THE LEARNING TIMELINE

Navigating AI; please, mind your knowledge gaps

Travelling with peers and experts is recommend beyond zone 1.

Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5

How to read the tube map: A group of Eric & Wendy Schmidt Postdoctoral Research Fellows at I-X reflected on their learning journey during their fellowships, where they implemented AI in scientific research. Each fellow has hence faced the following issue: How do you identify and explore suitable AI methods when starting with a scientific research question in mind, especially when these methods are not yet common in your field? During a series of workshops, the fellows developed a set of guidelines for navigating AI, which are summarized in the cartoon of an underground system shown above.

The main guidelines are mostly summarized along the **blue line** and are as follows: **1)** Frame your scientific question **2)** Learn the varying terminology inside and outside your field **3)** Do not reinvent the wheel **4)** Invest time in your code **5)** Start small and simple **6)** Start with synthetic data **7)** Bear in mind the FAIR principles **8)** Incorporate what knowledge you do have into your AI models **9)** Aim for an explainable, interpretable and trustworthy AI model **10)** Keep your Aim in mind.

The other lines (**green**, **pink**, **yellow**, **grey**, **red**, and **cyan**) dive further into each of the main guidelines.

References:

[1] Pearl & Mackenzie, *The Book of Why: The New Science of Cause and Effect*. Basic Books, Inc., USA, 1st edition, 2018. **Guideline 1**.

[2] McElreath, *Statistical Rethinking, A Course in R and Stan*. 2015. **Guideline 1**.

[3] Ouyang et al., *Bioimage model zoo: A community-driven resource for accessible deep learning in bioimage analysis*, bioRxiv, 2022. **Guideline 2**.

[4] Mineault. *The Good Research Code Handbook*. Zenodo 10.5281/zenodo.5796873, 2021. **Guideline 4**.

[5] Liaw et al., *Tune: A research platform for distributed model selection and training*. ArXiv:1807.05118, 2018. **Guideline 5**.

[6] *Explaining decisions made with AI*. https://ico.org.uk/for-organisations-2/guide-to-data-protection/key-dp-themes/explaining-decisions-made-with-ai/. Accessed: 16-06-2024. **Guideline 9**.

[7] OECD: *AI Policies, data and analysis for trustworthy artificial intelligence*. https://oecd.ai/en/. Accessed: 16-06-2024. **Guideline 9**.

[8] Cilli et al., *Explainable artificial intelligence (XAI) detects wildfire occurrence in the Mediterranean countries of Southern Europe*. Scientific Reports, 12:16349, 2022. **Guideline 9**.

[9] Abdollahi & Pradhan. *Explainable artificial intelligence (XAI) for interpreting the contributing factors feed into the wildfire susceptibility prediction model*. Science of The Total Environment, 879:163004, 2023. **Guideline 9**.

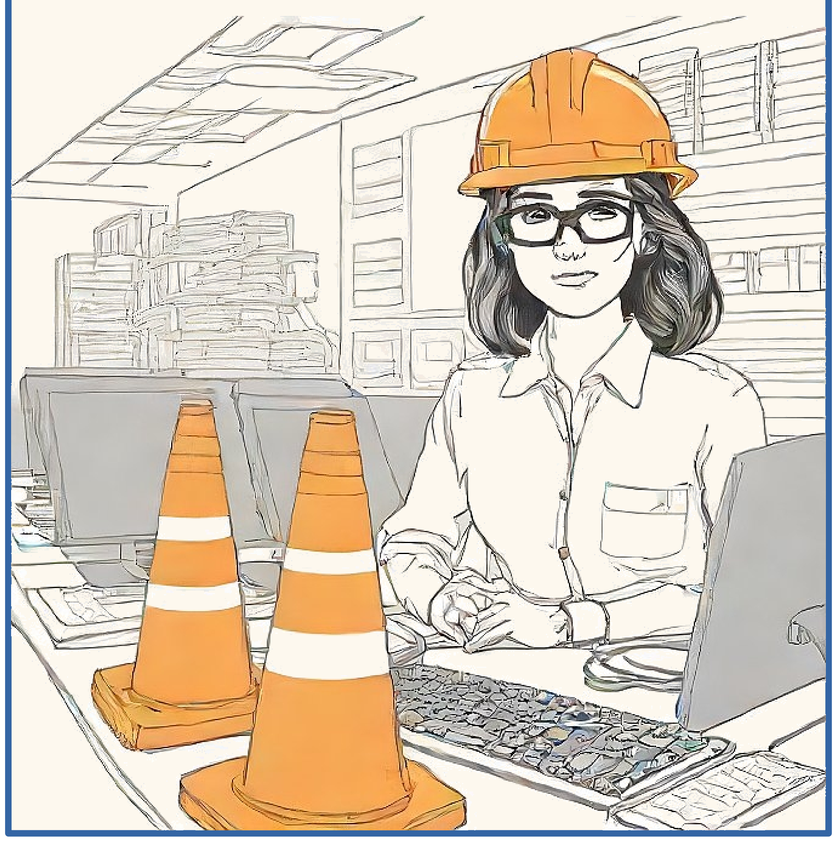
[10] Chubb et al., Speeding up to keep up: exploring the use of AI in the research process. AI & SOCIETY, 37(4):1439–1457, 2022. **Guideline 10**.

[11] Messeri & Crockett. Artificial intelligence and illusions of understanding in scientific research. Nature, 627(8002):49–58, 2024. **Guideline 10**.

The illustration to the right (fellow with traffic cones) is generated with Leornardo AI.

AI UNDER CONSTRUCTION?

Have a chat with our fellows!



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