

Table 1: Method Validity Matrix

Method	Task A	Task B	Task C	Valid Claims
Distance (nearest TSS)	✓	✗	✗	Proximity baseline for Task A only
ABC Model	⚠	✓	✗	Enhancer-gene linking (Task B), limited Task A
PoPS	✓	✗	✗	GWAS-to-gene prioritization (Task A)
eQTL colocalization	✓	⚠	✗	Gene expression mediation (Task A primary)
Hi-C / PCHiC	⚠	✓	✗	3D contact-based E-G links (Task B primary)
Coding/splice variants	✓	✗	⚠	Mendelian-regime genes (Task A)
ChromHMM / Epigenomics	✗	⚠	✓	Regulatory element annotation (Task C)