

1. Mariette Awad has classified AI into its function role according to its scientific process which are descriptive AI, predictive AI, generative AI, optimization AI, prescriptive AI, privacy-aware AI, casual AI, and explainable AI. These different types are important because they all support various parts of the scientific method. It shows that AI is not just a tool but it is a collection of tools which has different strengths, limits and risks. Scientists need to understand these categories really well in order to use AI responsibly, and think carefully about how it changes the way knowledge is created.
2. Yes, Awad does make a clear distinction between AI as a tool and AI as a scientific collaborator, and this distinction is mainly around her argument that how AI is transforming science. If we talk about it as a tool, it is an enhancer which helps scientists work faster and more efficiently. It can easily make predictions, finds various patterns in large data sets, and also chooses the best solution. But in this case humans are still fully in charge of deciding what questions to ask and what path the research takes. On other hand, when AI is a collaborator it does something more than just assist in tasks. It can suggest new research, it can question you, it can talk about new design projects or help create new knowledge. In this case, AI is more on the side of “thinking” in the research process. For example, some generative AI systems can propose hypotheses, and some automated lab systems can run experiments repeatedly and suggest simple automation. Right now, most AI works as a tool. However, newer systems say that science will be changing and AI will play a more meaningful and powerful role in discoveries.
3. There are several important problems and risks when using AI in science.
  - Many AI systems are hard to understand so some models, especially deep learning systems tend to work like “black boxes.” These can make very accurate predictions but they don’t know how to explain the process through which they reached that result. This is a limitation because science is not dependent on predicting things but it is also about understanding the causes and explaining why it is happening.
  - AI can also copy biases and opinions from the data with which it is trained. So if the data contains unfair and false patterns or gaps then the AI can repeat the same mistakes or even make those problems more complicated. This could lead to unfair results or false/misleading scientific conclusions.
  - Also reproducibility is a big concern. In science, when we do the same experiment again, researchers should be able to get some similar result from the last time. But when we use complex AI models, large data, it can be hard for others to fully copy the work.
  - So, AI might make science focus more on finding the patterns and making predictions instead of building strong ideas that actually explain how things are

happening and the reason behind it. It means that science will be able to focus more on spotting the correlation instead of deep meaning of cause and its effect. Overall, while AI makes scientific research faster and efficient, it also creates some challenges for how knowledge is used and understood.

4. According to Awad's theory, AI is not only accelerating but also starting to reshape aspects of the scientific method. I feel right now, AI mostly helps us by analyzing data, making predictions and finding the best solution quickly. But it also feels that newer systems can also suggest new ideas/questions and help us design our experiments. This means that AI is beginning to affect how scientists come up with research questions and create new knowledge, not just how fast they get results.  
I do agree that AI is slowly changing how science works. Even though a lot of its impact is still about making things speed up, its growing role in creating ideas and experimenting shows that science itself may be shifting in an important way.