Neighborhood Embedding and Re-Ranking of Disease Genes with ADAGIO supplemental document

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1. FINAL DISEASE GENE LISTS

An organized form of the final gene lists can be found at the following url https://github.com/merterden98/ADAGIO/tree/master/notebooks/final_genelists/adagio

2. BENCHMARKING RESULTS

A. Benchmarking Results for Drug Genelist

method disease	EGAD	ADAGIO	SVM	gm	RWR	z
Alzheimers disease	0.02±0.01	0.09±0.03	0.1±0.04	0.01±0.0	0.07±0.02	0.07±0.02
Parkinson's disease	0.25±0.05	0.44±0.07	0.41±0.07	0.3±0.07	0.38±0.07	0.41±0.06
allergy	0.02±0.01	0.03±0.01	0.03±0.01	0.0±0.0	0.03±0.01	0.03±0.01
arthritis	0.03±0.0	0.06±0.01	0.09±0.02	0.01±0.0	0.05±0.01	0.09±0.02
asthma	0.04±0.01	0.08±0.02	0.08±0.02	0.01±0.0	0.08±0.01	0.07±0.01
bipolar disorder	0.02±0.01	0.08±0.02	0.12±0.04	0.01±0.0	0.07±0.02	0.13±0.04
cardiac arrhythmia	0.34±0.07	0.52±0.06	0.48±0.09	0.39±0.09	0.45±0.07	0.48±0.08
chronic obstructive pulmonary disease	0.03±0.01	0.06±0.02	0.07±0.03	0.01±0.0	0.06±0.02	0.04±0.01
coronary heart disease	0.03±0.01	0.07±0.01	0.08±0.02	0.01±0.0	0.06±0.01	0.11±0.04
drug dependence	0.04±0.01	0.08±0.02	0.1±0.02	0.01±0.0	0.07±0.01	0.09±0.02
hypertension	0.03±0.01	0.07±0.02	0.09±0.03	0.01±0.0	0.06±0.01	0.07±0.02
multiple sclerosis	0.21±0.05	0.43±0.07	0.38±0.08	0.29±0.08	0.37±0.07	0.39±0.08
obesity	0.04±0.01	0.07±0.02	0.12±0.03	0.01±0.0	0.07±0.01	0.11±0.03
psoriasis	0.03±0.01	0.08±0.02	0.08±0.03	0.01±0.0	0.07±0.02	0.06±0.02
rheumatoid arthritis	0.02±0.0	0.06±0.01	0.06±0.01	0.01±0.0	0.05±0.01	0.08±0.02
schizophrenia	0.05±0.01	0.08±0.03	0.11±0.04	0.01±0.0	0.07±0.02	0.09±0.03
stroke	0.26±0.07	0.47±0.09	0.44±0.09	0.35±0.09	0.41±0.08	0.44±0.09
systemic lupus erythematosus	0.02±0.0	0.04±0.02	0.03±0.01	0.0±0.0	0.03±0.01	0.03±0.01
type I diabetes mellitus	0.01±0.0	0.03±0.01	0.02±0.0	0.0±0.0	0.03±0.01	0.02±0.01
type II diabetes mellitus	0.03±0.01	0.06±0.01	0.1±0.03	0.01±0.01	0.06±0.01	0.11±0.04
ulcerative colitis	0.03±0.01	0.07±0.05	0.03±0.01	0.0±0.0	0.05±0.03	0.06±0.03
unipolar depression	0.04±0.01	0.09±0.02	0.1±0.03	0.01±0.0	0.07±0.01	0.08±0.02

Table S1. AUPRC For Various Methods on Drug Genelist

| method | EGAD | ADAGIO | SVM | gm | RWR | z |
disease						
Alzheimers disease	0.76±0.04	0.89±0.04	0.9±0.04	0.43±0.05	0.89±0.03	0.89±0.04
Parkinson's disease	0.85±0.03	0.92±0.03	0.93±0.02	0.66±0.04	0.92±0.02	0.93±0.02
allergy	0.79±0.05	0.86±0.05	0.88±0.04	0.35±0.05	0.87±0.04	0.88±0.04
arthritis	0.69±0.03	0.81±0.03	0.84±0.03	0.48±0.03	0.82±0.03	0.84±0.03
asthma	0.84±0.03	0.91±0.03	0.89±0.03	0.41±0.03	0.91±0.03	0.89±0.03
bipolar disorder	0.67±0.04	0.87±0.04	0.88±0.04	0.51±0.03	0.87±0.03	0.88±0.04
cardiac arrhythmia	0.85±0.03	0.91±0.03	0.92±0.03	0.71±0.05	0.92±0.03	0.91±0.03
chronic obstructive pulmonary disease	0.8±0.05	0.87±0.04	0.87±0.05	0.41±0.04	0.88±0.05	0.87±0.04
coronary heart disease	0.75±0.04	0.85±0.04	0.85±0.05	0.47±0.04	0.85±0.03	0.84±0.04
drug dependence	0.77±0.03	0.85±0.03	0.89±0.03	0.54±0.04	0.85±0.04	0.89±0.03
hypertension	0.73±0.04	0.84±0.05	0.86±0.03	0.46±0.03	0.84±0.04	0.86±0.03
multiple sclerosis	0.8±0.04	0.89±0.03	0.89±0.04	0.62±0.05	0.9±0.03	0.89±0.03
obesity	0.74±0.04	0.86±0.03	0.87±0.04	0.51±0.03	0.87±0.03	0.88±0.03
psoriasis	0.79±0.04	0.87±0.02	0.88±0.04	0.38±0.03	0.88±0.03	0.87±0.04
rheumatoid arthritis	0.66±0.04	0.84±0.04	0.87±0.04	0.43±0.04	0.84±0.03	0.86±0.03
schizophrenia	0.77±0.05	0.87±0.05	0.87±0.05	0.49±0.04	0.87±0.05	0.87±0.05
stroke	0.84±0.04	0.92±0.03	0.92±0.03	0.67±0.06	0.92±0.03	0.92±0.03
systemic lupus erythematosus	0.76±0.05	0.88±0.04	0.85±0.06	0.33±0.05	0.88±0.04	0.85±0.06
type I diabetes mellitus	0.72±0.04	0.83±0.04	0.84±0.05	0.35±0.04	0.84±0.04	0.85±0.05
type II diabetes mellitus	0.71±0.04	0.86±0.04	0.88±0.05	0.48±0.03	0.87±0.04	0.88±0.05
ulcerative colitis	0.82±0.06	0.88±0.06	0.88±0.05	0.31±0.04	0.88±0.04	0.88±0.05
unipolar depression	0.8±0.04	0.87±0.04	0.89±0.04	0.48±0.04	0.88±0.03	0.89±0.04

Table S2. AUROC For Various Methods on Drug Genelist

| method | EGAD | ADAGIO | SVM | gm | RWR | z |
disease						
Alzheimers disease	0.13±0.04	0.33±0.08	0.33±0.07	0.04±0.03	0.3±0.05	0.29±0.07
Parkinson's disease	0.47±0.06	0.56±0.06	0.56±0.06	0.34±0.06	0.53±0.05	0.55±0.05
allergy	0.17±0.06	0.27±0.06	0.27±0.07	0.0±0.0	0.24±0.06	0.27±0.07
arthritis	0.07±0.02	0.22±0.04	0.29±0.06	0.01±0.01	0.19±0.04	0.25±0.05
asthma	0.16±0.05	0.39±0.06	0.35±0.06	0.02±0.02	0.39±0.06	0.35±0.05
bipolar disorder	0.13±0.04	0.39±0.06	0.46±0.07	0.03±0.03	0.35±0.06	0.47±0.08
cardiac arrhythmia	0.56±0.06	0.62±0.05	0.62±0.07	0.45±0.07	0.6±0.06	0.63±0.07
chronic obstructive pulmonary disease	0.13±0.05	0.33±0.07	0.3±0.06	0.03±0.02	0.32±0.07	0.27±0.07
coronary heart disease	0.15±0.04	0.33±0.05	0.37±0.07	0.0±0.01	0.3±0.05	0.37±0.07
drug dependence	0.2±0.05	0.33±0.05	0.36±0.05	0.04±0.03	0.31±0.05	0.35±0.06
hypertension	0.1±0.03	0.22±0.06	0.29±0.05	0.02±0.02	0.21±0.05	0.24±0.04
multiple sclerosis	0.41±0.07	0.5±0.07	0.51±0.07	0.36±0.07	0.5±0.07	0.5±0.07
obesity	0.17±0.04	0.31±0.07	0.42±0.05	0.02±0.02	0.28±0.05	0.38±0.07
psoriasis	0.15±0.05	0.33±0.07	0.25±0.06	0.0±0.01	0.3±0.06	0.25±0.07
rheumatoid arthritis	0.08±0.03	0.32±0.06	0.3±0.06	0.0±0.0	0.3±0.05	0.31±0.06
schizophrenia	0.3±0.06	0.38±0.07	0.41±0.07	0.04±0.03	0.35±0.07	0.39±0.07
stroke	0.46±0.08	0.56±0.07	0.54±0.08	0.4±0.09	0.55±0.07	0.56±0.07
systemic lupus erythematosus	0.15±0.05	0.28±0.09	0.24±0.07	0.0±0.0	0.24±0.08	0.25±0.08
type I diabetes mellitus	0.07±0.04	0.23±0.05	0.14±0.05	0.0±0.0	0.24±0.05	0.18±0.05
type II diabetes mellitus	0.13±0.04	0.31±0.06	0.38±0.06	0.02±0.02	0.29±0.06	0.39±0.08
ulcerative colitis	0.23±0.08	0.37±0.12	0.3±0.08	0.0±0.0	0.32±0.09	0.39±0.1
unipolar depression	0.14±0.04	0.35±0.06	0.35±0.06	0.04±0.03	0.34±0.05	0.34±0.06

Table S3. tAUROC at 95 For Various Methods on Drug Genelist

method disease	EGAD	ADAGIO	SVM	gm	RWR	z
Alzheimers disease	0.25±0.06	0.5±0.07	0.49±0.07	0.05±0.03	0.48±0.06	0.47±0.07
Parkinson's disease	0.6±0.06	0.67±0.06	0.68±0.05	0.35±0.06	0.65±0.05	0.67±0.05
allergy	0.38±0.07	0.47±0.08	0.46±0.07	0.0±0.0	0.45±0.07	0.46±0.08
arthritis	0.17±0.04	0.38±0.05	0.4±0.06	0.02±0.01	0.36±0.05	0.38±0.05
asthma	0.38±0.05	0.59±0.06	0.53±0.06	0.02±0.02	0.59±0.06	0.55±0.05
bipolar disorder	0.25±0.05	0.52±0.07	0.58±0.07	0.04±0.03	0.5±0.07	0.57±0.07
cardiac arrhythmia	0.65±0.05	0.7±0.05	0.71±0.06	0.46±0.07	0.69±0.05	0.72±0.06
chronic obstructive pulmonary disease	0.32±0.06	0.51±0.08	0.47±0.08	0.03±0.03	0.51±0.08	0.45±0.07
coronary heart disease	0.29±0.05	0.48±0.06	0.48±0.07	0.01±0.01	0.46±0.05	0.47±0.08
drug dependence	0.37±0.06	0.49±0.05	0.53±0.05	0.06±0.03	0.48±0.05	0.51±0.06
hypertension	0.22±0.04	0.4±0.07	0.4±0.05	0.03±0.02	0.39±0.06	0.38±0.05
multiple sclerosis	0.49±0.06	0.59±0.07	0.59±0.07	0.37±0.07	0.58±0.07	0.59±0.07
obesity	0.33±0.05	0.47±0.07	0.55±0.06	0.03±0.02	0.46±0.06	0.52±0.07
psoriasis	0.29±0.05	0.48±0.06	0.4±0.07	0.0±0.01	0.46±0.06	0.41±0.08
rheumatoid arthritis	0.19±0.04	0.45±0.07	0.4±0.07	0.0±0.0	0.43±0.06	0.4±0.07
schizophrenia	0.44±0.07	0.52±0.07	0.58±0.07	0.05±0.03	0.51±0.07	0.57±0.06
stroke	0.57±0.07	0.66±0.06	0.65±0.07	0.41±0.09	0.64±0.06	0.66±0.07
systemic lupus erythematosus	0.33±0.06	0.45±0.08	0.38±0.08	0.0±0.0	0.42±0.09	0.4±0.09
type I diabetes mellitus	0.21±0.05	0.41±0.06	0.31±0.05	0.0±0.0	0.41±0.06	0.33±0.06
type II diabetes mellitus	0.27±0.05	0.49±0.06	0.52±0.07	0.02±0.02	0.47±0.06	0.51±0.08
ulcerative colitis	0.43±0.09	0.52±0.11	0.48±0.09	0.0±0.0	0.48±0.09	0.52±0.1
unipolar depression	0.34±0.05	0.53±0.06	0.51±0.06	0.05±0.03	0.52±0.05	0.5±0.06

Table S4. tAUROC at 90 For Various Methods on Drug Genelist

B. Benchmarking Results for GWAS Genelist

method disease	EGAD	ADAGIO	SVM	gm	RWR	z
Alzheimers disease	0.01±0.0	0.02±0.01	0.01±0.0	0.0±0.0	0.02±0.01	0.01±0.0
Parkinson's disease	0.01±0.0	0.02±0.01	0.01±0.0	0.01±0.0	0.02±0.01	0.01±0.0
allergy	0.01±0.0	0.01±0.01	0.01±0.0	0.0±0.0	0.02±0.01	0.01±0.0
arthritis	0.02±0.01	0.02±0.01	0.02±0.01	0.01±0.01	0.02±0.01	0.03±0.01
asthma	0.02±0.0	0.03±0.01	0.02±0.0	0.0±0.0	0.03±0.01	0.03±0.01
bipolar disorder	0.02±0.01	0.01±0.0	0.02±0.0	0.0±0.0	0.02±0.01	0.02±0.01
cardiac arrhythmia	0.05±0.02	0.14±0.06	0.19±0.06	0.01±0.0	0.11±0.04	0.12±0.05
chronic obstructive pulmonary disease	0.01±0.0	0.01±0.0	0.01±0.0	0.0±0.0	0.02±0.0	0.01±0.0
coronary heart disease	0.01±0.0	0.02±0.0	0.01±0.0	0.01±0.0	0.02±0.0	0.01±0.01
drug dependence	0.01±0.0	0.02±0.0	0.01±0.0	0.01±0.0	0.02±0.0	0.02±0.01
hypertension	0.02±0.0	0.02±0.01	0.02±0.0	0.01±0.0	0.02±0.01	0.02±0.0
multiple sclerosis	0.02±0.01	0.03±0.01	0.02±0.0	0.01±0.0	0.03±0.01	0.02±0.01
obesity	0.04±0.01	0.02±0.01	0.03±0.01	0.01±0.0	0.02±0.01	0.03±0.01
psoriasis	0.01±0.0	0.02±0.0	0.01±0.0	0.0±0.0	0.02±0.0	0.01±0.0
rheumatoid arthritis	0.02±0.01	0.02±0.01	0.02±0.01	0.01±0.01	0.02±0.01	0.02±0.01
schizophrenia	0.01±0.0	0.01±0.0	0.01±0.0	0.0±0.0	0.01±0.0	0.01±0.01
stroke	0.01±0.0	0.01±0.0	0.01±0.0	0.01±0.0	0.01±0.0	0.01±0.0
systemic lupus erythematosus	0.01±0.0	0.01±0.01	0.01±0.0	0.0±0.0	0.01±0.01	0.01±0.0
type I diabetes mellitus	0.01±0.0	0.02±0.01	0.01±0.0	0.0±0.0	0.02±0.01	0.02±0.01
type II diabetes mellitus	0.02±0.01	0.02±0.01	0.01±0.0	0.0±0.0	0.02±0.01	0.01±0.0
ulcerative colitis	0.01±0.0	0.02±0.01	0.01±0.0	0.0±0.0	0.02±0.01	0.02±0.01
unipolar depression	0.02±0.0	0.03±0.0	0.02±0.01	0.01±0.0	0.03±0.01	0.03±0.02

Table S5. AUPRC For Various Methods on GWAS Genelist

method disease	EGAD	ADAGIO	SVM	gm	RWR	z
Alzheimers disease	0.66±0.05	0.73±0.05	0.63±0.06	0.35±0.04	0.73±0.04	0.63±0.08
Parkinson's disease	0.51±0.03	0.66±0.04	0.45±0.11	0.31±0.05	0.67±0.04	0.45±0.11
allergy	0.6±0.07	0.72±0.06	0.59±0.08	0.28±0.05	0.74±0.06	0.56±0.11
arthritis	0.66±0.06	0.68±0.03	0.68±0.04	0.38±0.03	0.69±0.04	0.69±0.05
asthma	0.76±0.05	0.83±0.04	0.8±0.04	0.27±0.03	0.84±0.03	0.84±0.04
bipolar disorder	0.69±0.05	0.7±0.05	0.69±0.08	0.39±0.04	0.7±0.04	0.71±0.09
cardiac arrhythmia	0.73±0.05	0.82±0.03	0.72±0.05	0.49±0.05	0.83±0.03	0.68±0.05
chronic obstructive pulmonary disease	0.65±0.05	0.74±0.04	0.68±0.06	0.31±0.05	0.76±0.05	0.71±0.06
coronary heart disease	0.59±0.05	0.69±0.04	0.55±0.07	0.33±0.04	0.71±0.04	0.51±0.09
drug dependence	0.63±0.05	0.66±0.04	0.64±0.07	0.39±0.04	0.66±0.05	0.67±0.09
hypertension	0.62±0.04	0.7±0.04	0.65±0.06	0.35±0.04	0.71±0.04	0.66±0.07
multiple sclerosis	0.6±0.04	0.74±0.03	0.63±0.1	0.32±0.05	0.75±0.03	0.65±0.06
obesity	0.72±0.05	0.73±0.04	0.74±0.05	0.37±0.04	0.74±0.04	0.77±0.06
psoriasis	0.63±0.04	0.73±0.04	0.64±0.05	0.31±0.03	0.76±0.04	0.63±0.07
rheumatoid arthritis	0.69±0.09	0.71±0.05	0.72±0.07	0.36±0.04	0.73±0.04	0.72±0.07
schizophrenia	0.67±0.05	0.72±0.05	0.67±0.06	0.38±0.05	0.73±0.05	0.68±0.06
stroke	0.54±0.04	0.65±0.04	0.36±0.06	0.3±0.06	0.63±0.04	0.36±0.07
systemic lupus erythematosus	0.67±0.06	0.78±0.04	0.66±0.07	0.31±0.05	0.79±0.05	0.66±0.09
type I diabetes mellitus	0.73±0.06	0.78±0.04	0.74±0.08	0.33±0.04	0.79±0.05	0.75±0.08
type II diabetes mellitus	0.67±0.08	0.68±0.04	0.56±0.07	0.33±0.04	0.69±0.04	0.54±0.09
ulcerative colitis	0.81±0.06	0.8±0.05	0.81±0.06	0.32±0.04	0.83±0.04	0.83±0.05
unipolar depression	0.69±0.04	0.77±0.04	0.74±0.06	0.35±0.04	0.77±0.04	0.75±0.08

Table S6. AUROC For Various Methods on GWAS Genelist

method disease	EGAD	ADAGIO	SVM	gm	RWR	z
Alzheimers disease	0.01±0.01	0.14±0.05	0.05±0.03	0.0±0.01	0.14±0.05	0.05±0.04
Parkinson's disease	0.02±0.02	0.02±0.02	0.02±0.01	0.0±0.01	0.02±0.02	0.02±0.02
allergy	0.04±0.03	0.09±0.06	0.05±0.03	0.0±0.0	0.09±0.05	0.08±0.05
arthritis	0.06±0.03	0.08±0.03	0.03±0.02	0.01±0.01	0.09±0.03	0.07±0.03
asthma	0.03±0.02	0.1±0.05	0.03±0.02	0.0±0.0	0.14±0.05	0.11±0.06
bipolar disorder	0.07±0.05	0.05±0.03	0.03±0.03	0.0±0.01	0.05±0.03	0.08±0.05
cardiac arrhythmia	0.27±0.11	0.42±0.09	0.48±0.07	0.02±0.02	0.39±0.1	0.39±0.12
chronic obstructive pulmonary disease	0.01±0.01	0.04±0.03	0.02±0.02	0.01±0.01	0.06±0.03	0.03±0.03
coronary heart disease	0.04±0.03	0.07±0.03	0.05±0.04	0.0±0.01	0.08±0.04	0.06±0.04
drug dependence	0.02±0.02	0.07±0.03	0.05±0.03	0.0±0.01	0.06±0.03	0.06±0.04
hypertension	0.05±0.03	0.1±0.04	0.03±0.02	0.0±0.0	0.1±0.04	0.06±0.03
multiple sclerosis	0.04±0.02	0.07±0.03	0.05±0.03	0.01±0.01	0.08±0.04	0.06±0.03
obesity	0.19±0.06	0.1±0.03	0.09±0.04	0.0±0.01	0.09±0.04	0.11±0.05
psoriasis	0.03±0.02	0.07±0.04	0.03±0.02	0.0±0.0	0.1±0.04	0.04±0.02
rheumatoid arthritis	0.07±0.04	0.12±0.03	0.06±0.04	0.01±0.02	0.13±0.04	0.1±0.04
schizophrenia	0.0±0.01	0.02±0.02	0.03±0.03	0.0±0.0	0.02±0.01	0.07±0.04
stroke	0.02±0.02	0.04±0.02	0.01±0.02	0.01±0.01	0.04±0.02	0.02±0.02
systemic lupus erythematosus	0.03±0.03	0.11±0.06	0.05±0.03	0.0±0.0	0.11±0.05	0.11±0.05
type I diabetes mellitus	0.08±0.04	0.21±0.07	0.1±0.05	0.0±0.0	0.19±0.08	0.18±0.07
type II diabetes mellitus	0.03±0.02	0.05±0.04	0.02±0.02	0.0±0.0	0.05±0.03	0.04±0.03
ulcerative colitis	0.08±0.05	0.17±0.06	0.08±0.04	0.0±0.0	0.19±0.07	0.15±0.07
unipolar depression	0.06±0.03	0.09±0.04	0.09±0.04	0.01±0.01	0.09±0.04	0.09±0.05

Table S7. tAUROC at 95 For Various Methods on GWAS Genelist

method disease	EGAD	adagio	bagsvm	gm	ppr	z
Alzheimers disease	0.05±0.03	0.2±0.07	0.09±0.04	0.0±0.01	0.2±0.06	0.11±0.05
Parkinson's disease	0.05±0.03	0.03±0.02	0.03±0.03	0.0±0.01	0.04±0.02	0.03±0.02
allergy	0.1±0.05	0.12±0.06	0.08±0.05	0.0±0.0	0.13±0.06	0.1±0.06
arthritis	0.11±0.04	0.14±0.04	0.09±0.03	0.01±0.01	0.15±0.04	0.12±0.04
asthma	0.13±0.04	0.29±0.08	0.14±0.06	0.0±0.0	0.33±0.08	0.3±0.09
bipolar disorder	0.2±0.07	0.09±0.04	0.13±0.07	0.0±0.01	0.1±0.04	0.17±0.08
cardiac arrhythmia	0.4±0.09	0.47±0.07	0.51±0.07	0.03±0.02	0.46±0.07	0.46±0.1
chronic obstructive pulmonary disease	0.05±0.03	0.14±0.06	0.05±0.03	0.01±0.02	0.18±0.05	0.12±0.07
coronary heart disease	0.09±0.04	0.11±0.05	0.09±0.05	0.01±0.01	0.12±0.05	0.1±0.05
drug dependence	0.09±0.04	0.13±0.05	0.08±0.05	0.01±0.01	0.14±0.06	0.13±0.07
hypertension	0.15±0.04	0.15±0.04	0.09±0.04	0.0±0.01	0.16±0.04	0.12±0.04
multiple sclerosis	0.11±0.04	0.16±0.04	0.12±0.04	0.01±0.01	0.16±0.05	0.13±0.04
obesity	0.33±0.07	0.2±0.05	0.2±0.06	0.01±0.01	0.19±0.06	0.23±0.06
psoriasis	0.08±0.03	0.14±0.06	0.06±0.03	0.0±0.0	0.19±0.05	0.08±0.04
rheumatoid arthritis	0.15±0.06	0.17±0.04	0.13±0.04	0.01±0.02	0.19±0.05	0.16±0.05
schizophrenia	0.04±0.03	0.09±0.04	0.08±0.04	0.01±0.01	0.1±0.04	0.12±0.06
stroke	0.05±0.02	0.05±0.03	0.03±0.02	0.01±0.01	0.06±0.03	0.03±0.02
systemic lupus erythematosus	0.13±0.05	0.18±0.07	0.12±0.05	0.0±0.0	0.19±0.07	0.15±0.06
type I diabetes mellitus	0.22±0.07	0.29±0.08	0.2±0.08	0.0±0.0	0.3±0.09	0.24±0.09
type II diabetes mellitus	0.11±0.05	0.09±0.05	0.06±0.03	0.0±0.0	0.1±0.04	0.08±0.04
ulcerative colitis	0.2±0.09	0.31±0.07	0.18±0.08	0.0±0.0	0.35±0.08	0.28±0.09
unipolar depression	0.12±0.05	0.18±0.05	0.14±0.06	0.02±0.02	0.21±0.06	0.19±0.07

Table S8. tAUROC at 90 For Various Methods on GWAS Genelist

3. WITNESS GRAPHS

A. K = 100

4. K = 500

5. ALL WITNESS GENELISTS
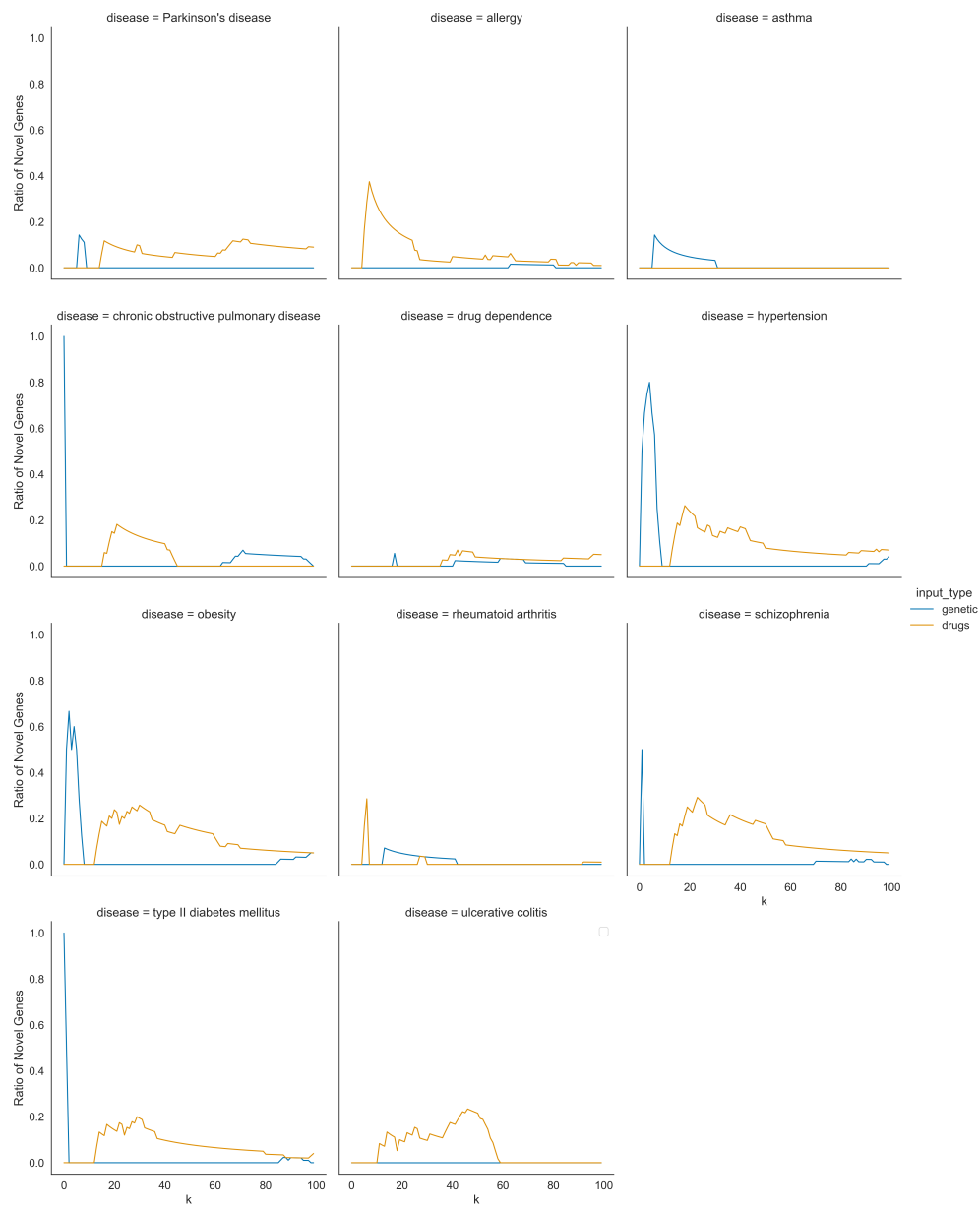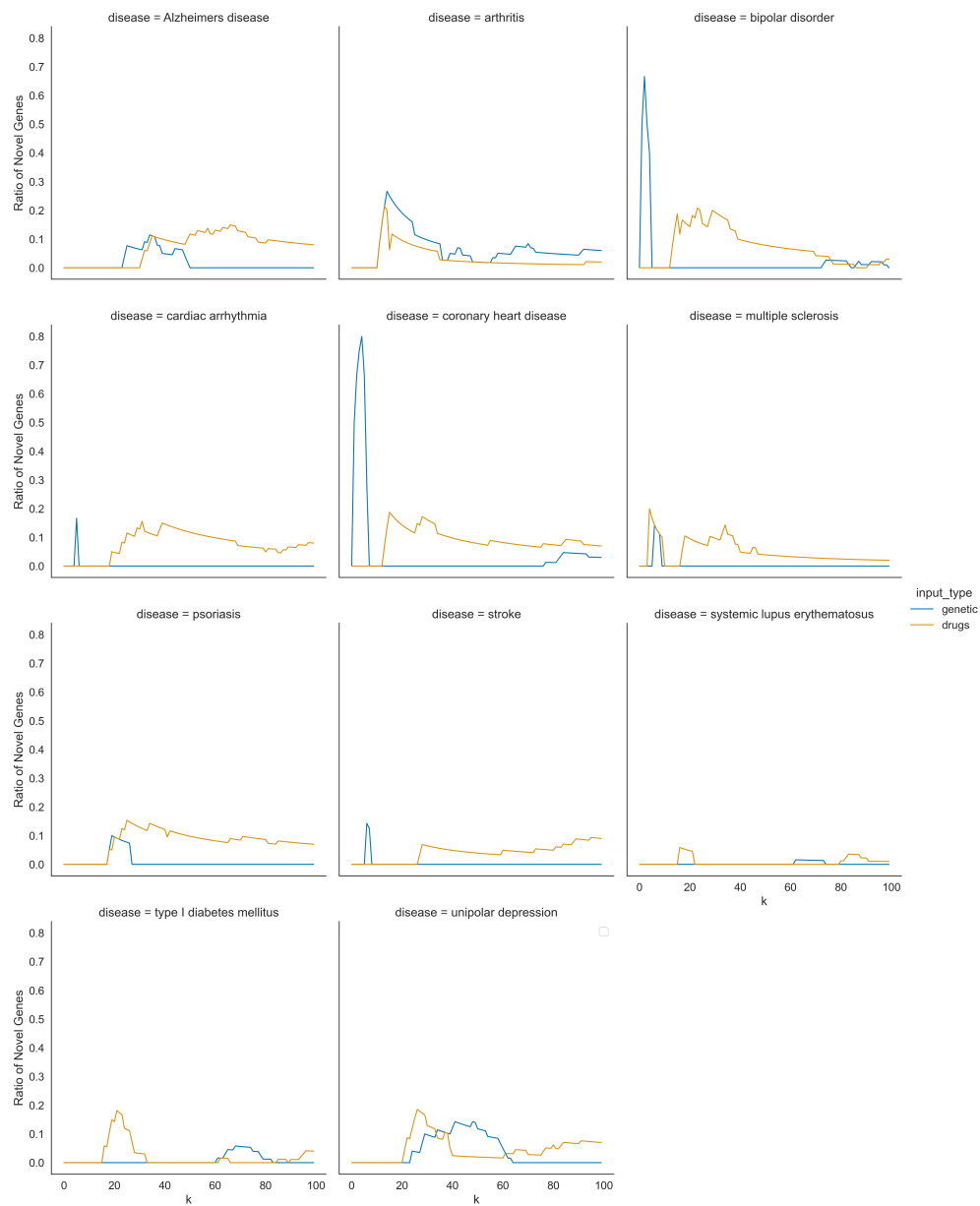
Fig. S1. Witnesses at k=100
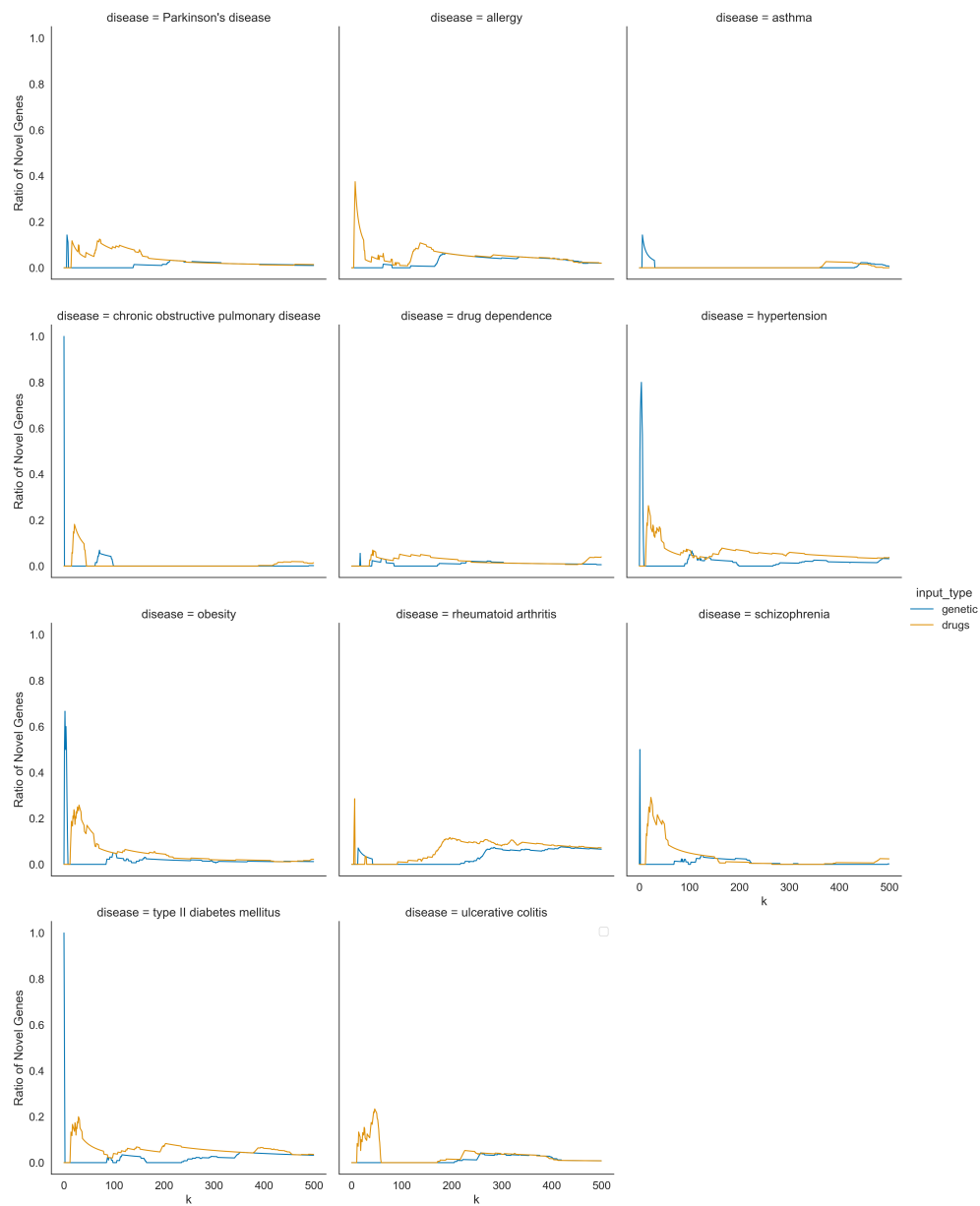
Fig. S2. Witnesses at k=500

name	ADAGIO	RWR	EGAD	SVM	degree
MED1	6	37	730	1336	200
NR2C2AP	7	394	74	7444	36
NR0B2	8	148	182	260	54
THRA	41	129	188	3622	75
HNF4A	54	150	260	1133	65
NR4A1	57	184	205	256	59
KLK6	64	4113	5518	8698	1
PPARD	80	242	183	2908	54
RORA	82	185	234	3215	62
ESRRA	88	211	199	2614	55
SOCS1	91	212	281	1137	105
ATP6V0A4	114	814	2617	6902	32
ATP6V0E2	117	927	10908	6810	28
ATP6V0B	119	842	11179	6926	29
ATP6V0E1	120	908	11126	8995	28
ATP6V1G3	121	906	4156	6809	28
ATP6V1G1	122	905	9161	9629	28
ATP6V1E2	123	871	5251	8845	29
ATP6V1C2	124	891	3910	6808	28
ATP6V1C1	126	884	10180	9531	29
ATP6V0C	129	834	6630	2487	31
TPPP	135	4563	8086	7595	2
ENTPD3	136	341	924	9172	147
ENTPD8	137	348	922	9173	147
ENTPD1	138	321	928	6699	148
SLC6A3	248	1323	3852	10665	14
ADAMTSL4	280	1153	3887	4432	7
ADAMTSL1	282	1142	9700	4434	7
B3GLCT	284	1146	7321	4433	7

Table S9. Allergy Witness Drugs

name	ADAGIO	RWR	EGAD	SVM	degree
NR0B2	64	201	183	315	54
KLK6	119	4116	5507	8664	1
ATP6V0A4	168	852	2626	6885	32
ATP6V0E2	170	964	10857	6797	28
ATP6V0B	172	880	11126	6909	29
ATP6V0E1	173	945	11073	8960	28
ATP6V1G3	174	943	4153	6796	28
ATP6V1G1	175	942	9130	9591	28
ATP6V1E2	176	908	5244	8811	29
ATP6V1C2	177	928	3908	6795	28
ATP6V1C1	179	921	10136	9493	29
ATP6V0C	182	872	6614	2509	31
TPPP	188	4562	8062	7570	2
SLC6A3	301	1354	3851	10618	14

Table S10. Allergy Witness Genetic

name	ADAGIO	RWR	EGAD	SVM	degree
ENTPD3	12	50	414	4490	147
ENTPD8	13	51	413	4491	147
ENTPD1	14	49	421	2325	148
PDE11A	15	452	4984	894	56
APRT	17	90	122	338	59
RYR2	94	814	1812	230	38
KCNU1	118	827	333	684	16
ARHGEF9	128	2535	3472	9109	1
PPP1R1A	129	1309	3665	2623	28
ATG4A	134	1550	9122	8897	4
GIMAP6	141	3271	11317	11555	1
STBD1	143	3774	3080	10195	1
GRIN1	158	463	553	4947	50
TRAF5	192	462	1692	562	29
GRIN2A	195	457	653	2515	55
GRIA1	198	436	485	1328	47
ATG4B	199	737	10410	7268	12
TRAF1	216	696	2052	1331	48
TRPV1	218	2852	11247	3167	10
PPP2R2D	222	1473	10701	4091	30
HVCN1	266	1419	3158	1266	7
ATP2B1	277	3233	3833	2249	9

Table S11. Arthritis Witness Drugs

name	ADAGIO	RWR	EGAD	SVM	degree
GABRP	12	93	4400	278	7
GABRE	13	92	8988	279	7
GABRG1	14	87	5327	287	7
GABRD	15	71	9659	300	8
SLC29A1	34	242	9112	10484	1
PDE10A	40	116	11151	990	56
PDE1B	43	109	3237	942	60
CACNA2D3	59	167	10978	765	33
SLC6A2	65	227	2778	4507	2
SLC6A4	66	228	3973	4508	2
PDE8A	71	162	6242	1012	38
NR3C2	93	235	7637	8452	3
PDE11A	160	616	5048	989	56

Table S12. Arthritis Witness Genetic

name	ADAGIO	RWR	EGAD	SVM	degree
COX3	14	71	641	11508	25
COX1	15	52	392	11557	28
COX6A1	16	75	656	11505	23
ETFDH	18	193	11040	8863	12
COX4I2	22	161	397	11478	15
ETFB	24	174	7473	11315	14
ETFA	28	172	11248	10838	15
COX7A2L	29	98	2152	11515	21
COX7C	30	92	2434	11583	21
ARHGEF9	92	1429	2633	8182	1
CACNG1	97	281	386	1418	62
ATG4A	99	858	8877	10698	4
GIMAP6	109	2171	11348	9187	1
STBD1	110	2665	2194	8180	1
CACNA2D1	111	248	338	1245	62
ATG4B	127	421	10340	9867	12
CACNG6	132	292	336	1203	60
KLK6	199	5978	5508	672	1
ACSF3	206	10491	6112	3251	1
ARMT1	207	10492	8318	3252	1
CACUL1	208	10489	8546	3360	1
OTUD3	209	10490	9194	3140	1
TOR4A	210	10487	7774	3106	1
GFM2	211	10486	4783	3208	1
ORMDL2	212	10484	2299	3185	1
DNPEP	213	10485	3955	3114	1
ATP8B3	214	10481	5644	3209	1
DALRD3	215	10482	7390	3186	1
FOXN2	216	10479	7320	3102	1
TSC22D3	237	1250	5831	1565	19
NBL1	280	5811	4443	4752	1

Table S13. Bipolar Disorder Drugs

name	ADAGIO	RWR	EGAD	SVM	degree
ND5	2	37	31	56	56
ND3	3	34	30	57	56
SLC29A1	74	187	8864	2527	1
SIGMAR1	75	188	4140	2816	1
COX3	87	214	716	11540	25
COX1	88	196	463	11588	28
COX6A1	93	218	731	11537	23
ETFDH	115	332	11072	8919	12
COX4I2	125	302	468	11510	15
ETFB	129	314	7532	11349	14
ETFA	135	312	11280	10878	15
ARHGEF9	234	1548	2707	8244	1
ATG4A	241	986	8925	10740	4
GIMAP6	251	2286	11379	9241	1
STBD1	252	2774	2271	8242	1

Table S14. Bipolar Disorder Genetic

name	ADAGIO	RWR	EGAD	SVM	degree
ETFDH	20	190	11000	10180	12
COX4I2	24	159	389	8342	15
ETFB	26	184	7417	4686	14
ETFA	30	181	11212	5315	15
COX7A2L	32	84	2058	10447	21
SLC39A1	39	2276	5458	8726	1
SLC39A2	40	2103	4800	8725	1
ARHGEF9	82	1461	2541	8868	1
ATG4A	83	916	8834	7953	4
GIMAP6	88	2157	11314	9973	1
STBD1	90	2634	2099	10236	1
ATG7	94	330	7429	232	12
ATG4B	98	316	10293	5790	12
SLC8A1	113	3272	6677	8568	6
ATP2B1	193	2971	2944	4775	9
ATP2B2	194	2512	6225	10486	9
ATP2B4	274	2163	7738	3185	12
NBL1	298	5779	4368	8647	1

Table S15. Cardiac Arrhythmia Drugs

name	ADAGIO	RWR	EGAD	SVM	degree
KCNC3	6	33	34	88	41
ETFDH	139	357	11102	10288	12
COX4I2	150	326	516	8463	15
ETFB	153	351	7535	4822	14
ETFA	157	348	11313	5447	15
SLC39A1	185	2427	5584	8843	1
SLC39A2	186	2254	4925	8842	1
ARHGEF9	248	1616	2670	8983	1
ATG4A	249	1075	8951	8075	4
GIMAP6	254	2308	11415	10081	1
STBD1	256	2784	2231	10343	1
SLC8A1	279	3417	6797	8688	6

Table S16. Cardiac Arrhythmia Genetic

name	ADAGIO	RWR	EGAD	SVM	degree
ETFDH	17	111	11069	11583	12
COX4I2	19	103	440	11615	15
ETFB	20	108	7591	11600	14
ETFA	22	107	11276	11588	15

Table S17. Chronic Obstructive Pulmonary Disease Drugs

name	ADAGIO	RWR	EGAD	SVM	degree
ND5	1	37	23	69	56
COX6A1	64	151	956	11581	23
ETFDH	66	219	11036	11545	12
COX4I2	68	211	495	11577	15
ETFB	69	216	7606	11562	14
ETFA	71	215	11241	11550	15
COX7A2L	72	164	2449	11583	21

Table S18. Chronic Obstructive Pulmonary Disease Genetic

name	ADAGIO	RWR	EGAD	SVM	degree
COX3	14	65	898	7378	25
COX1	15	56	591	397	28
COX6A1	16	69	908	7695	23
ETFDH	19	239	11025	9472	12
COX4I2	23	204	608	6960	15
ETFB	25	225	7655	4579	14
ETFA	27	220	11227	5243	15
COX7A2L	29	88	2623	7809	21
ARHGEF9	56	1637	3079	8524	1
ATG4A	77	1122	8999	7867	4
GIMAP6	85	2625	11321	9916	1
STBD1	86	3098	2660	10091	1
ATG7	101	557	7667	427	12
ATG4B	113	532	10361	5672	12
CACNG4	133	446	513	5983	60
CACNG1	191	621	583	9027	62
CACNA2D1	200	578	517	9054	62
CACNG5	201	582	527	6771	50
CACNB1	221	561	545	6876	65
DCTN3	251	522	808	5100	93

Table S19. Coronary Heart Disease Drugs

name	ADAGIO	RWR	EGAD	SVM	degree
ND5	2	38	35	40	56
ND3	3	34	34	41	56
ND4	4	36	33	58	56
ND4L	5	35	32	39	56
SLC29A1	78	209	9013	10557	1
COX3	83	231	1004	7470	25
COX1	84	222	694	558	28
COX6A1	85	235	1014	7784	23
ETFDH	109	404	11084	9546	12
COX4I2	118	369	711	7056	15
ETFB	120	390	7729	4693	14
ETFA	123	385	11286	5351	15
ARHGEF9	222	1781	3182	8606	1
ATG4A	243	1269	9068	7955	4
GIMAP6	251	2759	11380	9986	1
STBD1	252	3227	2767	10161	1
ATG7	267	714	7740	588	12
ATG4B	278	690	10423	5776	12

Table S20. Coronary Heart Disease Genetic

name	ADAGIO	RWR	EGAD	SVM	degree
RYR2	37	543	1059	446	38
ARHGEF9	40	1255	2886	8766	1
SCNN1A	43	107	199	290	27
SCNN1B	45	119	212	5051	28
ATG4A	85	874	8977	8184	4
GIMAP6	96	2256	11357	10054	1
STBD1	97	2775	2451	10308	1
ATG7	120	527	7613	336	12
ATG4B	139	498	10387	5862	12

Table S21. Drug Dependence Drugs

name	ADAGIO	RWR	EGAD	SVM	degree
GABRP	18	84	3926	57	7
SIGMAR1	42	191	4371	10949	1
RYR2	173	673	1155	579	38
ARHGEF9	176	1379	2978	8851	1
ATG4A	220	1000	9056	8272	4
GIMAP6	230	2376	11426	10126	1
STBD1	231	2891	2546	10380	1
ATG4B	272	628	10462	5958	12

Table S22. Drug Dependence Genetic

name	ADAGIO	RWR	EGAD	SVM	degree
COX1	14	67	742	8799	28
COX3	15	78	1212	11519	25
COX6A1	16	83	1233	11528	23
ETFDH	18	234	11032	9816	12
SDHB	19	66	195	7757	34
COX4I2	24	210	779	11545	15
ETFB	28	228	7778	9438	14
ETFA	32	226	11222	8611	15
COX7A2L	33	121	2903	11535	21
COX7C	36	109	3157	11551	21
COX5B	41	103	3568	11552	22
ARHGEF9	84	2130	3337	11376	1
ATG4A	89	1250	9067	11436	4
GIMAP6	95	2959	11317	11522	1
STBD1	97	3465	2940	11501	1
APRT	111	251	455	380	59
ATG7	122	697	7789	283	12
ATG4B	136	682	10396	8267	12
SLC8A1	141	3920	7098	3417	6
TRPV1	147	3084	11245	2535	10
ATP2B1	148	3268	3708	892	9
PDE10A	160	638	604	2456	56
PDE11A	161	639	605	2455	56
PDE2A	162	625	615	1080	57
PDE1B	164	624	678	2313	60
ATP1B4	194	2173	460	2474	9
ATP2B2	239	3608	6687	1999	9
PDE1C	267	673	597	3283	54
DDI2	293	9799	10937	10105	1
ANKRD13A	295	9805	3792	10102	1
ATXN10	297	9813	3316	10103	1
HEATR1	298	9815	8465	10114	1
HERC4	299	9817	10171	10118	1
ERGIC3	301	9827	8048	10169	1

Table S23. Hypertension Drugs

name	ADAGIO	RWR	EGAD	SVM	degree
ND5	2	38	38	226	56
ND3	3	34	37	227	56
ND4	4	36	36	72	56
ND4L	5	35	35	225	56
SLC12A3	92	233	10850	7410	2
COX1	97	252	839	8928	28
COX3	98	263	1320	11641	25
COX6A1	100	268	1342	11650	23
NR3C2	101	241	7630	5131	3
SLC6A2	105	236	2663	5887	2
SLC6A4	106	237	3906	5888	2
ETFDH	109	419	11155	9942	12
SDHB	111	251	276	7889	34
COX4I2	119	395	876	11667	15
ETFB	123	413	7900	9566	14
ETFA	132	411	11344	8741	15
COX7A2L	133	306	3029	11657	21
ARHGEF9	269	2300	3461	11498	1
ATG4A	274	1428	9189	11558	4
GIMAP6	280	3121	11438	11644	1
STBD1	282	3624	3066	11623	1

Table S24. Hypertension Genetic

name	ADAGIO	RWR	EGAD	SVM	degree
KCNE4	5	497	35	1100	4
KCNIP2	8	550	40	1099	3
SLC39A1	18	2794	5930	11481	1
SLC39A2	19	2643	5307	11480	1
KCNE1	29	932	100	263	6
ANAPC2	34	90	159	6703	116
CDC26	35	96	157	6377	116
ANAPC7	46	114	130	4801	105
CACNG4	197	442	869	3352	60

Table S25. Multiple Sclerosis Drug

name	ADAGIO	RWR	EGAD	SVM	degree
KCNC3	7	36	48	50	41
KCNA7	9	40	47	39	41
SLC39A1	144	2932	6044	11578	1
SLC39A2	147	2782	5419	11577	1

Table S26. Multiple Sclerosis Genetic

name	ADAGIO	RWR	EGAD	SVM	degree
COX3	14	90	934	11532	25
COX1	15	72	617	11485	28
COX6A1	16	102	943	11533	23
ETFDH	19	441	11000	10330	12
SDHB	21	64	196	11529	34
COX4I2	24	386	634	11535	15
ETFB	26	431	7595	11434	14
SDHA	27	76	216	11544	34
ETFA	28	428	11202	10657	15
COX7A2L	29	161	2502	11534	21
COX7C	31	145	2776	11547	21
COX5B	46	141	3204	11549	22
ARHGEF9	66	1788	2968	7007	1
ATG4A	108	1181	8961	6542	4
GIMAP6	119	2777	11302	11064	1
STBD1	123	3303	2543	8723	1
RASGRF1	172	459	715	1092	80
TRPV1	181	3067	11225	1751	10
ATG4B	205	603	10332	7965	12
CACNG1	255	860	1430	8356	62

Table S27. Obesity Drugs

name	ADAGIO	RWR	EGAD	SVM	degree
ND5	2	38	36	89	56
ND3	3	34	35	90	56
ND4L	5	35	33	88	56
COX3	86	278	1055	11657	25
COX1	87	260	731	11610	28
COX6A1	93	290	1064	11658	23
SLC6A2	98	231	2253	598	2
SLC6A4	99	233	3563	599	2
ETFDH	126	626	11123	10459	12
COX4I2	146	573	750	11660	15
ETFB	152	616	7724	11559	14
ETFA	159	613	11326	10786	15
COX7A2L	162	348	2638	11659	21
ARHGEF9	255	1960	3101	7157	1
ATG4A	295	1355	9091	6692	4

Table S28. Obesity Genetic

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name	ADAGIO	RWR	EGAD	SVM	degree
ARHGEF9	19	1509	3166	9031	1
ATG4A	21	835	9088	8695	4
GIMAP6	24	2109	11396	10266	1
STBD1	26	2709	2743	10579	1
ATG7	35	322	7777	103	12
ATG4B	43	297	10446	5880	12
NR2C2AP	67	533	308	6536	36
CSF2RB	72	182	623	1615	97
THRA	86	261	769	3014	75
IL22RA1	108	262	548	4983	75
ESRRB	109	519	341	5051	38
IL21R	117	301	404	6907	71
HNF4A	119	279	695	755	65
NR2F1	121	264	391	1946	50
IL9R	122	307	389	7666	70
IFNA6	136	442	299	9484	64
IFNA7	137	443	297	9483	64
IFNA16	138	444	296	9485	64
IFNA10	139	437	298	9486	64
KLK6	173	5615	5880	8404	1
ESRRG	177	500	383	2911	41
PPARD	190	454	559	2803	54
NR2C2	192	451	508	2087	50
NR1D1	195	468	500	3638	49
ESRRA	204	439	580	3068	55
NBL1	275	5437	4872	8936	1
ATP6V0A4	287	1174	3192	5921	32
ATP6V0E2	291	1354	10916	5894	28
ATP6V0E1	293	1308	11107	6811	28
ATP6V0B	294	1221	11154	5978	29
ATP6V1G3	295	1303	4609	5893	28
ATP6V1G1	296	1301	9283	5824	28
ATP6V1E2	299	1260	5631	7038	29
ATP6V1C2	300	1285	4380	5892	28
ATP6V1C1	301	1269	10244	6376	29

Table S29. Psoriasis Drugs

name	ADAGIO	RWR	EGAD	SVM	degree
SLC6A2	19	108	2407	74	2
SLC6A4	20	109	3668	75	2
ARHGEF9	117	1586	3212	9020	1
ATG4A	119	916	9084	8686	4
GIMAP6	122	2175	11371	10247	1
STBD1	124	2769	2791	10560	1
ATG4B	141	388	10430	5907	12
KLK6	269	5648	5905	8399	1

Table S30. Psoriasis Genetic

name	ADAGIO	RWR	EGAD	SVM	degree
APRT	6	35	65	179	59
ITPA	7	34	365	6262	130
HPRT1	28	81	93	217	51
TRAF1	93	299	9257	1668	48
ATP1B4	114	1641	393	7659	9
KLK6	134	5863	5824	8525	1
TANK	142	1278	3347	3610	28
BIRC2	144	417	2462	1138	58
SLC8A1	153	3773	7028	9230	6
COL4A1	163	457	667	3075	76
TRADD	164	440	1627	2949	69
KCNMB2	168	2870	8085	3790	13
KCNMB4	169	2859	3289	7737	13
KCNMB3	170	2858	6343	7738	13
COL1A1	173	387	716	2129	83
ATP2B1	175	3490	3455	4894	9
ATP2B2	176	3548	6599	5845	9
ATP6V0A4	178	1115	3096	5337	32
ATP6V0E2	180	1284	10915	5512	28
KCNMB1	181	2817	4394	2182	14
ATP6V0B	182	1156	11167	5526	29
ATP6V0E1	183	1248	11119	6769	28
ATP6V1G3	184	1243	4541	5511	28
ATP6V1G1	185	1242	9276	5939	28
ATP6V1E2	186	1201	5569	7019	29
ATP6V1C2	187	1225	4304	5510	28
ATP6V1C1	189	1211	10235	6433	29
ATP6V0C	195	1134	6891	6432	31
COL4A5	197	553	615	4871	70
ITGA8	202	523	801	5746	89
ITGA11	213	538	834	6994	88
TPPP	235	5932	8264	6409	2
COL4A2	245	604	767	5080	68
ACSF3	257	10866	6407	11584	1
ARMT1	258	10867	8554	11585	1
COL3A1	259	596	786	3069	73
COL4A4	265	578	611	5812	69
COL6A2	266	676	707	8824	62
COL24A1	267	666	742	8094	64
COL4A3	268	566	616	4167	70
ITGA7	292	618	870	3393	79
ADAMTSL4	301	1841	4283	4068	7

name	ADAGIO	RWR	EGAD	SVM	degree
SLC29A1	14	104	9010	11034	1
KLK6	219	5874	5827	8517	1
TANK	227	1335	3360	3646	28
BIRC2	228	490	2476	1204	58
SLC8A1	237	3799	7027	9213	6
COL4A1	246	530	674	3116	76
KCNMB2	251	2902	8073	3823	13
KCNMB4	252	2891	3302	7732	13
KCNMB3	253	2890	6345	7733	13
ATP2B1	258	3517	3469	4911	9
ATP2B2	259	3575	6601	5854	9
ATP6V0A4	261	1176	3109	5352	32
ATP6V0E2	263	1341	10875	5526	28
KCNMB1	264	2849	4404	2229	14
ATP6V0B	265	1215	11125	5540	29
ATP6V0E1	266	1306	11077	6774	28
ATP6V1G3	267	1301	4548	5525	28
ATP6V1G1	268	1300	9249	5946	28
ATP6V1E2	269	1259	5573	7023	29
ATP6V1C2	270	1283	4314	5524	28
ATP6V1C1	272	1269	10199	6439	29
ATP6V0C	278	1195	6891	6438	31
COL4A5	280	624	624	4888	70
ITGA8	285	594	814	5755	89

Table S32. Rheumatoid Arthritis Genetic

name	ADAGIO	RWR	EGAD	SVM	degree
COX1	14	50	496	11532	28
COX3	15	62	734	11478	25
COX6A1	16	75	739	11472	23
ETFDH	17	341	11025	9158	12
COX4I2	19	322	504	11525	15
ETFB	20	336	7503	11354	14
ETFA	22	334	11230	11076	15
COX7A2L	23	137	2222	11477	21
COX7C	24	127	2505	11565	21
COX5B	36	123	2952	11573	22
RYR2	47	460	818	2820	38
PPP2R2D	174	790	10656	551	30

Table S33. Schizophrenia Drugs

name	ADAGIO	RWR	EGAD	SVM	degree
ND5	2	36	24	70	56
SLC6A9	71	191	7951	2144	1
SIGMAR1	85	190	4136	2120	1
COX1	86	195	576	11285	28
COX3	87	206	815	11233	25
COX6A1	91	217	820	11227	23
ETFDH	104	469	10793	8996	12
COX4I2	114	450	585	11278	15
ETFB	115	464	7403	11116	14
ETFA	123	462	10991	10845	15
COX7A2L	125	276	2279	11232	21
RYR2	193	585	901	2850	38

Table S34. Schizophrenia Genetic

name	ADAGIO	RWR	EGAD	SVM	degree
SLC39A1	28	2312	5559	8743	1
SLC39A2	29	2136	4912	8742	1
TNC	61	634	3648	3257	31
TNR	74	645	3420	275	29
ARHGEF9	82	1498	2696	8908	1
ATG4A	85	972	8891	8079	4
GIMAP6	89	2208	11337	10073	1
STBD1	90	2686	2251	10273	1
COMP	96	493	919	276	32
ATG4B	122	482	10318	5802	12
CACNG1	130	414	347	7918	62
CACNA2D1	133	323	310	7830	62
CACNG5	155	428	383	6430	50
SCNN1D	183	1182	9482	10529	18
PARVA	216	617	6803	2150	30
	257	711	5193	3089	27

Table S35. Stroke Drugs

name	ADAGIO	RWR	EGAD	SVM	degree
KCNC3	7	36	38	58	41
SLC39A1	158	2445	5651	8821	1
SLC39A2	159	2270	5004	8820	1
TNC	214	781	3741	3378	31
ARHGEF9	235	1638	2802	8985	1
ATG4A	238	1119	8969	8162	4
GIMAP6	242	2342	11403	10146	1
STBD1	243	2816	2363	10345	1
ATG4B	274	629	10390	5904	12

Table S36. Stroke Genetic

name	ADAGIO	RWR	EGAD	SVM	degree
ETFDH	17	64	11083	11278	12
DCTN3	81	197	671	7699	93
APRT	83	258	459	868	59
ACTR1A	84	203	634	5120	89
PDE10A	143	793	11189	2941	56
PDE11A	144	794	4523	2940	56
PDE2A	145	781	6976	1713	57
PDE1B	147	787	2526	2081	60
PDE3A	168	774	8016	1756	60
CEP192	173	425	545	3664	70
CEP78	175	450	525	7252	69
OFD1	176	445	532	6422	69
CEP250	178	433	535	2570	70
CEP57	179	426	544	2364	71
SDCCAG8	184	469	518	6830	68
CEP70	185	463	520	9101	68
CEP72	187	456	524	6206	68
NINL	188	460	522	3080	68
CEP152	189	440	527	7696	68
SSNA1	191	430	548	3351	71
CDK5RAP2	192	407	554	2595	72
CEP135	193	422	539	6742	69
CEP76	194	423	550	2008	71
NEDD1	195	420	546	5606	70
SFI1	196	448	530	9202	70
TUBG2	199	452	510	7802	68
DCTN5	222	1209	5127	3465	24
ADAMTSL4	230	1744	4096	3317	7
ADAMTSL1	232	1723	9709	3319	7
B3GLCT	233	1729	7415	3318	7
TNFRSF11A	234	2686	11432	3863	8
ADAMTS7	245	1704	9899	644	8
DCTN4	257	1183	10923	3432	25
POFUT2	260	1641	7206	1819	9
CCT6B	264	2160	6604	3857	10
OSBPL1A	267	1335	6228	4197	22
PDE8A	283	1131	5812	1575	38
PDE7B	285	1121	5750	1574	38
PDE7A	286	1120	10444	1576	38
CFP	291	1522	2646	753	12

Table S37. Systemic Lupus Erythematosus Drugs

name	ADAGIO	RWR	EGAD	SVM	degree
ETFDH	63	168	11069	11266	12
PDE10A	245	887	11175	3006	56
PDE11A	246	888	4572	3005	56
PDE2A	247	875	7014	1788	57
PDE1B	249	881	2591	2156	60
PDE3A	270	869	8044	1831	60

Table S38. Systemic Lupus Erythematosus Genetic

name	ADAGIO	RWR	EGAD	SVM	degree
ETFDH	17	87	11081	11314	12
COX4I2	19	69	436	11624	15
ETFB	20	77	7611	11595	14
ETFA	22	75	11291	11548	15
SOCS1	63	152	262	511	105
CSF2RB	86	199	582	253	97
ATP6V0A4	91	590	1009	3275	32
ATP6V1E2	95	651	958	5933	29
ATP6V0E2	96	791	912	3599	28
ATP6V0B	97	633	967	3494	29
ATP6V0E1	101	724	939	5376	28
ATP6V1G3	102	719	941	3598	28
ATP6V1G1	103	717	942	7266	28
ATP6V1C2	104	697	947	3597	28
ATP6V1C1	105	688	961	6478	29
ATP6V0C	116	624	997	1539	31
IL21R	127	365	389	656	71
IL9R	133	371	378	838	70
CNTFR	174	369	477	10019	71

Table S39. Type I Diabetes Drugs

name	ADAGIO	RWR	EGAD	SVM	degree
ETFDH	62	187	11103	11334	12
COX4I2	65	171	484	11643	15
ETFB	66	178	7649	11614	14
ETFA	69	176	11312	11567	15
ATP6V0A4	188	680	1062	3336	32
ATP6V1E2	192	741	1008	5982	29
ATP6V0E2	193	880	960	3659	28
ATP6V0B	194	723	1019	3554	29
ATP6V0E1	198	813	988	5429	28
ATP6V1G3	199	808	990	3658	28
ATP6V1G1	200	806	991	7309	28
ATP6V1C2	201	786	996	3657	28
ATP6V1C1	202	777	1013	6525	29
ATP6V0C	213	714	1050	1607	31

Table S40. Type I Diabetes Genetic

name	ADAGIO	RWR	EGAD	SVM	degree
COX1	14	50	465	403	28
COX3	15	62	887	7456	25
COX6A1	16	68	898	7773	23
ETFDH	18	202	11029	9616	12
COX4I2	22	180	478	7130	15
ETFB	23	197	7516	4897	14
ETFA	26	194	11238	5428	15
COX7A2L	28	94	2269	7887	21
COX7C	30	84	2543	5896	21
ARHGEF9	88	1509	2742	9287	1
ATG4A	92	924	8906	8154	4
GIMAP6	99	2198	11337	10039	1
STBD1	100	2644	2309	10275	1
ATG7	109	504	7528	421	12
ATG4B	116	491	10343	5772	12
ATP1B4	125	1651	324	7605	9
SLC8A1	128	3550	6794	9145	6
ATP2B1	143	3197	3140	6368	9
ATP2B2	146	3277	6355	5610	9
DDI2	194	9673	10917	10999	1
ANKRD13A	195	9687	3229	10997	1
ATXN10	197	9692	2716	10998	1
HEATR1	198	9697	8268	11003	1
HERC4	200	9698	10100	11007	1
ERGIC3	202	9712	7806	11047	1
SLC29A1	203	9713	8845	11013	1
HSPA4L	204	9711	4819	11011	1

Table S41. Type II Diabetes Drugs

name	ADAGIO	RWR	EGAD	SVM	degree
ND5	1	36	24	55	56
COX1	87	199	537	547	28
COX3	88	211	960	7512	25
COX6A1	91	217	971	7825	23
ETFDH	107	351	11056	9650	12
COX4I2	113	329	550	7190	15
ETFB	114	346	7566	4975	14
ETFA	117	343	11264	5500	15
ARHGEF9	237	1637	2823	9324	1
ATG4A	241	1061	8953	8204	4
GIMAP6	248	2317	11362	10072	1
STBD1	249	2763	2393	10305	1
ATG7	258	648	7578	565	12
ATG4B	265	635	10375	5842	12
SLC8A1	277	3654	6852	9184	6
ATP2B1	292	3303	3215	6433	9
ATP2B2	295	3383	6413	5681	9

Table S42. Type II Diabetes Genetic

name	ADAGIO	RWR	EGAD	SVM	degree
SOCS1	12	50	229	117	105
CSF2RB	15	66	292	588	97
IL4	16	57	113	151	88
IL22RA1	20	91	243	7455	75
IL21R	23	103	160	1856	71
IL9R	24	101	149	1869	70
IL15RA	32	92	123	1550	71
CRLF2	36	110	194	4647	70
IFNA17	37	131	132	10675	64
IFNA6	38	137	140	10670	64
IFNA7	39	138	138	10669	64
IFNA16	40	139	137	10671	64
IFNA10	41	134	139	10672	64
IFNA14	42	136	134	10673	64
IFNA6	43	130	131	3330	64
IFNA4	44	133	135	10676	64
IFNA8	45	127	128	1499	64
IFNA21	46	129	133	10674	64
IFNA2	47	123	126	1078	64
PLAAT3	173	514	770	7261	69
PLB1	178	527	762	6996	67
LCP2	190	518	716	703	62
PDE2A	219	804	6895	3501	57
PDE11A	220	827	4365	5256	56
PDE10A	221	828	11235	5257	56
PDE3A	222	798	7971	5118	60
PDE1B	223	810	2298	5331	60
PDE8A	224	1060	5698	3256	38
PDE7B	226	1049	5637	3255	38
PDE7A	227	1048	10470	3257	38
LAT	255	618	1064	1044	63
TANK	261	1617	2925	5561	28
TRADD	288	676	775	1605	69

Table S43. Ulcerative Colitis Drugs

name	ADAGIO	RWR	EGAD	SVM	degree
PLAAT3	207	539	768	7206	69
PLB1	212	552	760	6945	67
LCP2	223	543	717	717	62
PDE2A	252	820	6856	3475	57
PDE11A	253	843	4342	5217	56
PDE10A	254	844	11152	5218	56
PDE3A	255	815	7921	5080	60
PDE1B	256	826	2292	5290	60
PDE8A	257	1068	5667	3232	38
PDE7B	259	1058	5606	3231	38
PDE7A	260	1057	10396	3233	38
LAT	287	639	1062	1046	63
TANK	293	1616	2915	5519	28

Table S44. Ulcerative Colitis Genetic

name	ADAGIO	RWR	EGAD	SVM	degree
SCNN1G	22	81	260	242	27
SCNN1A	23	85	273	236	27
ARHGEF9	25	1182	3019	9121	1
SCNN1B	26	88	316	327	28
CACNG2	27	83	209	321	85
CACNG3	32	98	200	1667	80
CACNG8	33	99	199	1668	80
CACNG7	38	100	166	799	74
CACNG4	62	160	222	1236	60
ATG4A	66	820	9029	10616	4
GIMAP6	77	1883	11376	10244	1
STBD1	78	2368	2595	10141	1
CACNG5	81	306	182	611	50
CACNG1	84	454	617	4719	62
RASGRF1	85	325	533	284	80
CACNA2D1	92	437	540	4263	62
TRPV1	109	2345	11304	3456	10
ATG4B	110	485	10410	7659	12

Table S45. Unipolar Depression Drugs

name	ADAGIO	RWR	EGAD	SVM	degree
SIGMAR1	25	148	4445	10749	1
SLC6A2	29	139	2235	2270	2
SLC6A4	30	140	3543	2271	2
SCN3A	35	120	4608	1658	3
SCN9A	42	128	10501	2414	2
NR3C2	49	144	7414	5508	3
ARHGEF9	141	1280	3078	9139	1
ATG4A	180	922	9049	10617	4
GIMAP6	191	1977	11375	10249	1
STBD1	192	2458	2657	10149	1
CACNG1	198	563	661	4769	62
CACNA2D1	206	547	571	4321	62
TRPV1	222	2435	11304	3515	10
ATG4B	223	593	10421	7687	12

Table S46. Unipolar Depression Genetic