Kids Running in the Yard Assignment 1 Reflection - Neysa Singh

1. What classification scheme does the paper use and why do these types matter for scientific research?

The paper classifies AI based on the role it plays in the scientific process instead of just the technical model behind it. Awad clearly defines the difference between predictive AI, descriptive AI, generative AI, optimization AI, causal and interpretable AI, privacy-aware AI, and meta-scientific AI . What I found really interesting is that this framework organizes AI by its function in research. Predictive AI forecasts outcomes, descriptive AI identifies patterns, generative AI produces new content, optimization AI improves experimental setups, and causal and interpretable AI focus on explanation. Meta-scientific AI even partially automates parts of scientific reasoning. This classification matters because science is a process involving multiple stages, and AI can now intervene at almost every stage. So instead of thinking about AI as just "a model," Awad shows us that AI is a large part of the research as well, from data processing to developing theory.

2. Does Awad distinguish between AI as a tool and AI as a scientific collaborator? Do these examples suggest a real shift in how science is conducted?

Awad does distinguish between AI as a tool and AI as a collaborator. Traditional applications (like neural networks in medical imaging) function as advanced tools. They do enhance human capability but are still used just as tools. However, she also discusses meta-scientific AI systems and large language models that can help in hypothesis generation and reasoning. In those cases, the AI contributes to the actual idea formation rather than simply executing tasks. This definitely functions more as a collaborator, and it hints at a shift in how scientific questions are generated and explored. At the same time, I do not think this represents a complete replacement of traditional scientific methods, since human interpretation is still very important. It feels less like a total revolution and more like a gradual change in how scientific reasoning is supported.

3. What limitations or risks are associated with AI in science? How do these relate to interpretability, bias, reproducibility, or theory formation?

The author is clear that AI has serious risks alongside its benefits. One of the biggest concerns is interpretability, many deep learning systems operate as black boxes, which makes it difficult to understand why a model even came to a certain conclusion. Even with tools like SHAP or LIME, full transparency is not guaranteed. Here, bias can also be an issue, especially in language models trained on social data. If the data reflects some sort of systemic bias, then the outputs would probably enforce it. Reproducibility also becomes hard when models are dependent on large datasets or systems that cannot easily be replicated. Lastly, there is a deeper concern: if science relies too much on correlation-based models, then the process of forming theories is

weakened and we run the risk of mistaking correlation with causation. These limitations show that AI must be used carefully within scientific frameworks.

4. Is AI more likely to accelerate discovery or reshape the scientific method itself? Do you agree?

According to the article, AI does both. It accelerates discovery and has the potential to reshape aspects of the scientific method. Predictive and generative systems clearly speed up modeling and exploration, but, when AI starts to influence idea generation and reasoning, it affects how knowledge is formed in the first place. So in that sense, AI is not just a faster calculator but a participant in these workflows. I would agree that AI is gradually reshaping scientific methodology, although I think the impact of this shift depends on how it is managed. If AI systems remain accountable, they can probably help strengthen scientific reasoning. Ultimately, AI's impact will depend less on its technical power and more on how responsibly it is used in research.