

Supplementary Tables and Figures of “A Markov Random Field Model for Network- based Differential Expression Analysis of Single-cell RNA-seq Data”

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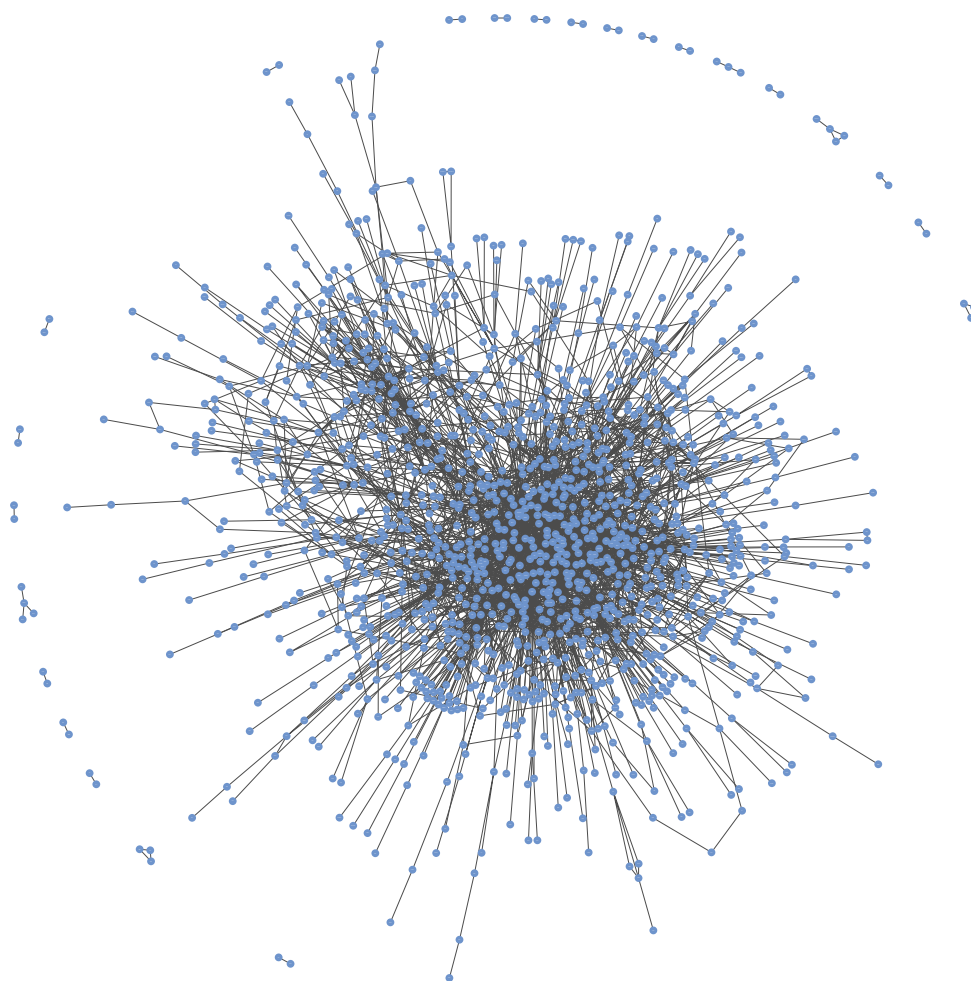
Supplementary Table 1. 52 KEGG Pathways Used in Simulation Study

Pathway ID	Pathway Name	K = 5	K = 10	K = 18
hsa04630	JAK-STAT signaling pathway	DE	DE	DE
hsa04510	Focal adhesion			
hsa00860	Porphyrin and chlorophyll metabolism			
hsa04621	NOD-like receptor signaling pathway			
hsa00900	Terpenoid backbone biosynthesis		EE	EE
hsa04024	cAMP signaling pathway			
hsa04340	Hedgehog signaling pathway			
hsa04623	Cytosolic DNA-sensing pathway			
hsa04330	Notch signaling pathway			
hsa00510	N-Glycan biosynthesis			
hsa04622	RIG-I-like receptor signaling pathway			
hsa04141	Protein processing in endoplasmic reticulum			
hsa00480	Glutathione metabolism			
hsa00280	Valine, leucine and isoleucine degradation			
hsa04530	Tight junction			
hsa00071	Fatty acid degradation			
hsa00790	Folate biosynthesis			
hsa00520	Amino sugar and nucleotide sugar metabolism			
hsa00010	Glycolysis / Gluconeogenesis	EE	EE	EE
hsa00120	Primary bile acid biosynthesis			
hsa00140	Steroid hormone biosynthesis			
hsa00220	Arginine biosynthesis			
hsa00350	Tyrosine metabolism			
hsa00500	Starch and sucrose metabolism			
hsa00515	Mannose type O-glycan biosynthesis			
hsa00531	Glycosaminoglycan degradation			
hsa00563	Glycosylphosphatidylinositol (GPI)-anchor biosynthesis			
hsa00600	Sphingolipid metabolism			
hsa01040	Biosynthesis of unsaturated fatty acids			
hsa04010	MAPK signaling pathway			
hsa04012	ErbB signaling pathway			
hsa04014	Ras signaling pathway			
hsa04020	Calcium signaling pathway			
hsa04062	Chemokine signaling pathway			
hsa04064	NF-kappa B signaling pathway			
hsa04066	HIF-1 signaling pathway			
hsa04110	Cell cycle			
hsa04120	Ubiquitin mediated proteolysis			
hsa04137	Mitophagy - animal			
hsa04140	Autophagy - animal			
hsa04150	mTOR signaling pathway			

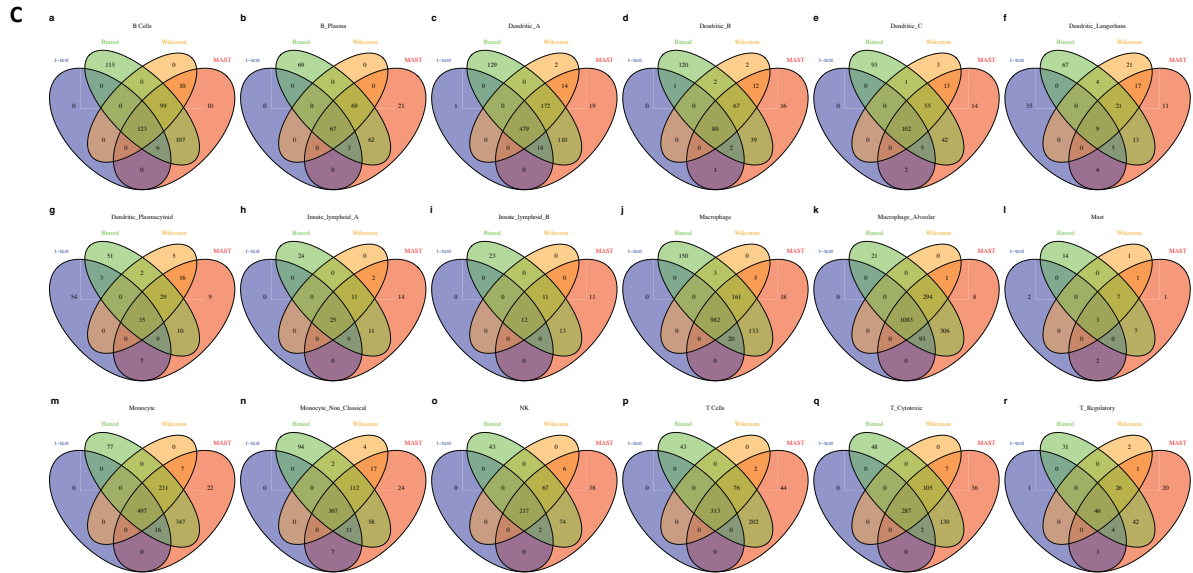
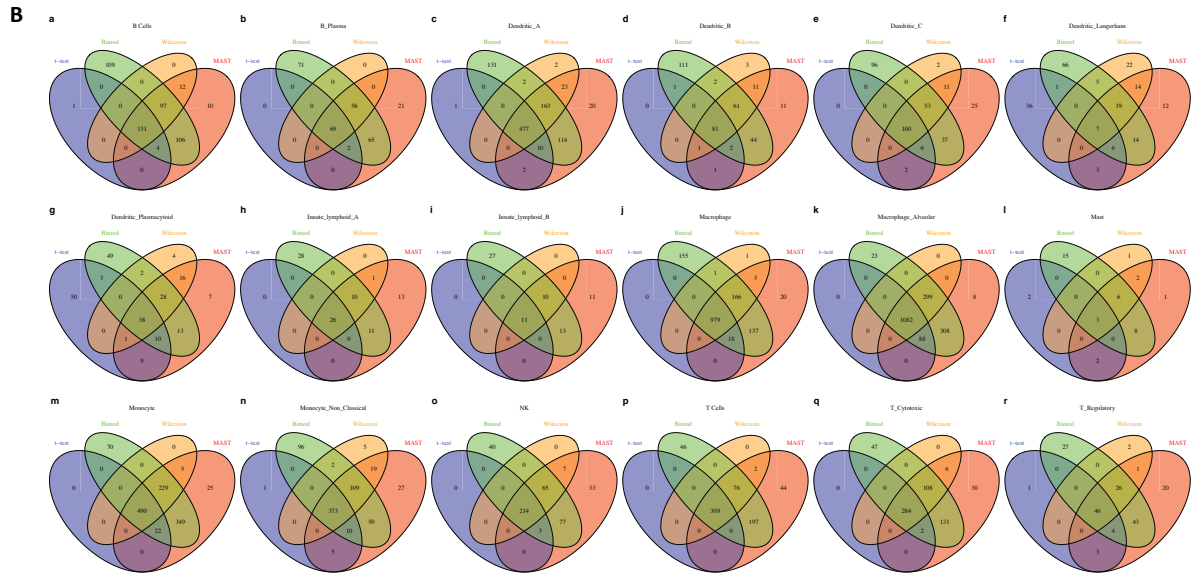
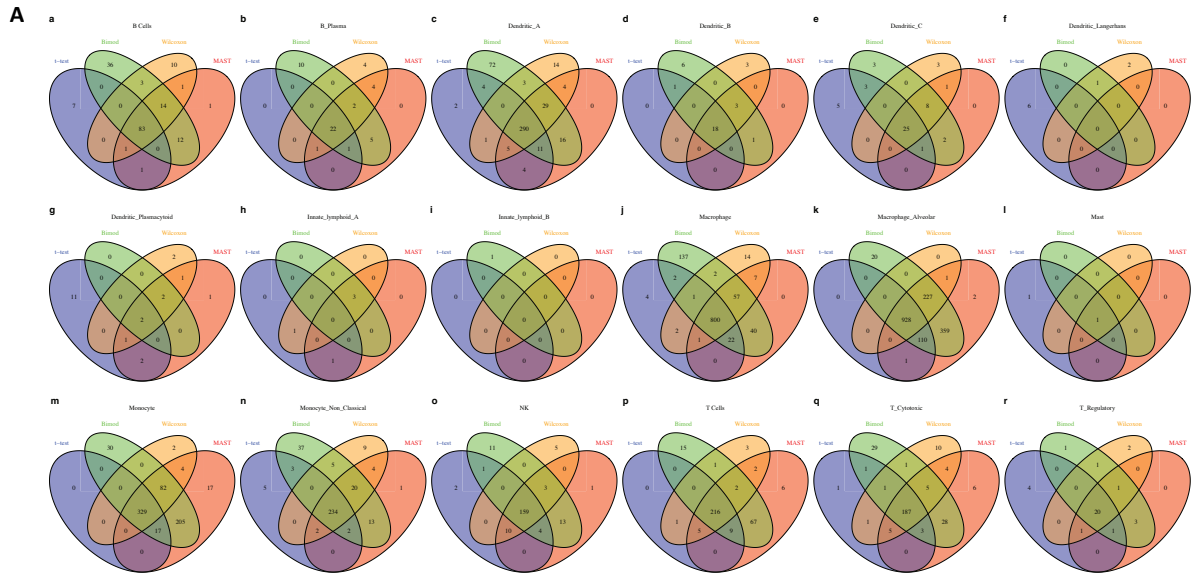
hsa04151	PI3K-Akt signaling pathway			
hsa04210	Apoptosis			
hsa04310	Wnt signaling pathway			
hsa04350	TGF-beta signaling pathway			
hsa04610	Complement and coagulation cascades			
hsa04612	Antigen processing and presentation			
hsa04660	T cell receptor signaling pathway			
hsa04720	Long-term potentiation			
hsa04724	Glutamatergic synapse			
hsa04728	Dopaminergic synapse			
hsa04730	Long-term depression			



Supplementary Figure 1. A simple illustration of the 2,000 gene network from BioGrid database. In total, there are 5,400 edges.



Supplementary Figure 2. A simple illustration of the 2,000 gene network from IntAct database. In total, there are 3,104 edges.



Supplementary Figure 3. Venn Diagrams of Cell-type Specific DEGs with four types of test statistics input. (A) shows the Venn Diagram of DE genes identified by four methods without the MRF model, **(B)** shows the Venn Diagram of DE genes identified by four methods with the MRF model utilizing the BioGrid gene network, and **(C)** shows the Venn Diagram of DE genes identified by four methods with the MRF model utilizing the IntAct gene network.