
Multimodal, Generative, and Agentic AI for Pathology

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1:30PM-2:50PM

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Abstract:

Advances in digital pathology and artificial intelligence have presented the potential to build models for objective diagnosis, prognosis and therapeutic-response and resistance prediction. In this talk we will discuss our work on: **(1)** Data-efficient methods for weakly-supervised whole slide classification with examples in cancer diagnosis and subtyping (Nature BME, 2021), identifying origins for cancers of unknown primary (Nature, 2021) and allograft rejection (Nature Medicine, 2022) **(2)** Discovering integrative histology-genomic prognostic markers via interpretable multimodal deep learning (Cancer Cell, 2022; IEEE TMI, 2020; ICCV, 2021; CVPR, 2024; ICML, 2024). **(3)** Building unimodal and multimodal foundation models for pathology, contrasting with language and genomics (Nature Medicine, 2024a, Nature Medicine 2024b, CVPR 2024). **(4)** Developing a universal multimodal generative co-pilot and chatbot for pathology (Nature, 2024). **(5)** 3D Computational Pathology (Cell, 2024) **(6)** Bias and fairness in computational pathology algorithms (Nature Medicine, 2024; Nature BME 2023) **(7)** Agentic AI workflows for diagnostic pathology and biomedical research.

Reading list:

- [Lu, M.Y., Chen, B., Williamson, D.F., Chen, R.J., Zhao, M., Chow, A.K., Ikemura, K., Kim, A., Pouli, D., Patel, A. and Soliman, A., Mahmood, F. 2024. A multimodal generative AI copilot for human pathology. *Nature*. 634\(8033\), pp.466-473. <https://www.nature.com/articles/s41586-024-07618-3>](https://www.nature.com/articles/s41586-024-07618-3)
- [Chen, R.J., Ding, T., Lu, M.Y., Williamson, D.F., Jaume, G., Song, A.H., Chen, B., Zhang, A., Shao, D., Shaban, M. and Williams, M., Mahmood, F. 2024. Towards a general-purpose foundation model for computational pathology. *Nature Medicine*. 30\(3\), pp.850-862. <https://www.nature.com/articles/s41591-024-02857-3>](https://www.nature.com/articles/s41591-024-02857-3)
- [Song, A.H., Williams, M., Williamson, D.F., Chow, S.S., Jaume, G., Gao, G., Zhang, A., Chen, B., Baras, A.S., Serafin, R. and Colling, R., Mahmood, F. 2024. Analysis of 3D pathology samples using weakly supervised AI. *Cell*. 187\(10\), pp.2502-2520. \[https://www.cell.com/cell/abstract/S0092-8674\\(24\\)00351-9\]\(https://www.cell.com/cell/abstract/S0092-8674\(24\)00351-9\)](https://www.cell.com/cell/abstract/S0092-8674(24)00351-9)
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