

## EmbedOR v. UMAP v. tSNE Comparisons

Table 1: Low energy expansion: permutation test results ( $\alpha = 0.01$ )

	$H_0 : \mu^{\text{UMAP}} = \mu^{\text{EmbedOR}}$ $H_1 : \mu^{\text{UMAP}} > \mu^{\text{EmbedOR}}$	$H_0 : \mu^{\text{tSNE}} = \mu^{\text{EmbedOR}}$ $H_1 : \mu^{\text{tSNE}} > \mu^{\text{EmbedOR}}$
baron	✓	×
camp	✓	✓
cifar10	✓	✓
klein	✓	✓
kang	✓	×
kanton	✓	×
paul	×	×
petropoulos	✓	×
romanov	✓	×
tsai	✓	×
wagner	✓	×
wikipedia	✓	✓
zeisel	✓	×

Table 2: High energy contraction: permutation test results ( $\alpha = 0.01$ )

	$H_0 : \mu^{\text{UMAP}} = \mu^{\text{EmbedOR}}$ $H_1 : \mu^{\text{UMAP}} > \mu^{\text{EmbedOR}}$	$H_0 : \mu^{\text{tSNE}} = \mu^{\text{EmbedOR}}$ $H_1 : \mu^{\text{tSNE}} > \mu^{\text{EmbedOR}}$
baron	×	×
camp	✓	✓
cifar10	✓	✓
klein	✓	×
kang	✓	✓
kanton	✓	✓
paul	×	×
petropoulos	✓	✓
romanov	✓	×
tsai	✓	✓
wagner	×	×
wikipedia	✓	✓
zeisel	✓	×

Permutation test using 10,000 resamples and  $\alpha = 0.01$ . ✓ denotes rejection of the null hypothesis, while × denotes failure to reject.