targeting specific groups. There is concern that an AI arms race could escalate global tensions, potentially leading to catastrophic consequences for humanity, especially as AI continues to evolve and surpass human intelligence.

AI Is Dangerous, but Not for the Reasons You Think

- Current Impacts of AI: AI technology has significant impacts on society today, including contributing to climate change, using artists' work without consent, and perpetuating bias. Researchers emphasize the need to track these impacts and develop tools for transparency and understanding.

- Sustainability Concerns: Training AI models consumes large amounts of energy and generates substantial carbon emissions. For example, training the Bloom model emitted as much carbon as driving a car around the planet five times. Tools like CodeCarbon can help measure energy use and encourage more sustainable practices in AI development.

- Bias and Discrimination: AI systems often reflect and reinforce societal biases, leading to unfair outcomes, especially in law enforcement. Tools like the Stable Bias Explorer help reveal these biases, enabling users to better understand and address the issues, while promoting the need for more inclusive and responsible AI practices.