Presentation 1

- Links to presentation(s) and code(s) on GitHub
- What did you do?
    - I extended the prior MIL baseline, which used only H&E slides, to a multi-stain approach using H&E, SOX, and Melan. I designed two architectures: Option A, where each stain branch has its own CNN and MIL attention producing case vectors that are fused later, and Option B, where each branch outputs patch embeddings that are fused first and then pooled with a single MIL attention.
- How does it help the project?
    - This design overcomes the limits of single-stain H&E by incorporating complementary stain signals. It improves robustness when one stain is noisy and provides a framework to explore the trade-off between interpretability and finer cross-stain feature integration.
- Issues faced (if any)
    - The main challenges were ensuring reliable cross-stain patch alignment and deciding whether to apply MIL attention per stain or only after fusion.
- Attempts to resolve issues (if any)
    - I will rely on patching work from the previous quarter for alignment. I will propose the two design choices systematically in our presentation. We will critique on the implementation architectures and literature support and choose the most optimal one.
- Issues resolved (if any)
    - During presentation, we have decided that option A is the more promising and straightforward approach.
- Next steps
    - The next step is to implement option A, possibly adapting the codes from the paper. In addition, other design improvements, such as exploring different color spaces and batch sizes, will be collaboratively implemented and tested.
- References (Mention if you built up on someone else's work)
    - Cheng, Y., Lama, N., Chen, M., Amidi, E., Ramzanpour, M., Rahman, M. A., Xiu, J., Helmstetter, A., Dickman, L., Ribeiro, J. R., Ghani, H., Oberley, M., Spetzler, D., & Sledge, G. W. (2025). Synergistic H&E and IHC image analysis by AI predicts

cancer biomarkers and survival outcomes in colorectal and breast cancer. Communications medicine, 5(1), 328. https://doi.org/10.1038/s43856-025-01045-9

- Foersch, S., Glasner, C., Woerl, A. C., Eckstein, M., Wagner, D. C., Schulz, S., Kellers, F., Fernandez, A., Tserea, K., Kloth, M., Hartmann, A., Heintz, A., Weichert, W., Roth, W., Geppert, C., Kather, J. N., & Jesinghaus, M. (2023). Multistain deep learning for prediction of prognosis and therapy response in colorectal cancer. Nature medicine, 29(2), 430–439. https://doi.org/10.1038/s41591-022-02134-1