



Vertex	Pillai	F(15, 78)	p-value
Corpus Callosum (L)	2.591	32.914	5.09e-25
Corpus Callosum (R)	2.556	29.951	1.09e-23
Fimbria (L)	2.440	22.637	7.27e-20
Secondary Motor Cortex (L)	2.438	22.544	8.21e-20
Midbrain Reticular Nucleus (R)	2.430	22.161	1.38e-19
Substantia Nigra (R)	2.305	17.254	2.20e-16
Internal Capsule (R)	2.304	17.229	2.29e-16
Secondary Motor Cortex (R)	2.297	16.989	3.40e-16
Cerebral Peduncle (R)	2.247	15.511	4.34e-15
Internal Capsule (L)	2.238	15.266	6.71e-15
Striatum (L)	2.236	15.230	7.13e-15
Lateral Ventricle (L)	2.218	14.739	1.74e-14
Stria Terminalis (R)	2.202	14.349	3.59e-14
Cerebellar White Matter (R)	2.199	14.278	4.08e-14
Optic Tracts (L)	2.186	13.956	7.52e-14
Subthalamic Nucleus (L)	2.178	13.781	1.05e-13
Hippocampus (R)	2.177	13.764	1.08e-13
Stria Terminalis (L)	2.177	13.747	1.11e-13
Frontal Association Cortex (L)	2.170	13.601	1.47e-13
Rostral Linear Nucleus (R)	2.165	13.473	1.88e-13

Top 20 most heterogenous brain regions (out of 332 total regions)

Identifying heterogenous brain regions

- **Theorem:**  
Estimated latent positions are asymptotically Gaussian

- Use MANOVA to identify heterogeneous brain regions

- Outperforms other joint graph embedding methods



Simulation





# Identifying heterogenous brain regions

- **Theorem:**  
Estimated latent positions are asymptotically Gaussian
  - Use MANOVA to identify heterogenous brain regions
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  - [Simulation](#)

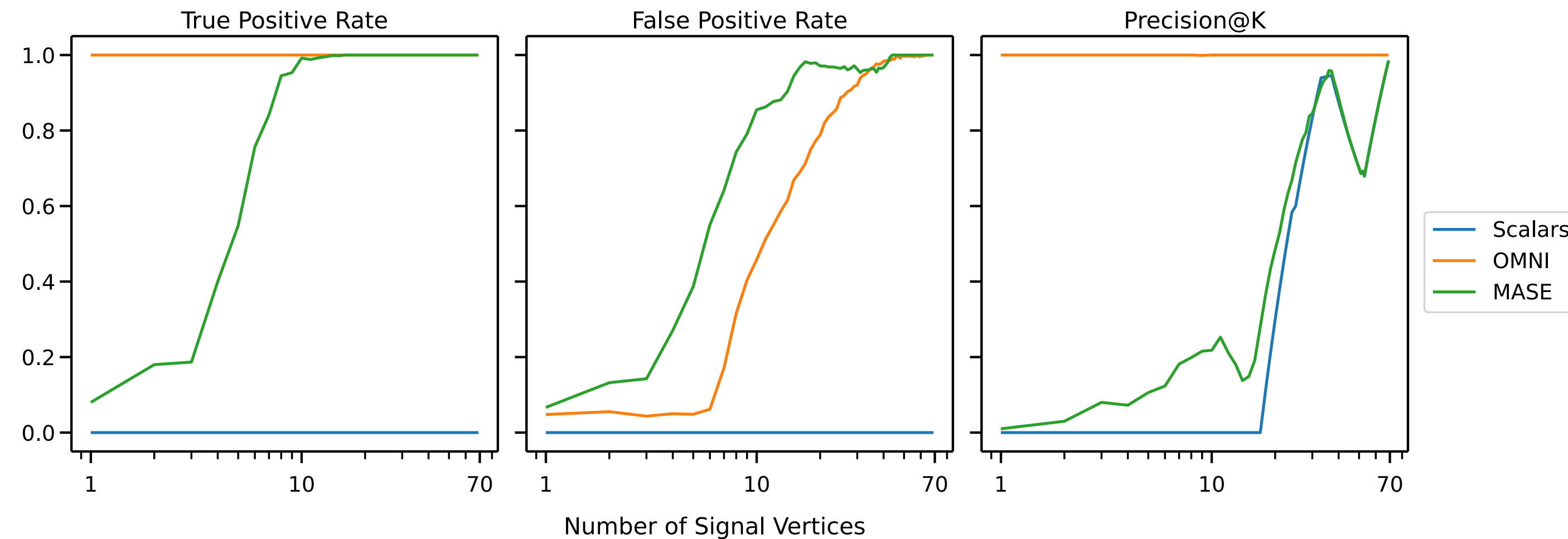
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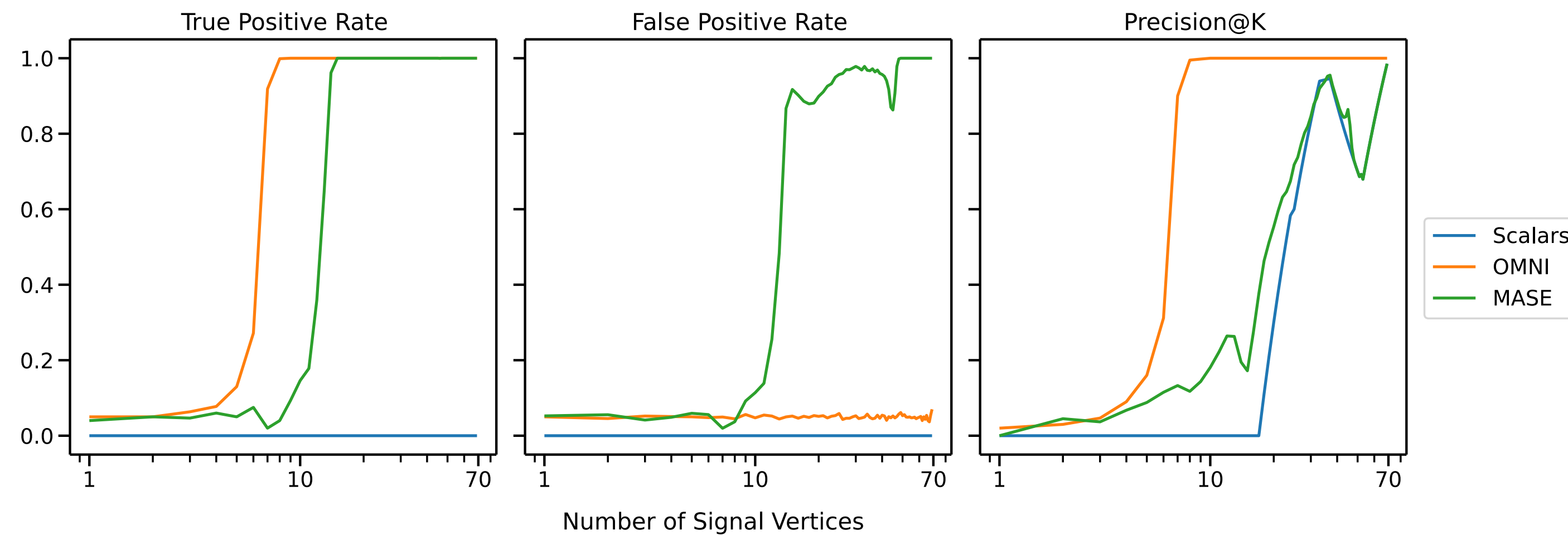
# Vertex Simulation

No embedding is perfect, but omnibus is the best in this setting.

A. Equal Off-Block Probabilities



B. Unequal Off-Block Probabilities





# Identifying heterogenous brain regions

A. (L) Corpus Callosum (Rank 1)

