

Table 1: Parameter sensitivity analysis and Intensity graph analysis results for Glioblastoma tumors

	CV	Test Accuracy	AUC
64 Bins	89 ± 7	78	85
16 Bins	95 ± 8	80	78
4 Bins	80 ± 11	70	65
64 + 16 + 4 Bins	96 ± 5	82	73
Intensity Graph Features	69 ± 11	59	56

Table 2: GIN and GAT results from Glioblastoma tumors by combining all 13 adjacency matrices

Graph neural networks	CV	Test Accuracy	AUC
GIN	58 ± 5.9	62	0.5
GAT	58 ± 4	57	0.54

Table 3: Parameter sensitivity analysis and Intensity graph analysis results for metastasis brain tumors

	CV	Test Accuracy	AUC
64 Bins	84 ± 6	74	86
16 Bins	79 ± 13	67	70
4 Bins	76 ± 10	61	67
64 + 16 + 4 Bins	77 ± 11	69	71
Intensity Graph Features	73 ± 11	55	55

Table 4: GIN and GAT results from metastasis brain tumors by combining all 13 adjacency matrices

Graph neural networks	CV	Test Accuracy	AUC
GIN	57 ± 7.6	60	0.5
GAT	47 ± 5	44.59	0.58

Table 5: Parameter sensitivity analysis and Intensity graph analysis results for IPMN

	CV	Test Accuracy	AUC
64 Bins	85 ± 4.5	79	0.83
16 Bins	83 ± 6.4	71	0.77
4 Bins	84 ± 6	66	0.59
64 + 16 + 4 Bins	$88.21\% \pm 5.95$	72.16	0.73
Intensity Graph Features	83 ± 3.2	61	0.52

Table 6: GIN and GAT results from IPMN by combining all 13 adjacency matrices

Graph neural networks	CV	Test Accuracy	AUC
GIN	72.22 ± 8	66	0.5
GAT	75.20 ± 10	60	0.52

Table 7: Statistical Z-test on the test accuracy performance metric across four different models: GrRAiL, GraphSAGE, GCN-JK, and Radiomics.

Comparison	Cohort	P value	Z Stats
GrRAiL vs GraphSAGE	Glioblastoma cohort	0.109	1.602
GrRAiL vs GCN-JK	Glioblastoma cohort	0.164	1.389
GrRAiL vs Radiomics	Glioblastoma cohort	0.342	0.949
GrRAiL vs Intensity graph	Glioblastoma cohort	0.04	2.019
GrRAiL vs GraphSAGE	Metastatic brain tumor cohort	0.0002	3.786
GrRAiL vs GCN-JK	Metastatic brain tumor cohort	0.04	2.05
GrRAiL vs Radiomics	Metastatic brain tumor cohort	0.084	1.724

GrRAiL vs Intensity graph	Metastatic brain tumor cohort	0.017	2.37
GrRAiL vs GraphSAGE	IPMN cohort	0.02	2.209
GrRAiL vs GCN-JK	IPMN cohort	0.077	1.765
GrRAiL vs Radiomics	IPMN cohort	0.19	1.3
GrRAiL vs Intensity graph	IPMN cohort	0.005	2.78