

Explainable mRNA Degradation Prediction

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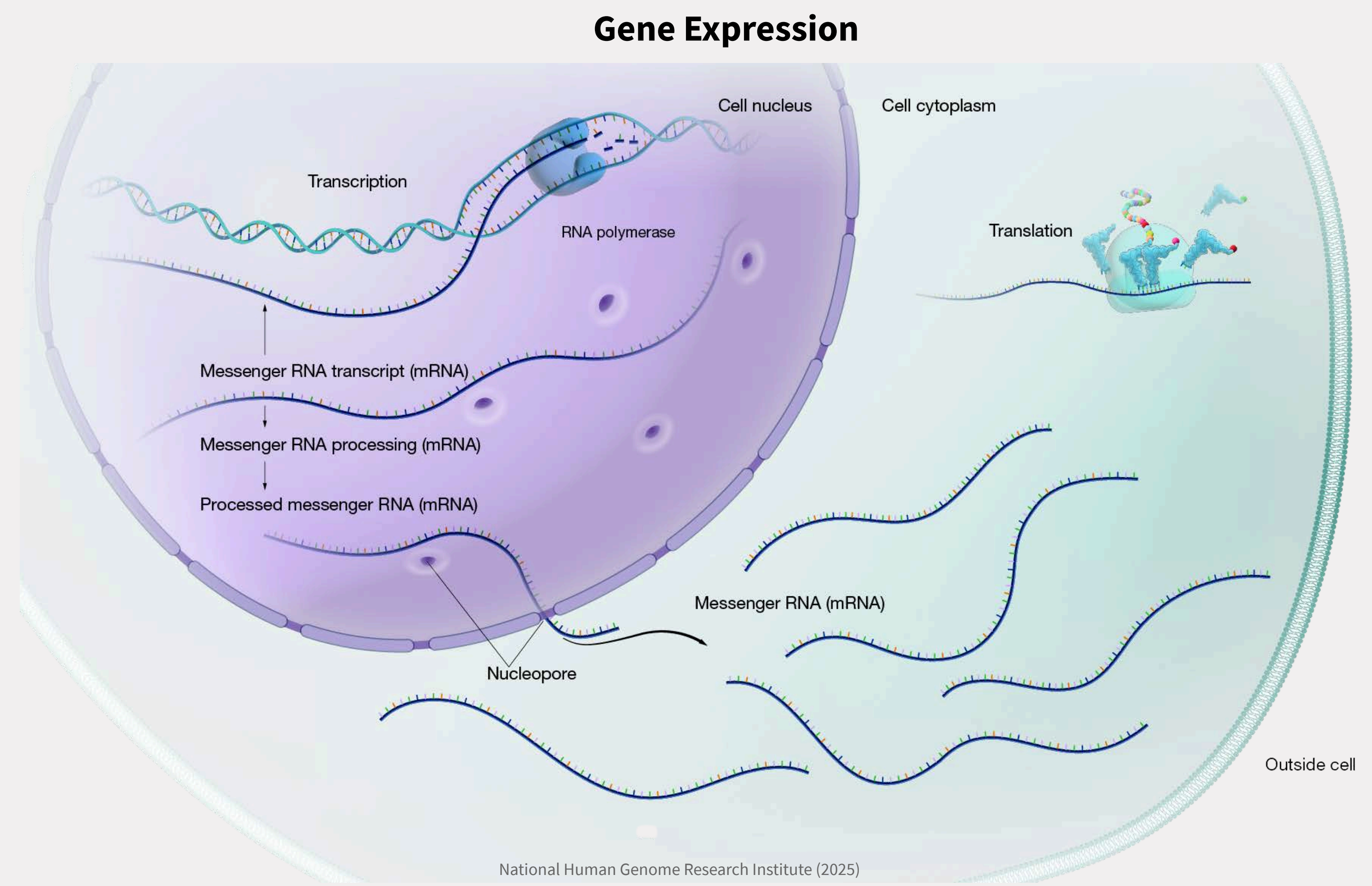
Task: Predict the likelihood of messenger RNA (mRNA) degradation at each base & interpretability

Data: 3k COVID-19 vaccine mRNA sequences

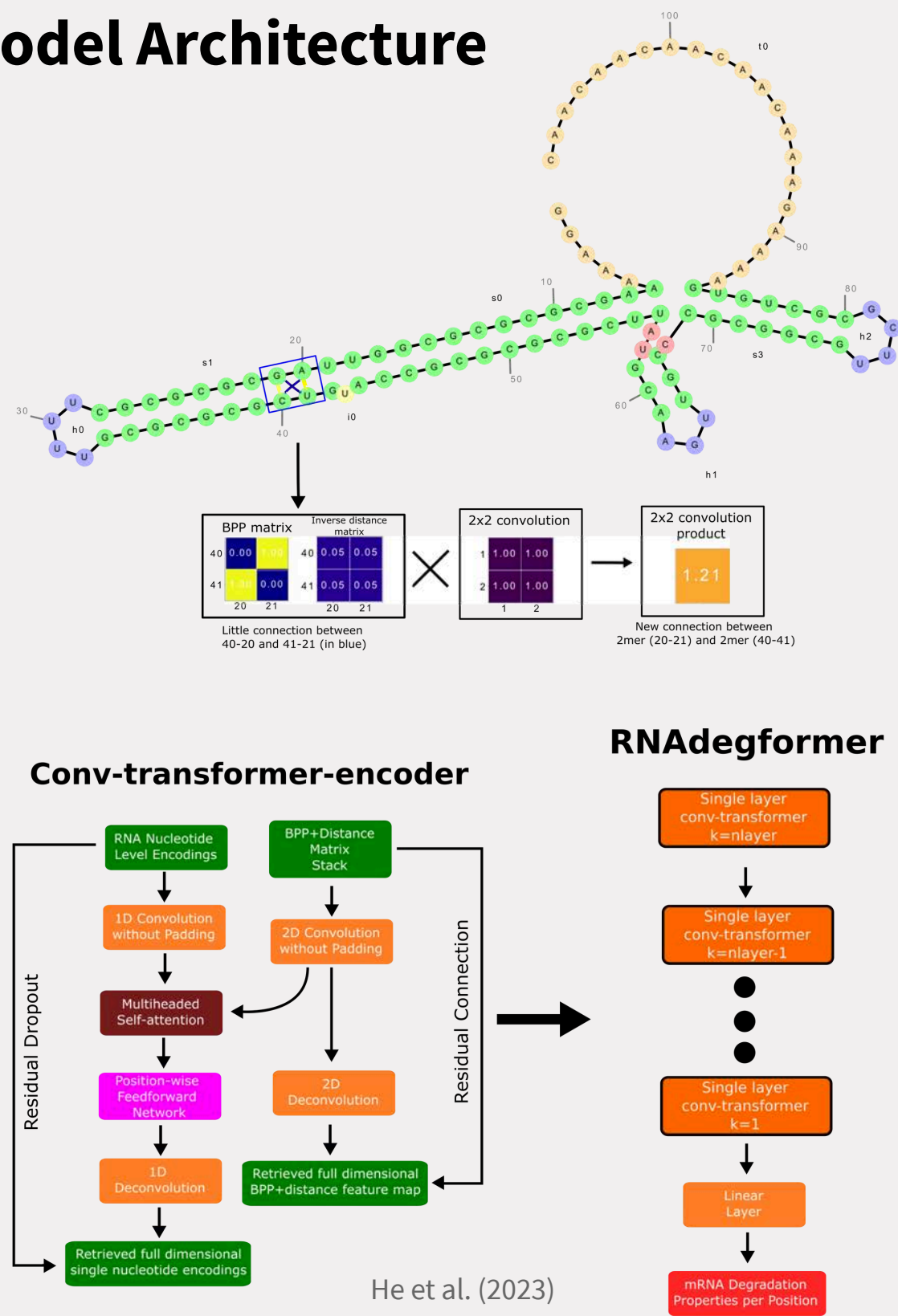
Approach: Ablation study and investigation of attention maps of Transformer-based architecture

Findings:

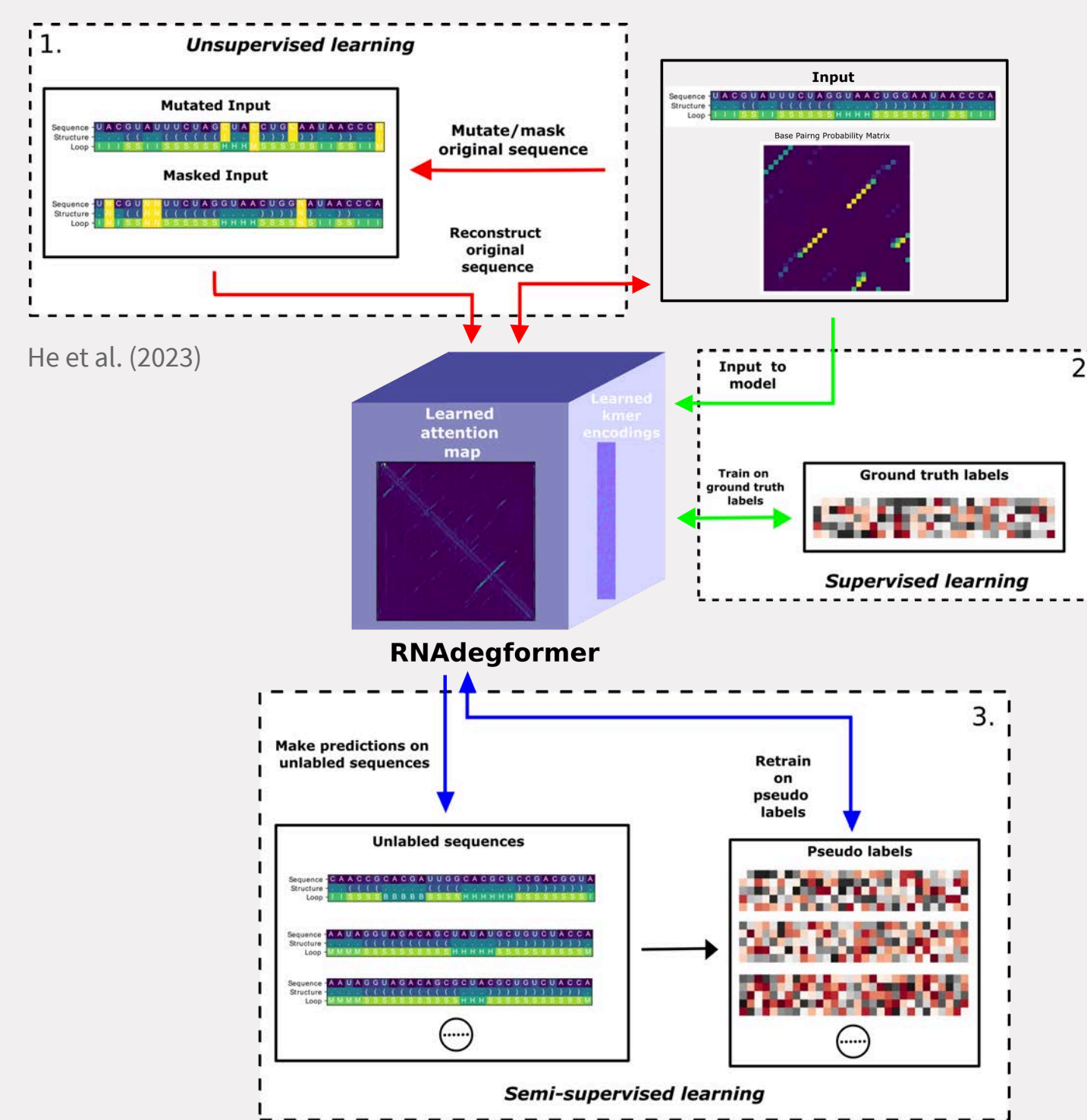
- Secondary structure affects degradation
 - Stems are very stable
 - Loops and bulges most likely to break
- Attention heads focus on specific patterns
- Most relevant: beginning and end of sequence, loops and neighboring bases



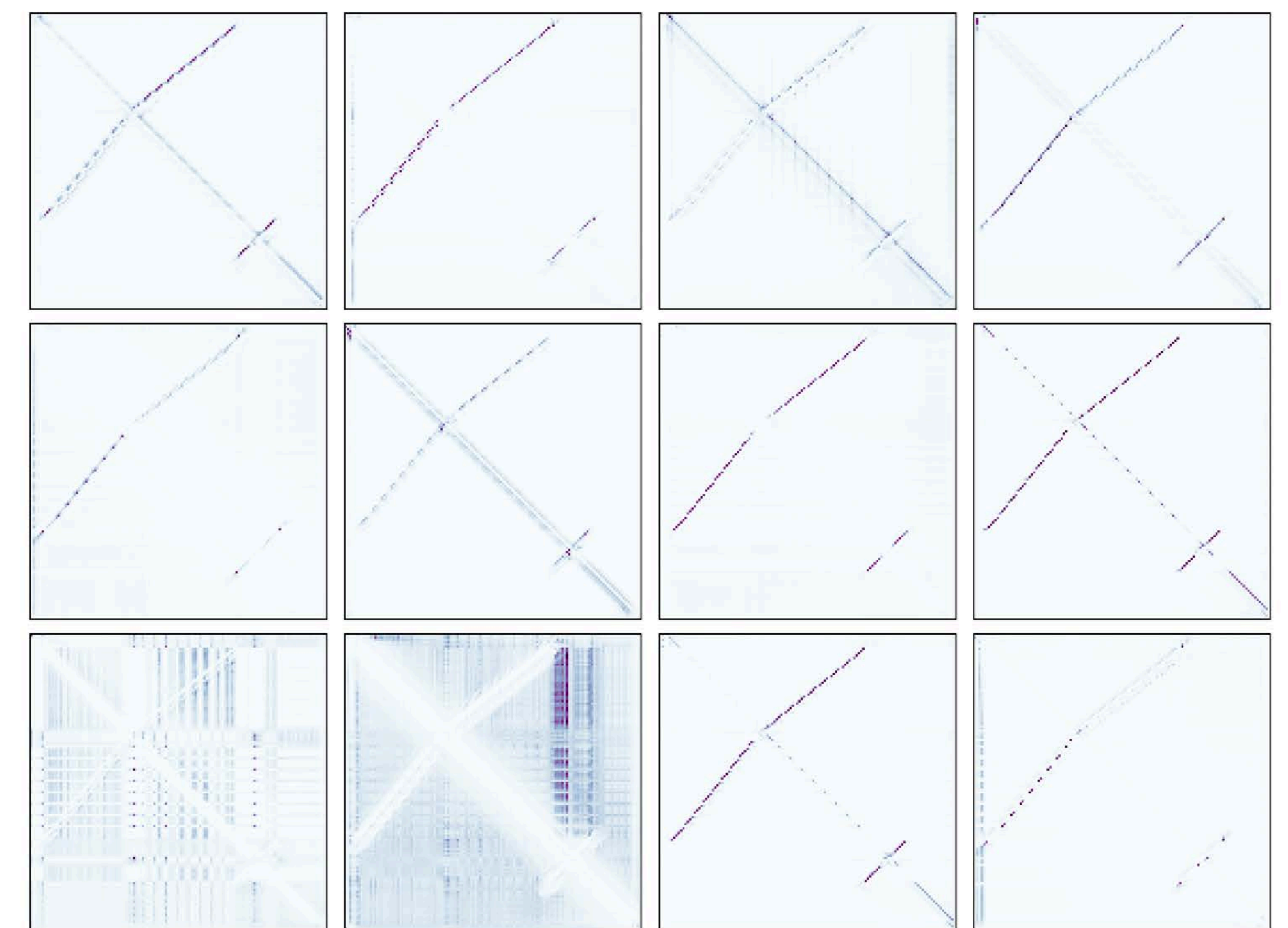
Model Architecture



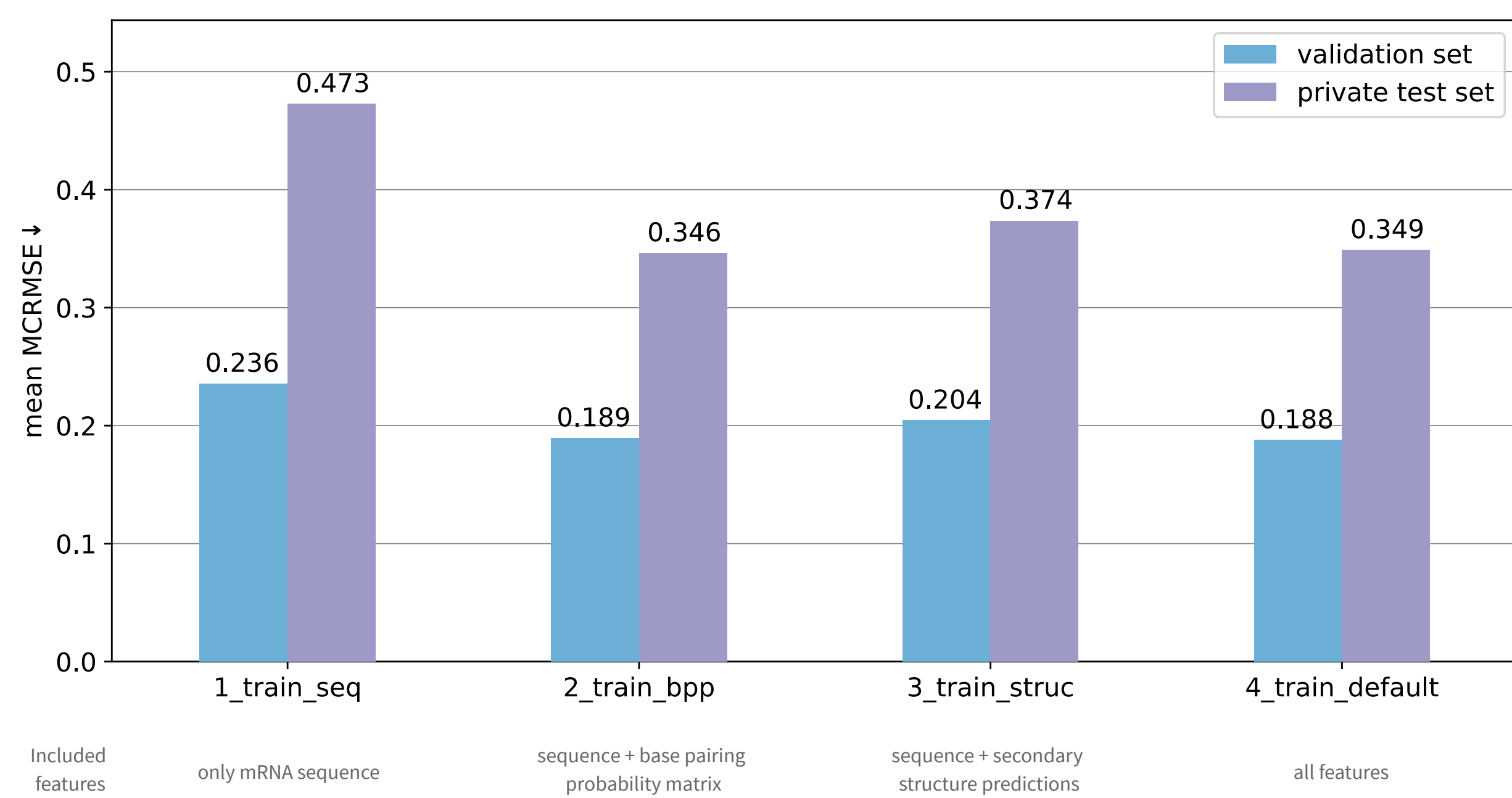
Training Procedure



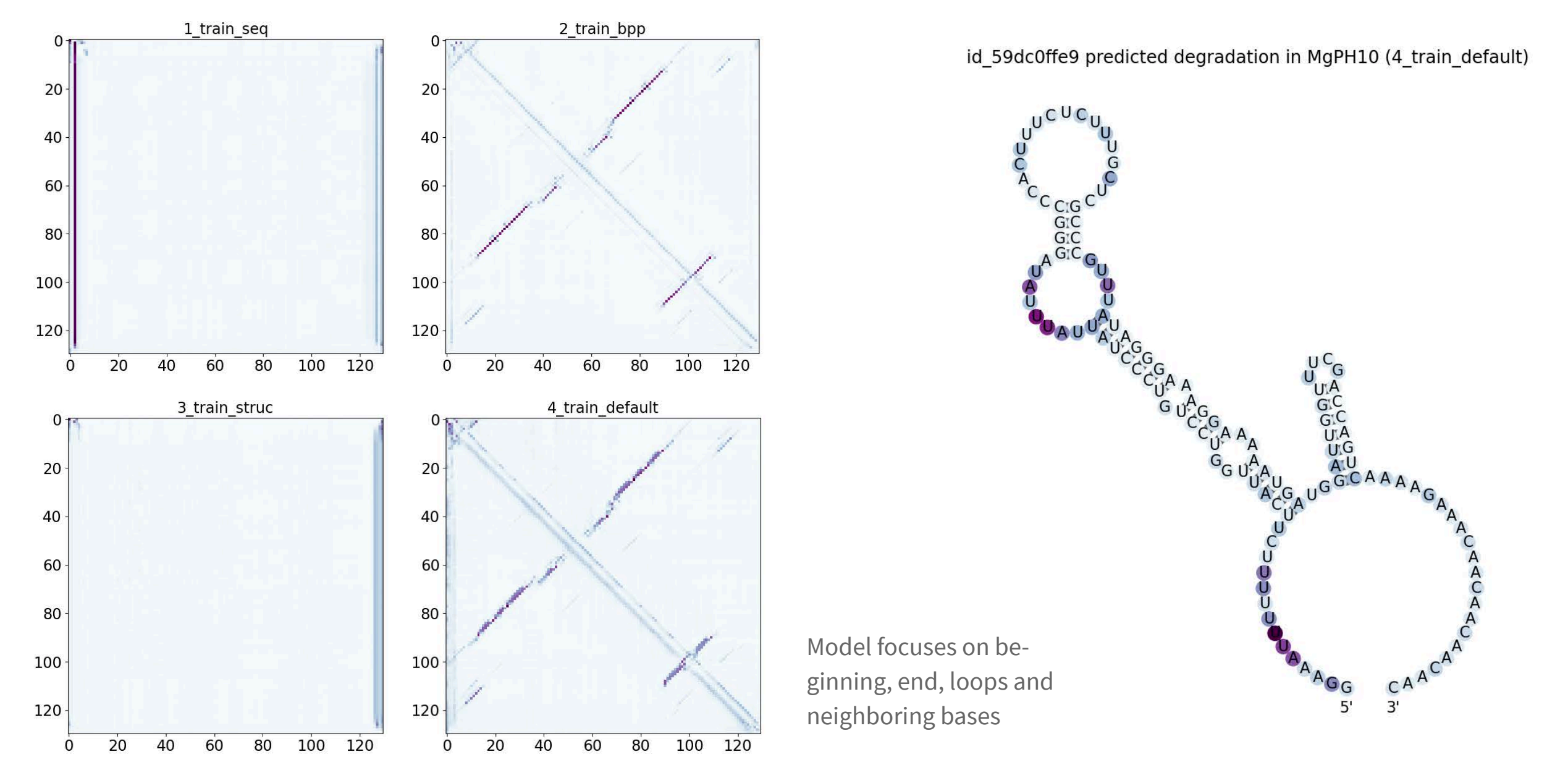
Sample Attention Heads



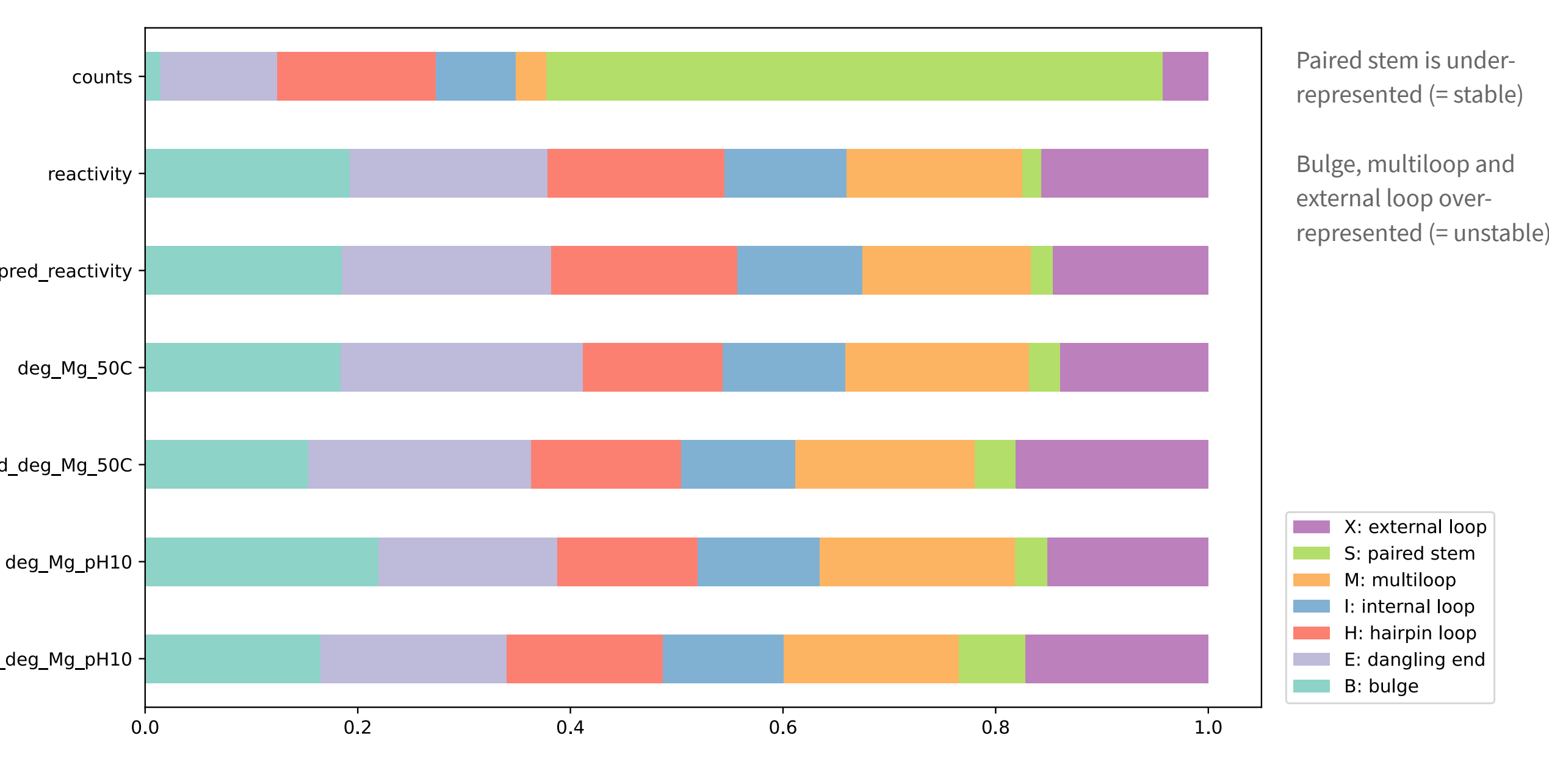
Ablation Study Results



Sample of Degradation Prediction & Attention Maps



Median Degradation Likelihood per Target over Predicted Loop Type



Code & Report

Reference Paper: Shujun He, Baizhen Gao, Puqiant Sabritz, and Qing Sun. RNAdeformer: accurate prediction of mRNA degradation at nucleotide resolution with deep learning. Briefings in Bioinformatics, 24(1):bbac581, 2023.

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