Heterogeneous Graph Attention Network Improves Cancer Multiomics Integration

Sina Tabakhi[1], Charlotte Vandermeulen[2], Ian Sudbery[2], Haiping Lu[1]

[1]School of Computer Science, University of Sheffield, UK. [2]School of Biosciences, University of Sheffield, UK.

Motivation

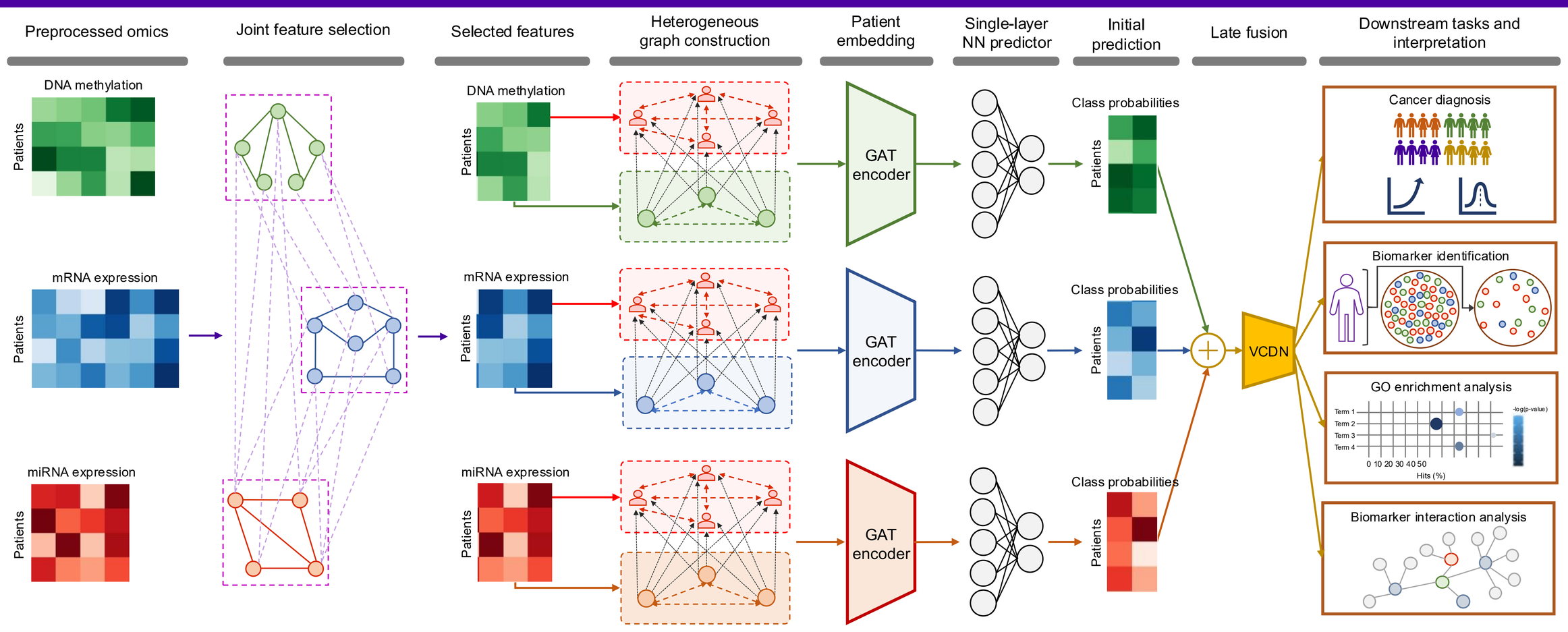
- **Cancer**: Interactions across multiple molecular modalities (**multiomics**)
- Multiomics integration: Deeper insights into cancer biology
- Challenges in graph-based deep learning
  - ❑ **Independent feature selection**
  - ❑ **Homogeneous graph learning**

Heterogeneous graph over jointly reduced omics features?

Contributions

- **HeteroGATomics**: **Hetero**geneous **G**raph **AT**tention network for **omics** integration
  - ❑ **Joint feature selection** across all omics
  - ❑ **Heterogeneous graph learning** for cancer prediction
    - ■ **Dual-view** approach with **feature** and **patient** similarity networks

HeteroGATomics Architecture



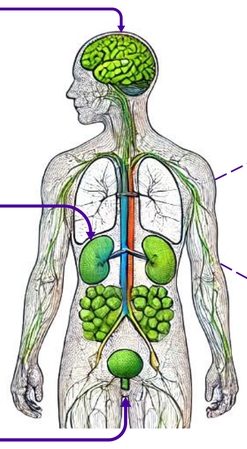
Datasets

- The Cancer Genome Atlas (**TCGA**) cohorts

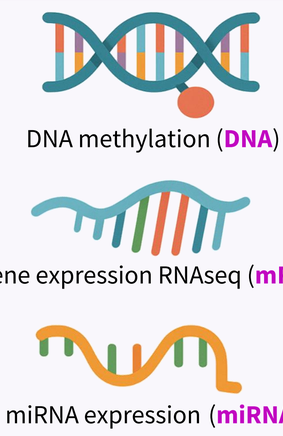
Brain lower-grade glioma (**LGG**)

Renal cell carcinoma (**RCC**)

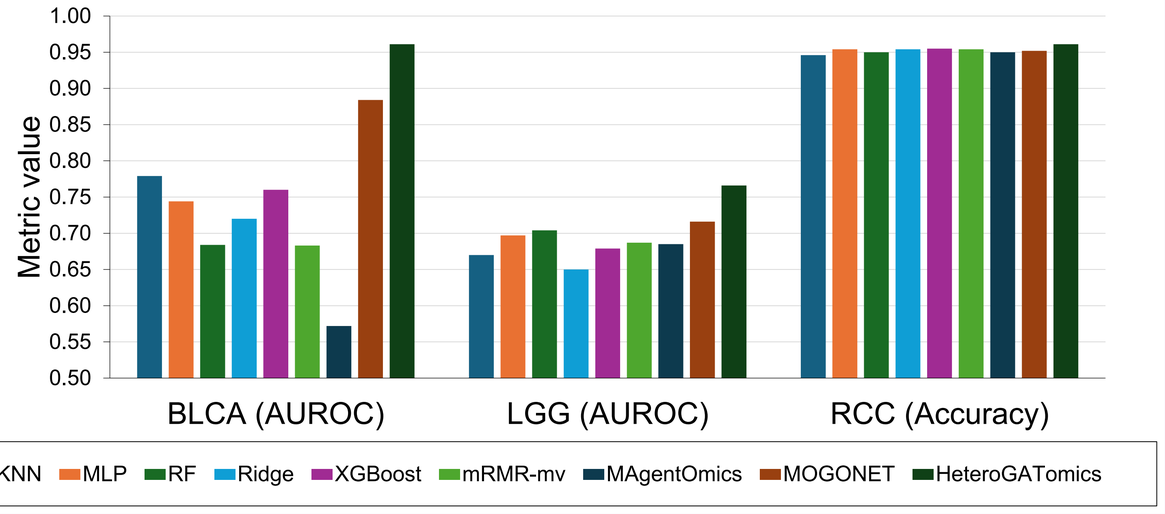
Bladder urothelial carcinoma (**BLCA**)



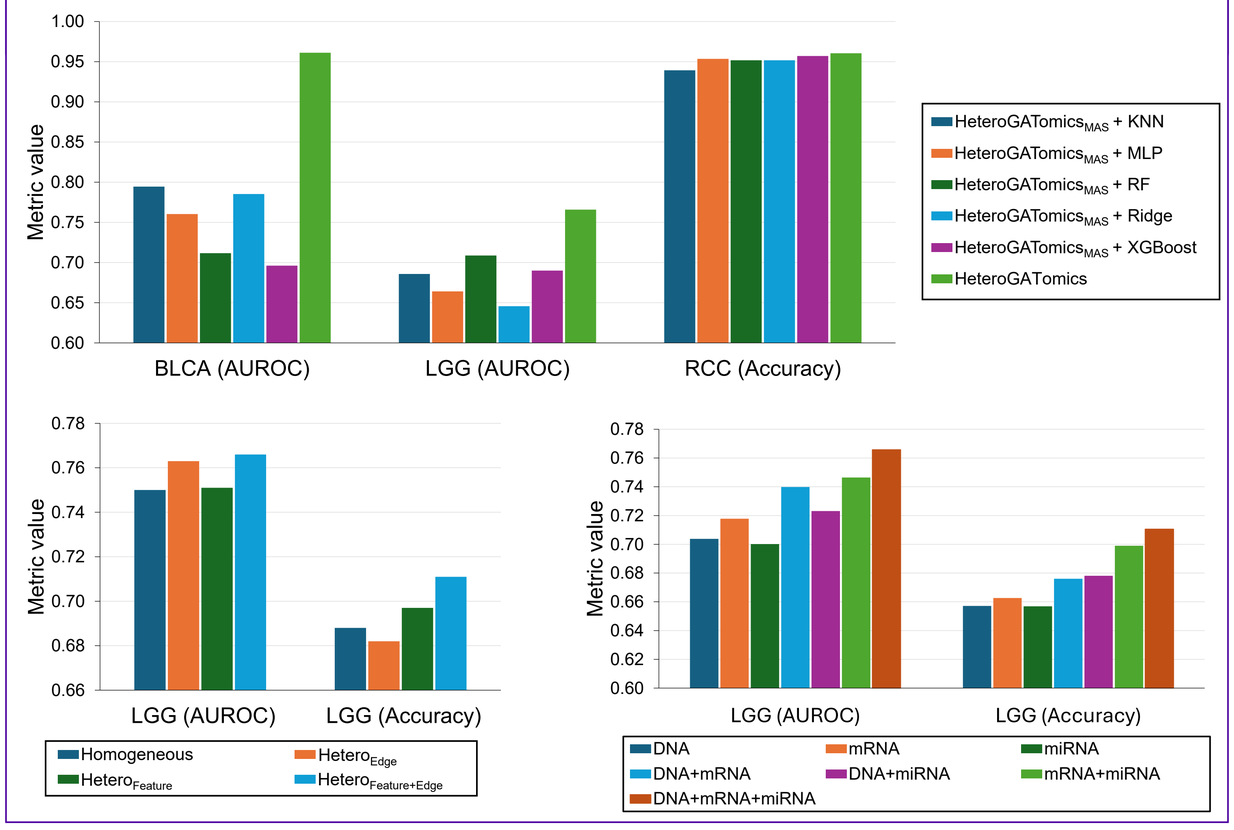
Omics Modalities



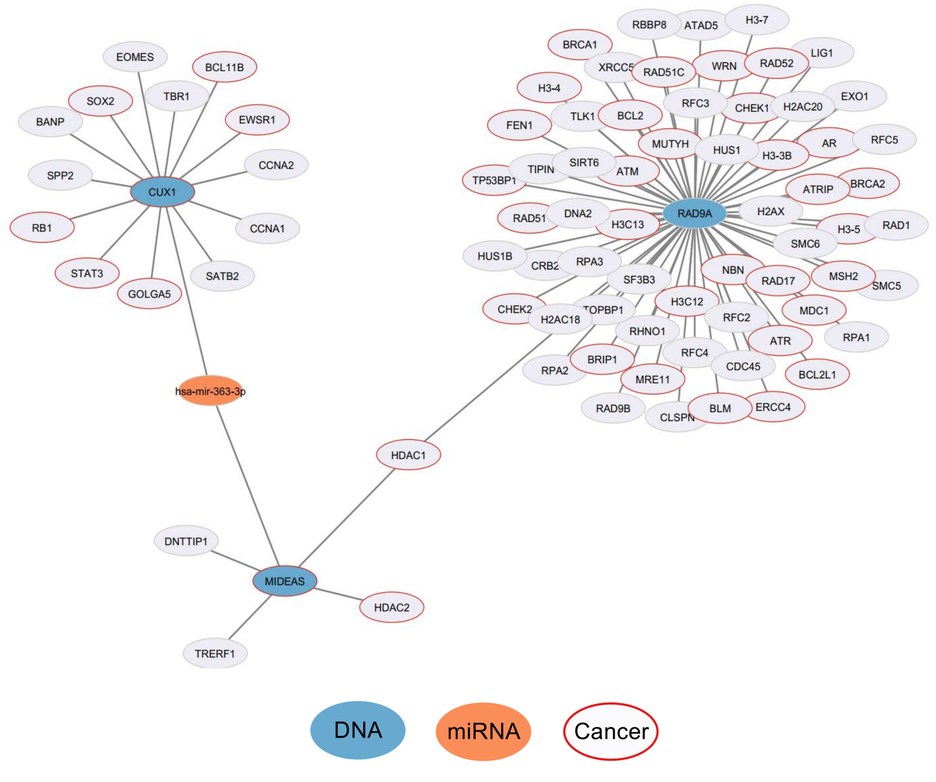
Cancer Classification Performance



Ablation Studies



Biomarker Identification (LGG)



arXiv

GitHub

Contact:

stabakhi1@sheffield.ac.uk