

Additional file 2: Supplementary Tables for iVAE:
An Interpretable Representation Learning
Framework Enhances Clustering Performance for
Single-Cell Data

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Table S1 Improvements of β parameter values on hematopoietic dataset across 10 technical repeats

Comparison	ARI	NMI	ASW	DB	CH	Overall
$\beta=0.01$ vs $\beta=5.0$	0.523	0.525	0.250	1.228	1145.890	0.859
$\beta=0.01$ vs $\beta=1.0$	0.087	0.087	0.163	0.729	838.603	0.403
$\beta=0.01$ vs $\beta=0.5$	0.051	0.051	0.097	0.342	605.699	0.243
$\beta=0.01$ vs $\beta=0.1$	0.024	0.024	0.032	0.101	290.383	0.097
$\beta=0.01$ vs $\beta=0.05$	0.005	0.005	0.017	0.045	229.645	0.057

Table S2 Improvements of β parameter values on endocrinogenesis dataset across 10 technical repeats

Comparison	ARI	NMI	ASW	DB	CH	Overall
$\beta=0.01$ vs $\beta=5.0$	0.357	0.359	0.251	1.352	1366.682	0.863
$\beta=0.01$ vs $\beta=1.0$	0.042	0.043	0.157	0.672	953.348	0.361
$\beta=0.01$ vs $\beta=0.5$	0.018	0.018	0.084	0.271	609.416	0.191
$\beta=0.01$ vs $\beta=0.1$	0.016	0.017	0.026	0.067	338.455	0.087
$\beta=0.01$ vs $\beta=0.05$	0.007	0.008	0.016	0.040	304.163	0.064

Table S3 Improvements of iVAE on two biological datasets across 10 technical repeats

Dataset	ARI	NMI	ASW	DB	CH	Overall
Hematopoiesis	0.054	0.055	0.054	0.330	524.042	0.586
Endocrinogenesis	0.013	0.013	0.034	0.211	702.338	0.373

Table S4 Improvements of iVAE compared to VAE variants on hematopoiesis dataset across 10 technical repeats

Comparison	ARI	NMI	ASW	DB	CH	Overall
iVAE vs DIP-VAE	0.077	0.077	0.132	0.481	1823.936	0.717
iVAE vs TC-VAE	0.032	0.032	0.119	0.417	1153.826	0.478
iVAE vs beta-VAE	0.017	0.017	0.043	0.100	1159.958	0.241
iVAE vs info-VAE	0.007	0.007	0.042	0.124	1143.217	0.216

Table S5 Improvements of iVAE compared to VAE variants on endocrinogenesis dataset across 10 technical repeats

Comparison	ARI	NMI	ASW	DB	CH	Overall
iVAE vs DIP-VAE	0.112	0.112	0.151	0.639	2103.070	0.739
iVAE vs TC-VAE	0.001	0.001	0.080	0.256	779.259	0.215
iVAE vs info-VAE	0.007	0.007	0.042	0.134	1241.512	0.195
iVAE vs beta-VAE	-0.001	-0.001	0.041	0.130	1243.476	0.175

Table S6 Performance improvements with different irecon values on hematopoiesis dataset across 10 technical repeats

Comparison	ASW	CH	DB	Overall
irecon=1 vs irecon=0.5	0.016	461.463	0.043	0.248
irecon=1 vs irecon=0.1	0.044	819.145	0.072	0.496
irecon=1 vs irecon=0.05	0.041	914.773	0.089	0.534
irecon=1 vs irecon=0.01	0.054	1001.394	0.099	0.625

Table S7 Performance improvements with different irecon values on endocrinogenesis dataset across 10 technical repeats

Comparison	ASW	CH	DB	Overall
irecon=1 vs irecon=0.5	0.013	555.437	0.033	0.205
irecon=1 vs irecon=0.1	0.023	1121.242	0.055	0.386
irecon=1 vs irecon=0.05	0.030	1289.549	0.091	0.501
irecon=1 vs irecon=0.01	0.036	1360.632	0.094	0.545