The principal element of our analytical approach is to define specific sets of genomic regulatory loci
WITHOUT ANY PRIOR KNOWLEDGE
of what genes (if any) they may (or may not) control.

This is in striking contrast with the approaches that being utilized in the prior art: to identify genes that are differentially regulated between different states and/or conditions, thus introducing the confounders and biases associated with the multiple hypothesis testing, overfitting, and random co-occurrence due to the very large excess of analyzed features (genes) over the relatively small numbers of samples (100K range or more of analyzed features versus just a few hundred analyzed samples at best). Attempts to address these issues using statistical approaches (corrections for multiple hypothesis testing) and experimental design improvements (multiple replications, validation in independent data sets and using independent analytical techniques) did not adequately resolve these problems.

Importantly, our analyses revealed that this approach identifies not only genes altered expression of which implicated in the broad spectrum of human physiological and pathological conditions. It also identifies genes defined by the independent studies as genetic loci comprising mutation signatures associated with development and progression of multiple common human disorders, including cancer, neurodevelopmental, neuropsychiatric, and neurodegenerative disorders, as well autoimmune and immuno-inflammatory diseases.

Supporting the concept that many major human disorders are driven by aberrant functions of primate-specific genomic regulatory networks with prominent unique-to-human (human-specific) components, this approach identifies genetic loci implicated in inter-individual genetic mosaicism (somatic mosaicism) of cells, tissues and organs in the human body.

Analytical Pipelines

Define panels of genomic regulatory loci

Human-specific genomic regulatory sequences (HSGRS)

Identify genes regulated by HSGRS

Human stem cell-associated retroviral sequences (SCARS)

Identify genes regulated by SCARS

Heat-Map-Guided (HMG) visualization of gene and protein expression profiles

using databases of distinct types of human cells, tissues, anatomical sites, organs, physiological states, pathological conditions, as well as regulatory, chemical, and environmental perturbations

Comparative gene set enrichment (CGSE) analyses of gene and protein expression profiles

using databases of distinct types of human cells, tissues, anatomical sites, organs, physiological states, pathological conditions, as well as regulatory, chemical, and environmental perturbations

Asses the statistical significance of observations

Formulate the concepts regarding the potential roles and impacts of genomic regulatory networks governed by HSGRS and SCARS in human development, physiology, and pathology

Analytical Pipelines

Define panels of genomic regulatory loci

Functional enhancers of naïve and primed hESC

Human stem cell-associated retroviral sequences (SCARS)

Identify genes regulated by HSGRS

Identify genes regulated by SCARS

Heat-Map-Guided (HMG) visualization of gene and protein expression profiles

using databases of distinct types of human cells, tissues, anatomical sites, organs, physiological states, pathological conditions, as well as regulatory, chemical, and environmental perturbations

Comparative gene set enrichment (CGSE) analyses of gene and protein expression profiles

using databases of distinct types of human cells, tissues, anatomical sites, organs, physiological states, pathological conditions, as well as regulatory, chemical, and environmental perturbations

Asses the statistical significance of observations

Formulate the concepts regarding the potential roles and impacts of genomic regulatory networks governed by HSGRS and SCARS in human development, physiology, and pathology

Analytical Pipelines

Define panels of genomic regulatory loci

Functional enhancers of naïve and primed hESC

Identify genes regulated by HSGRS

Human-specific genomic regulatory sequences (HSGRS)

Identify genes regulated by SCARS

Heat-Map-Guided (HMG) visualization of gene and protein expression profiles

using databases of distinct types of human cells, tissues, anatomical sites, organs, physiological states, pathological conditions, as well as regulatory, chemical, and environmental perturbations

Comparative gene set enrichment (CGSE) analyses of gene and protein expression profiles

using databases of distinct types of human cells, tissues, anatomical sites, organs, physiological states, pathological conditions, as well as regulatory, chemical, and environmental perturbations

Asses the statistical significance of observations

Formulate the concepts regarding the potential roles and impacts of genomic regulatory networks governed by HSGRS and SCARS in human development, physiology, and pathology

~59K human-specific genomic regulatory sequences

13,824 genes are putative regulatory targets of HSGRS

Structurally, functionally, and evolutionary distinct families of human-specific regulatory sequences (HSRS) and associated putative regulatory target genes defined by the GREAT algorithm.

Classification category/Reference database	Number of records (hg19)	Associated genes
Fixed human-specific insertions.	11878	7979
Human-specific TE loci expressed in human dorsolateral prefrontal cortex	4637	4051
Set of duplicated regions in GRCh38 space	7599	6618
Fixed human-specific deletions	5883	5489
Human-specific STR expansions	4875	4844
hsTFBS	3803	1087
ace-DHS	3538	3445
FHSRR	4249	2810
Human-specific STR contractions	1279	973
hESC_FHSRR_DHS	1932	1458
DHS_FHSRR (non-hESC)	2118	552
HARs	2745	2281
haDHS	524	747
Human-biased CNCC enhances	1000	1439
Chimp-biased CNCC enhances	1000	1445
H3K4me3 peaks with human-specific enrichment in prefrontal neurons	410	578
Human-specific hESC functional enhancers	1619	1214
All HSRS	59089	13824

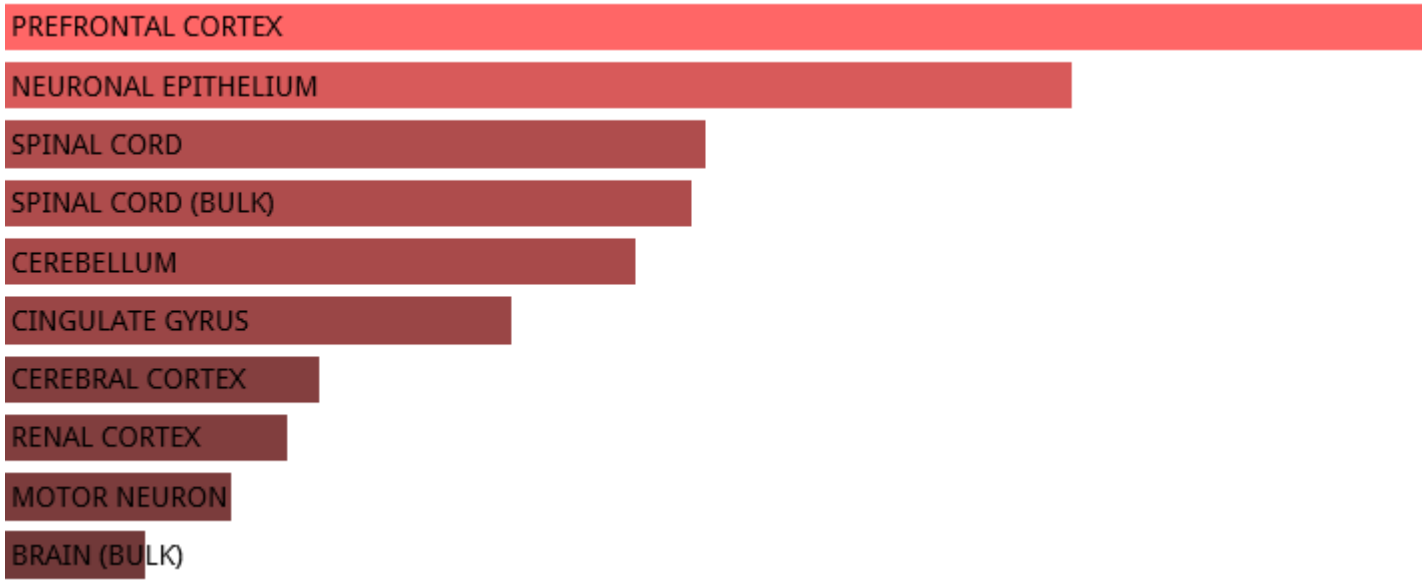
Legend: Definitions of structurally, functionally, and evolutionary distinct families of human-specific regulatory sequences (HSRS) can be found in Glinsky (2020);

Association of human cancer survival predictor genes with human-specific genomic regulatory sequences (HSGRS)

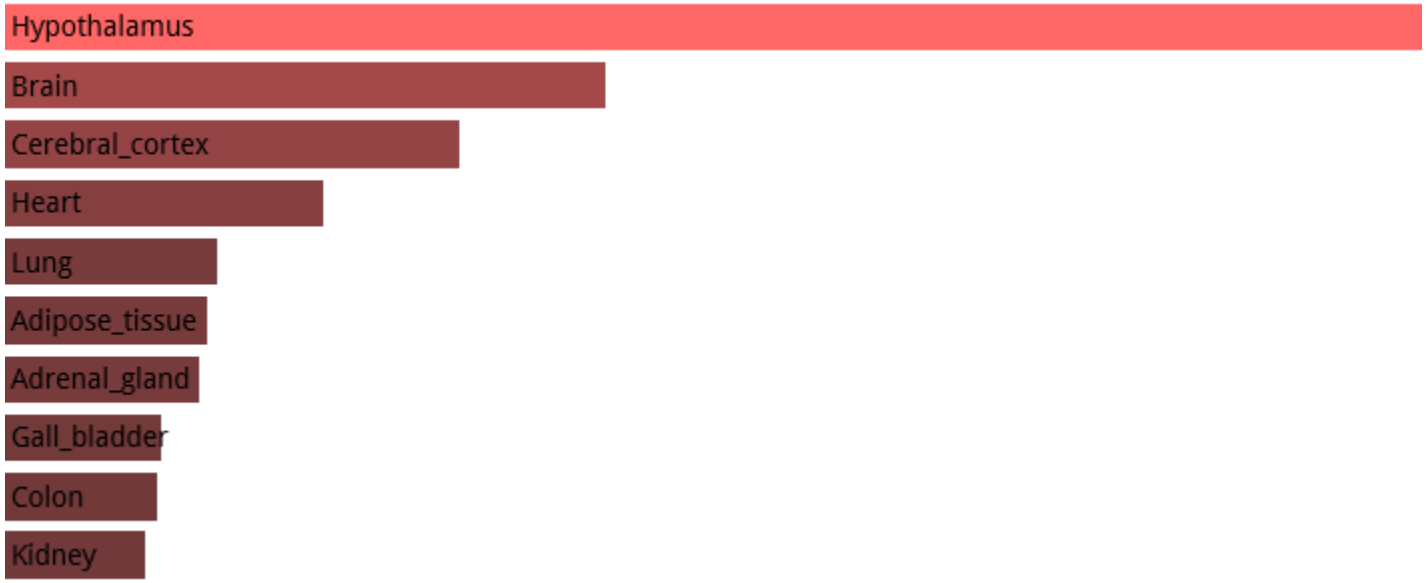
Cancer type	All genes	Associated with HSGRS	Percent
Thyroid	347	269	77.52
Glioma	271	206	76.01
Melanoma	205	153	74.63
Head and neck	808	597	73.89
Colorectal	603	440	72.97
Renal	6070	4418	72.78
Ovarian	504	366	72.62
Liver	2892	2086	72.13
Lung	662	477	72.05
Breast	582	414	71.13
Urothelial	1101	783	71.12
Stomach	307	218	71.01
Prostate	161	114	70.81
Endometrial	1631	1153	70.69
Cervical	717	505	70.43
Pancreatic	1549	1075	69.40
All human cancer survival genes	10713	7738	72.23

11,878 fixed human-specific insertions

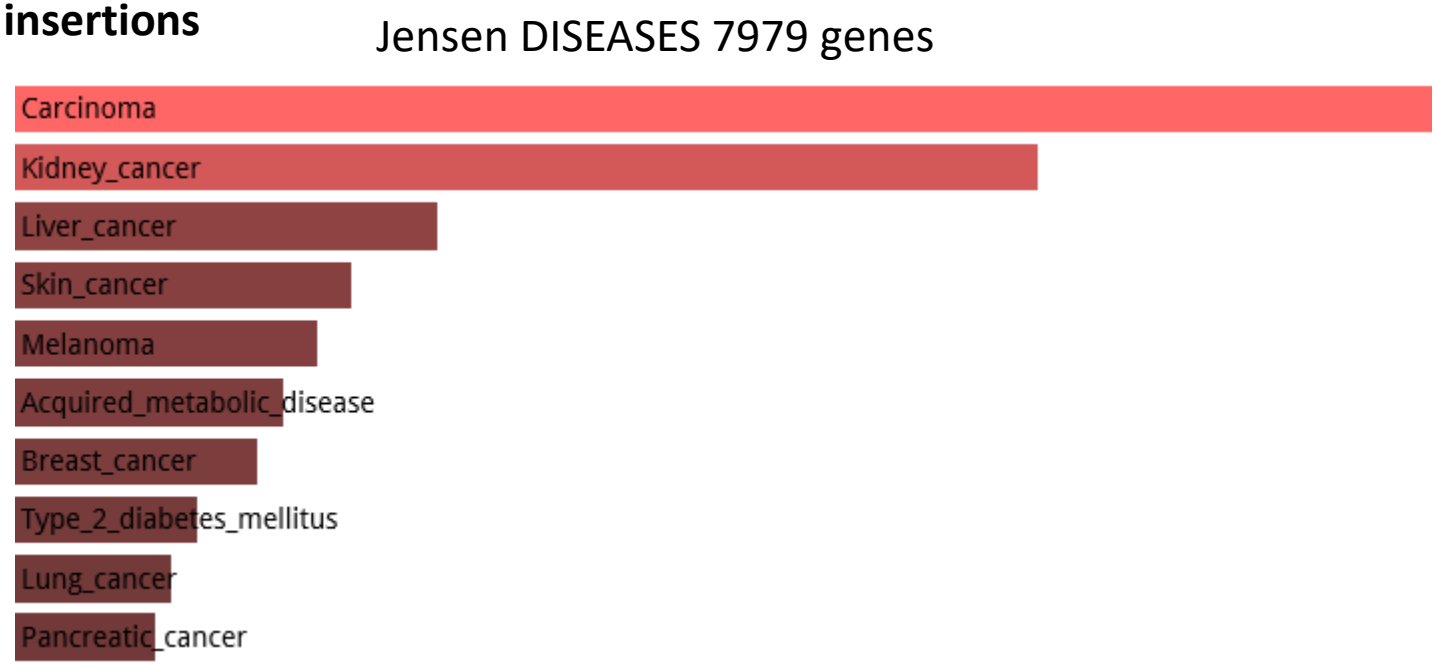
ARCHS4 Tissues 7979 genes

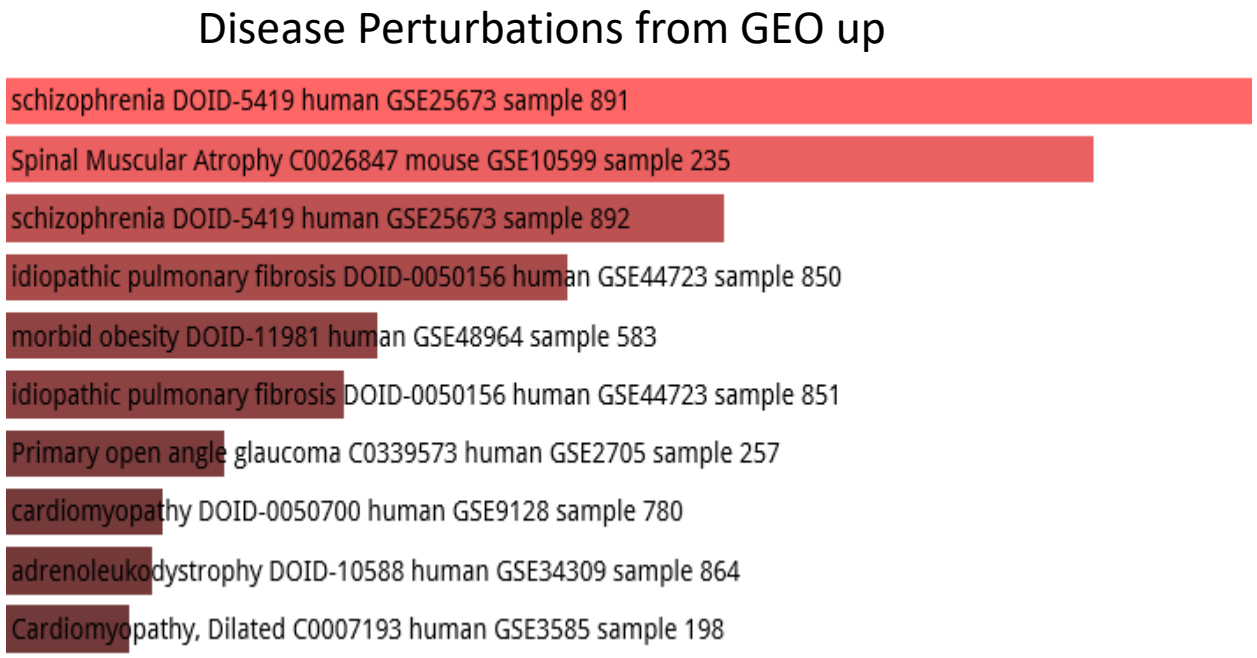


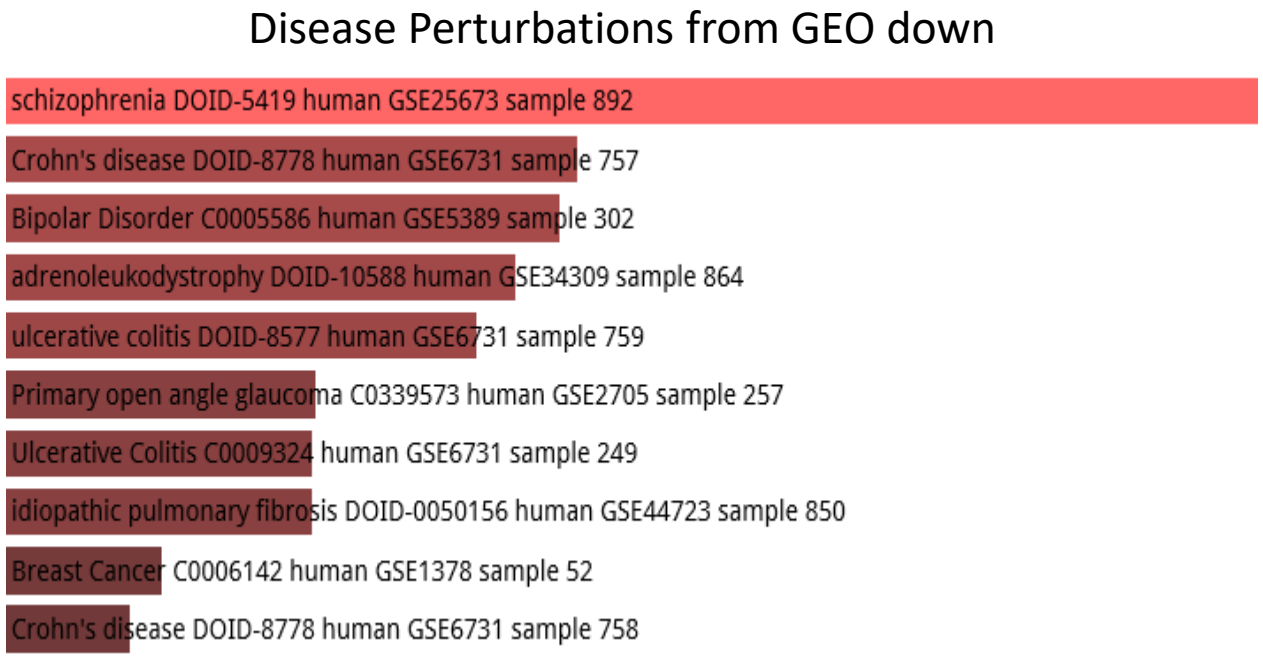
Jensen TISSUES 7979 genes



11,878 fixed human-specific insertions



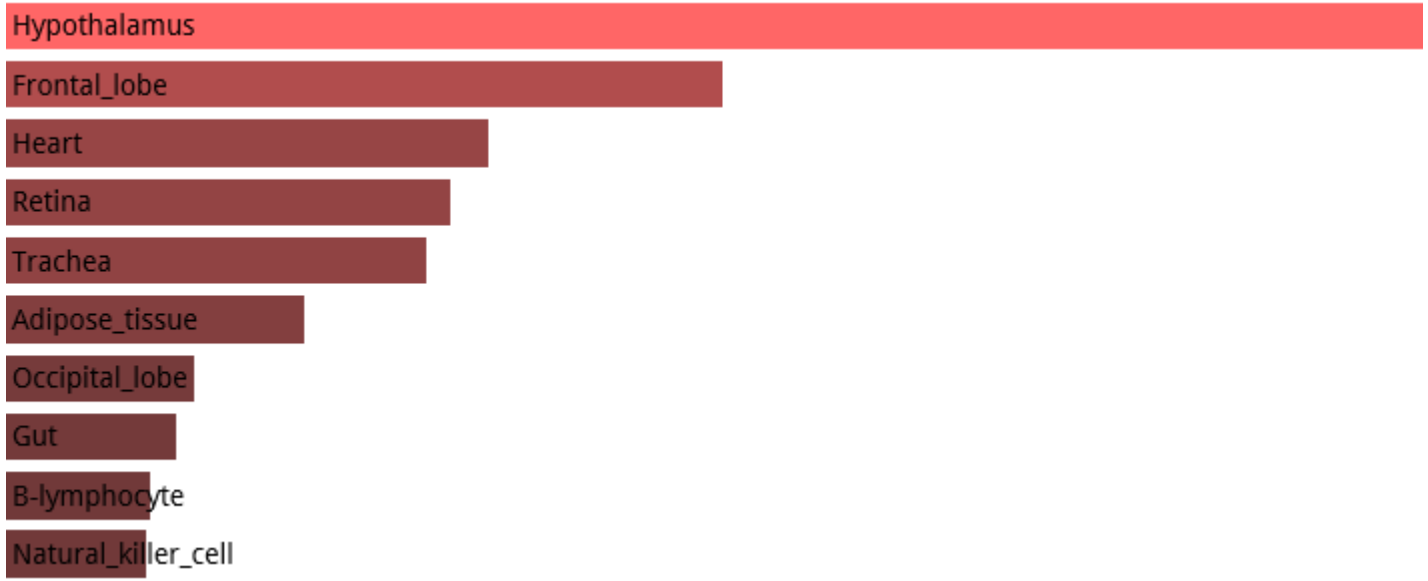




7,599 duplicated regions in the human genome

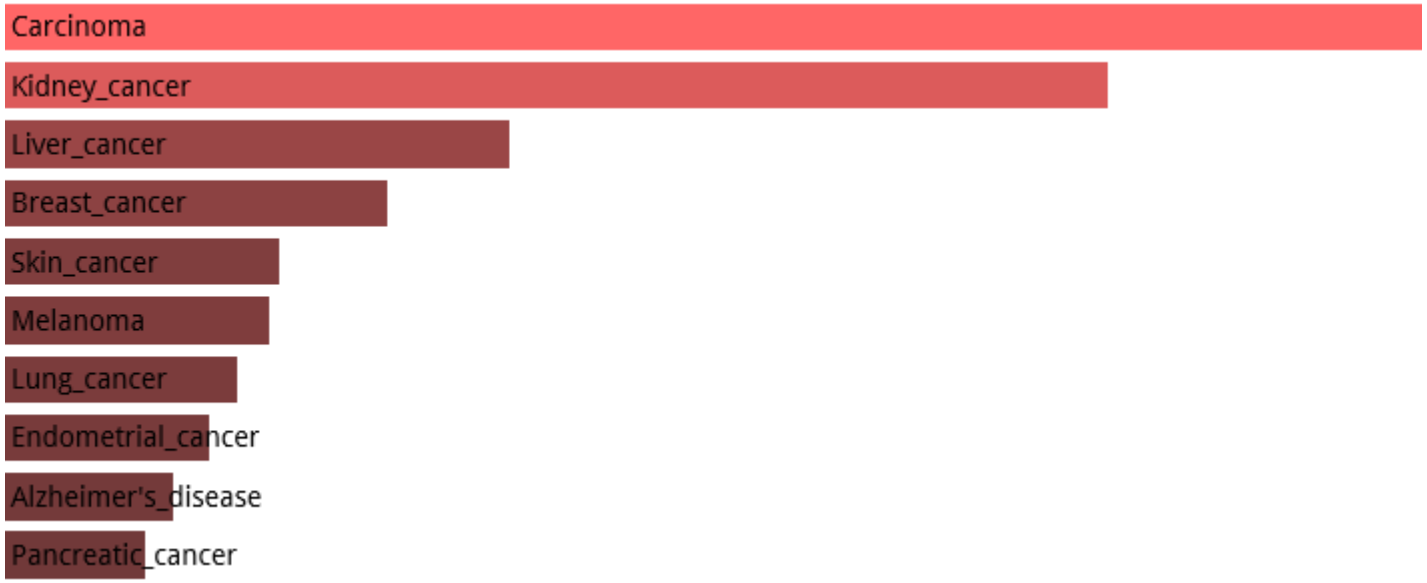
ARCHS4 Tissues 6618 genes

Jensen TISSUES 6618 genes

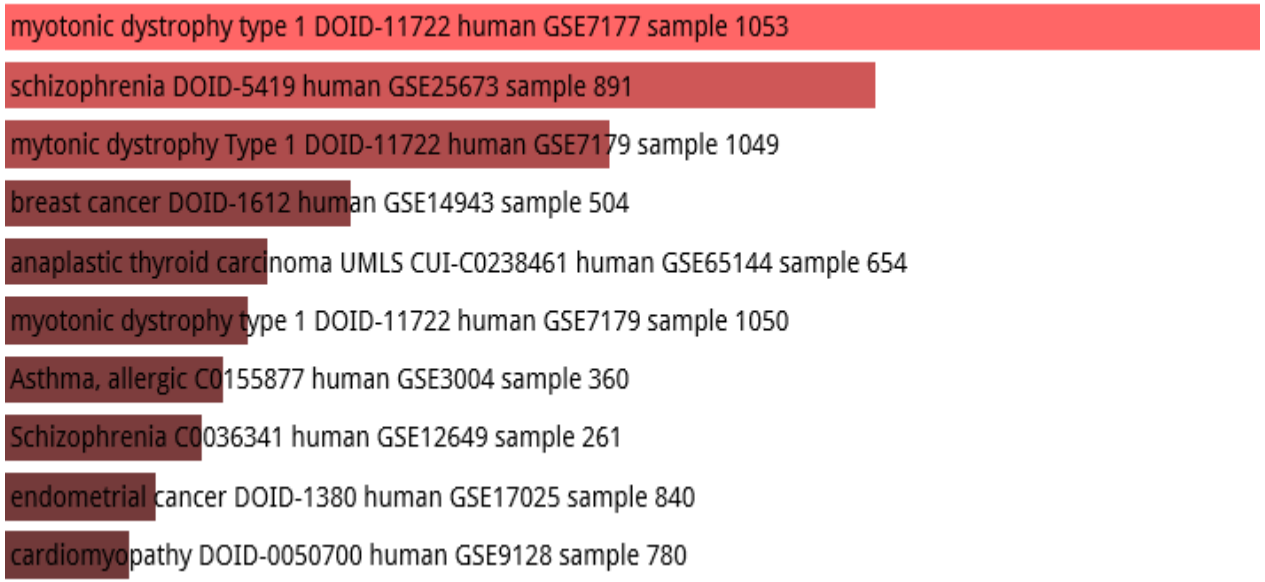


7,599 duplicated regions in the human genome

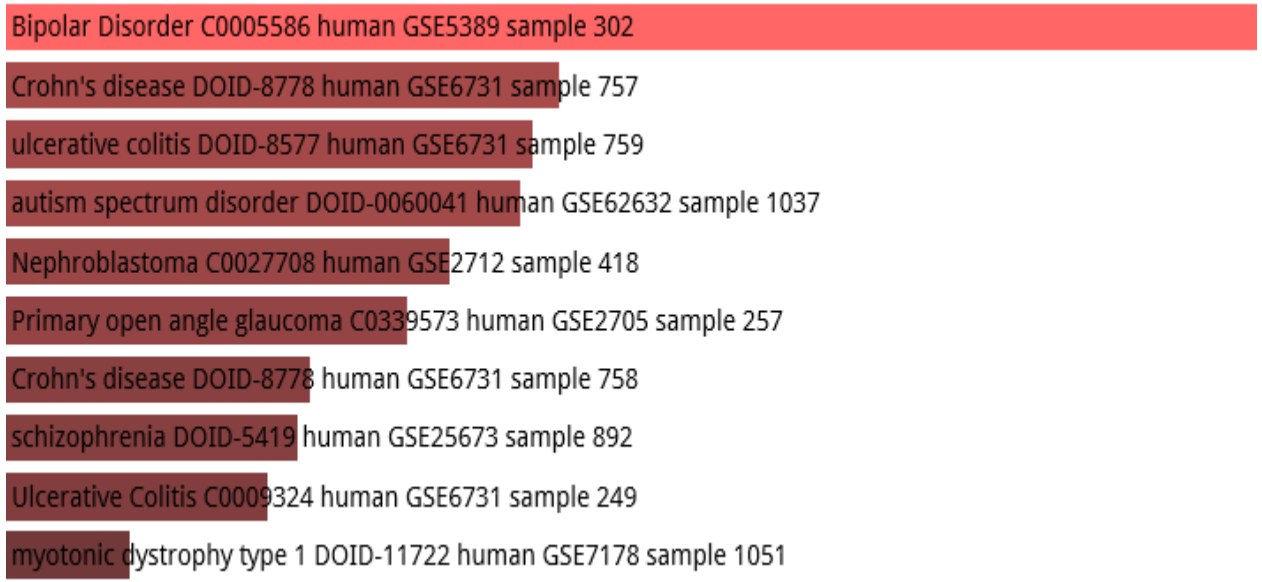
Jensen DISEASES 6618 genes



Disease Perturbations from GEO up

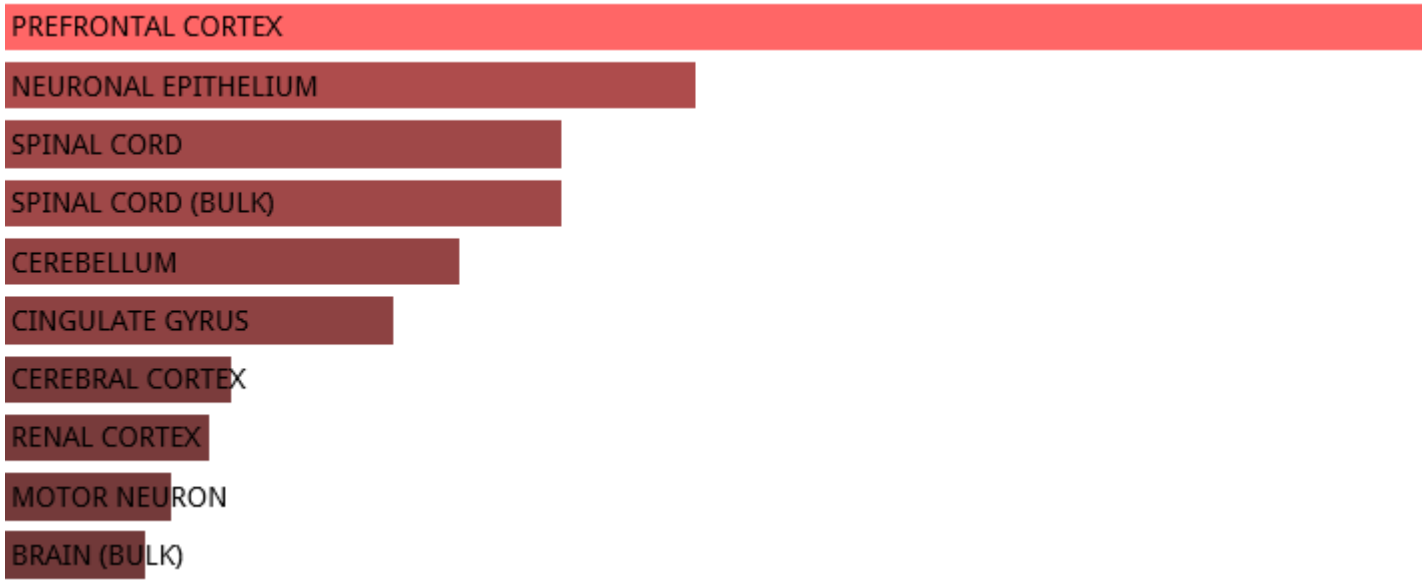


Disease Perturbations from GEO down

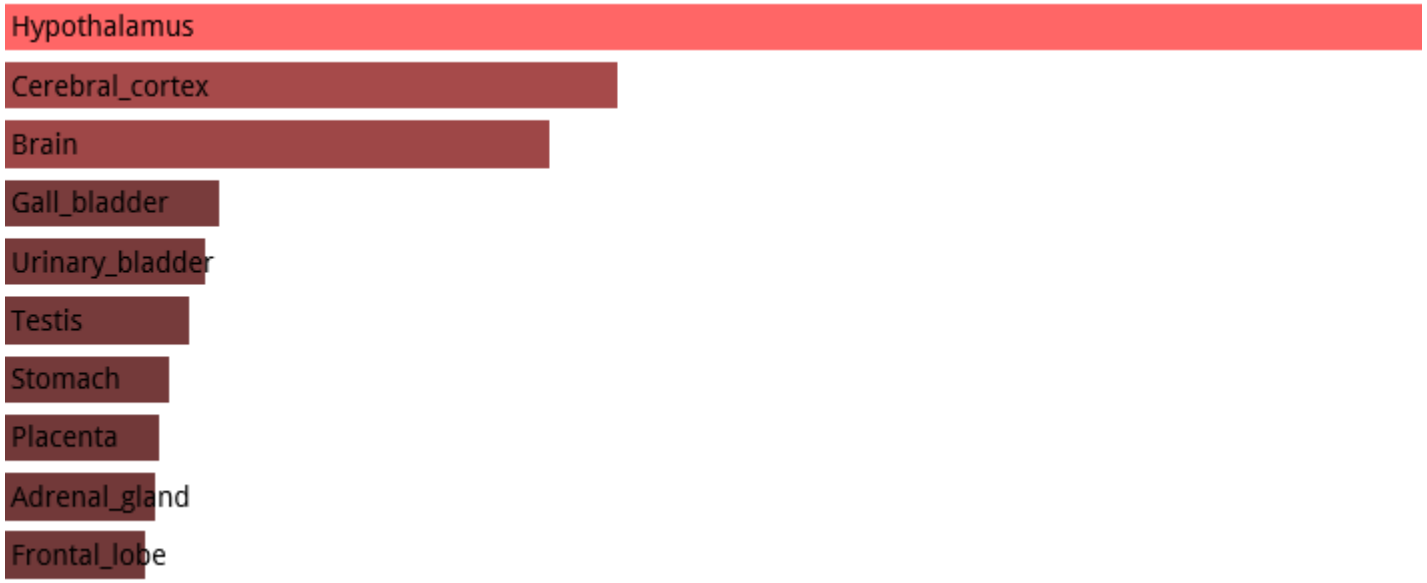


5,883 fixed human-specific deletions

ARCHS4 Tissues 5489 genes



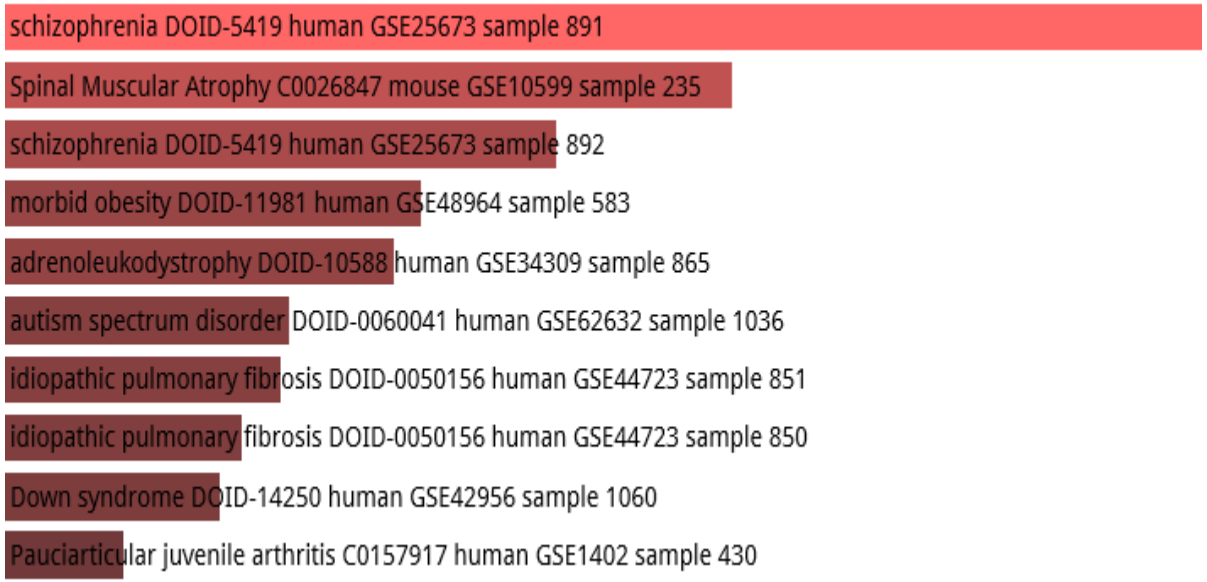
Jensen TISSUES 5489 genes



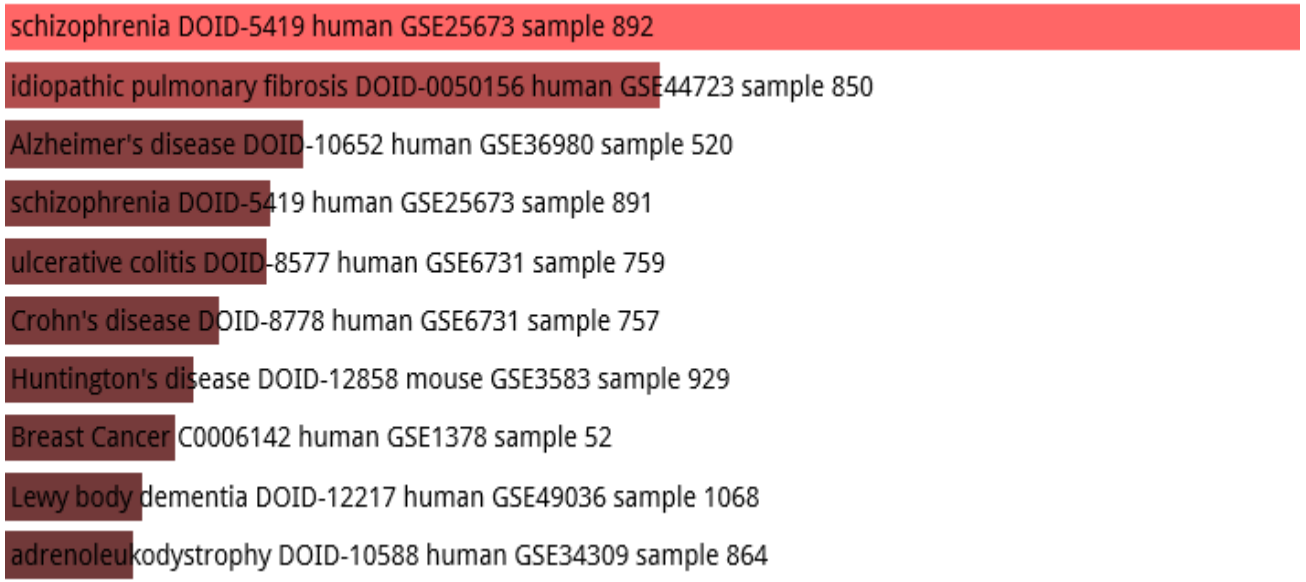
5,883 fixed human-specific deletions

Jensen DISEASES 5489 genes

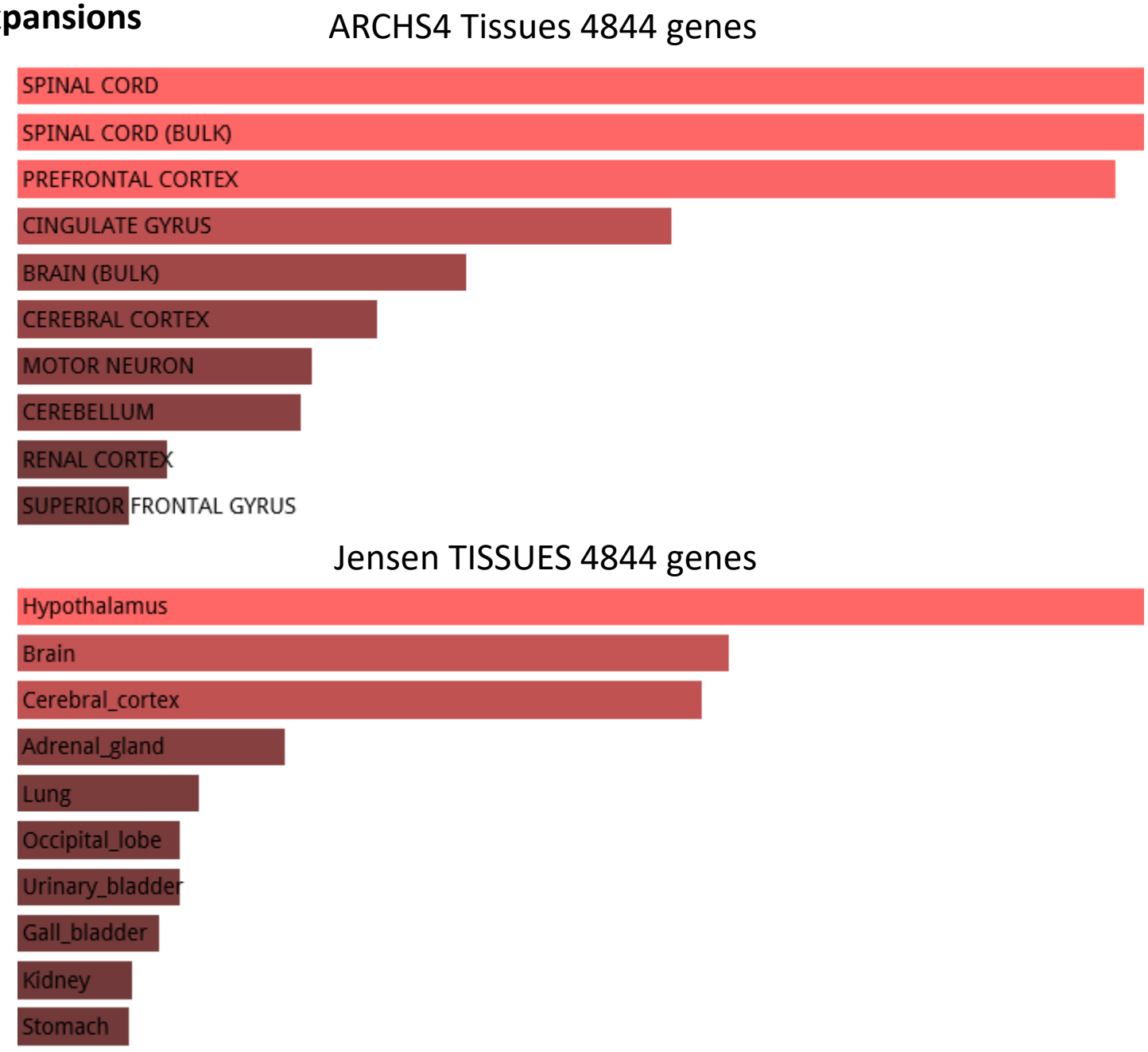
Disease Perturbations from GEO up



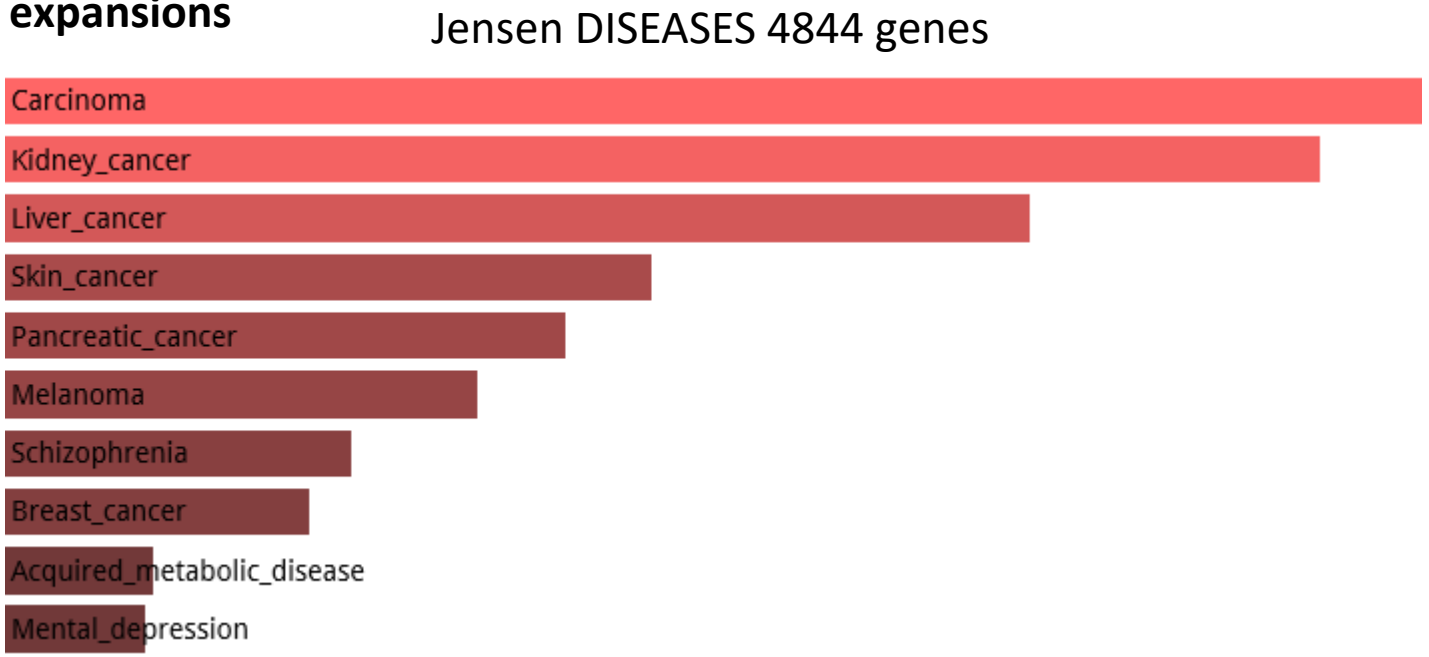
Disease Perturbations from GEO down

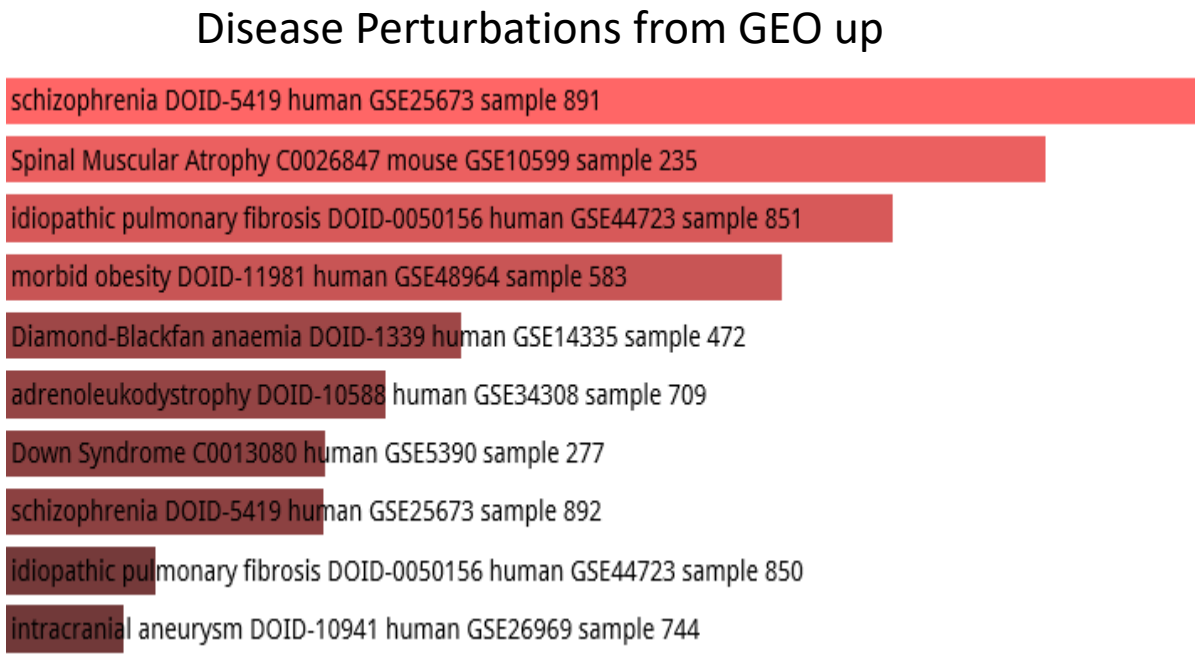


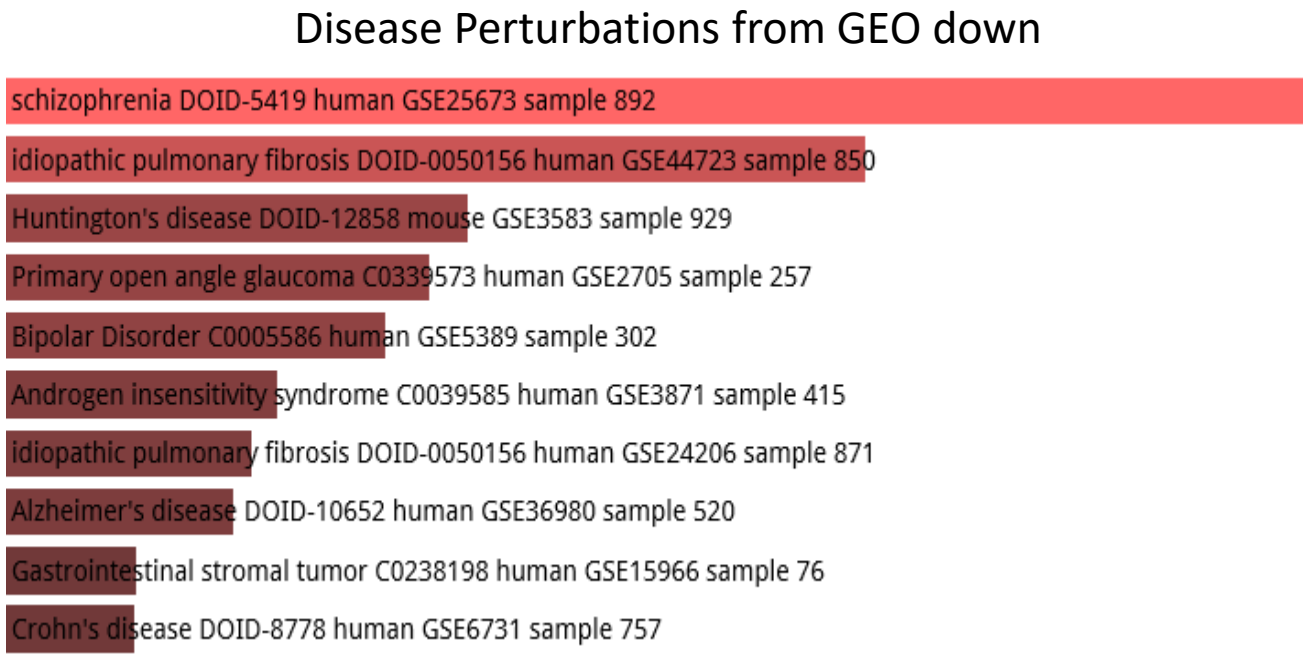
4,875 human-specific STR expansions



4,875 human-specific STR expansions

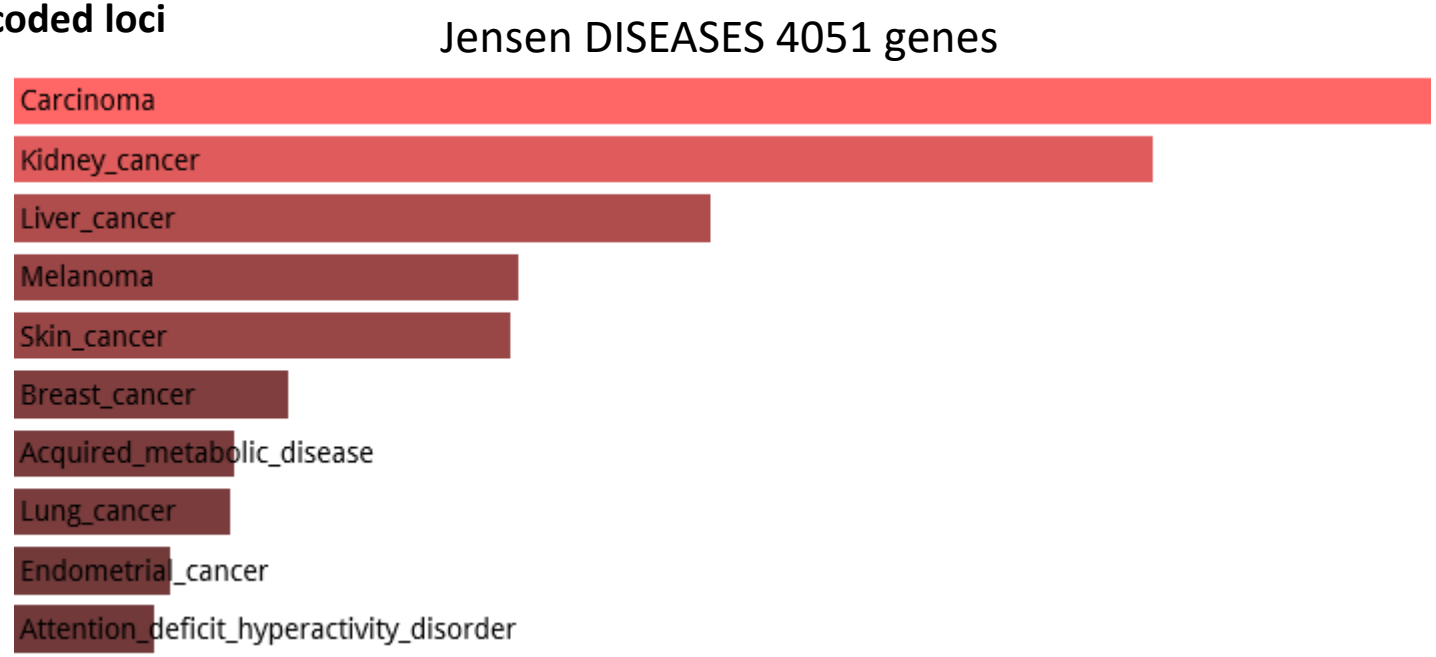


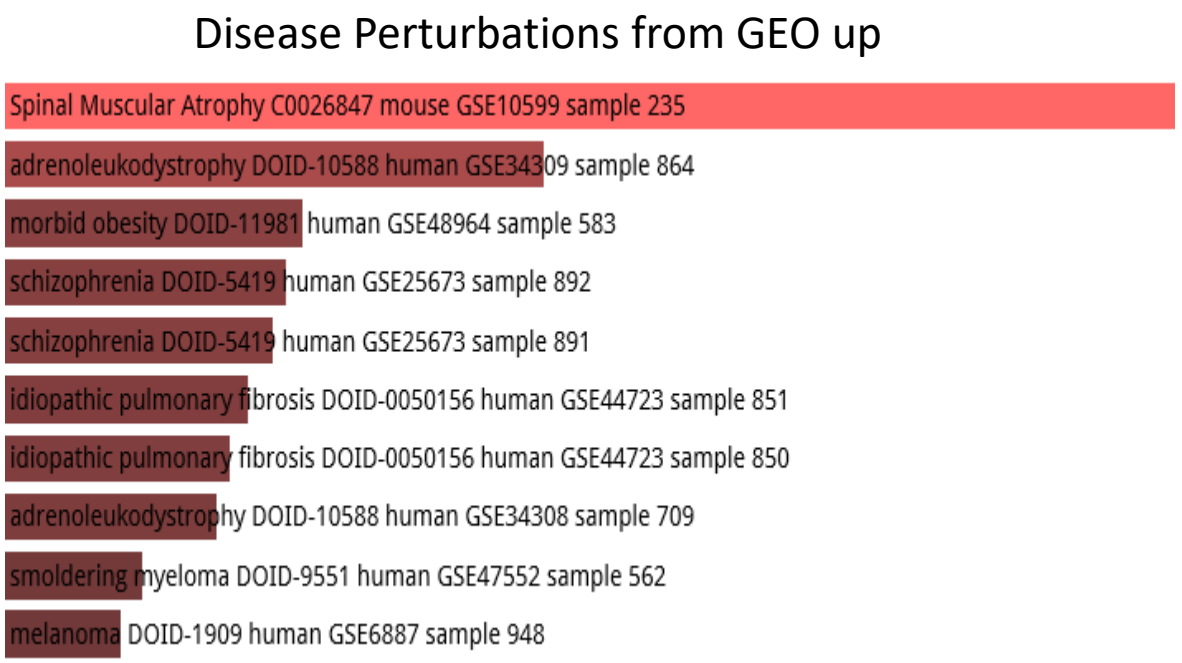


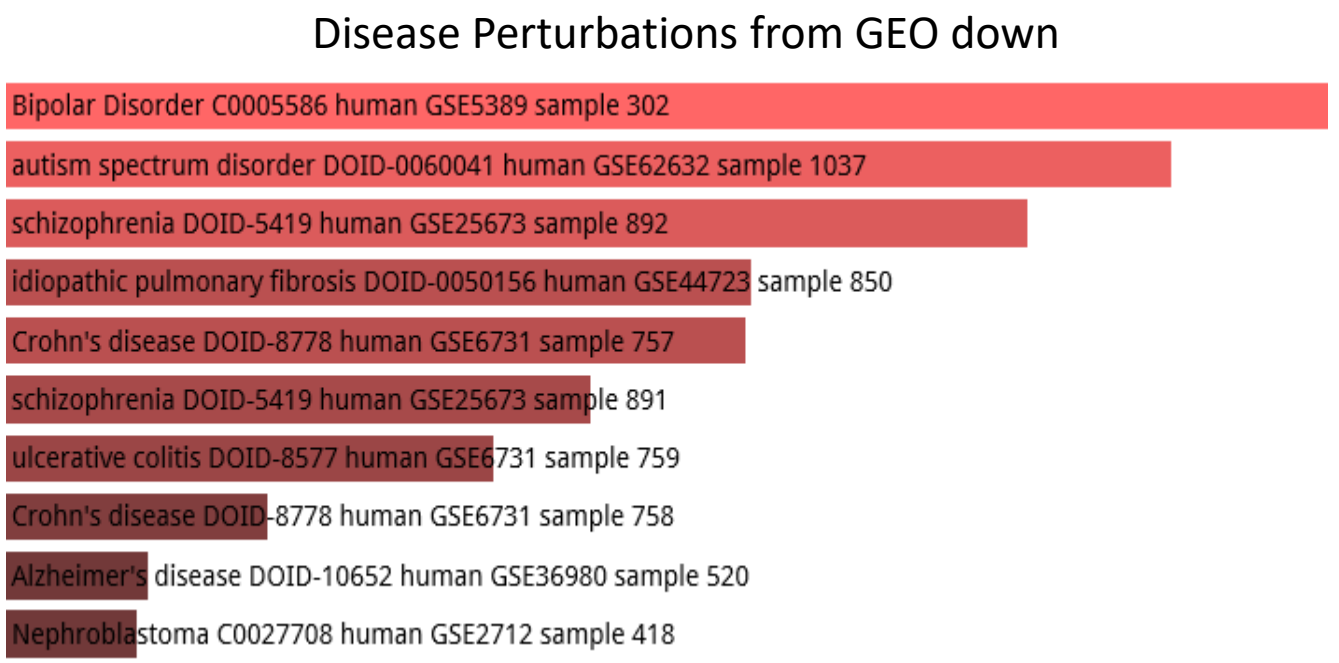


4,637 human-specific TE-encoded loci expressed in human DLPFC

4,637 human-specific TE-encoded loci expressed in human DLPFC

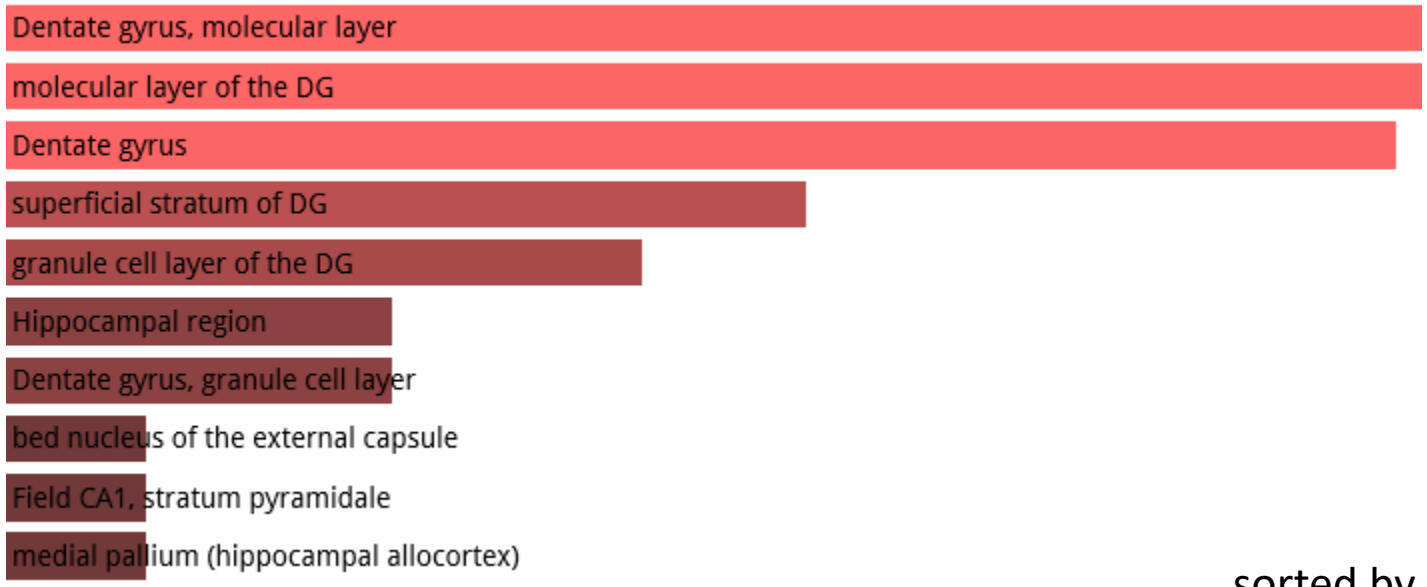






4,637 human-specific TE-encoded loci expressed in human DLPFC

Allen Brain Atlas up 4051 genes



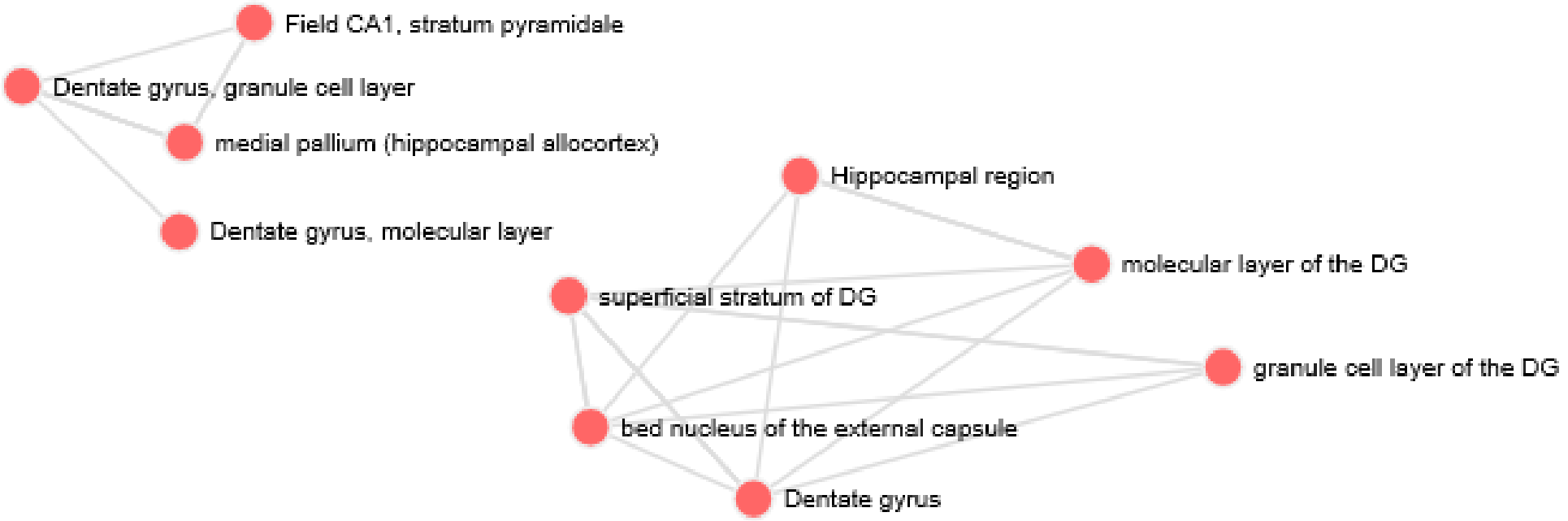
sorted by p-value ranking

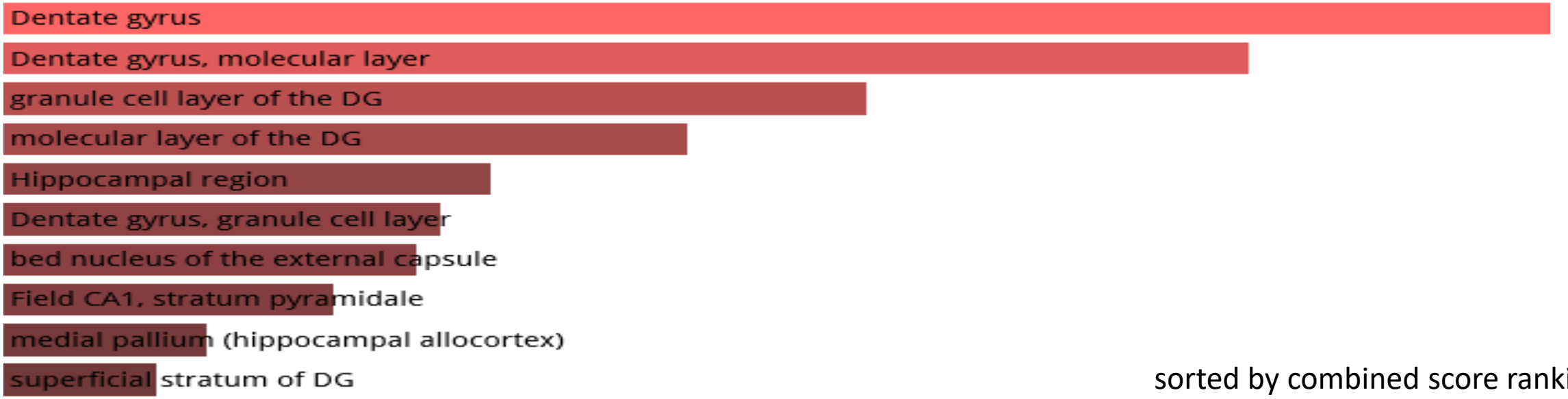
TOP 15 CATEGORIES

Term	Overlap	P-value	Adjusted P-value
Dentate gyrus	110/320	2.07E-09	1.51E-06
Dentate gyrus, molecular layer	105/301	1.92E-09	1.51E-06
molecular layer of the DG	105/301	1.92E-09	1.51E-06
superficial stratum of DG	179/601	1.14E-08	6.24E-06
granule cell layer of the DG	102/301	1.83E-08	8.03E-06
Hippocampal region	101/301	3.78E-08	1.18E-05
Dentate gyrus, granule cell layer	101/301	3.78E-08	1.18E-05
bed nucleus of the external capsule	100/301	7.67E-08	1.68E-05
Field CA1, stratum pyramidale	100/301	7.67E-08	1.68E-05
medial pallium (hippocampal allocortex)	100/301	7.67E-08	1.68E-05
mantle zone of DG	174/599	1.22E-07	2.4E-05
Subiculum, dorsal part, molecular layer	99/301	1.54E-07	2.4E-05
hilus of the DG	99/301	1.54E-07	2.4E-05
Dentate gyrus, polymorph layer	99/301	1.54E-07	2.4E-05
hippocampus (cortex Ammonis)	98/301	3.03E-07	2.88E-05

4,637 human-specific TE-encoded loci expressed in human DLPFC

Allen Brain Atlas up 4051 genes

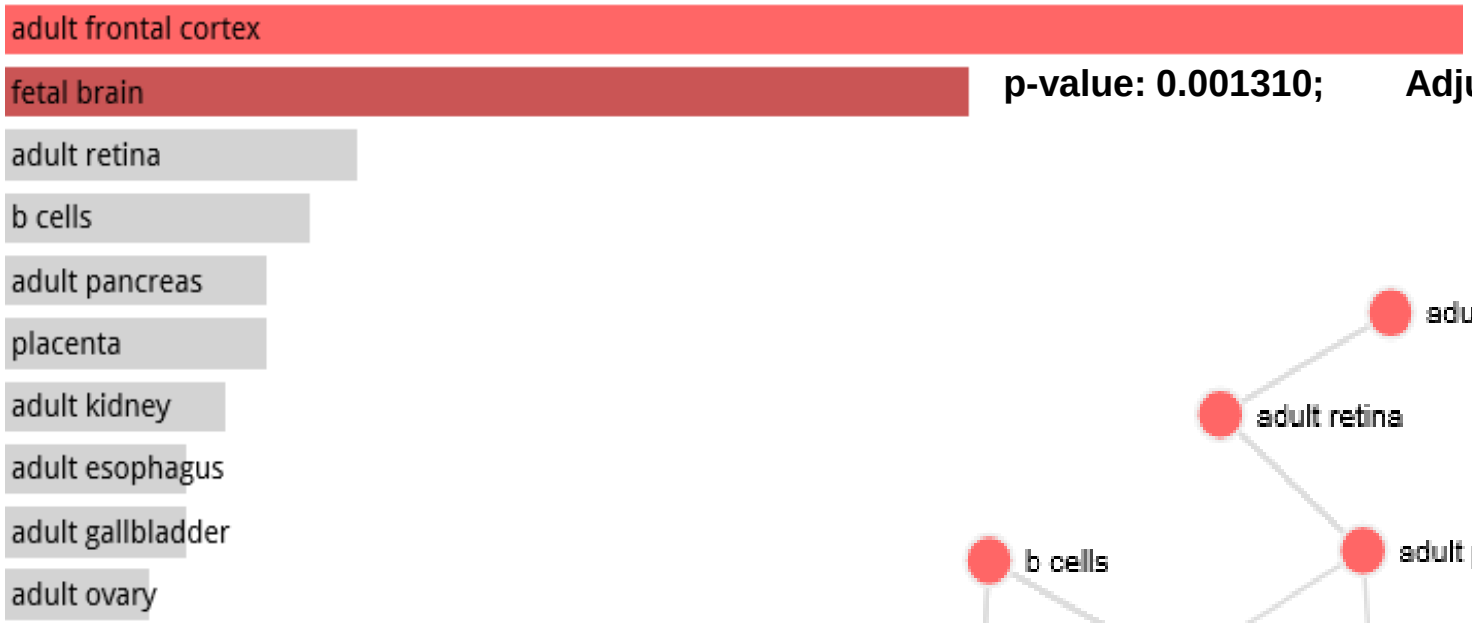




sorted by combined score ranking

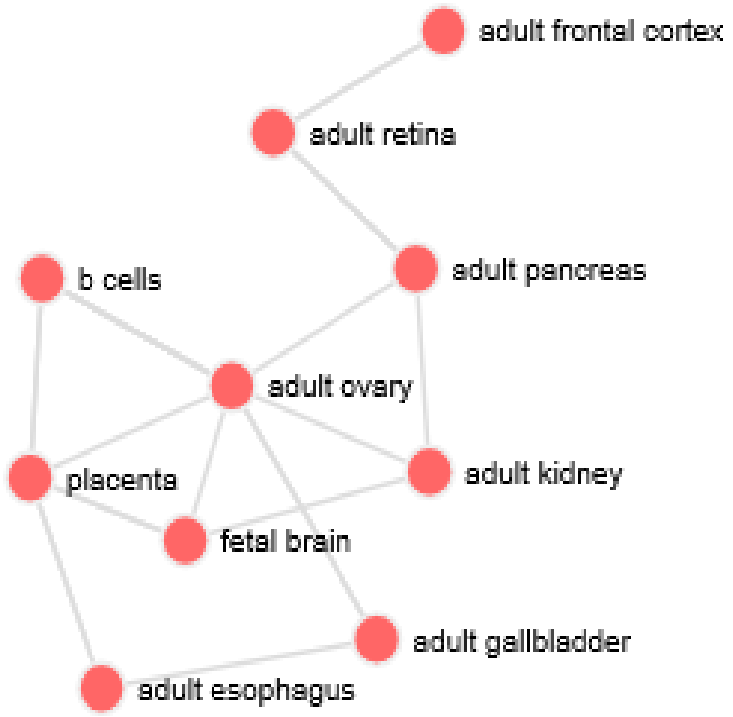
4,637 human-specific TE-encoded loci expressed in human DLPFC

Tissue Protein Expression from Human Proteome Map: 4051 genes

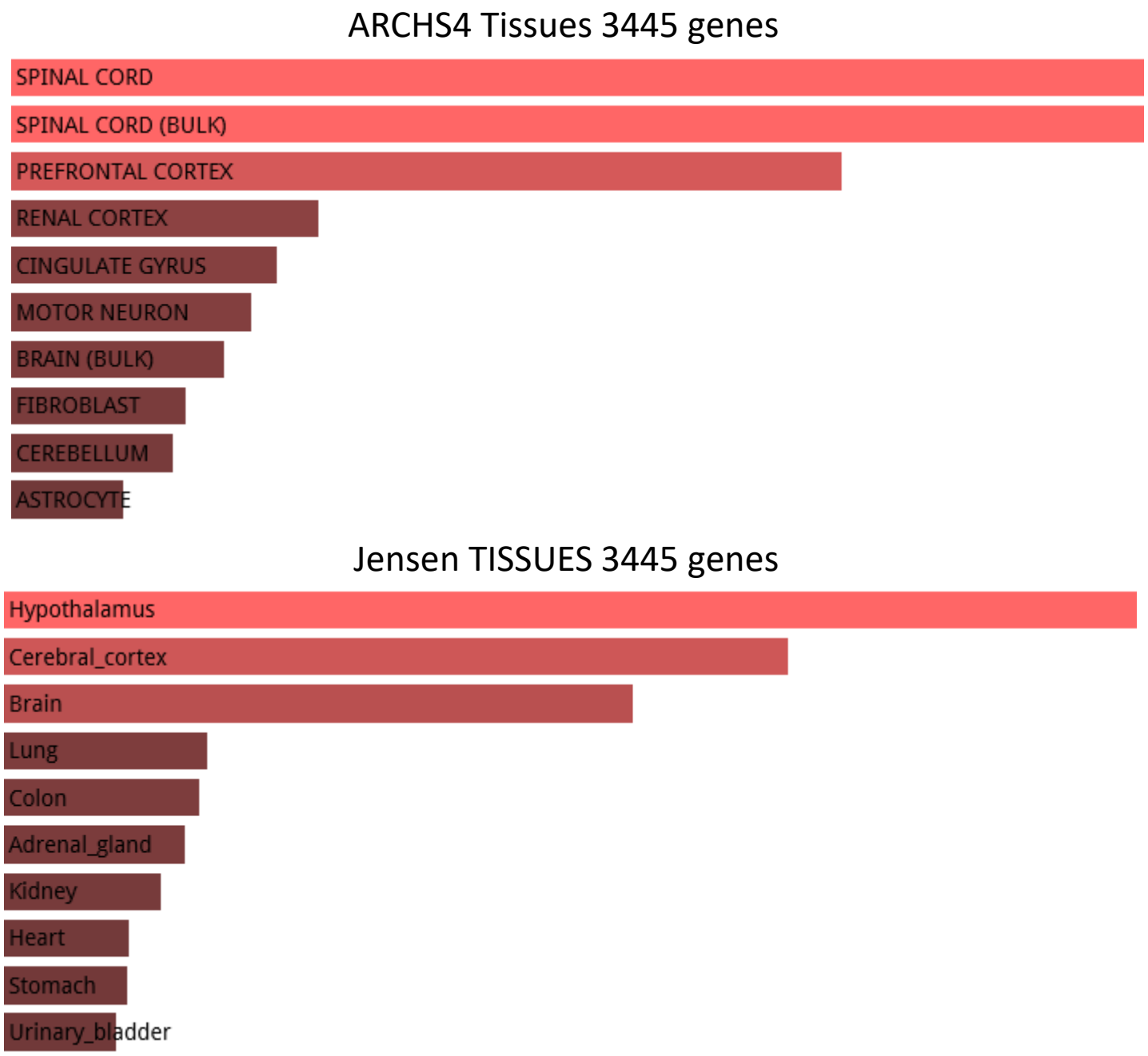


p-value: 0.00006954 Adjusted p-value: 0.002086

p-value: 0.001310; Adjusted p-value: 0.01966



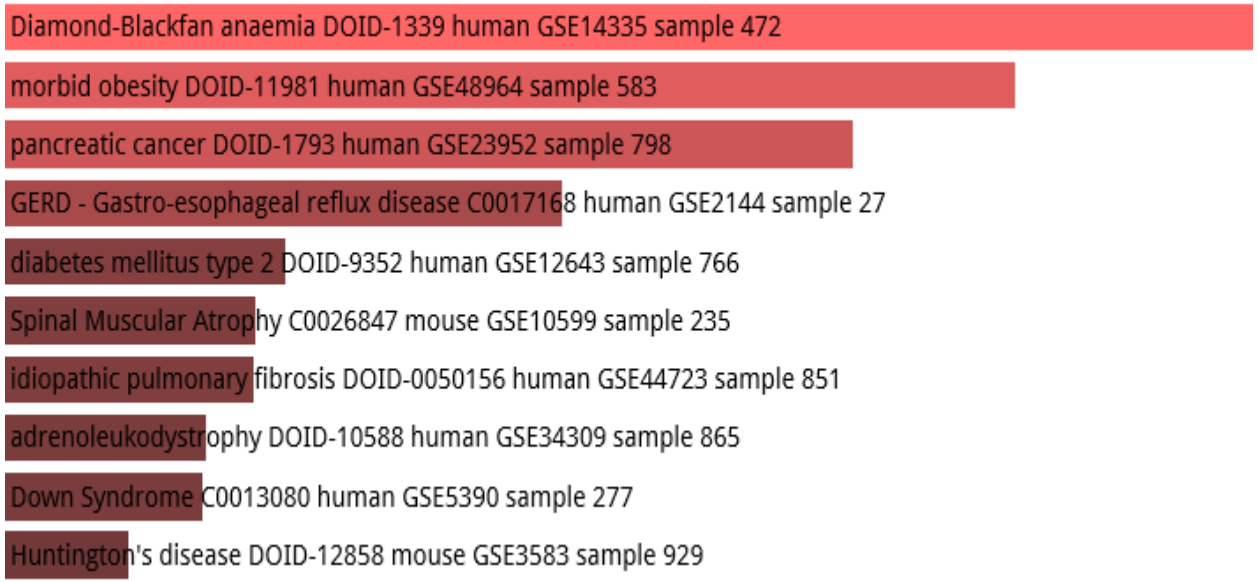
3,538 human-specific ace-DHS



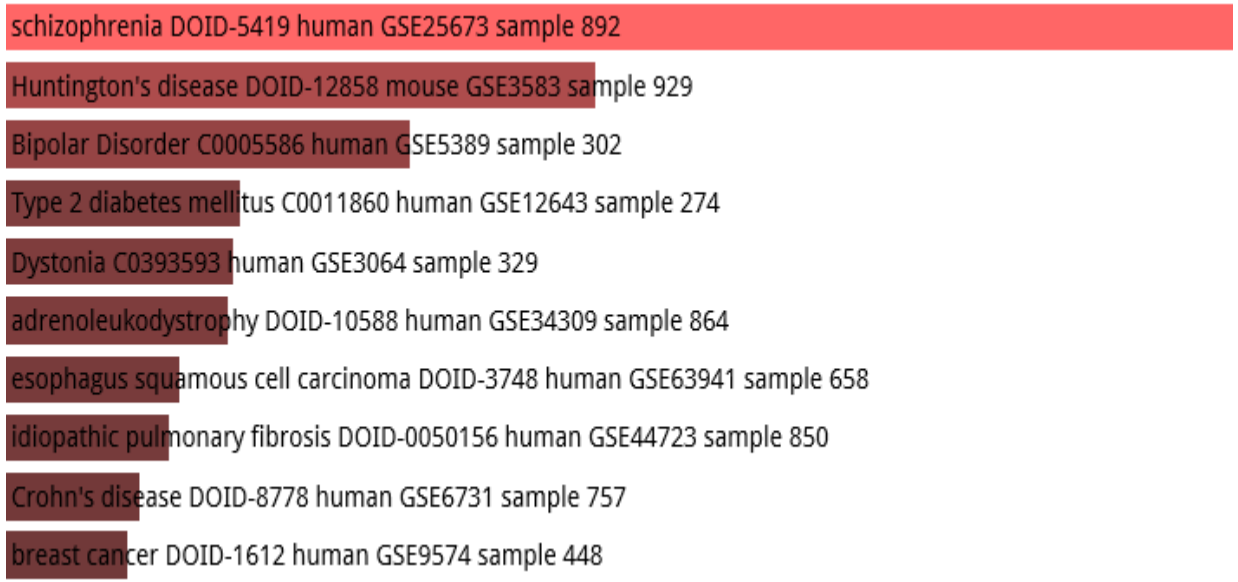
3,538 human-specific ace-DHS

Jensen DISEASES 3445 genes

Disease Perturbations from GEO up

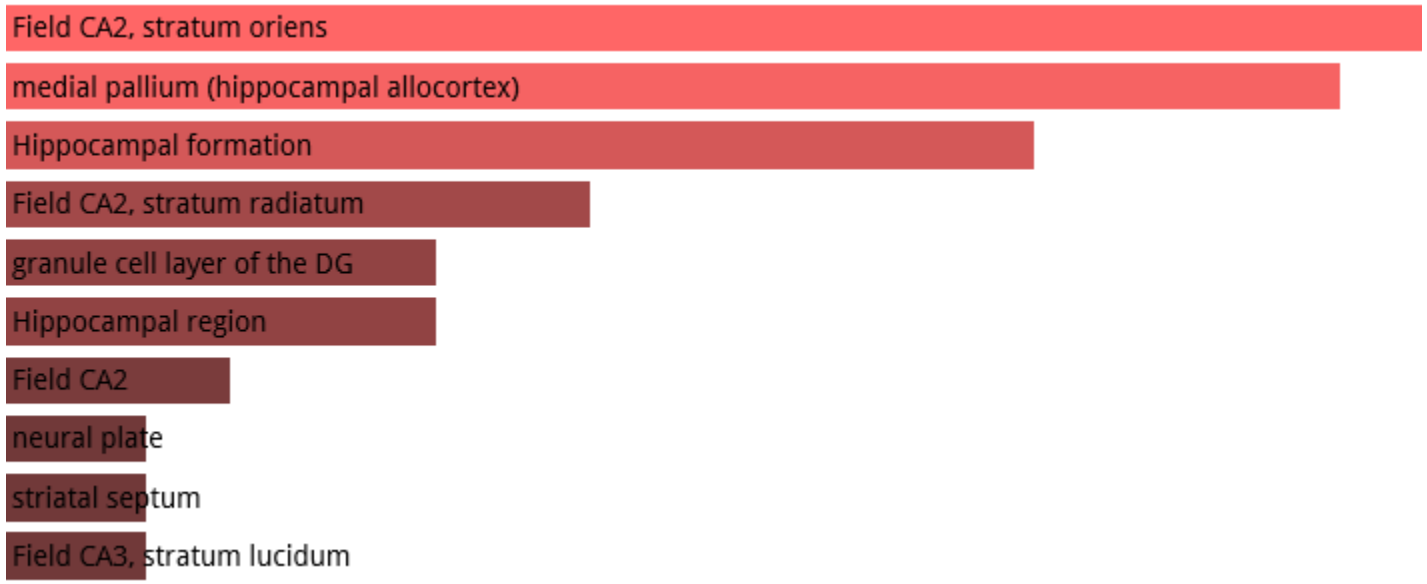


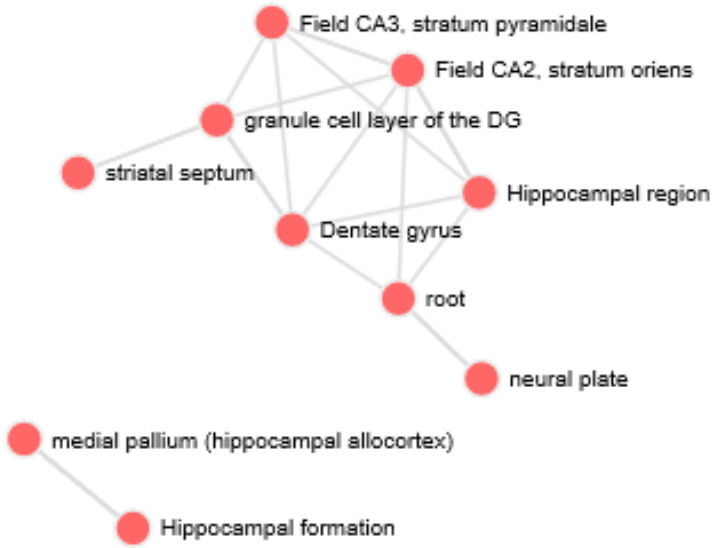
Disease Perturbations from GEO down



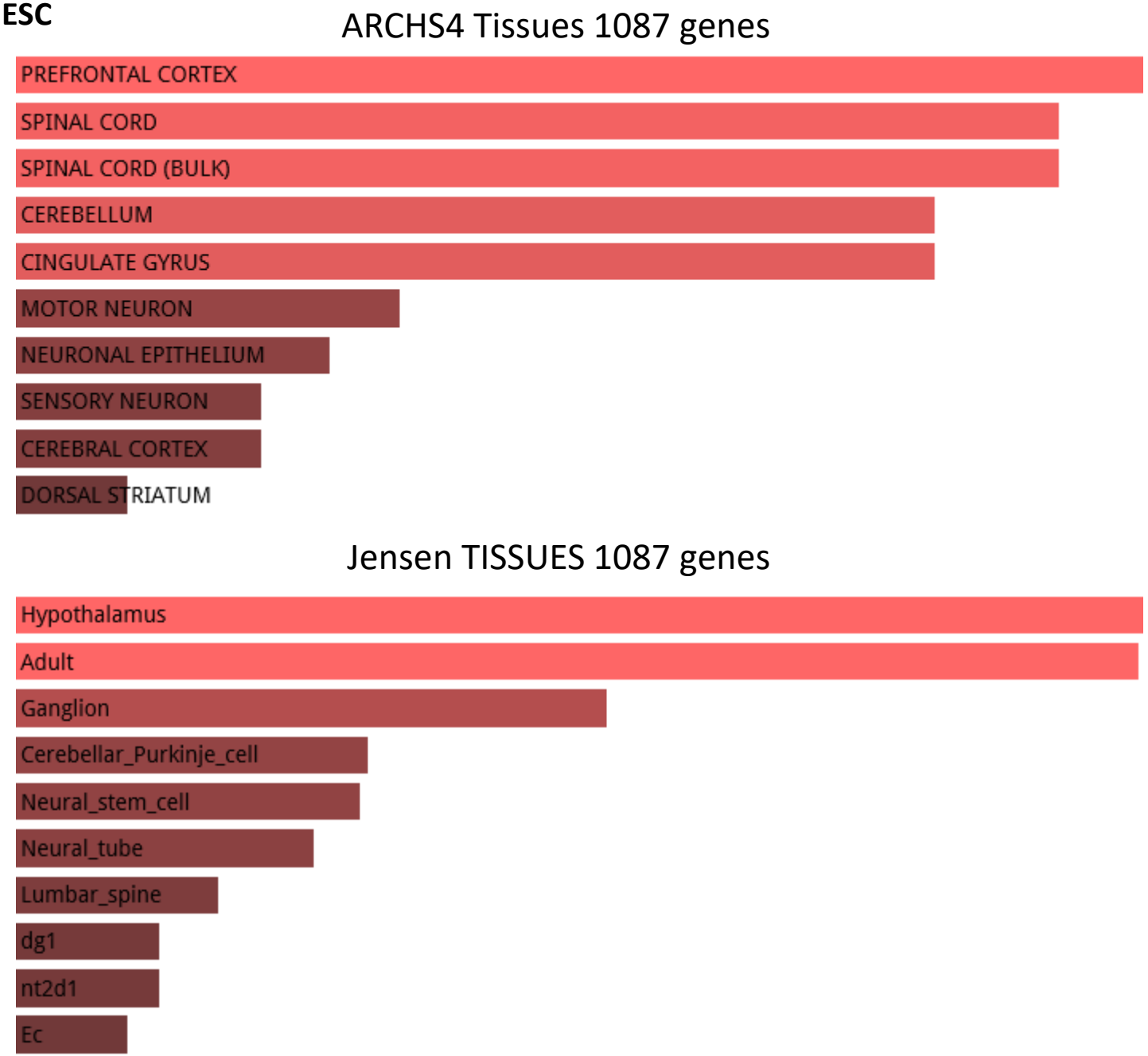
3,538 human-specific ace-DHS

Allen Brain Atlas up 3445 genes



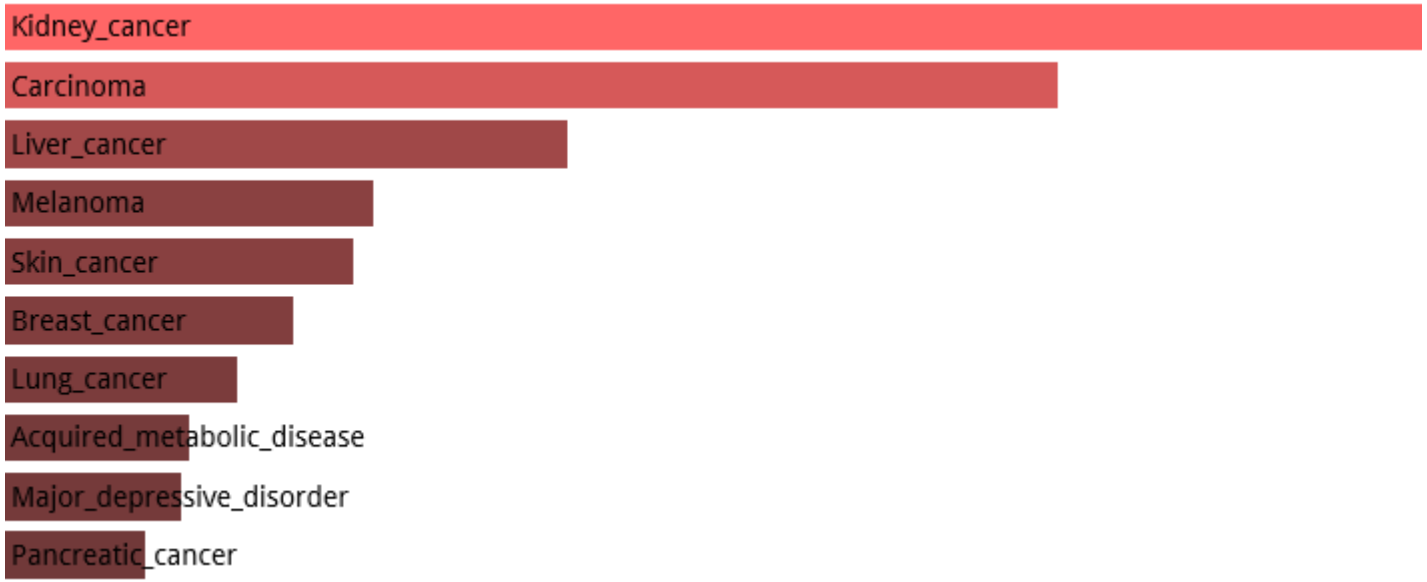


3,803 human-specific TFBS in hESC

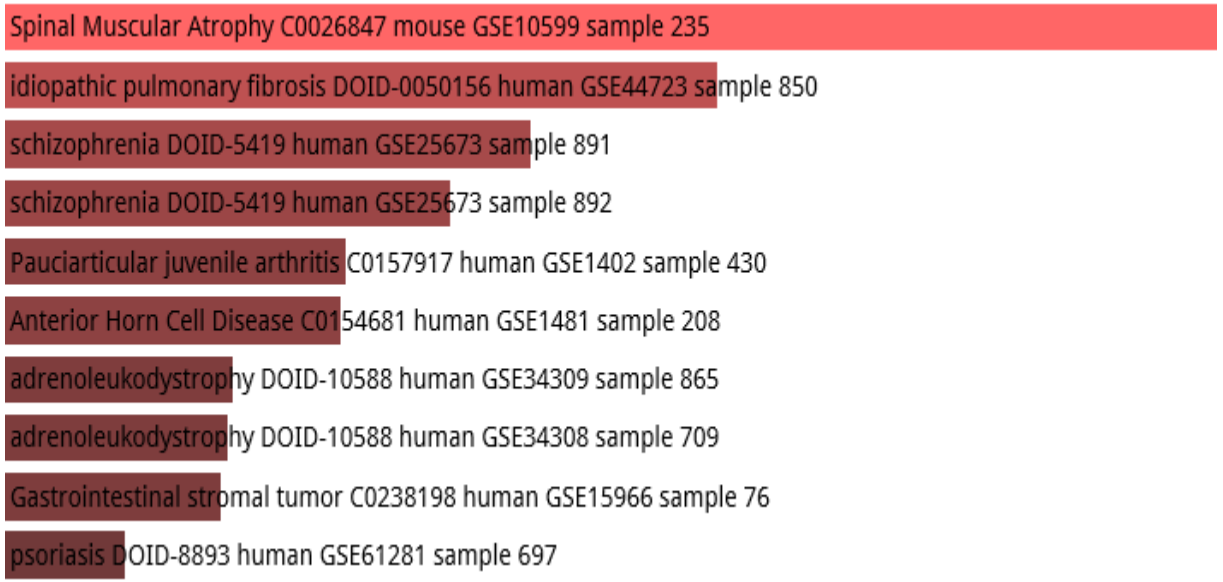


3,803 human-specific TFBS in hESC

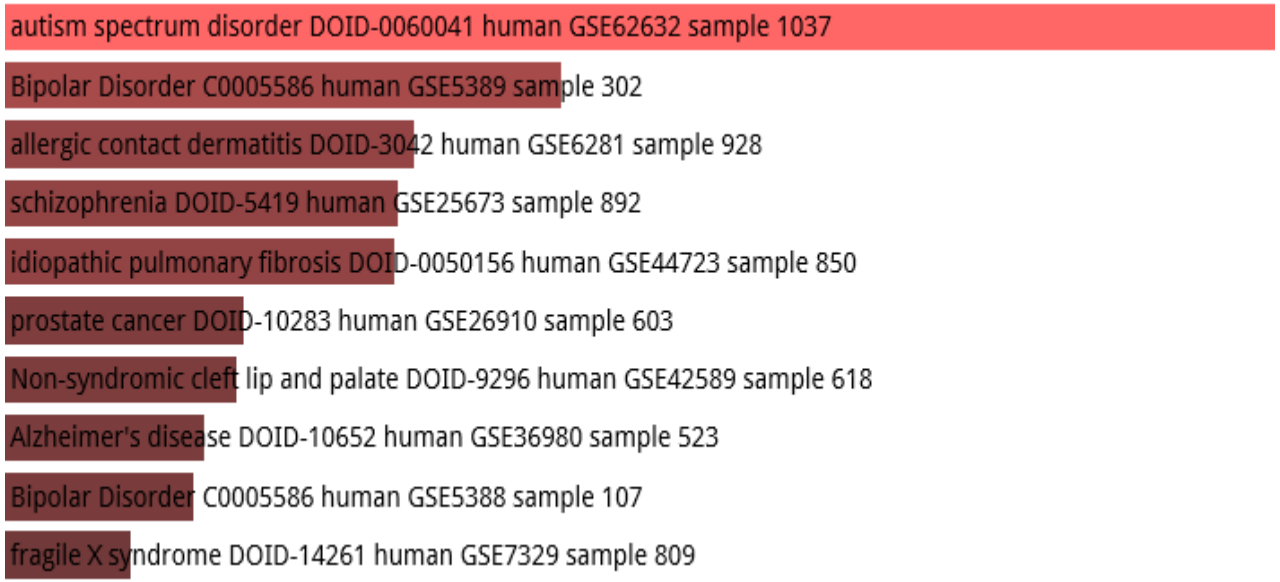
Jensen DISEASES 1087 genes



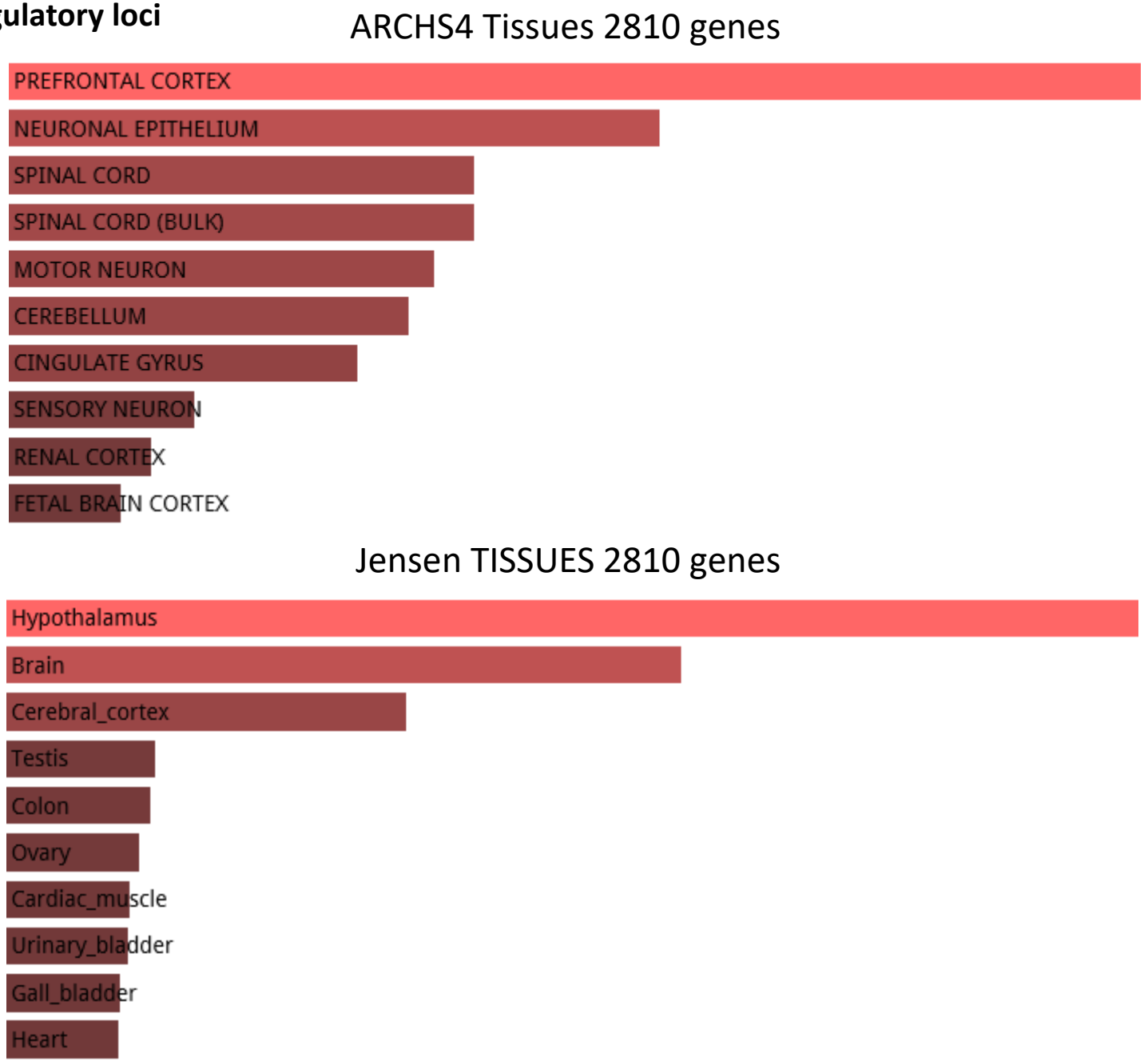
Disease Perturbations from GEO up



Disease Perturbations from GEO down

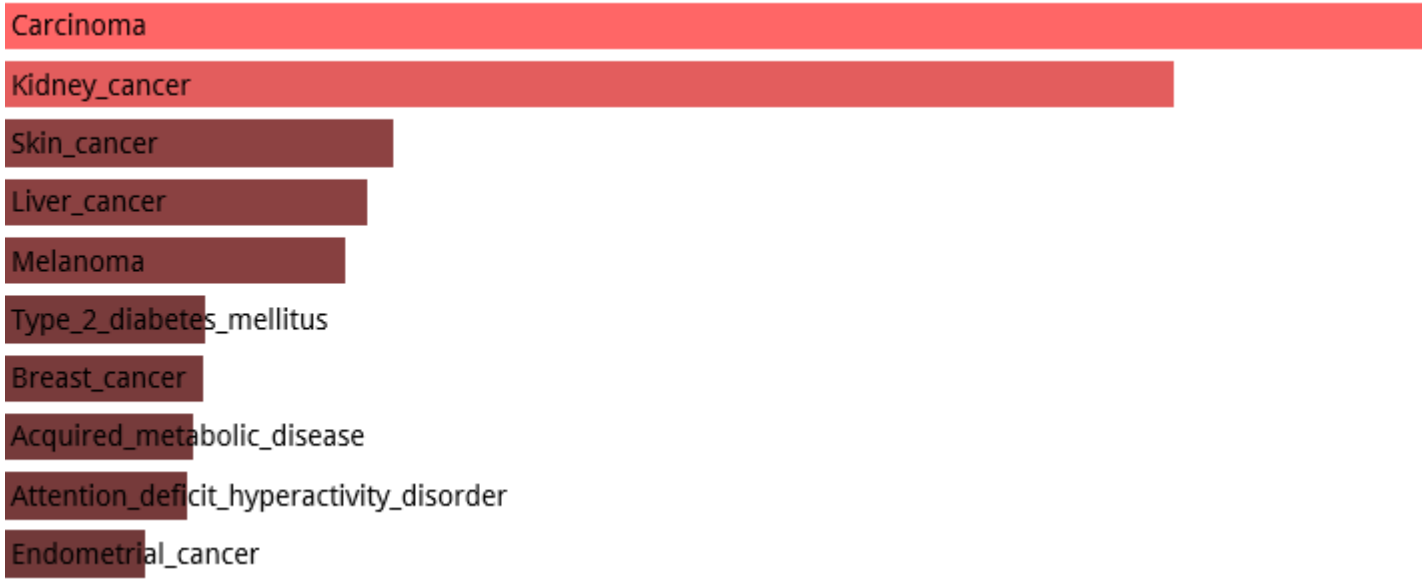


4,249 fixed human-specific regulatory loci

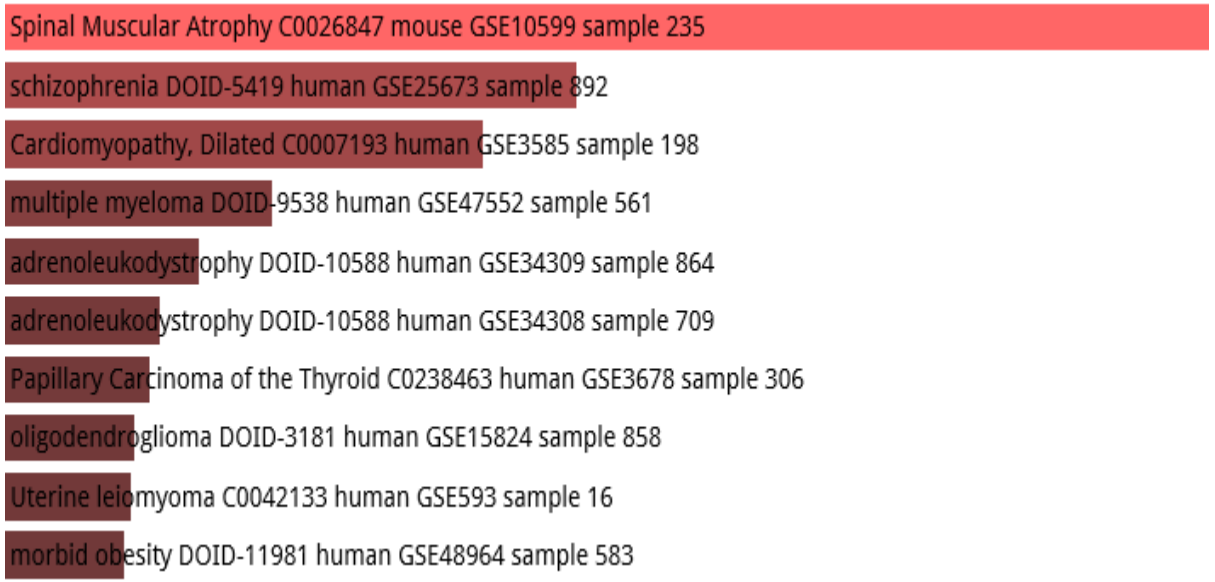


4,249 fixed human-specific regulatory loci

Jensen DISEASES 2810 genes

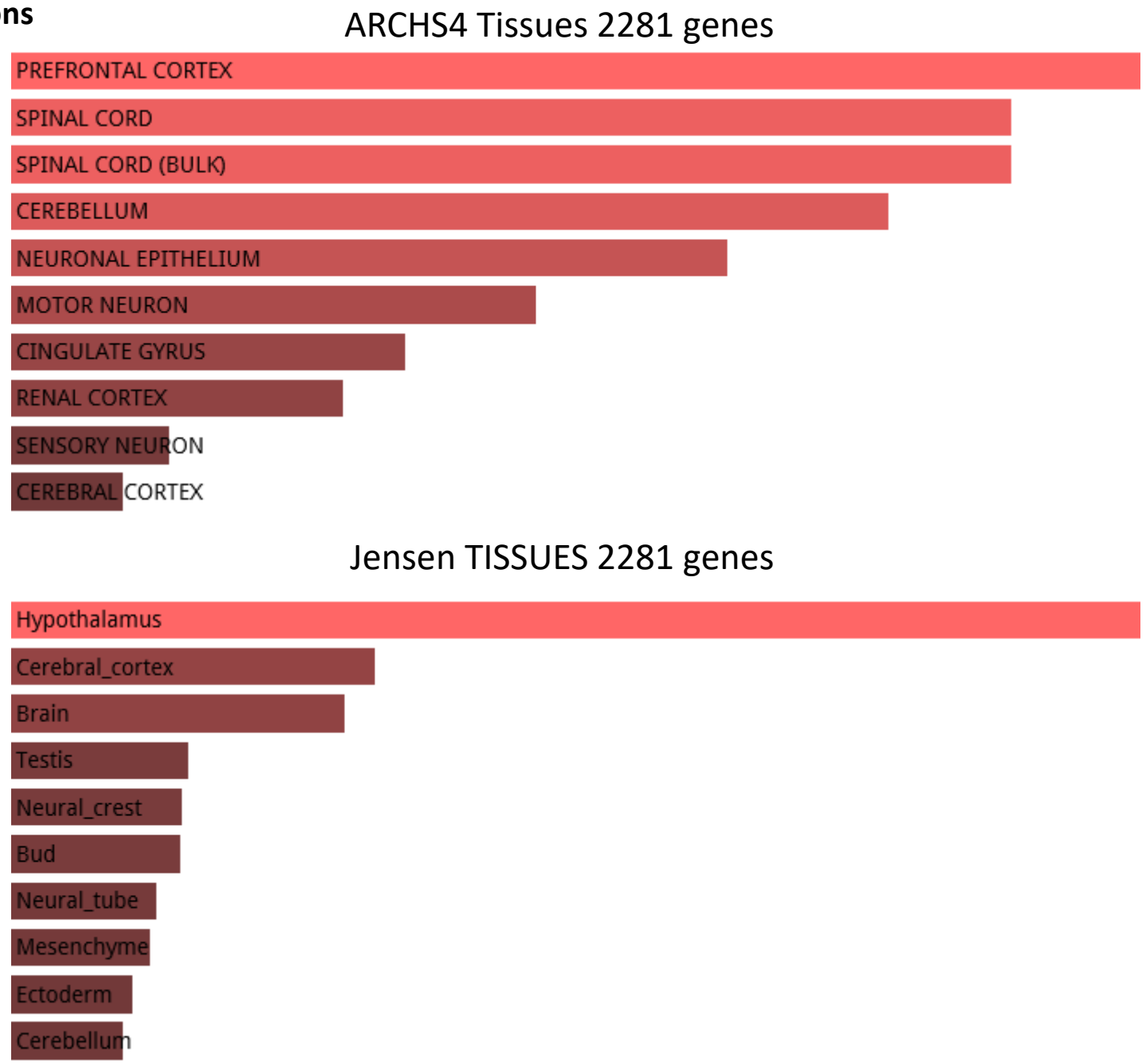


Disease Perturbations from GEO up



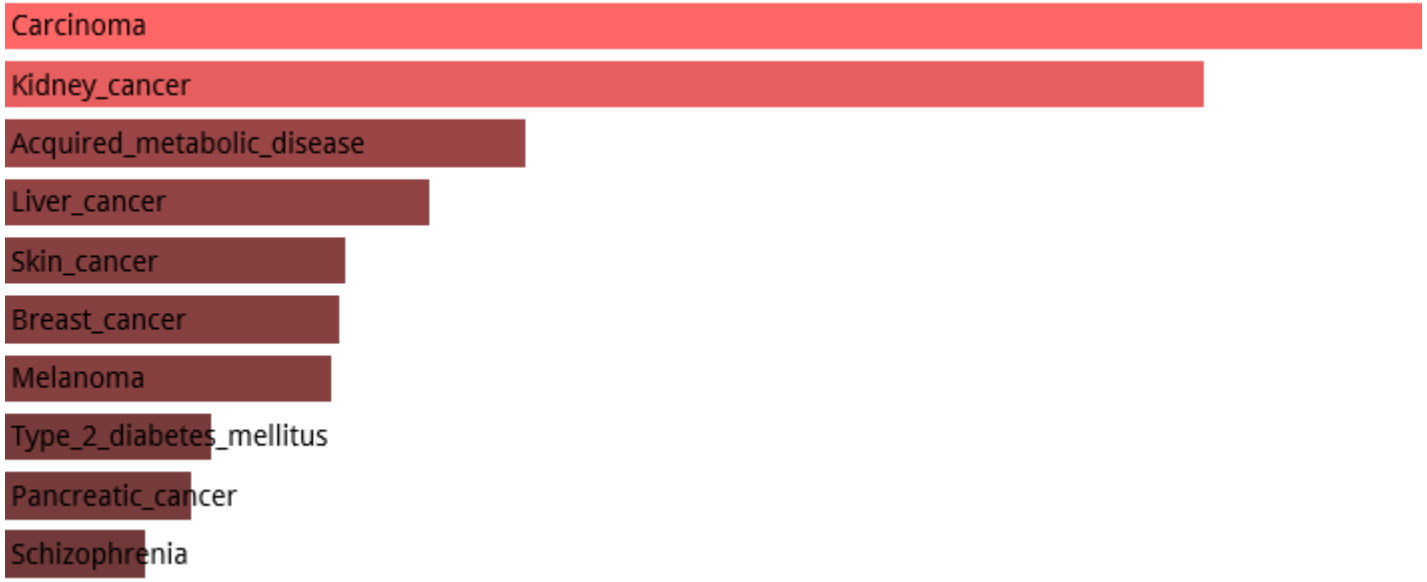
Disease Perturbations from GEO down

2,745 human accelerated regions

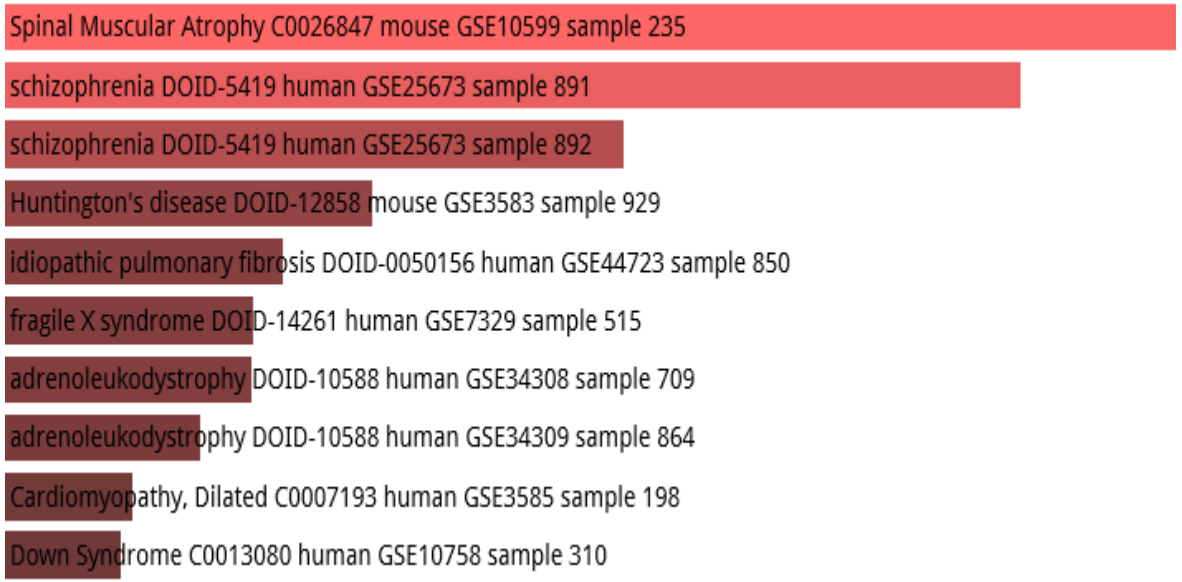


2,745 human accelerated regions

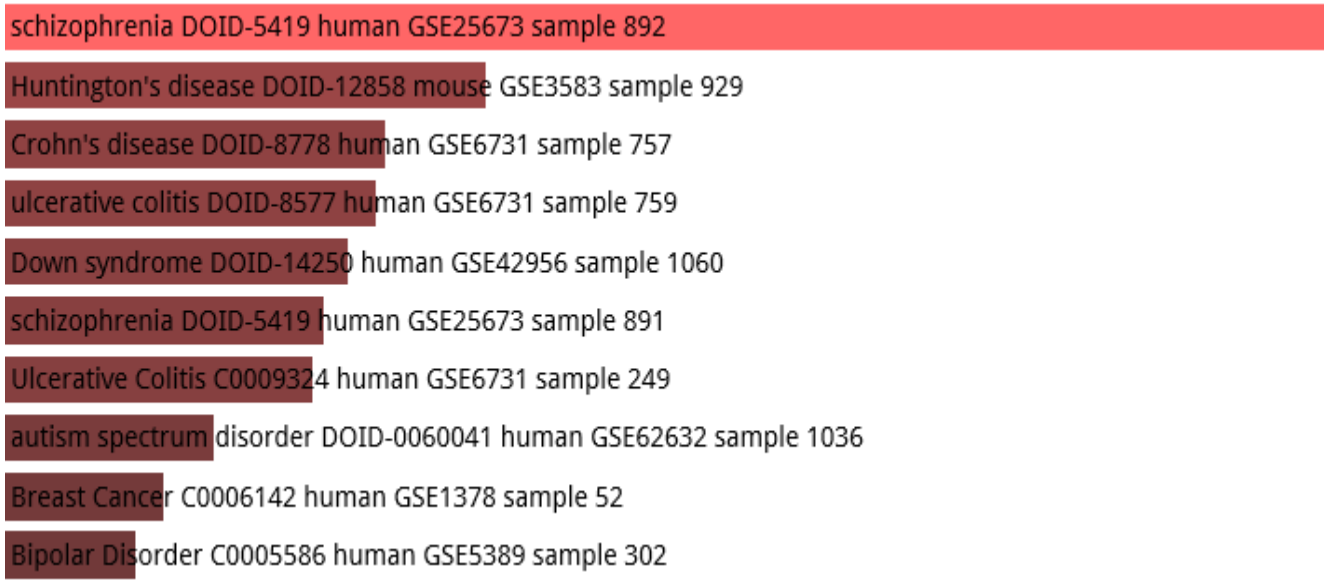
Jensen DISEASES 2281 genes



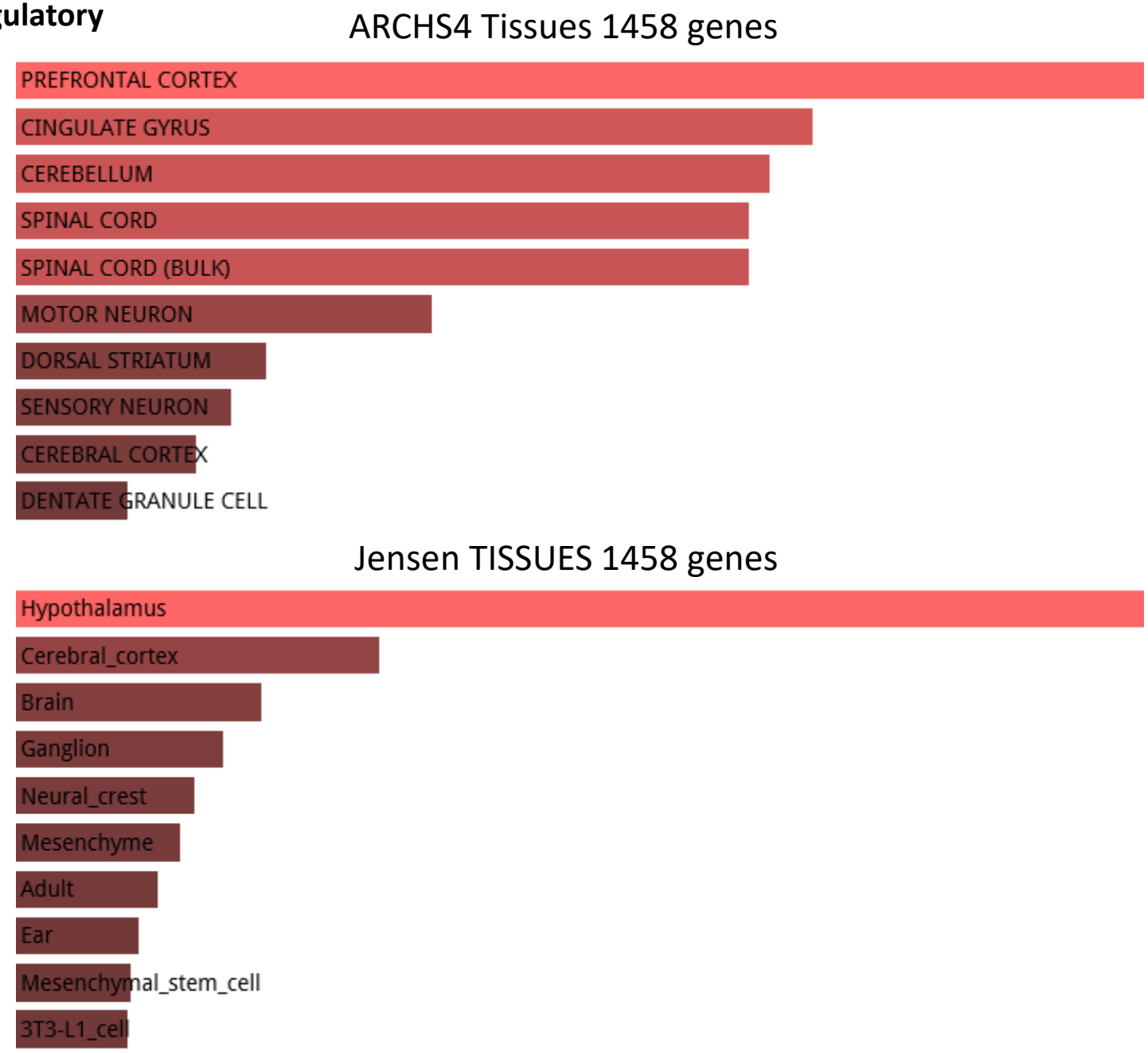
Disease Perturbations from GEO up



Disease Perturbations from GEO down

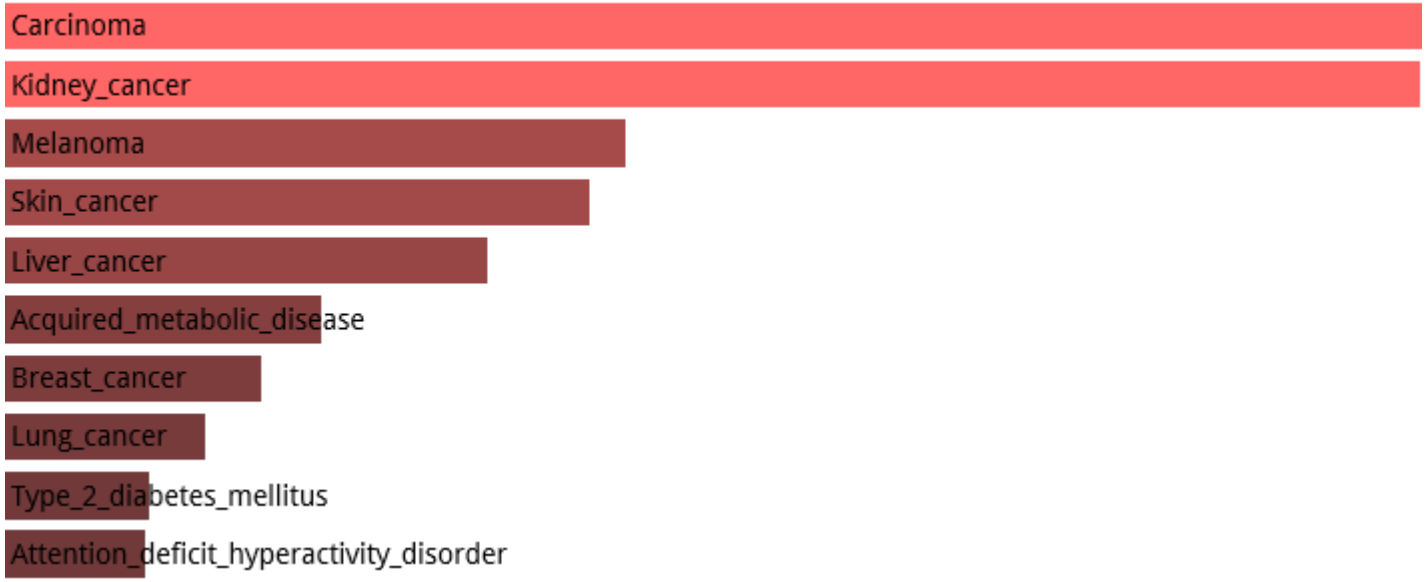


1,932 fixed human-specific regulatory regions (hESC DHS)

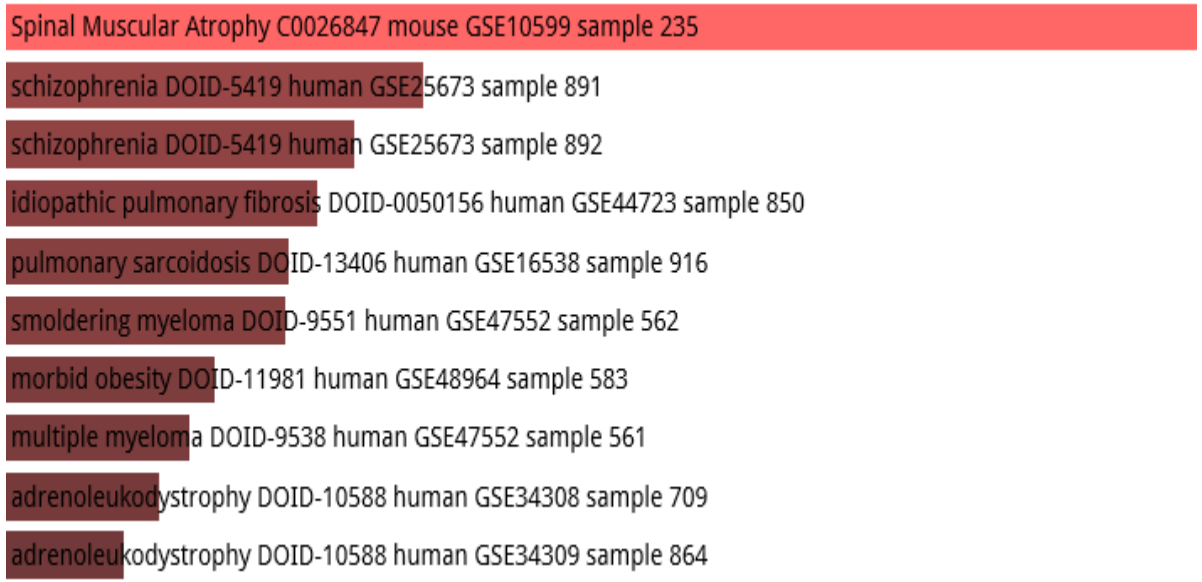


1,932 fixed human-specific regulatory regions (hESC DHS)

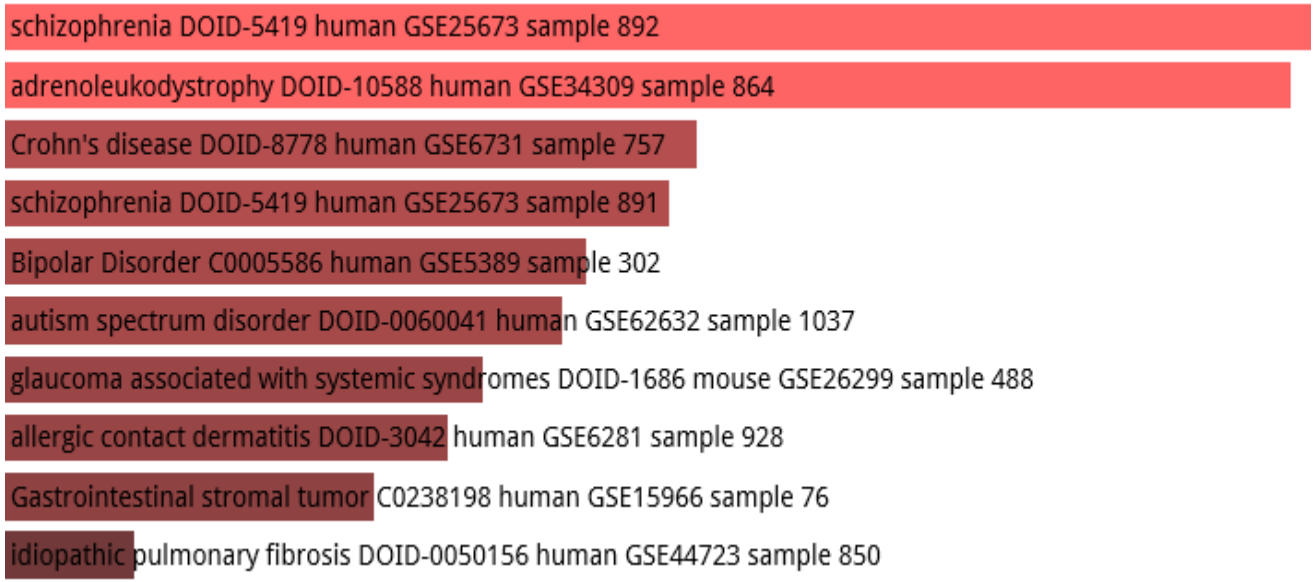
Jensen DISEASES 1458 genes



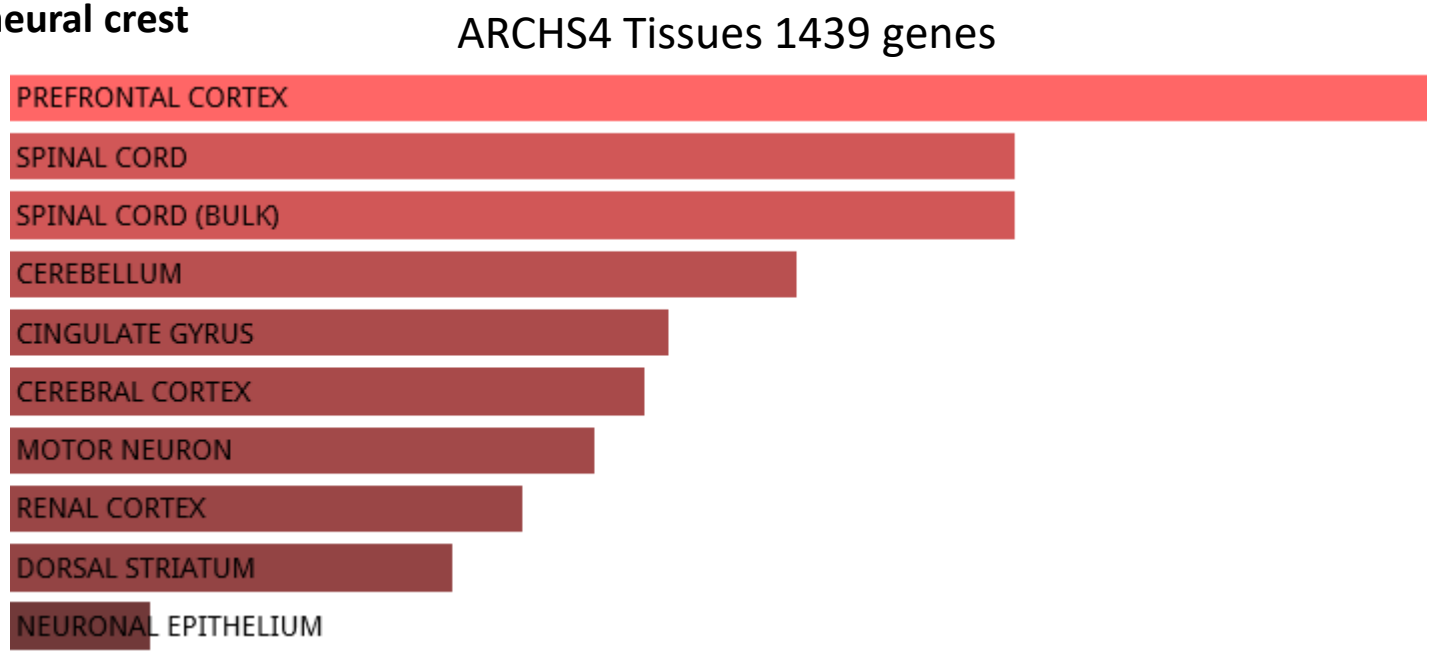
Disease Perturbations from GEO up

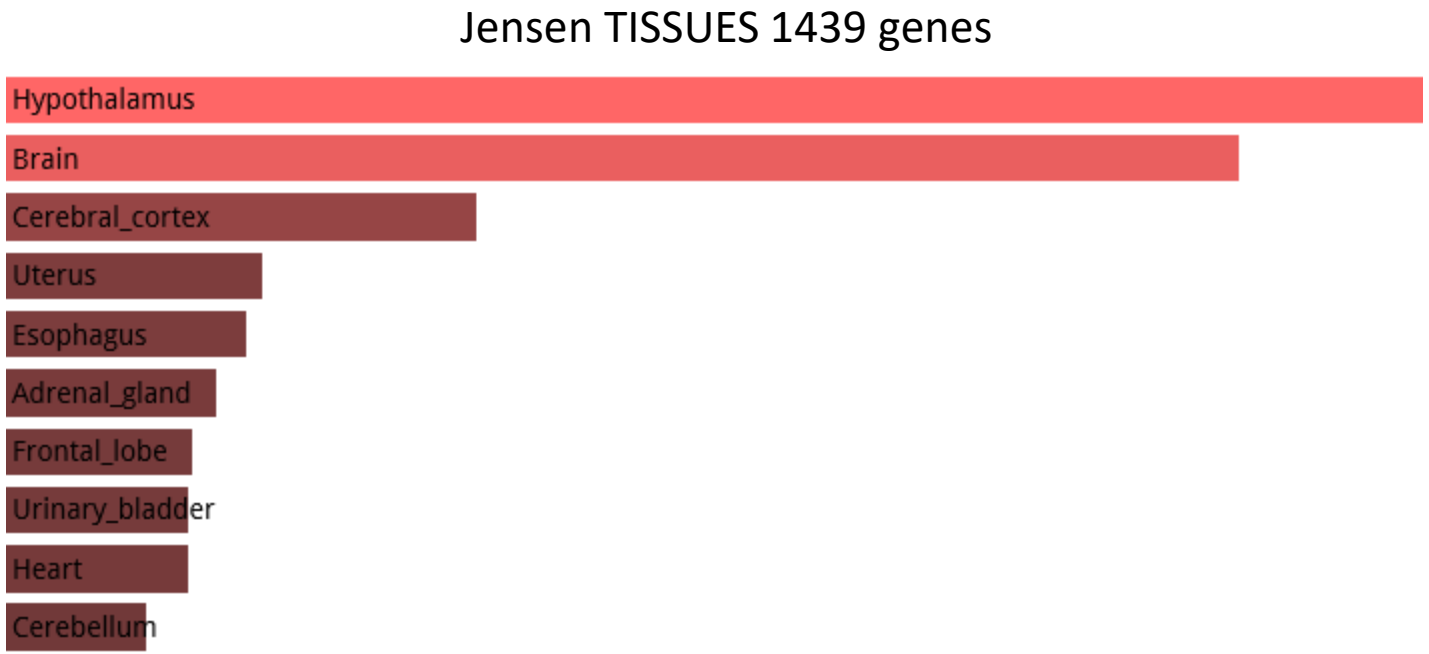


Disease Perturbations from GEO down

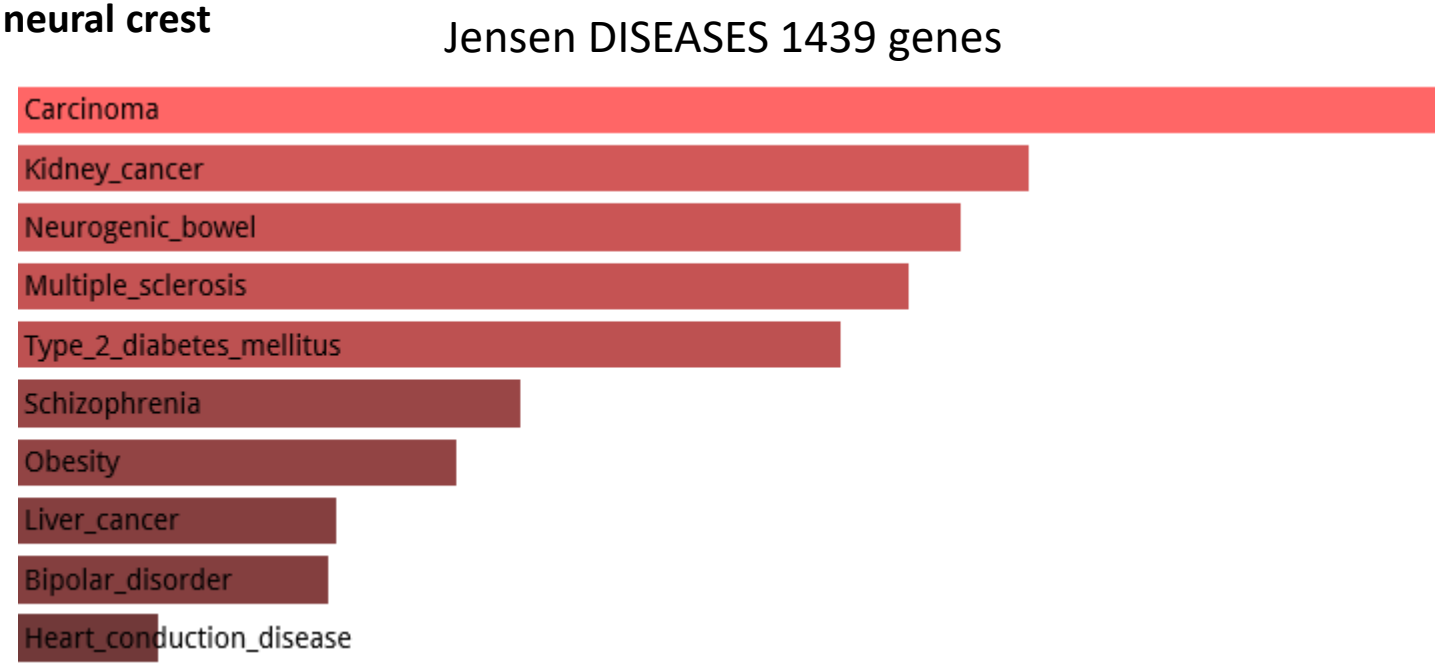


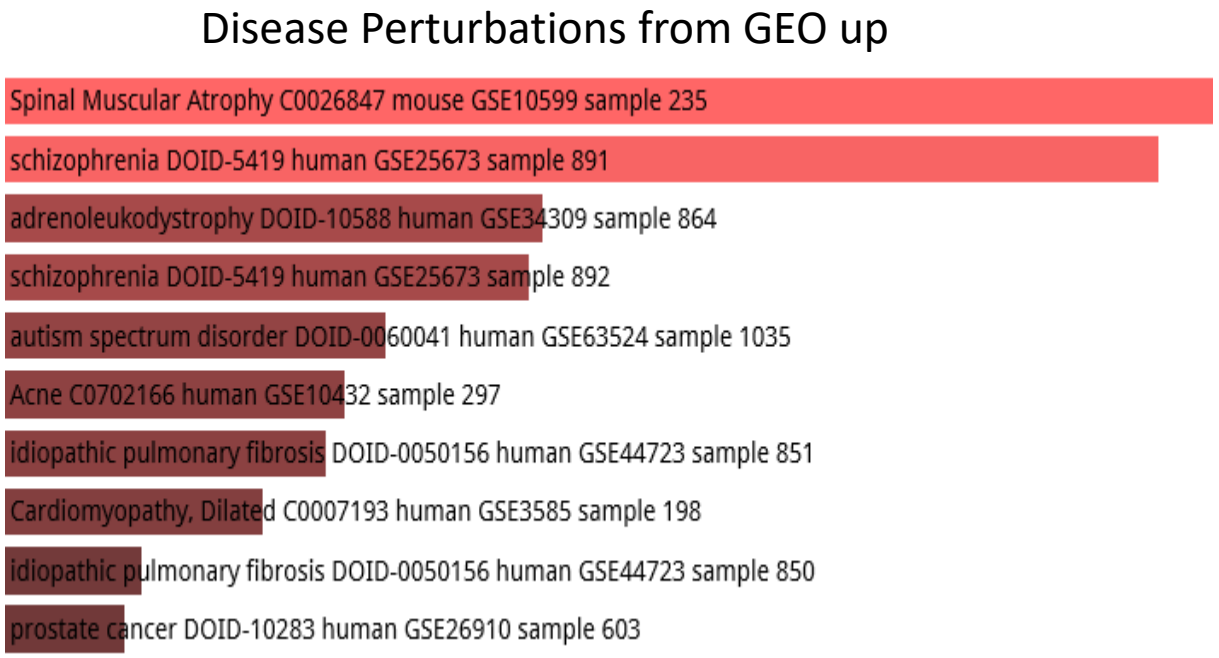
1,000 human-biased cranial neural crest cells (CNCCs) enhancers

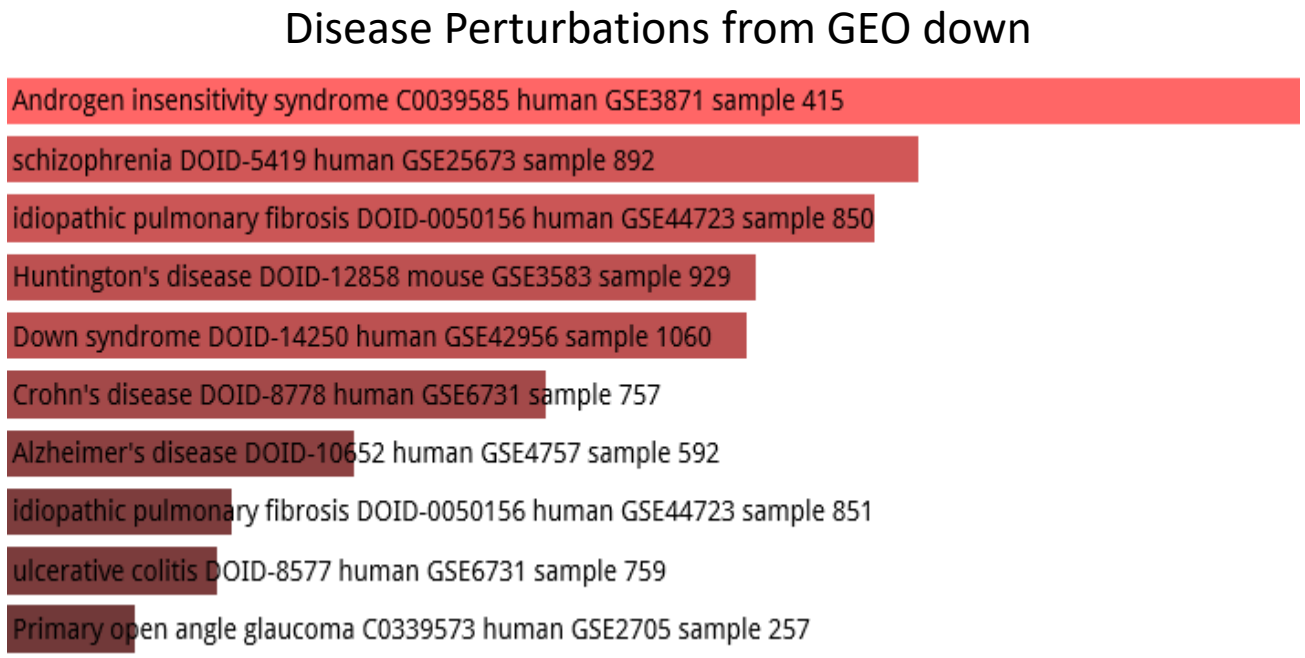




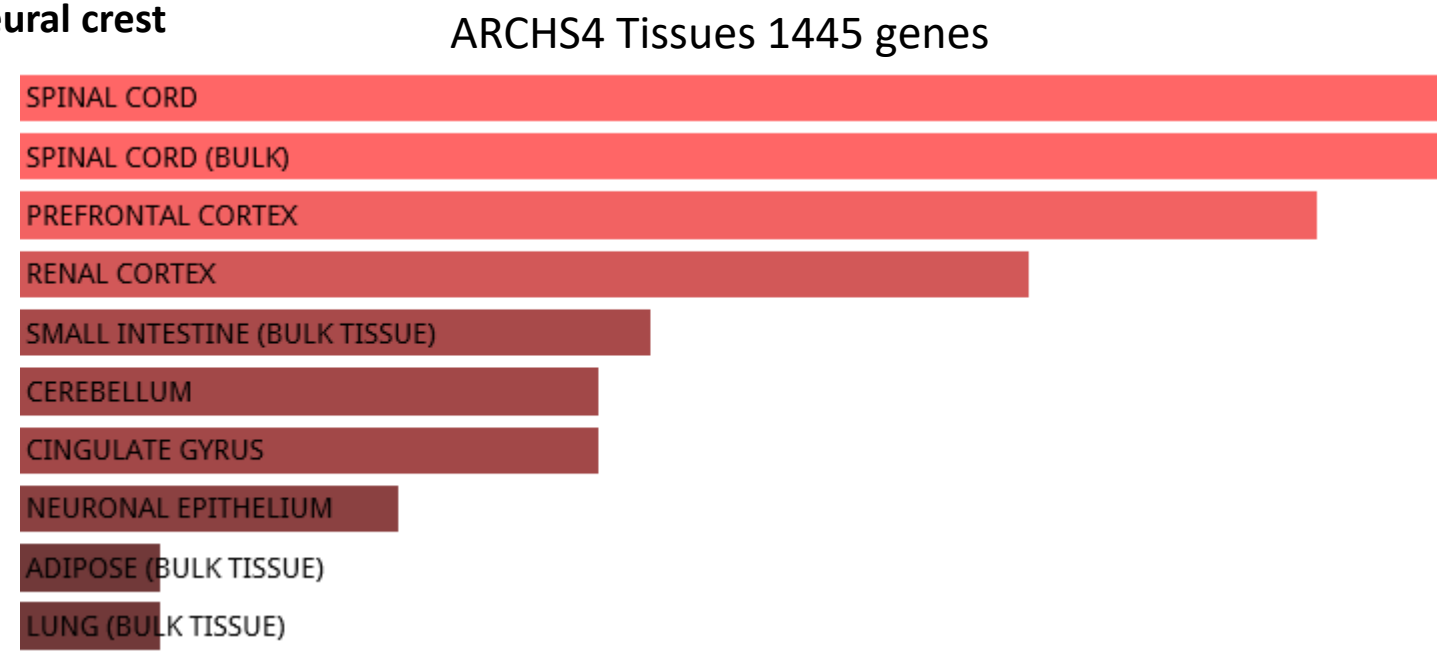
1,000 human-biased cranial neural crest cells (CNCCs) enhancers





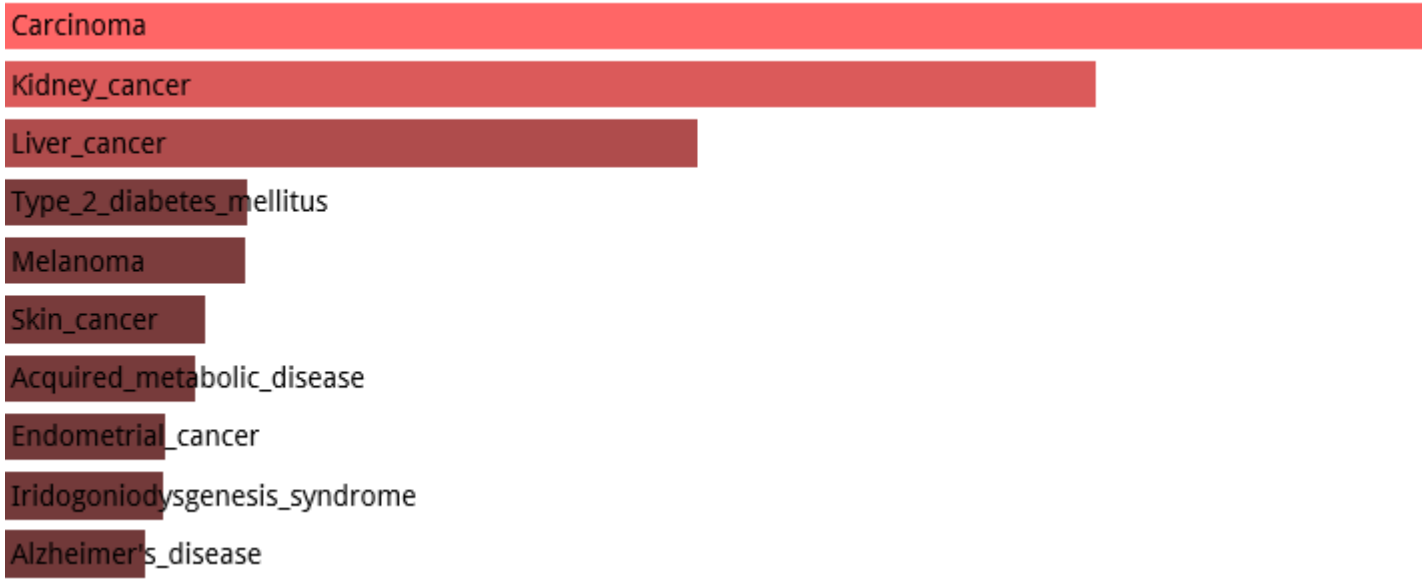


1,000 chimp-biased cranial neural crest cells (CNCCs) enhancers

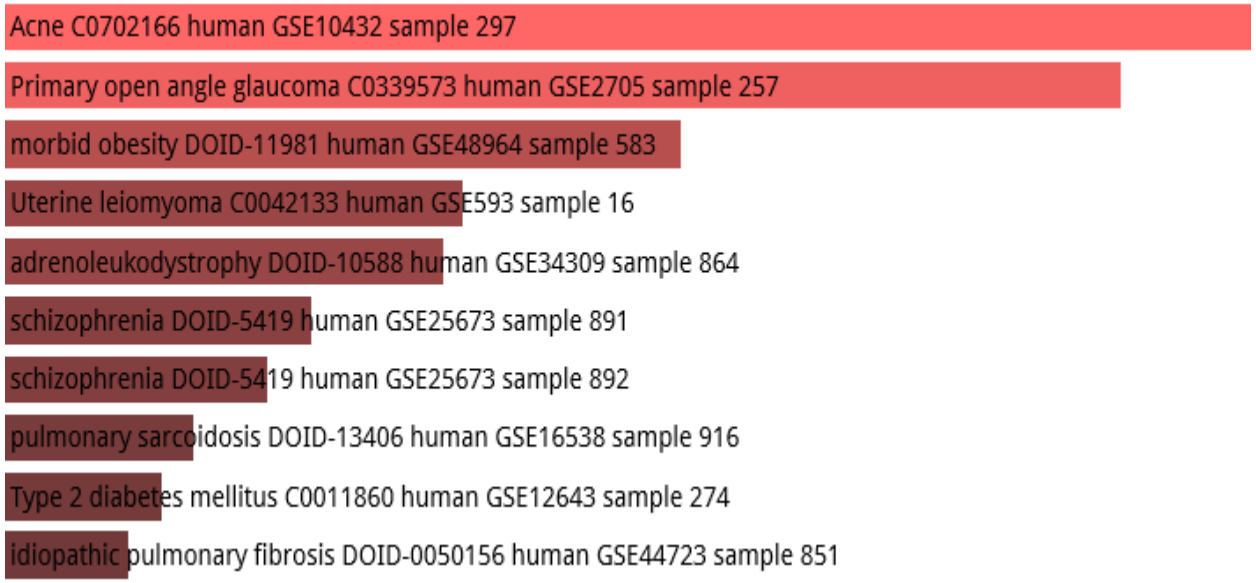


1,000 chimp-biased cranial neural crest cells (CNCCs) enhancers

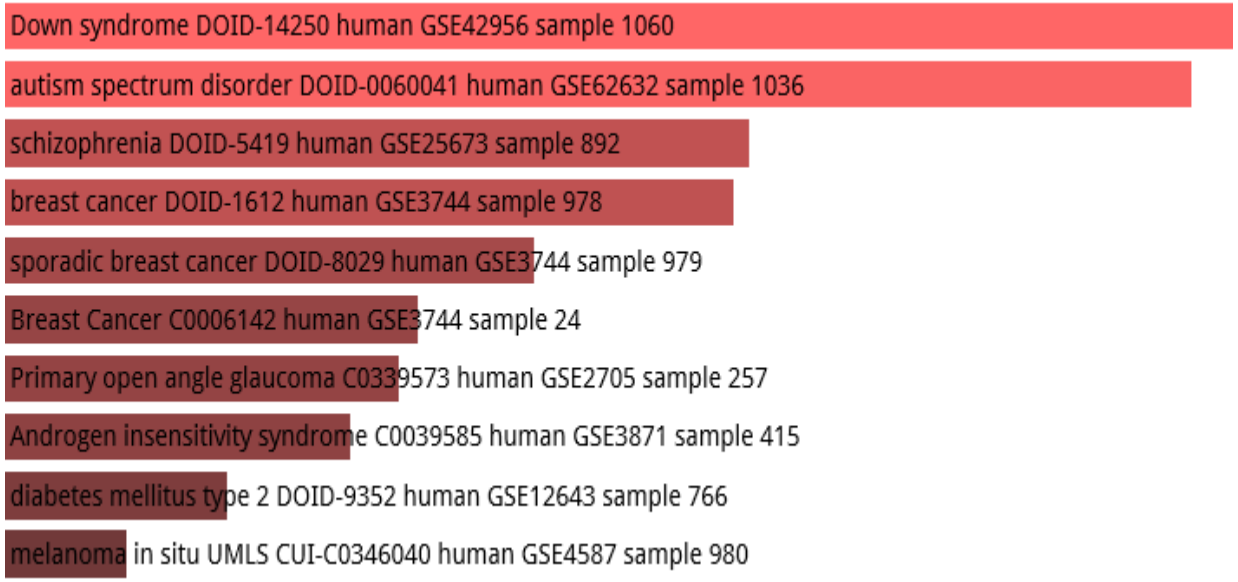
Jensen DISEASES 1445 genes



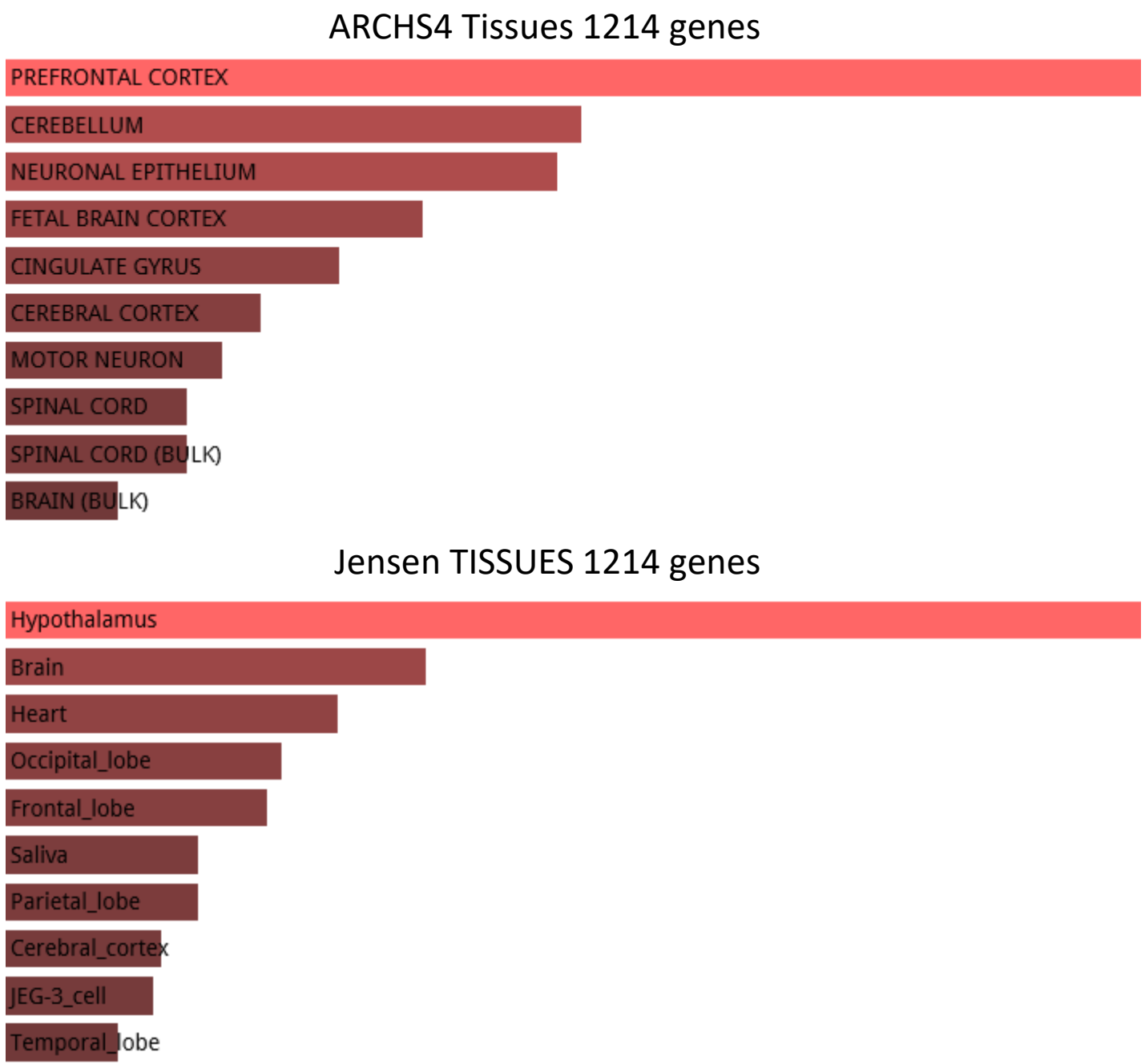
Disease Perturbations from GEO up



Disease Perturbations from GEO down

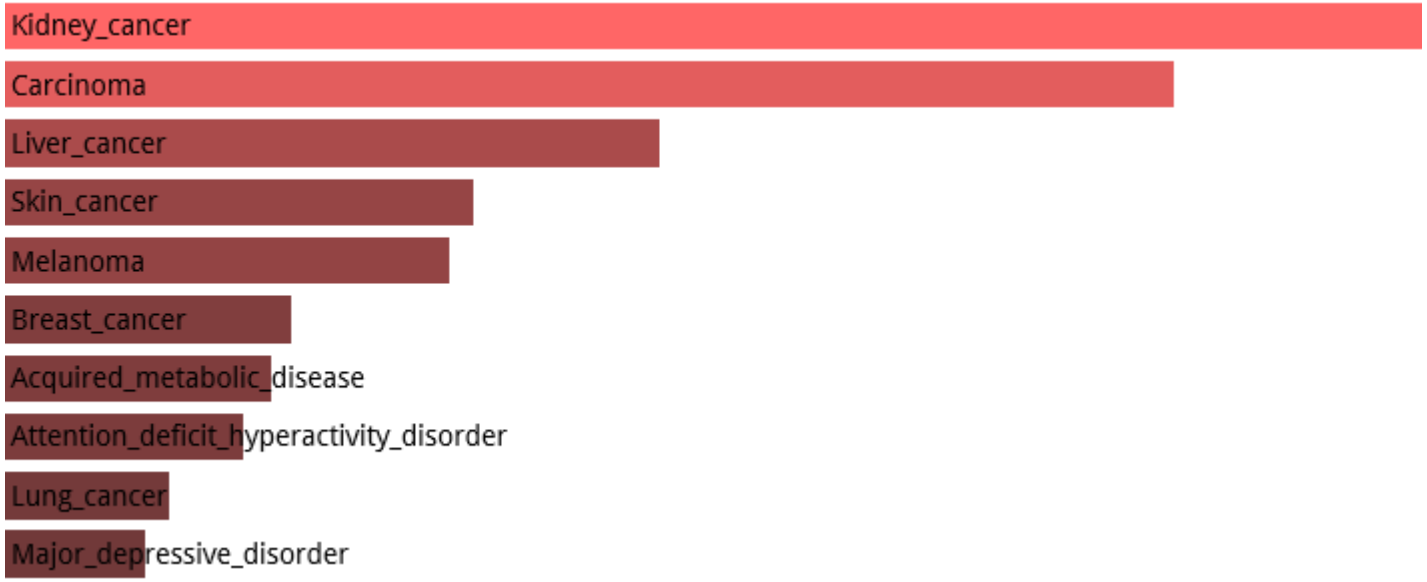


1,619 human-specific functional hESC enhancers

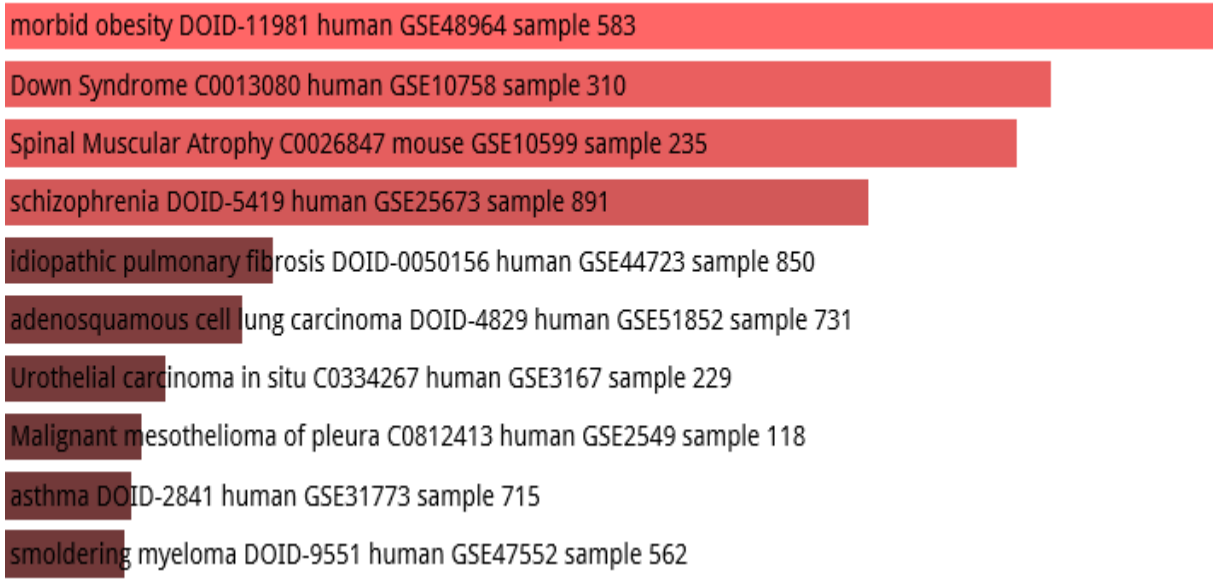


1,619 human-specific functional hESC enhancers

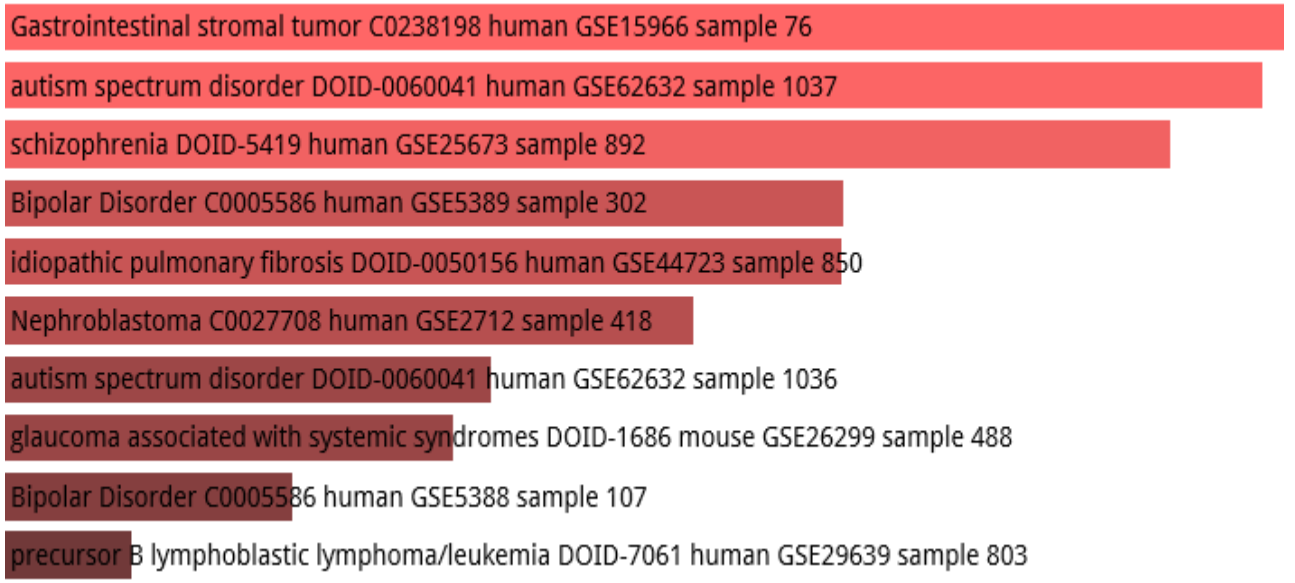
Jensen DISEASES 1214 genes



Disease Perturbations from GEO up 1214 genes

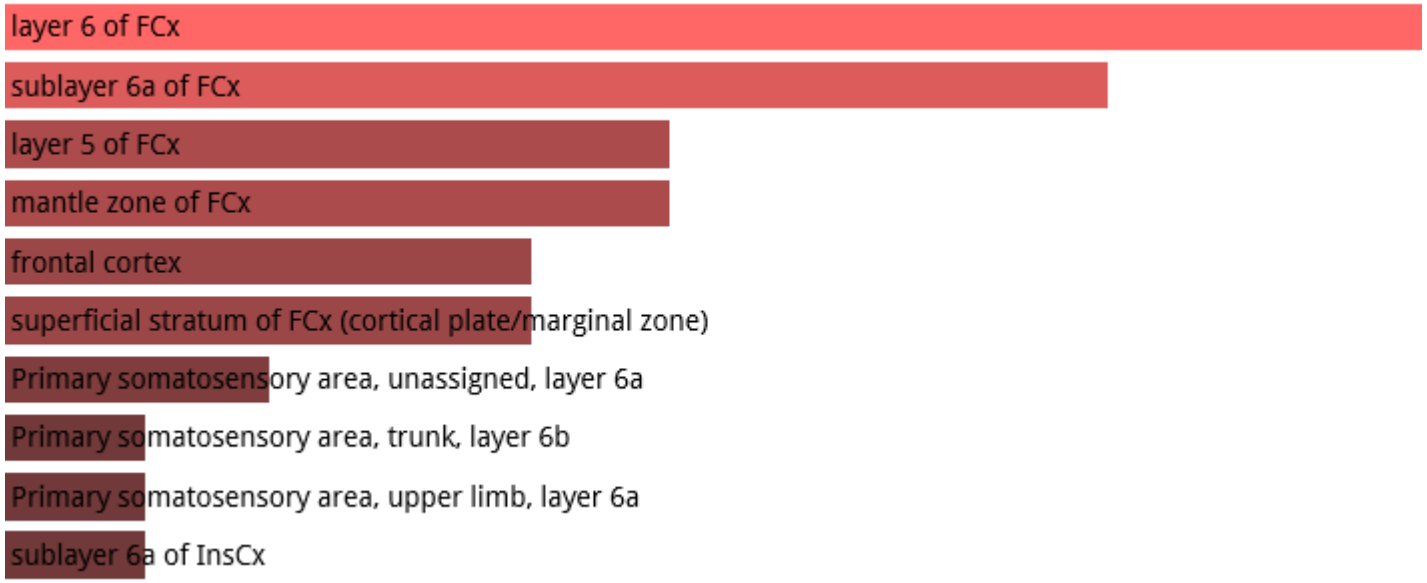


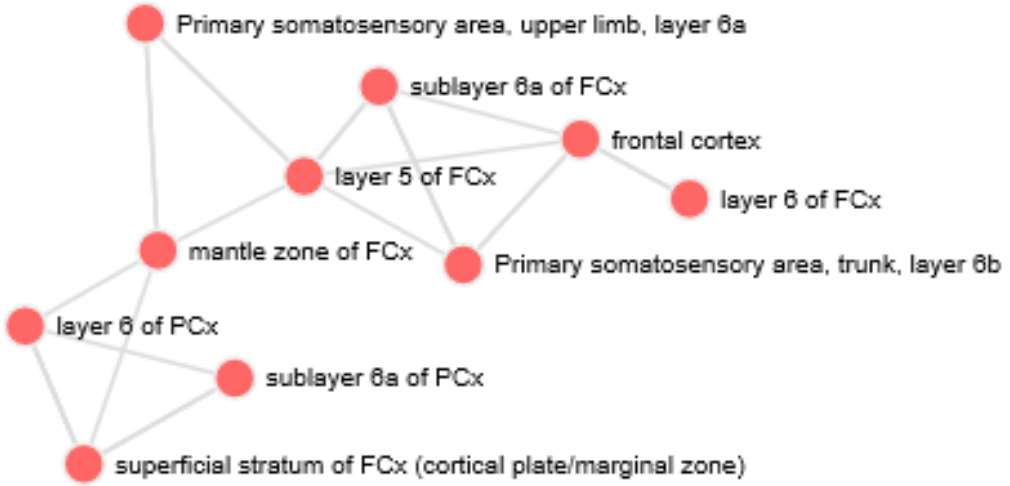
Disease Perturbations from GEO down 1214 genes



1,619 human-specific functional hESC enhancers

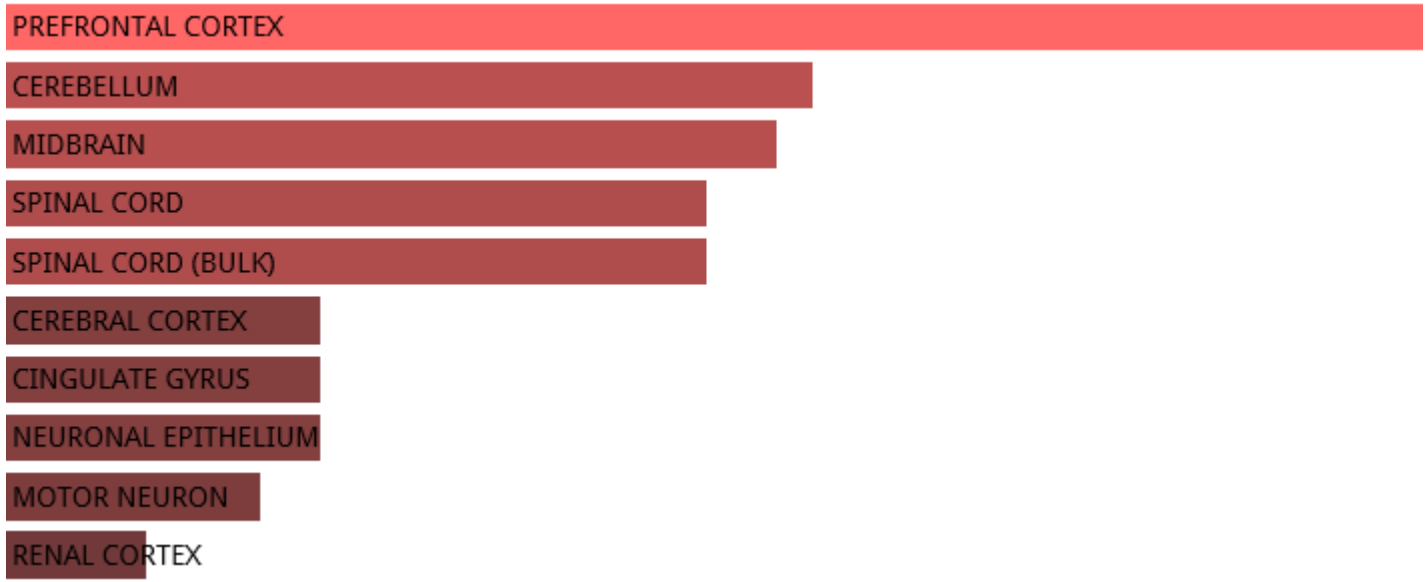
Allen Brain Atlas up 1214 genes



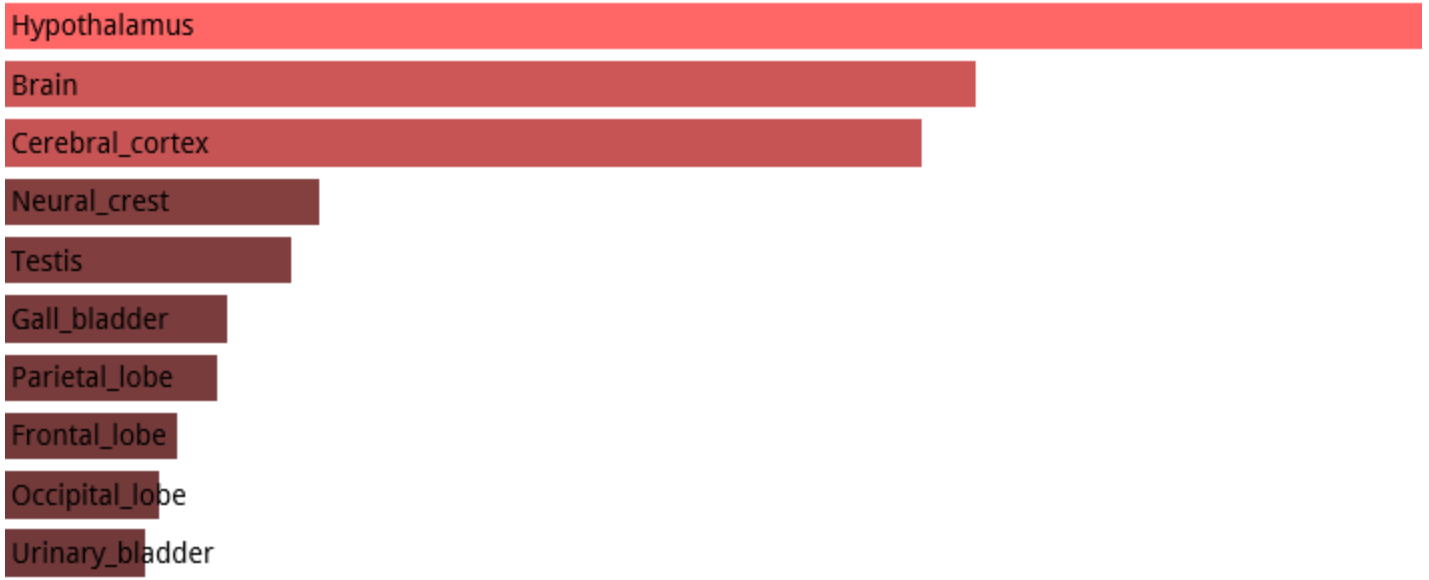


524 human-specific DHS

ARCHS4 Tissues 747 genes

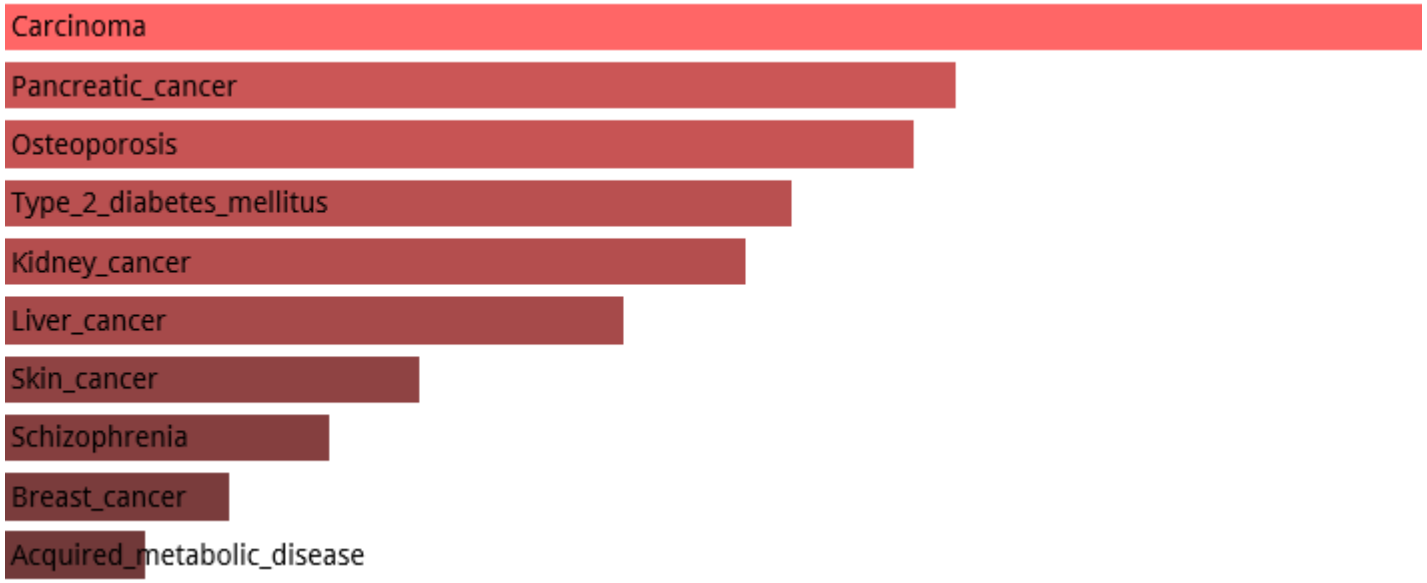


Jensen TISSUES 747 genes

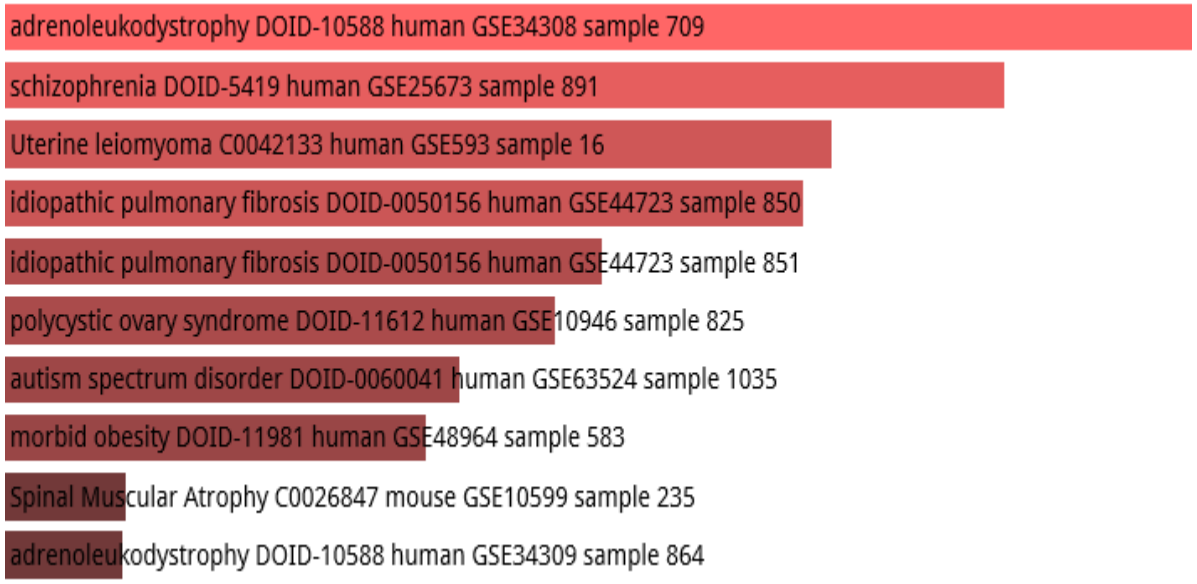


524 human-specific DHS

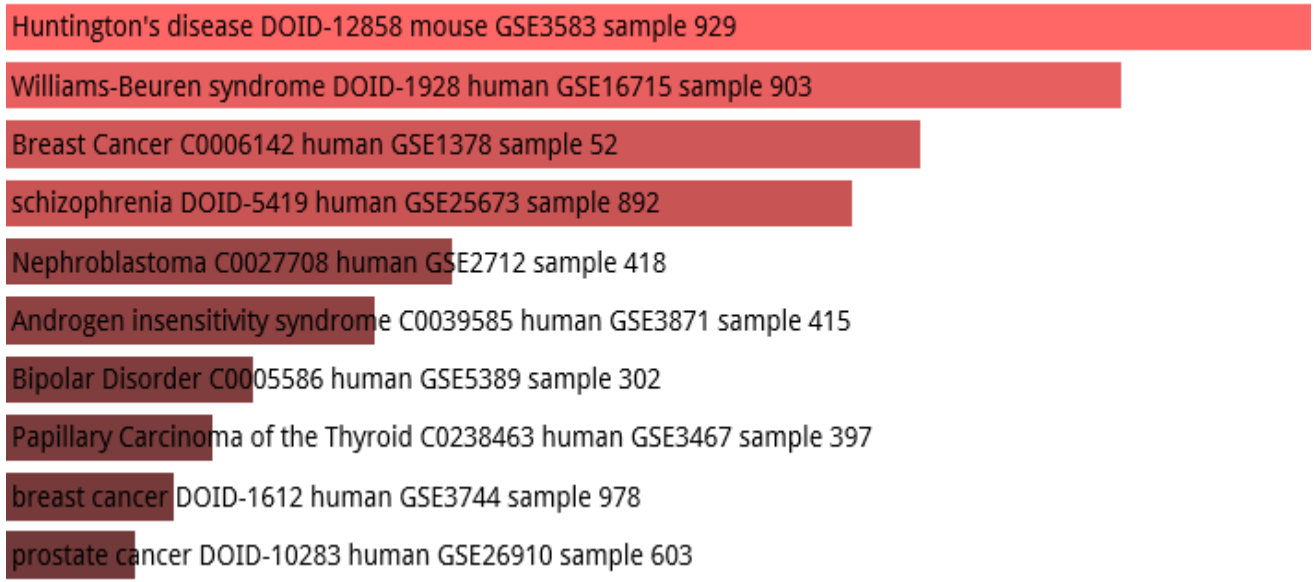
Jensen DISEASES 747 genes



Disease Perturbations from GEO up 747 genes



Disease Perturbations from GEO down 747 genes



42,847 human genes not linked by the GREAT algorithm with HSRS were randomly split into 21 control gene sets of various sizes ranging from 2,847 to 6,847 genes and subjected to the GSEA

GSEA OF TWENTY-ONE CONTROL GENE SETS NOT ASSOCIATED WITH HUMAN-SPECIFIC GENOMIC REGULATORY LOCI

Random Set 1

ARCHS4 Tissues random 6000 genes

ASTROCYTE
KIDNEY (BULK TISSUE)
GASTRIC TISSUE (BULK)
SPINAL CORD (BULK)
SMALL INTESTINE (BULK TISSUE)
OVARY (BULK TISSUE)
SPINAL CORD
PLACENTA (BULK)
SKIN (BULK TISSUE)
HUMAN EMBRYO

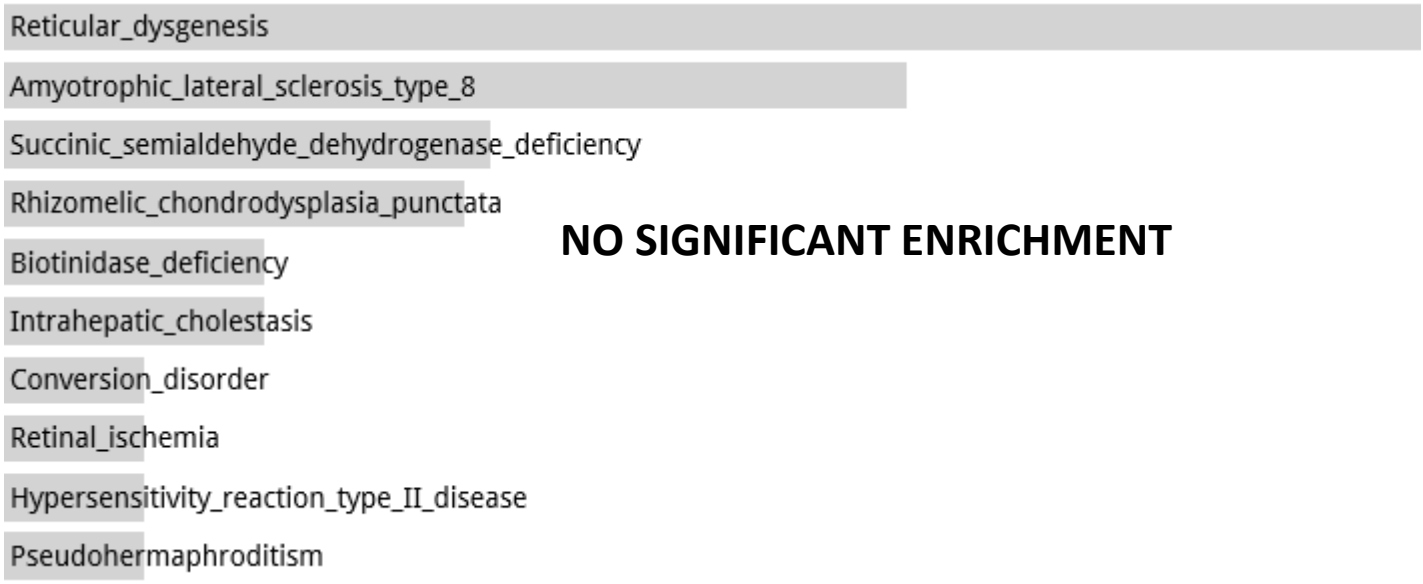
NO SIGNIFICANT ENRICHMENT

Jensen TISSUES random 6847 genes

NO DATA AVAILABLE

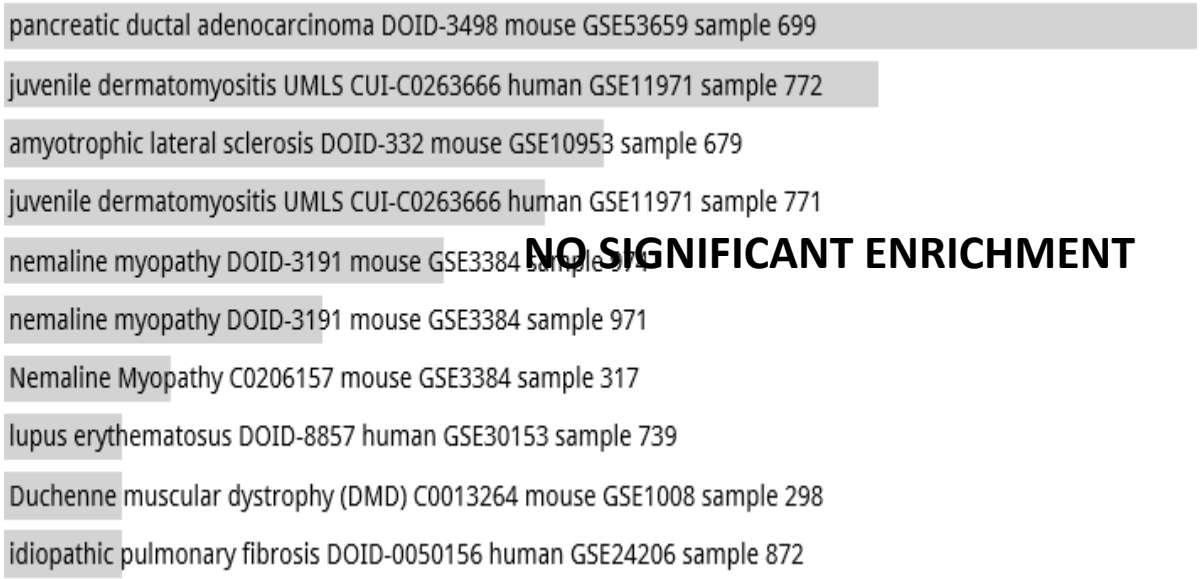
Random Set 1

Jensen DISEASES random 6000 genes



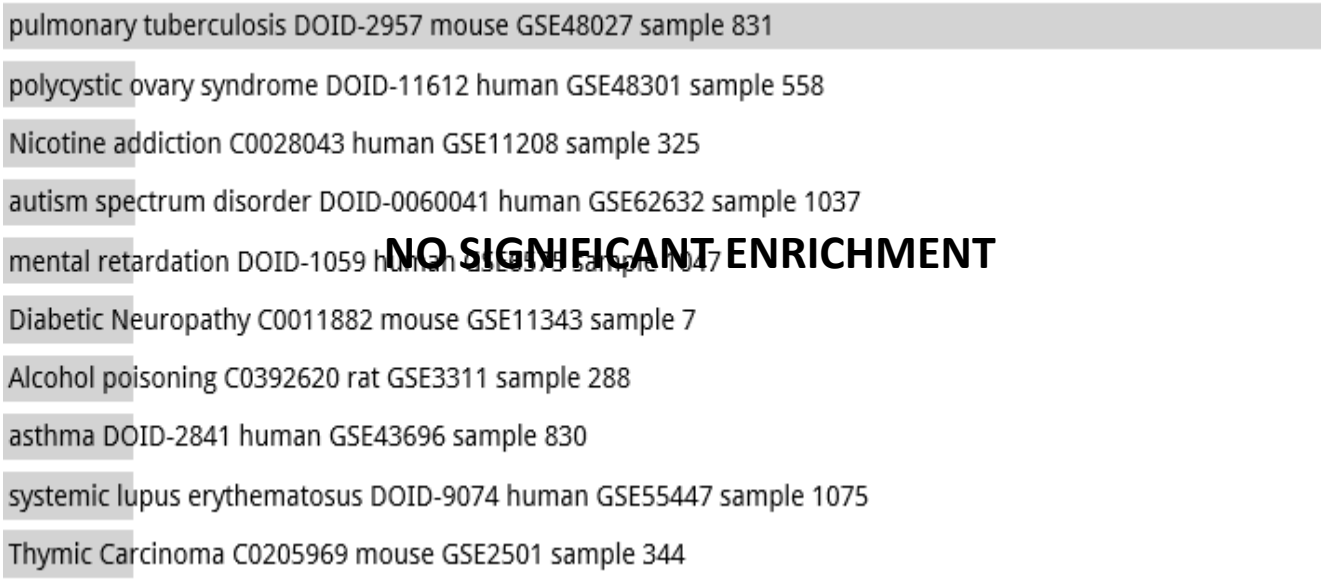
NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO up random 6000 genes



NO SIGNIFICANT ENRICHMENT

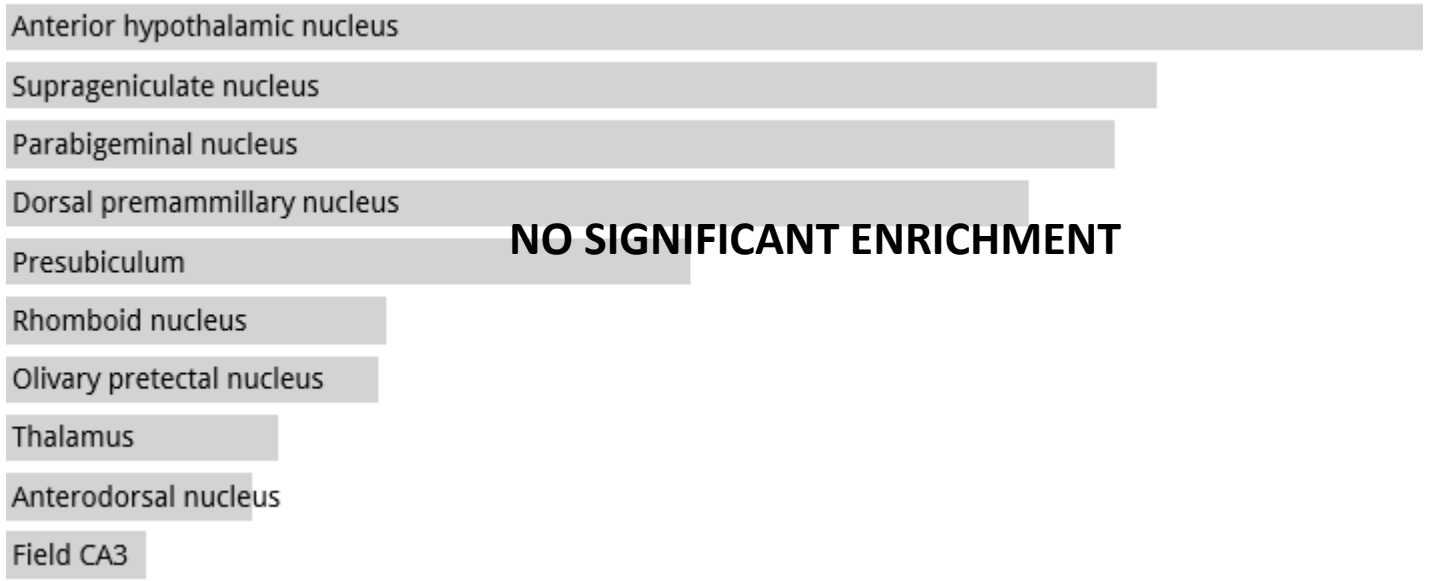
Disease Perturbations from GEO down random 6000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 1

Allen Brain Atlas up random 6000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 2

ARCHS4 Tissues random 6000 genes

GASTRIC TISSUE (BULK)
SKIN (BULK TISSUE)
OMENTUM
SMALL INTESTINE (BULK TISSUE)
CINGULATE GYRUS
COLON (BULK TISSUE)
NEURONAL EPITHELIUM
PREFRONTAL CORTEX
PANCREATIC ISLET
MYOBLAST

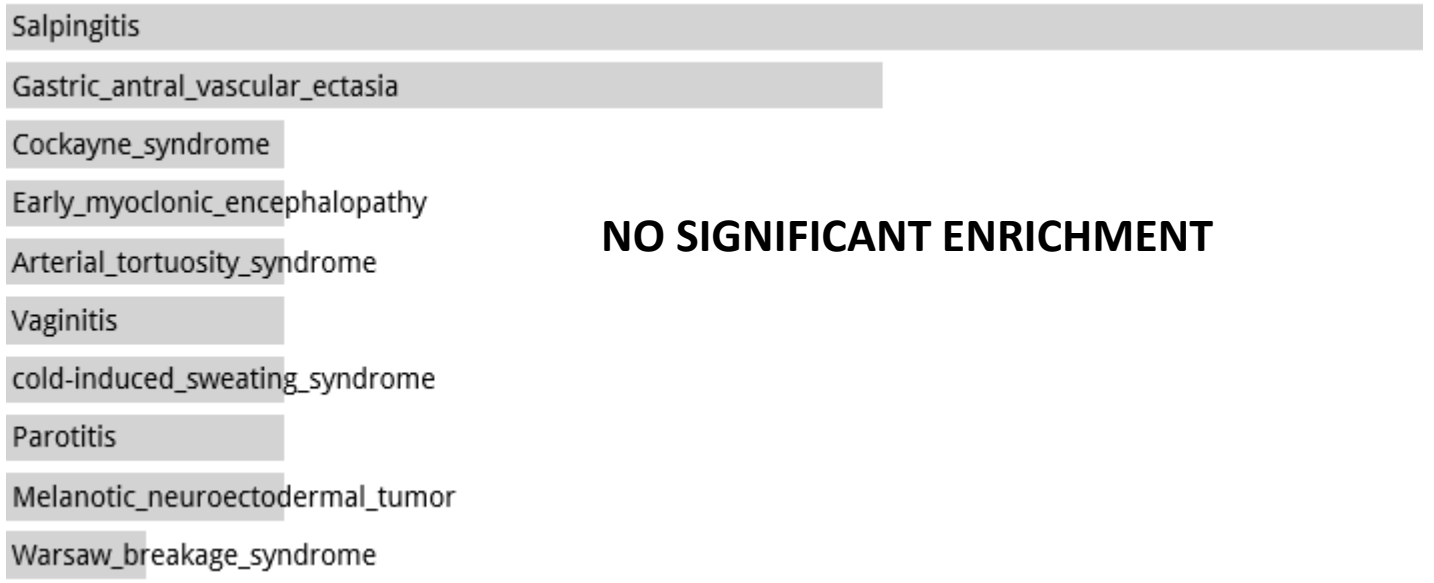
NO SIGNIFICANT ENRICHMENT

Jensen TISSUES random 6847 genes

NO DATA AVAILABLE

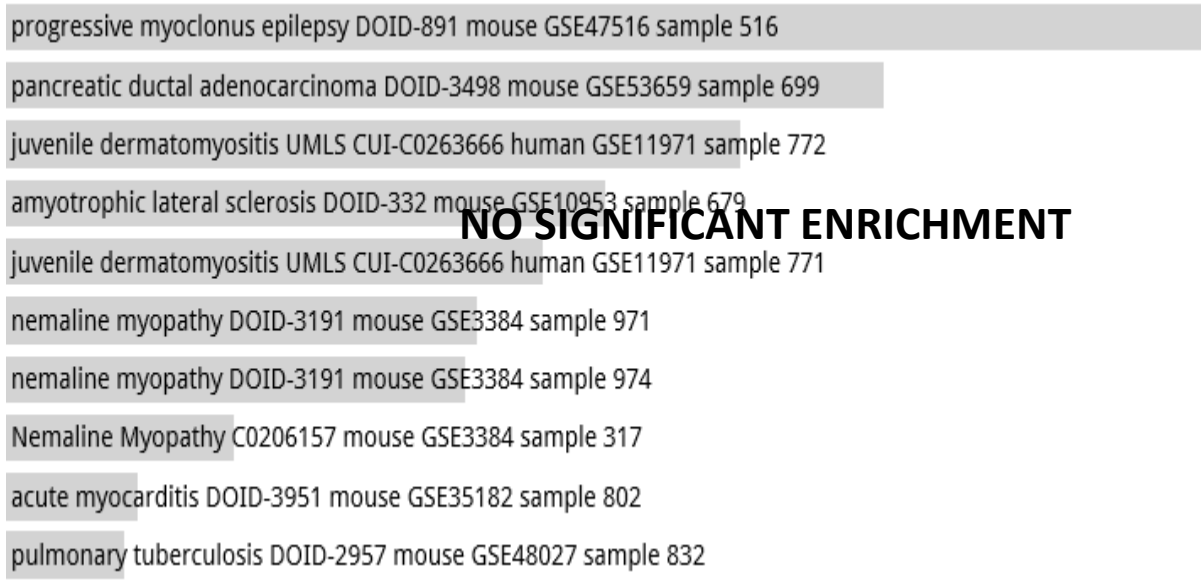
Random Set 2

Jensen DISEASES random 6000 genes



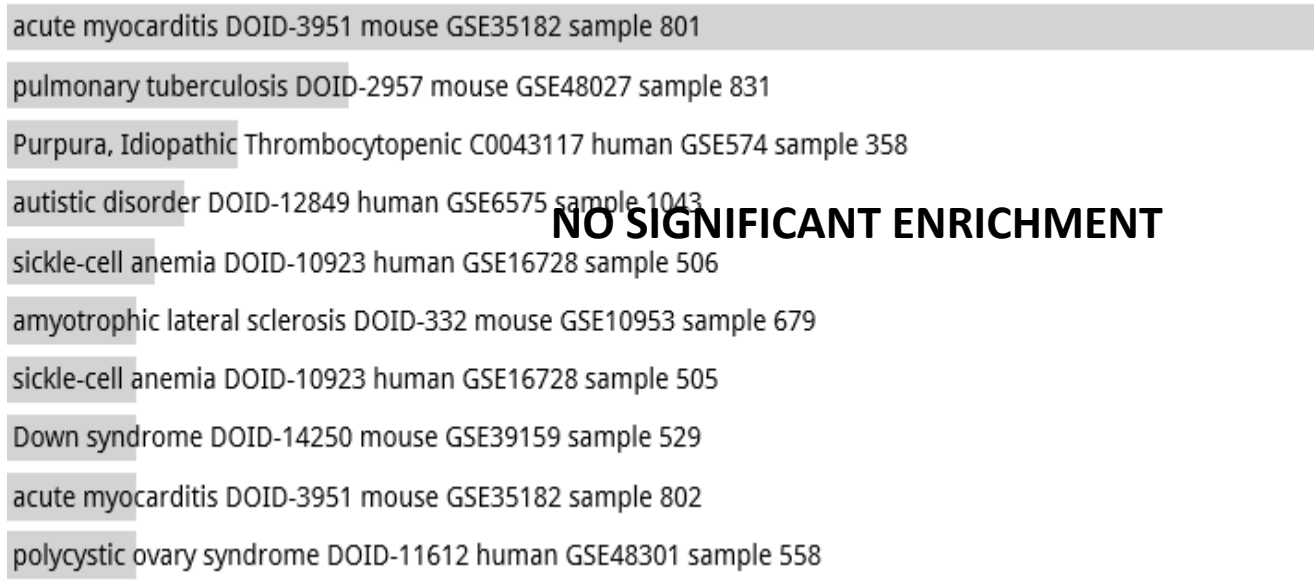
NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO up random 6000 genes



NO SIGNIFICANT ENRICHMENT

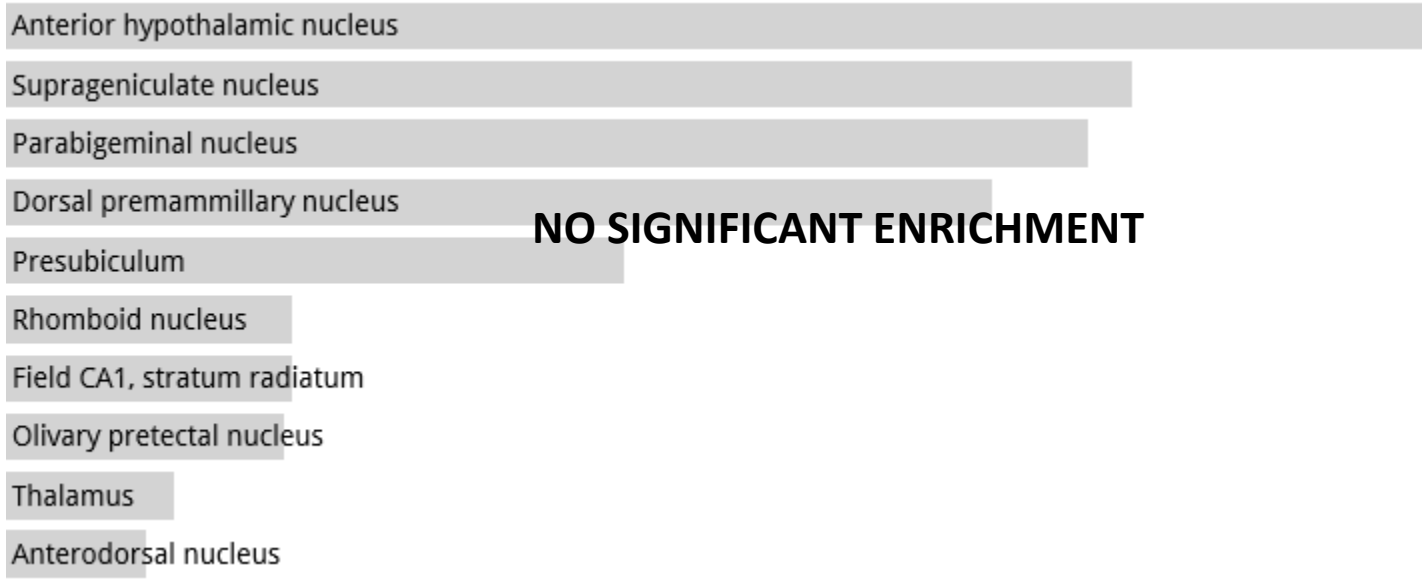
Disease Perturbations from GEO down random 6000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 2

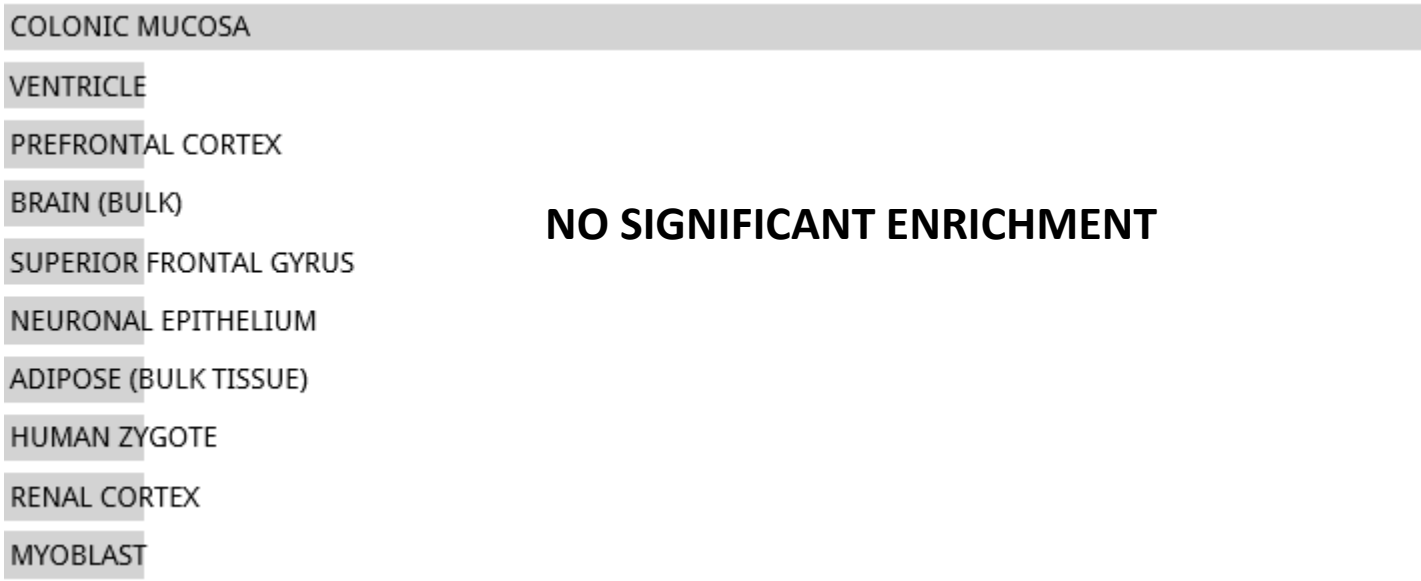
Allen Brain Atlas up random 6000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 3

ARCHS4 Tissues random 6000 genes



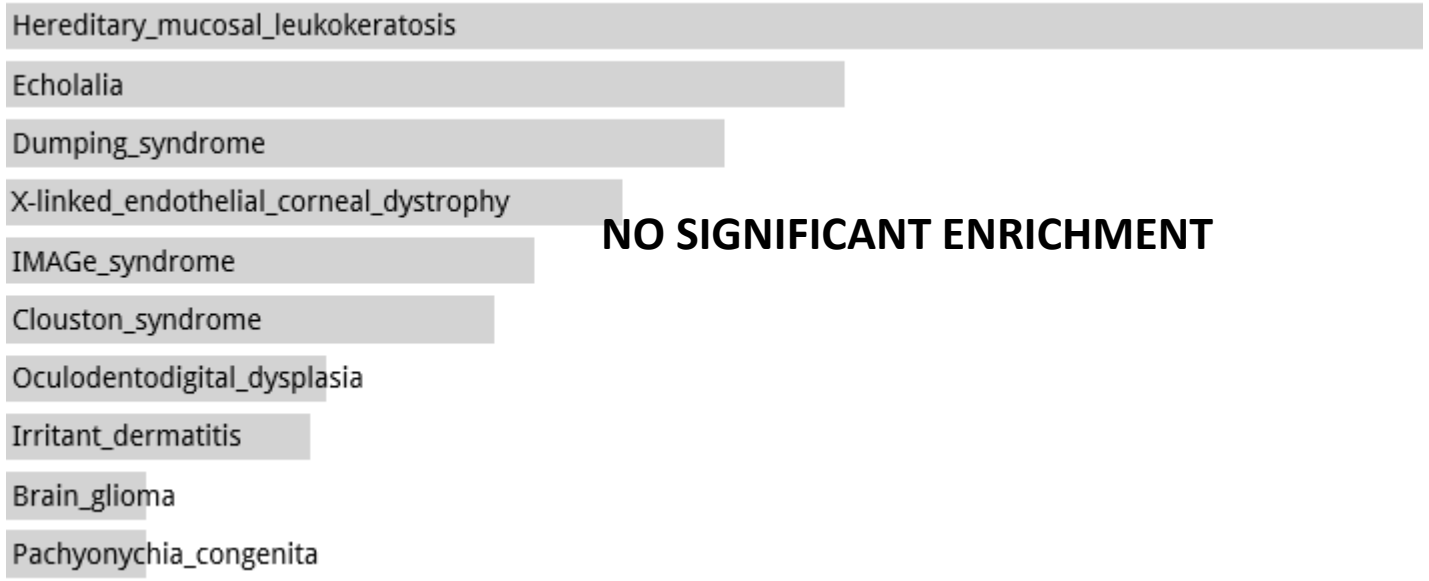
NO SIGNIFICANT ENRICHMENT

Jensen TISSUES random 6847 genes

NO DATA AVAILABLE

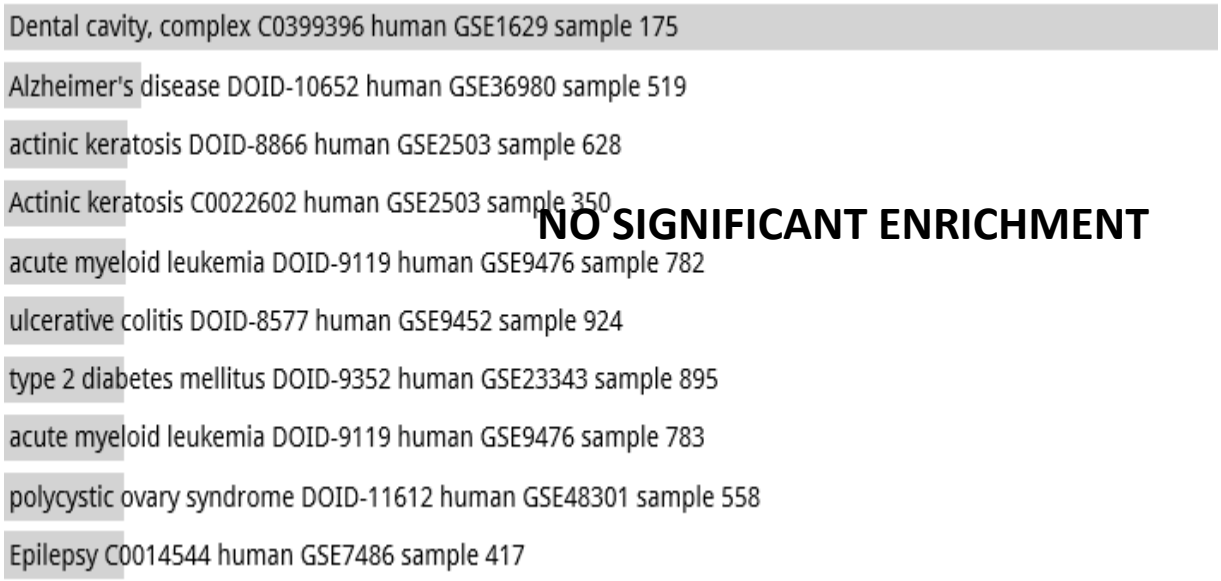
Random Set 3

Jensen DISEASES random 6000 genes



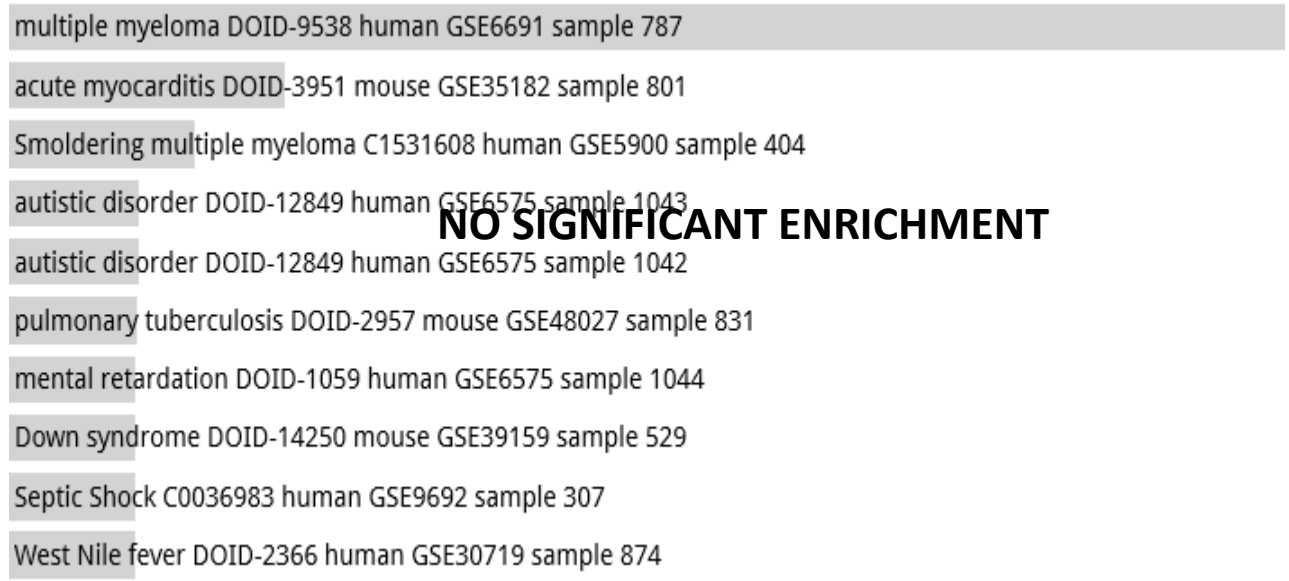
NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO up random 6000 genes



NO SIGNIFICANT ENRICHMENT

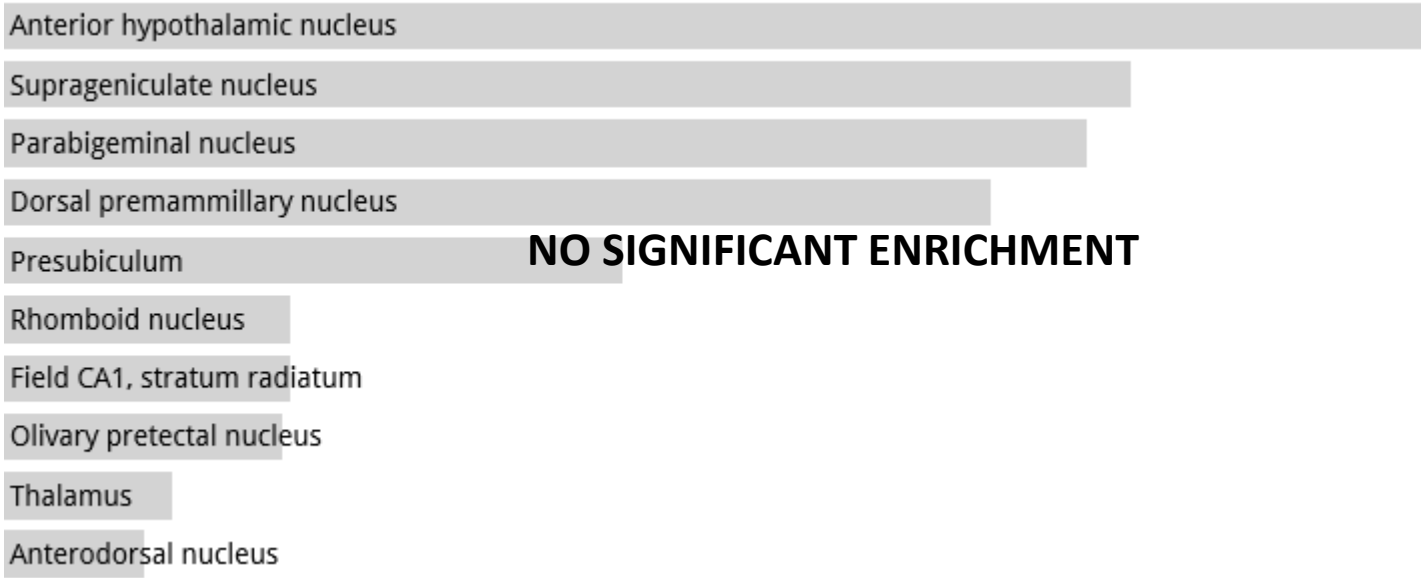
Disease Perturbations from GEO down random 6000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 3

Allen Brain Atlas up random 6000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 4

ARCHS4 Tissues random 6000 genes

GASTRIC TISSUE (BULK)
PREFRONTAL CORTEX
COLON (BULK TISSUE)
LUNG (BULK TISSUE)
OMENTUM
NEURONAL EPITHELIUM
LIVER (BULK TISSUE)
ILEUM (BULK)
FETAL BRAIN CORTEX
SUPERIOR FRONTAL GYRUS

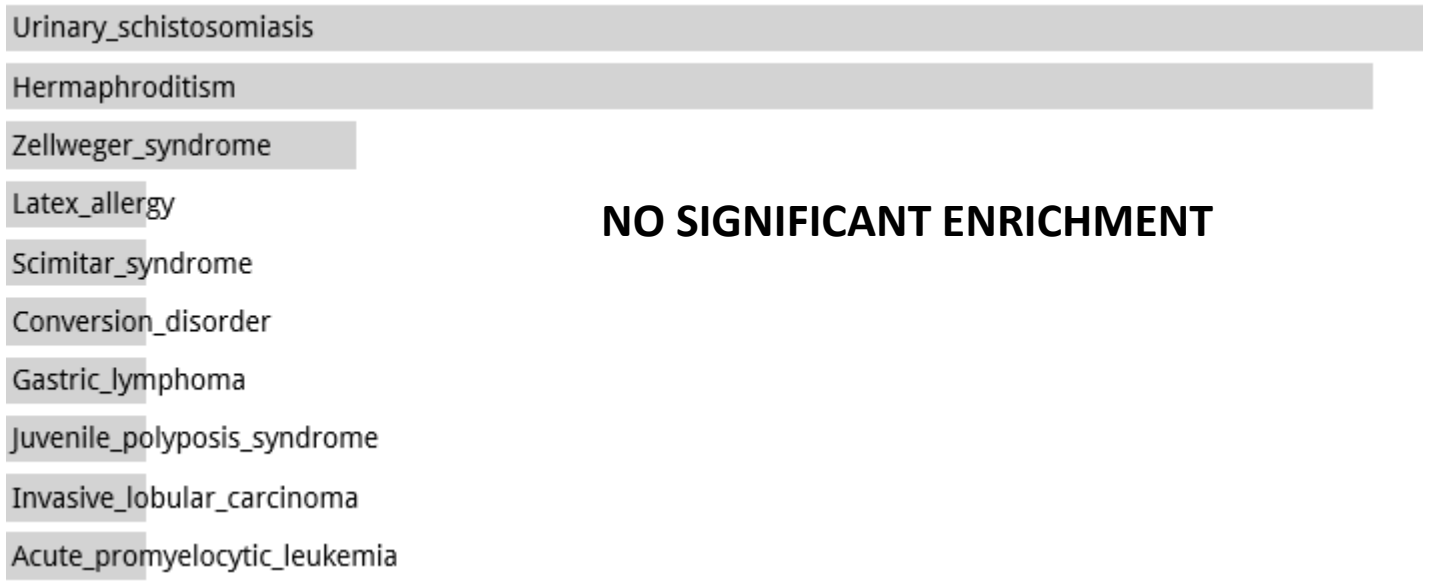
NO SIGNIFICANT ENRICHMENT

Jensen TISSUES random 6847 genes

NO DATA AVAILABLE

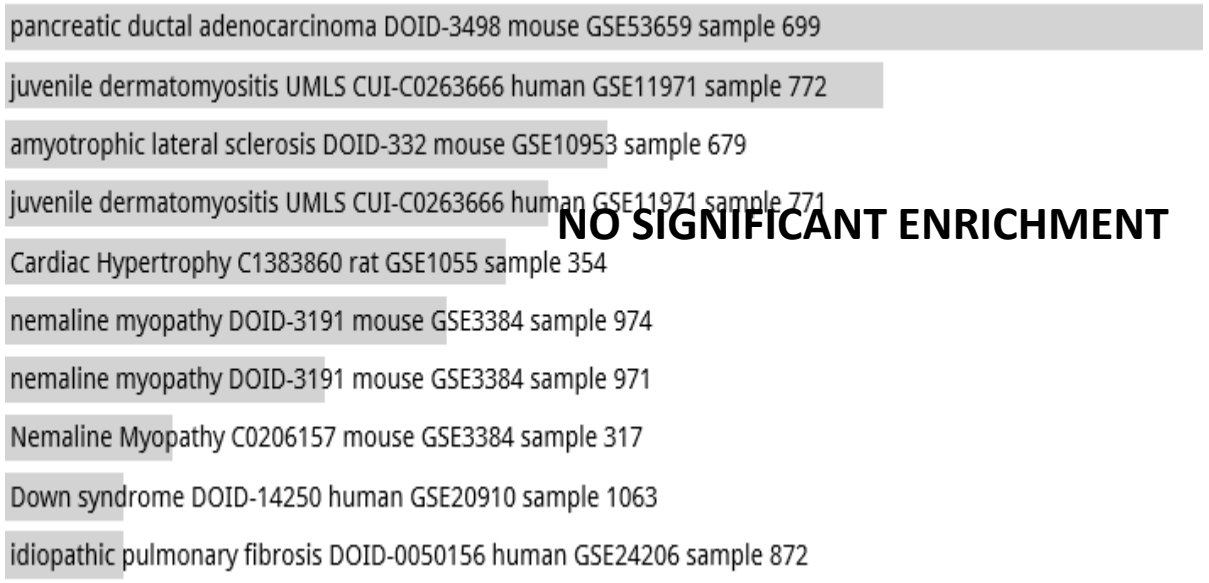
Random Set 4

Jensen DISEASES random 6000 genes



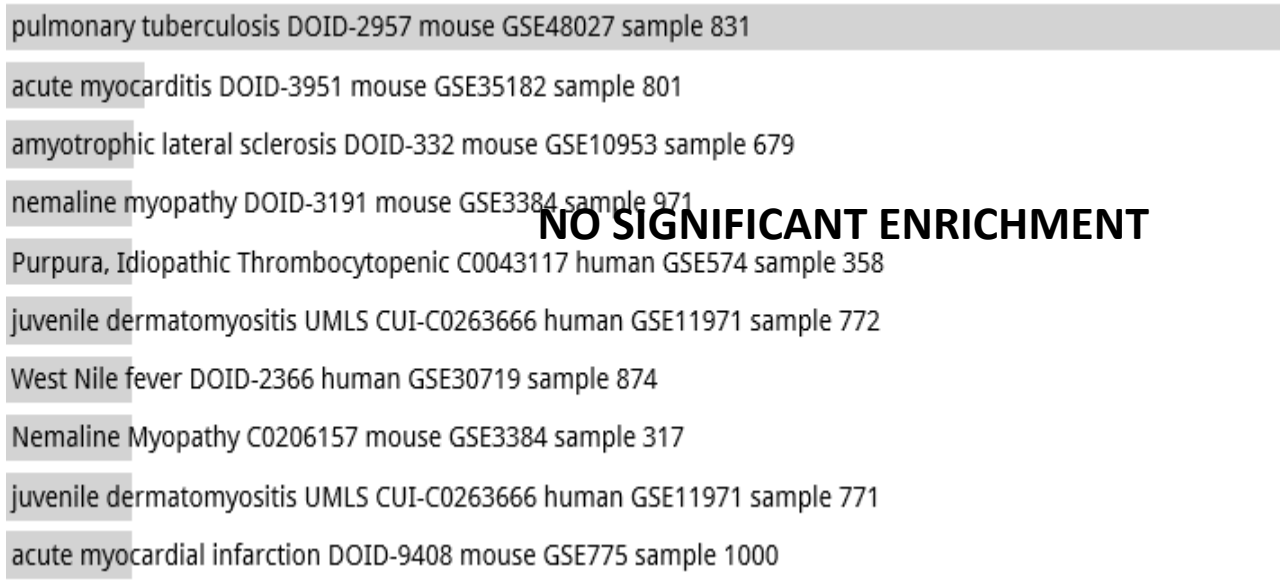
NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO up random 6000 genes



NO SIGNIFICANT ENRICHMENT

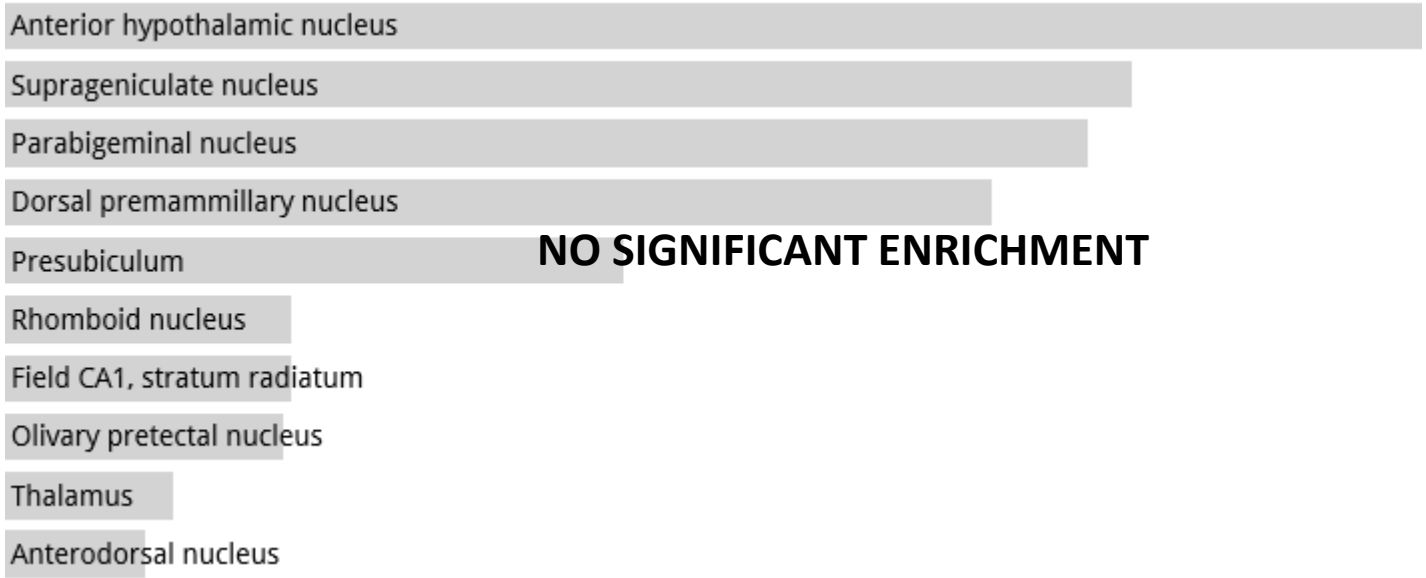
Disease Perturbations from GEO down random 6000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 4

Allen Brain Atlas up random 6000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 5

ARCHS4 Tissues random 6000 genes

SMALL INTESTINE (BULK TISSUE)
VASCULAR SMOOTH MUSCLE
SKIN (BULK TISSUE)
THYROID (BULK TISSUE)
STROMAL CELL
RESPIRATORY SMOOTH MUSCLE
RENAL CORTEX
SKELETAL MUSCLE (BULK TISSUE)
REGULATORY T CELLS
PANCREATIC ISLET

NO SIGNIFICANT ENRICHMENT

Jensen TISSUES random 6847 genes

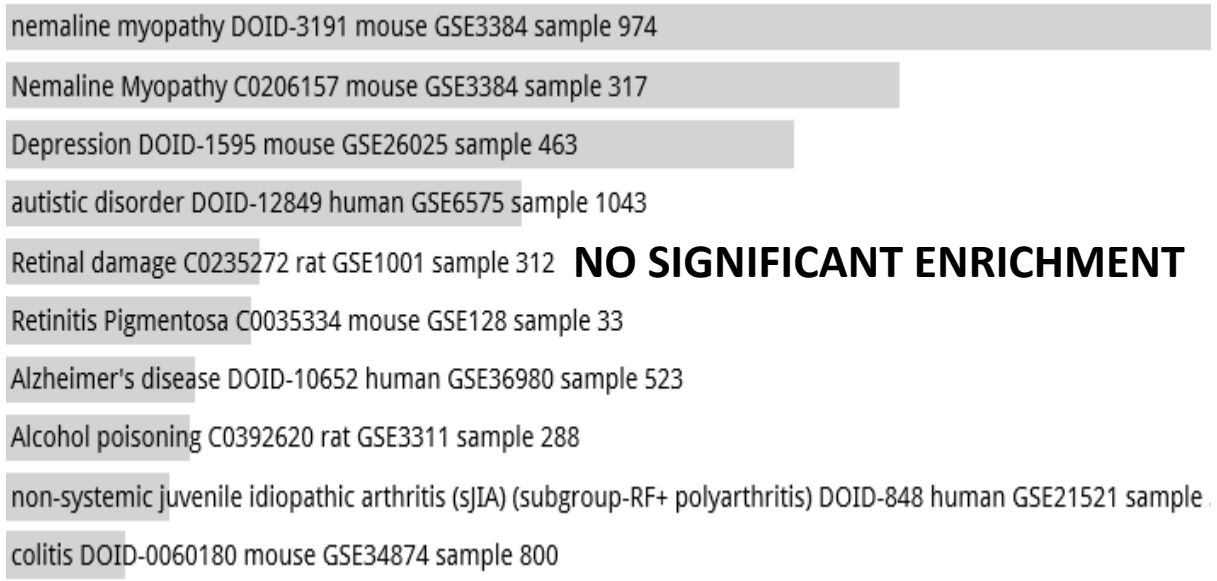
NO DATA AVAILABLE

Random Set 5

Jensen DISEASES random 6000 genes

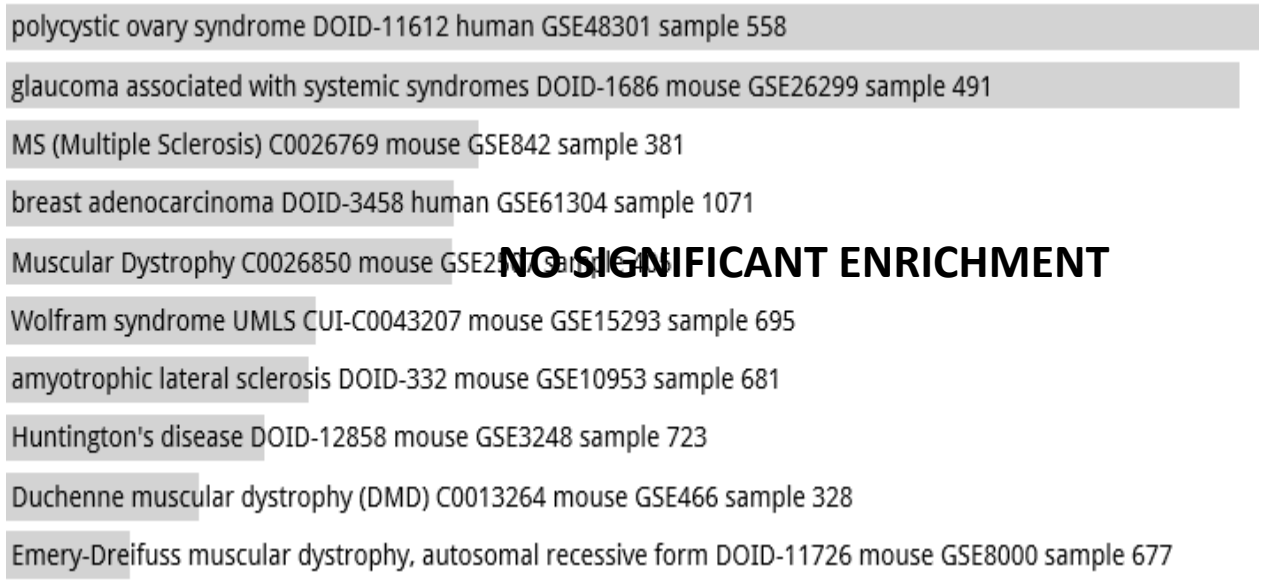
NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO up random 6000 genes



NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO down random 6000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 5

Allen Brain Atlas up random 6000 genes

Presubiculum
Endopiriform nucleus, dorsal part
dorsal endopiriform nucleus
Copula pyramidis
bed nucleus of the external capsule
mantle zone of r7Co
Agranular insular area, posterior part, layer 6a
Entorhinal area, medial part, dorsal zone, layer 5
corticoid layer of TuStr
Infralimbic area, layer 6b

NO SIGNIFICANT ENRICHMENT

Random Set 6

ARCHS4 Tissues random 6000 genes

NO DATA AVAILABLE

Jensen TISSUES random 6000 genes

NO DATA AVAILABLE

Random Set 6

Jensen DISEASES random 6000 genes

NO DATA AVAILABLE

Disease Perturbations from GEO up random 6000 genes

NO DATA AVAILABLE

Disease Perturbations from GEO down random 6000 genes

Systemic lupus erythematosus (SLE) C0024141 human GSE12374 sample 123

NO SIGNIFICANT ENRICHMENT

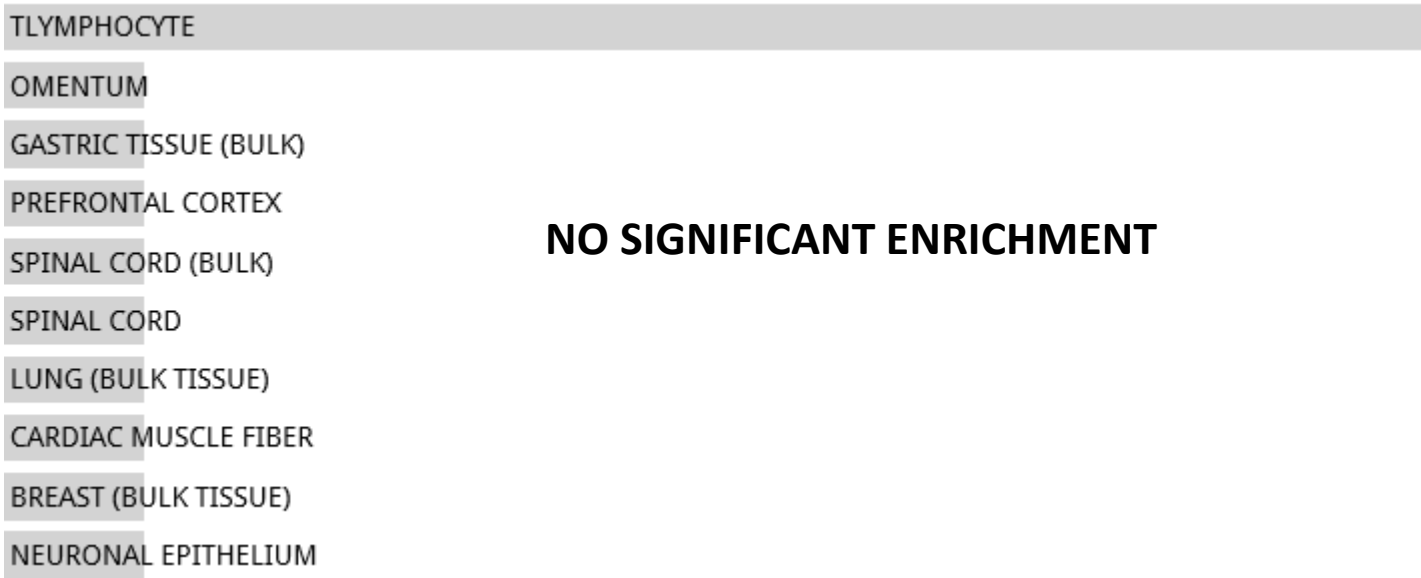
Random Set 6

Allen Brain Atlas up random 6000 genes

NO DATA AVAILABLE

Random Set 7

ARCHS4 Tissues random 6847 genes



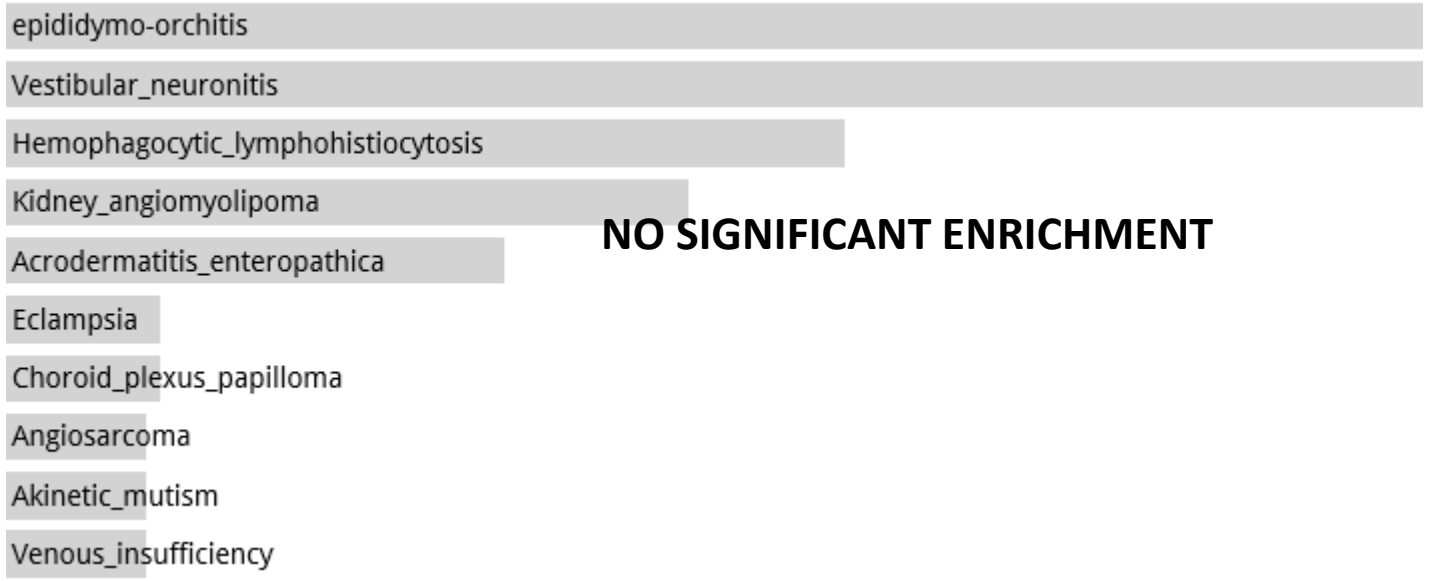
NO SIGNIFICANT ENRICHMENT

Jensen TISSUES random 6847 genes

NO DATA AVAILABLE

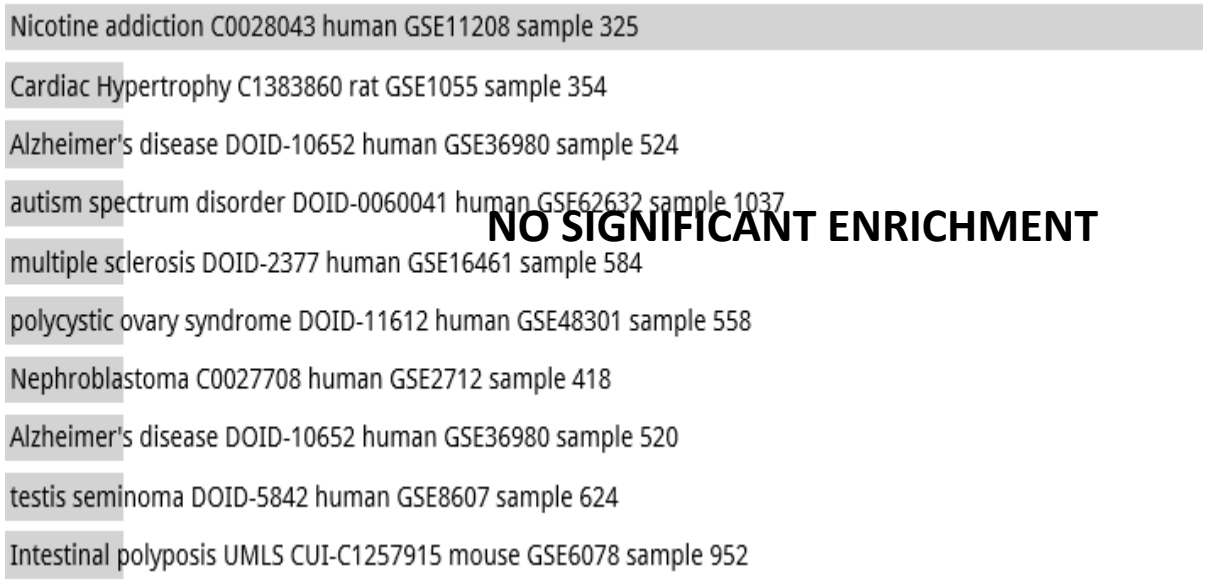
Random Set 7

Jensen DISEASES random 6847 genes



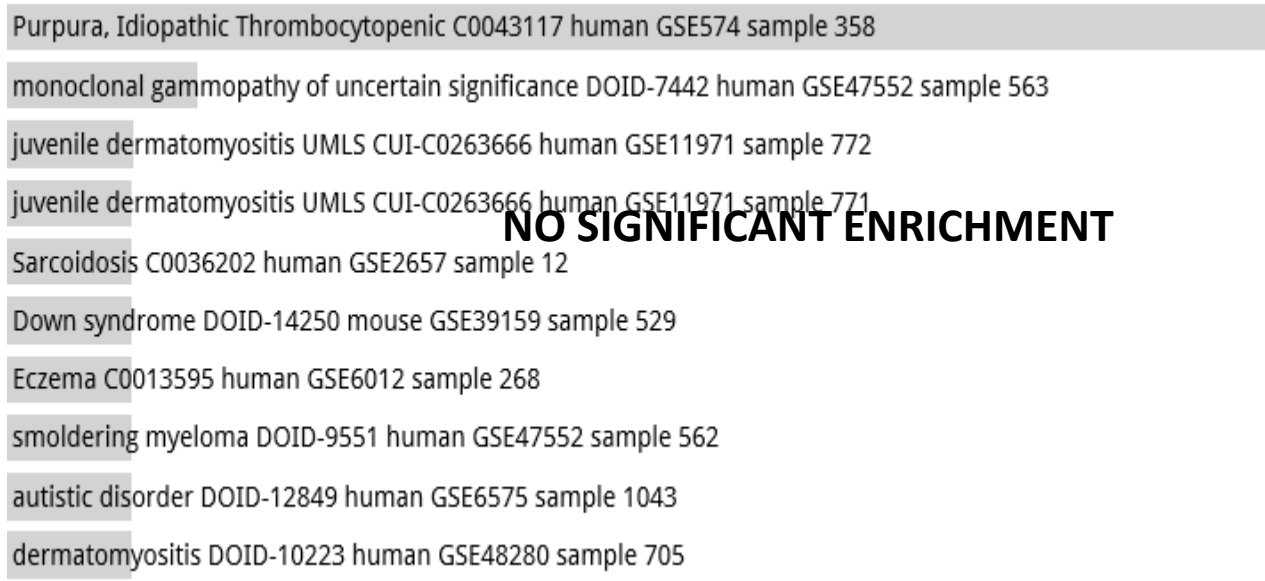
NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO up random 6000 genes



NO SIGNIFICANT ENRICHMENT

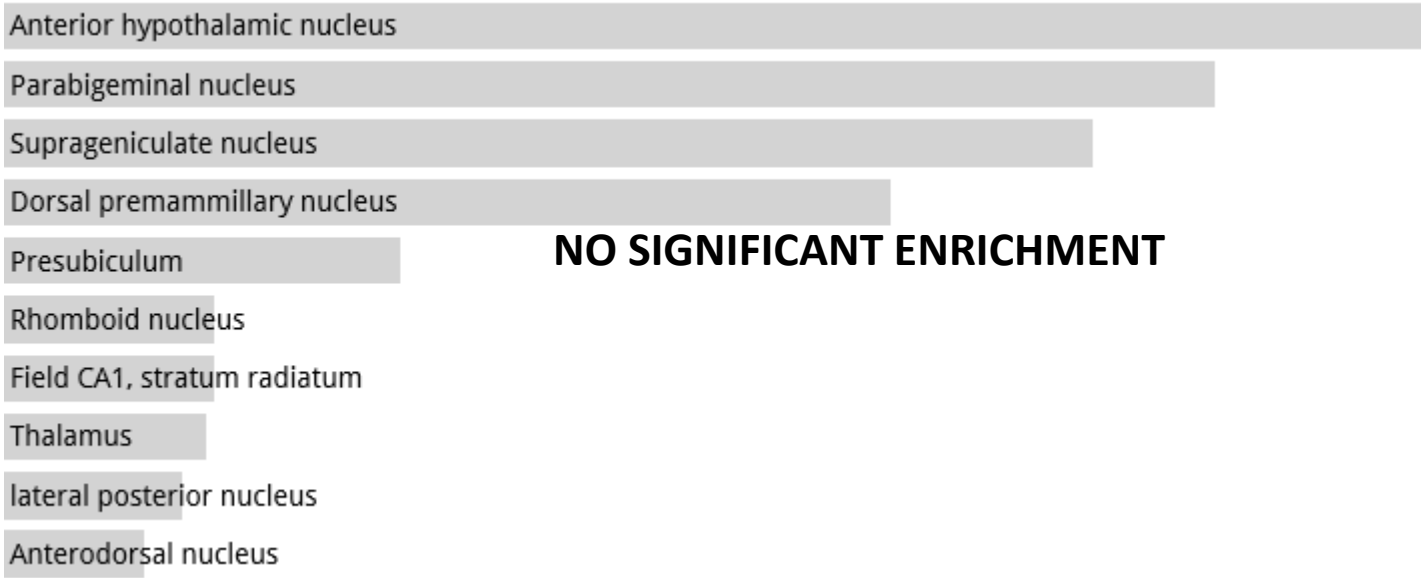
Disease Perturbations from GEO down random 6000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 7

Allen Brain Atlas up random 6847 genes



NO SIGNIFICANT ENRICHMENT

Random Set 8

ARCHS4 Tissues random 6001 genes

GASTRIC TISSUE (BULK)
SKIN (BULK TISSUE)
RENAL CORTEX
KIDNEY (BULK TISSUE)
PREFRONTAL CORTEX
PANCREATIC ISLET
SPINAL CORD (BULK)
SMALL INTESTINE (BULK TISSUE)
COLON (BULK TISSUE)
SPINAL CORD

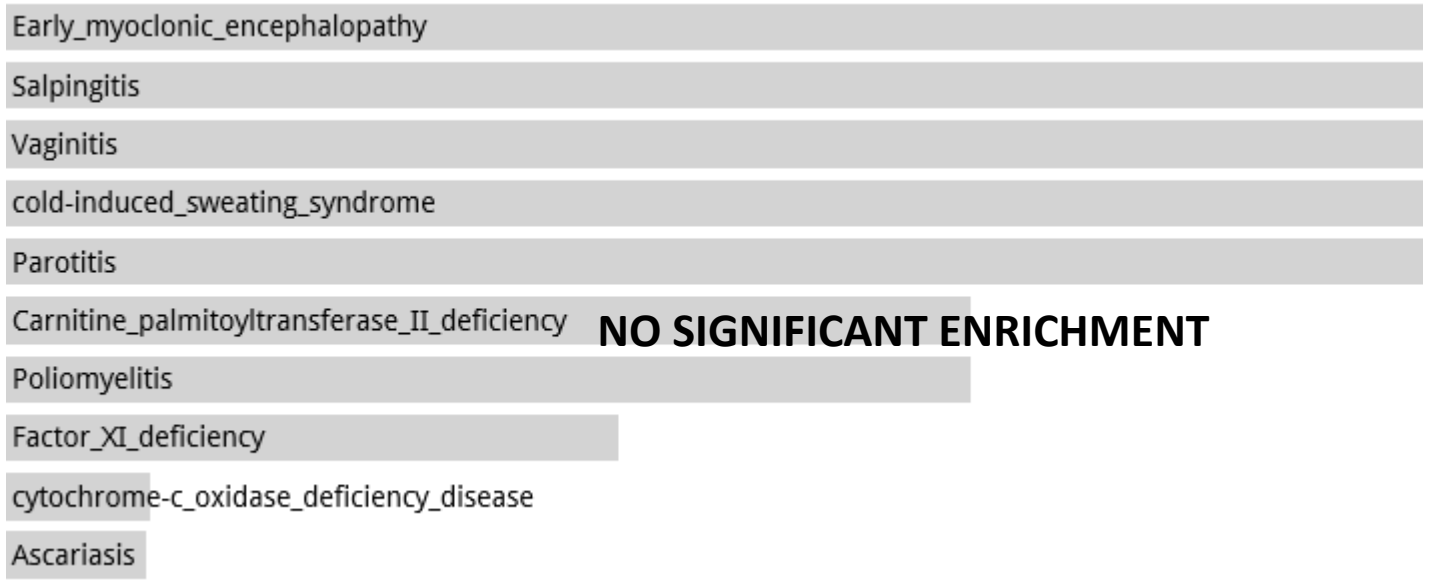
NO SIGNIFICANT ENRICHMENT

Jensen TISSUES random 6001 genes

NO DATA AVAILABLE

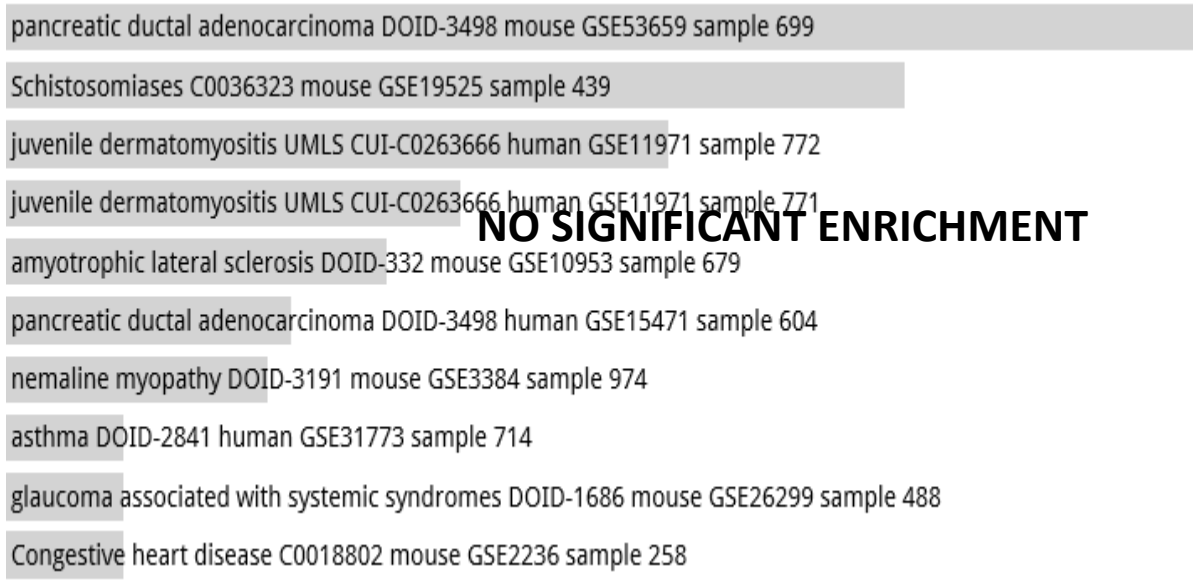
Random Set 8

Jensen DISEASES random 6001 genes



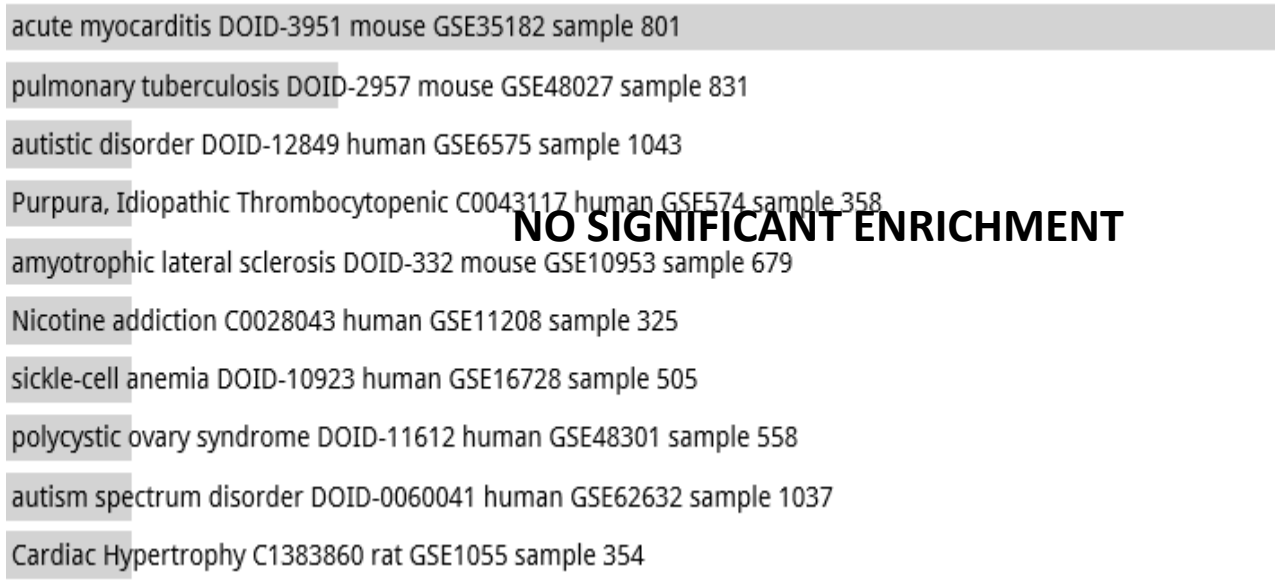
NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO up random 6000 genes



NO SIGNIFICANT ENRICHMENT

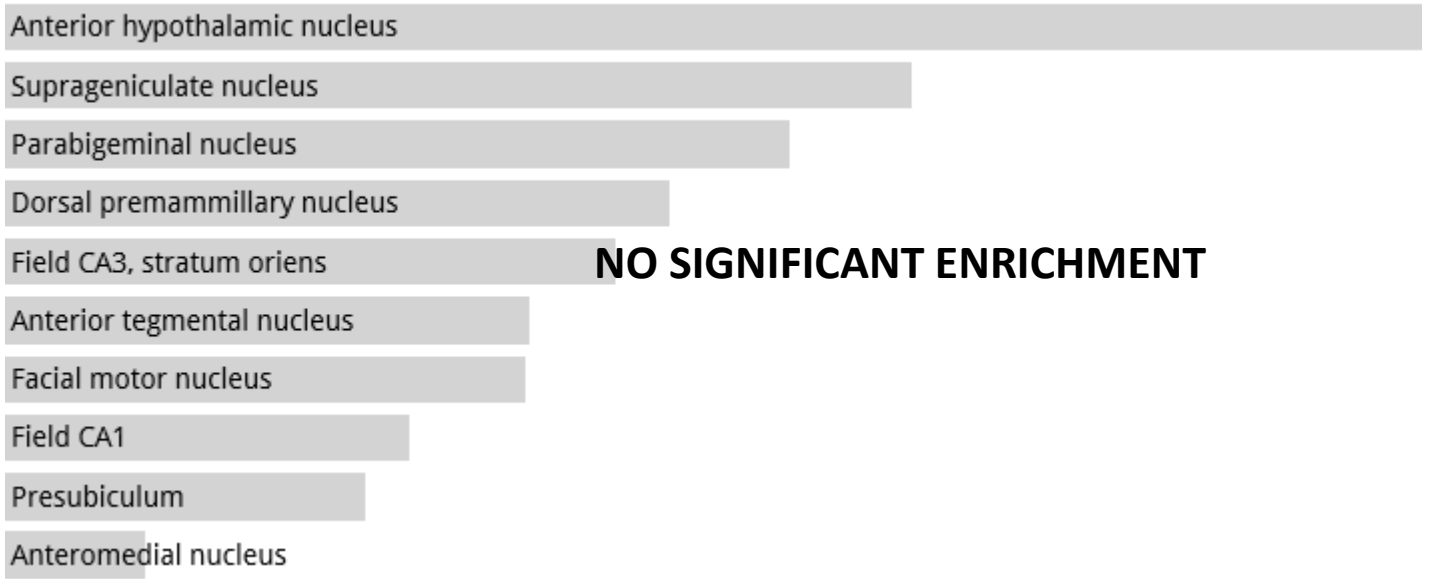
Disease Perturbations from GEO down random 6000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 8

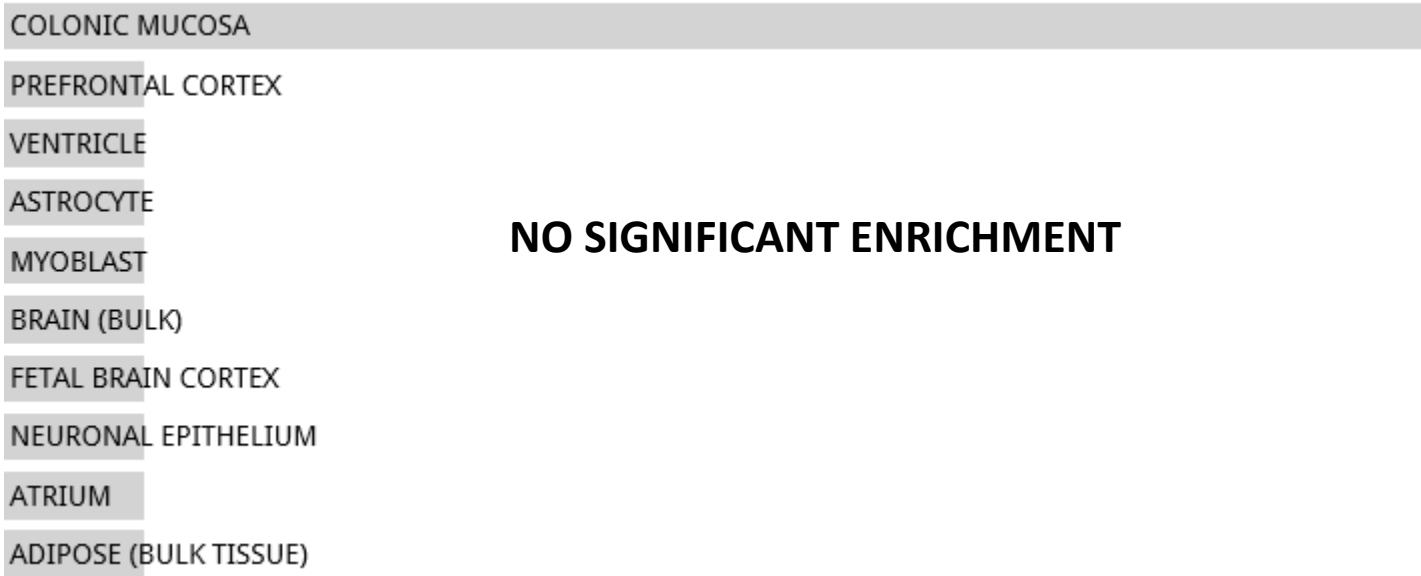
Allen Brain Atlas up random 6001 genes



NO SIGNIFICANT ENRICHMENT

Random Set 9

ARCHS4 Tissues random 6000 genes



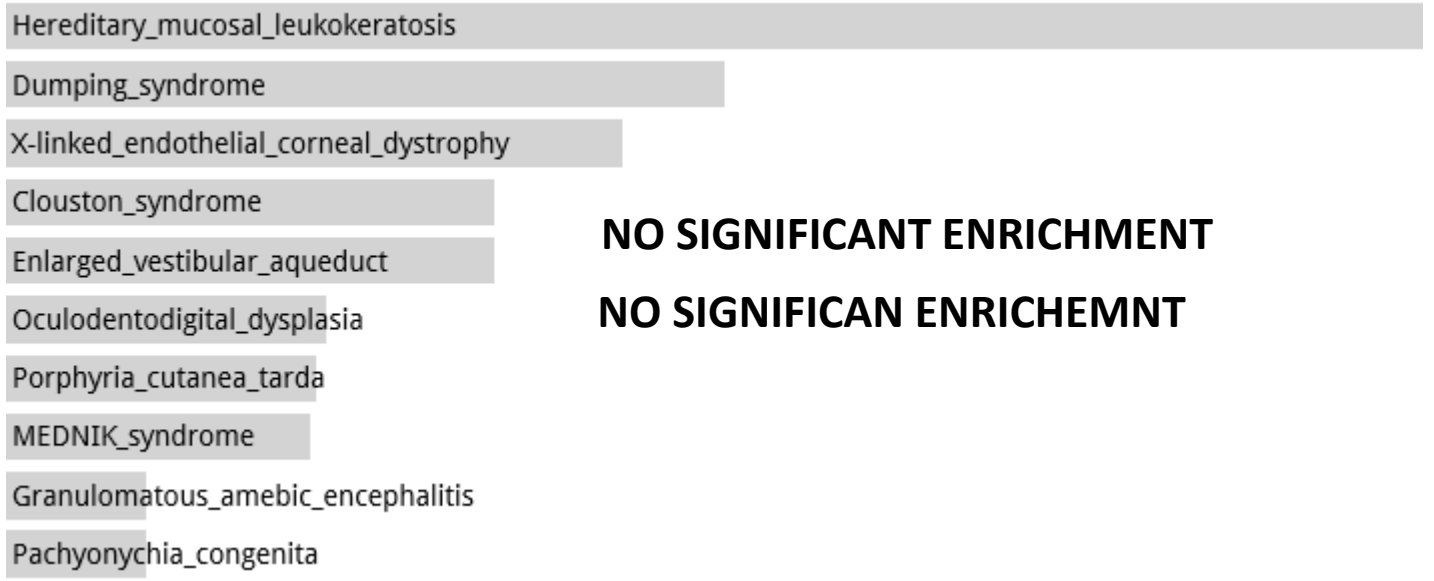
NO SIGNIFICANT ENRICHMENT

Jensen TISSUES random 6000 genes

NO DATA AVAILABLE

Random Set 9

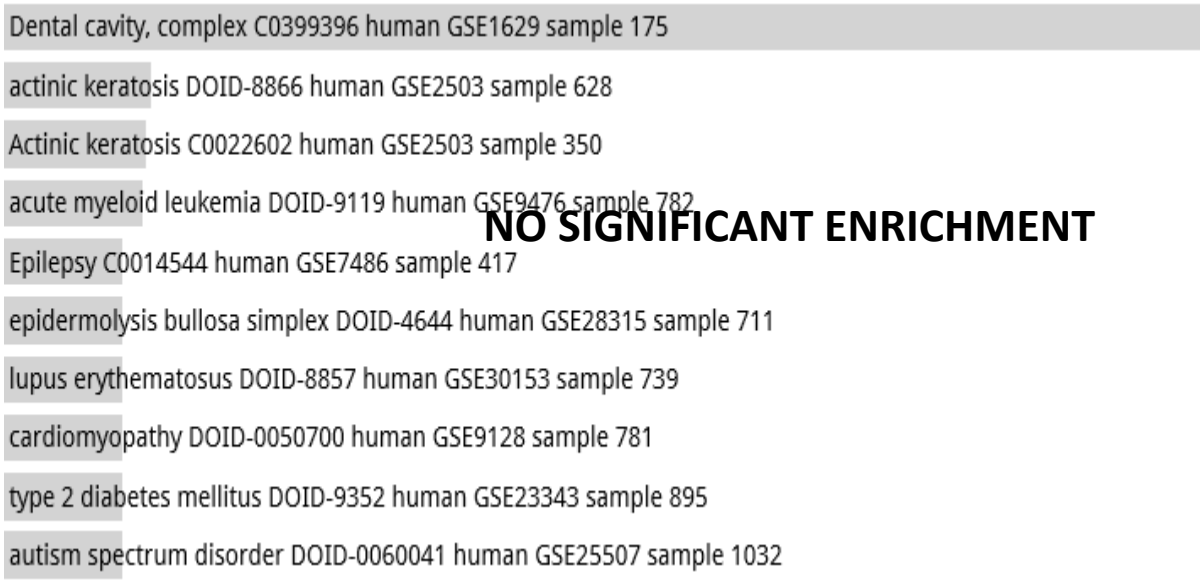
Jensen DISEASES random 6000 genes



NO SIGNIFICANT ENRICHMENT

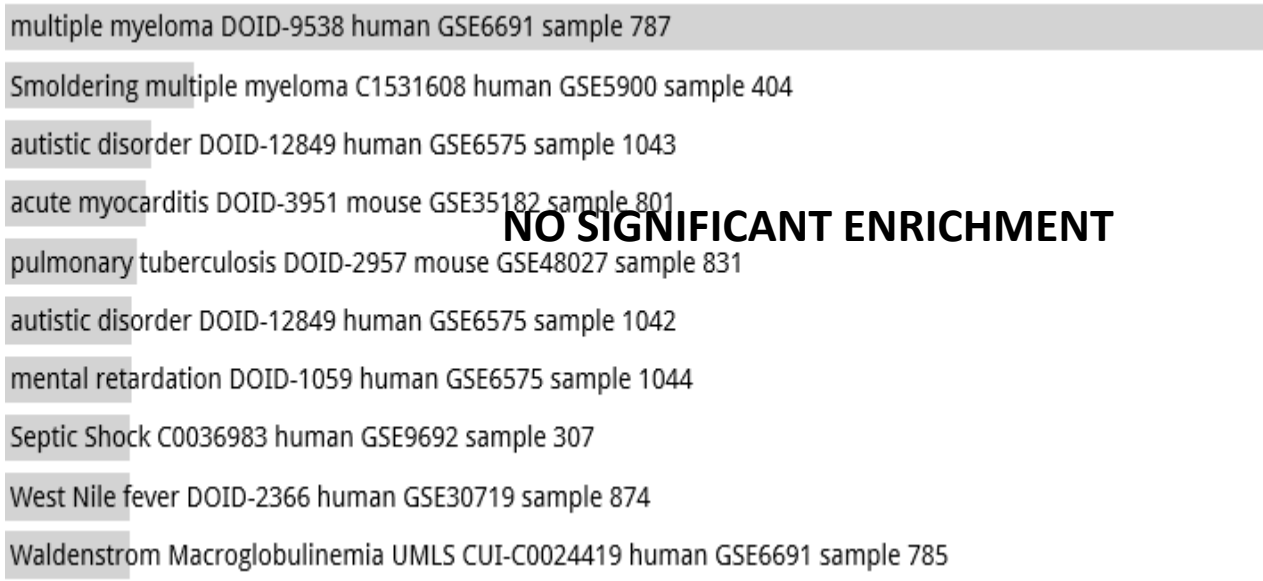
NO SIGNIFICAN ENRICHEMNT

Disease Perturbations from GEO up random 6000 genes



NO SIGNIFICANT ENRICHMENT

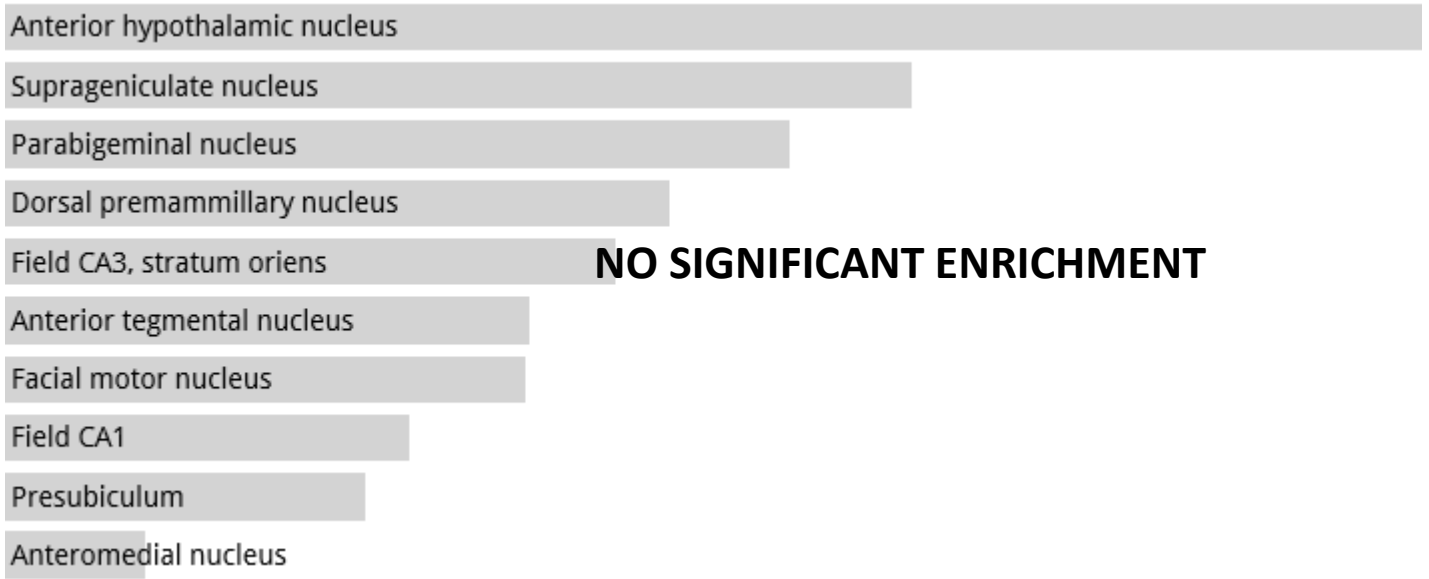
Disease Perturbations from GEO down random 6000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 9

Allen Brain Atlas up random 6000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 10

ARCHS4 Tissues random 6000 genes

GASTRIC TISSUE (BULK)
PREFRONTAL CORTEX
OMENTUM
COLON (BULK TISSUE)
LUNG (BULK TISSUE)
NEURONAL EPITHELIUM
LIVER (BULK TISSUE)
FETAL BRAIN CORTEX
RENAL CORTEX
AMNIOTIC FLUID

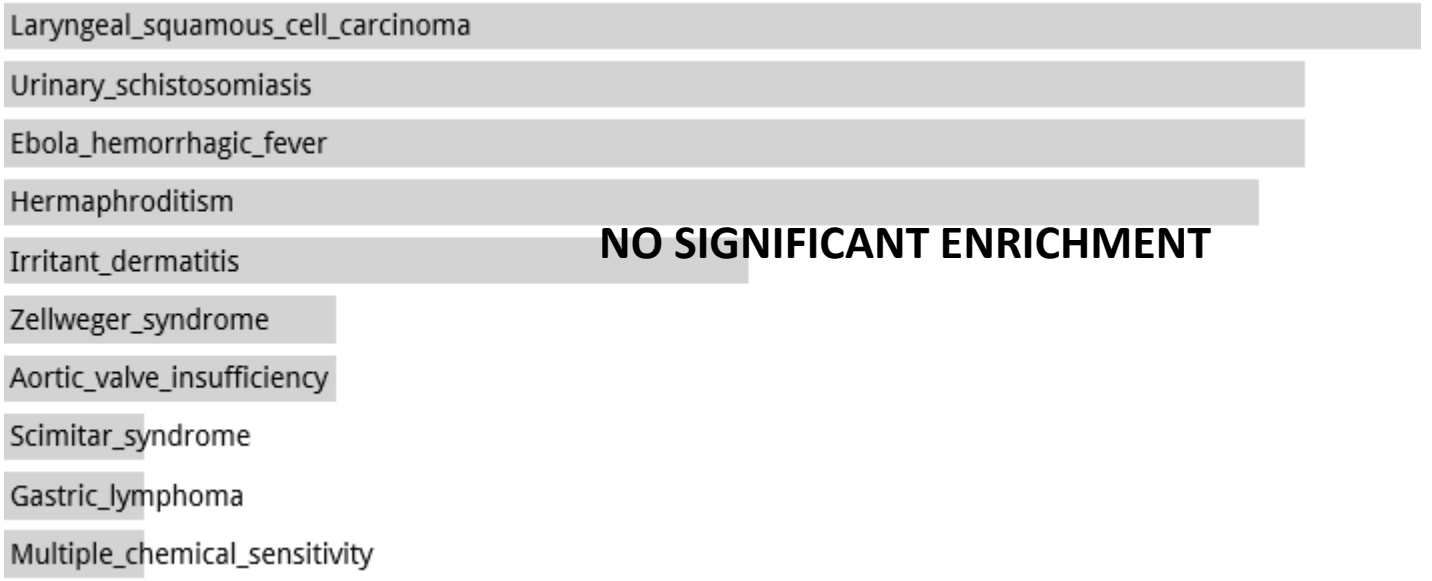
NO SIGNIFICANT ENRICHMENT

Jensen TISSUES random 6000 genes

NO DATA AVAILABLE

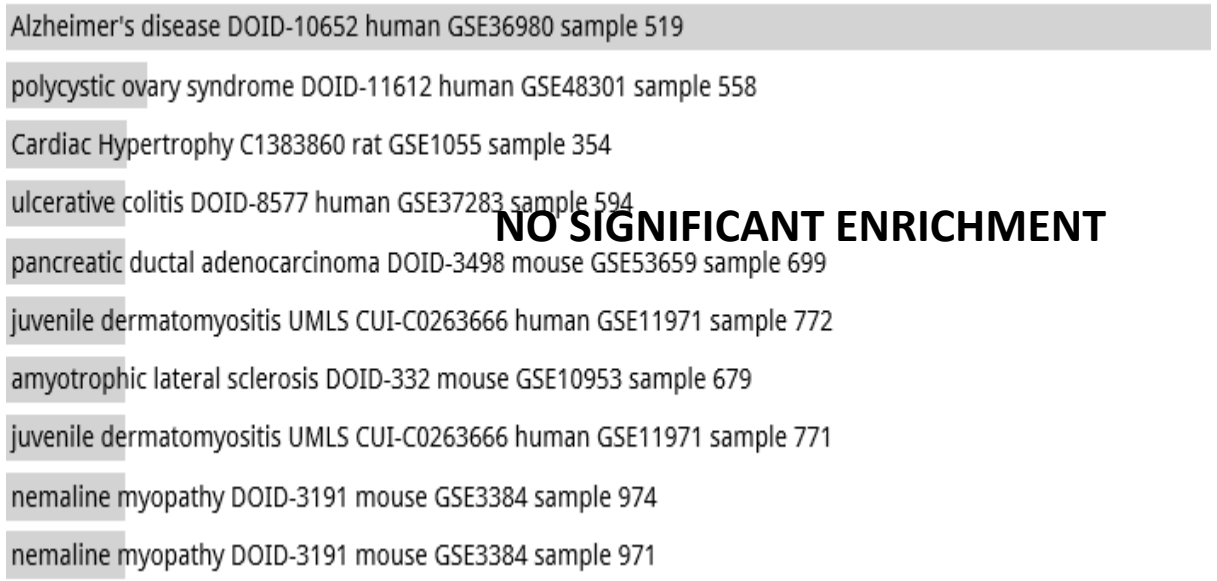
Random Set 10

Jensen DISEASES random 6000 genes



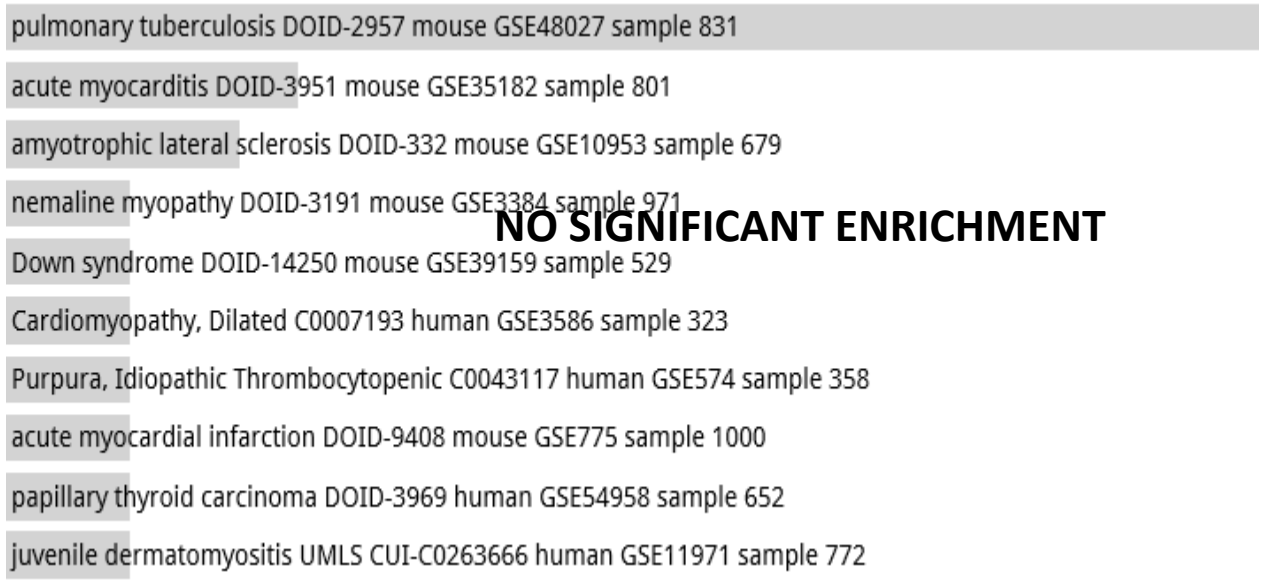
NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO up random 6000 genes



NO SIGNIFICANT ENRICHMENT

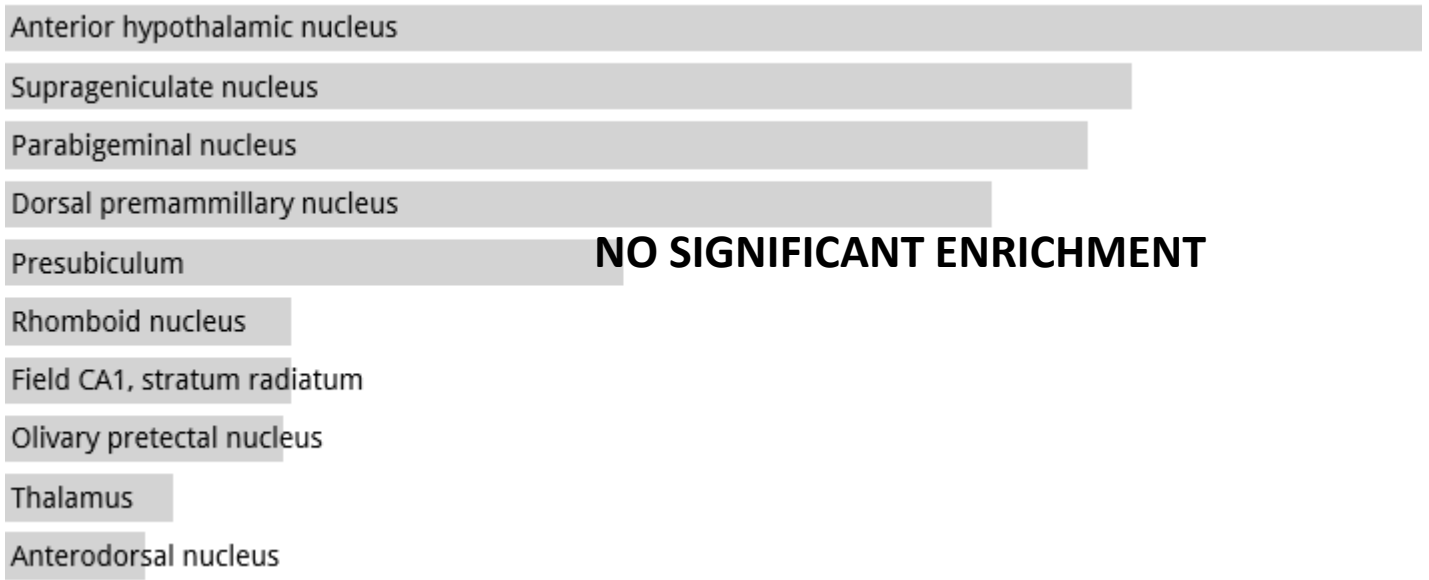
Disease Perturbations from GEO down random 6000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 10

Allen Brain Atlas up random 6000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 11

ARCHS4 Tissues random 4000 genes

OMENTUM

VENTRICLE

SKIN (BULK TISSUE)

WHARTONS JELLY

VASCULAR SMOOTH MUSCLE

OVARY (BULK TISSUE)

CEREBELLUM

CHONDROCYTE

THYROID (BULK TISSUE)

SPINAL CORD (BULK)

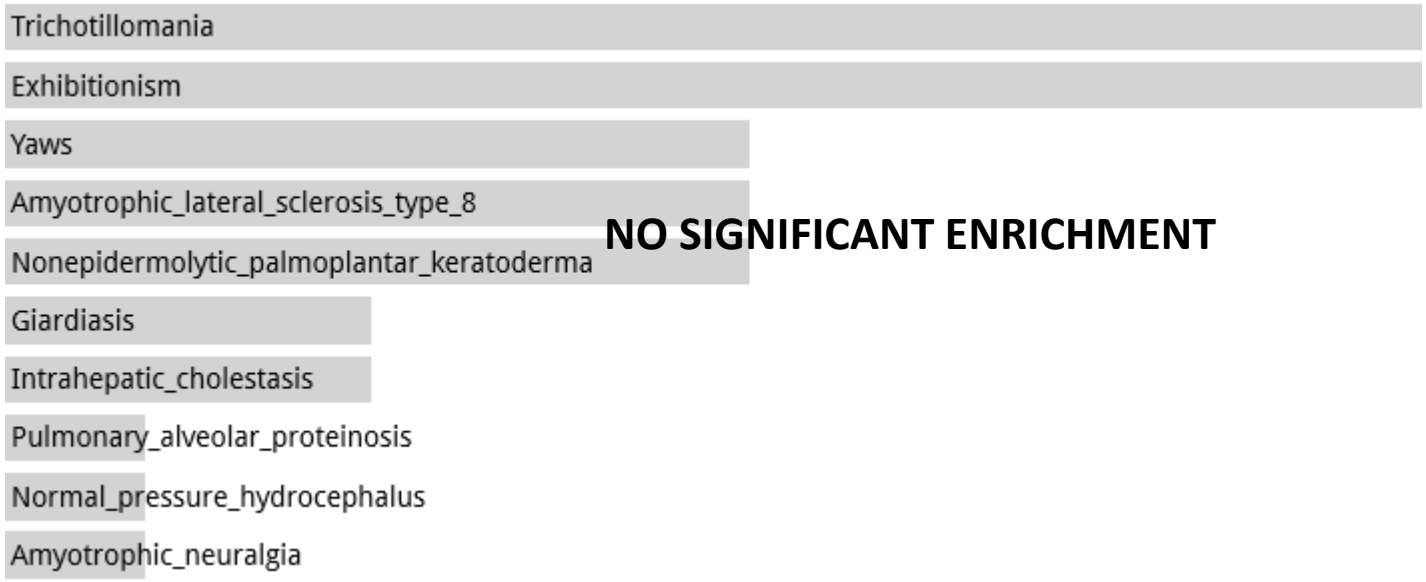
NO SIGNIFICANT ENRICHMENT

Jensen TISSUES random 4000 genes

NO DATA AVAILABLE

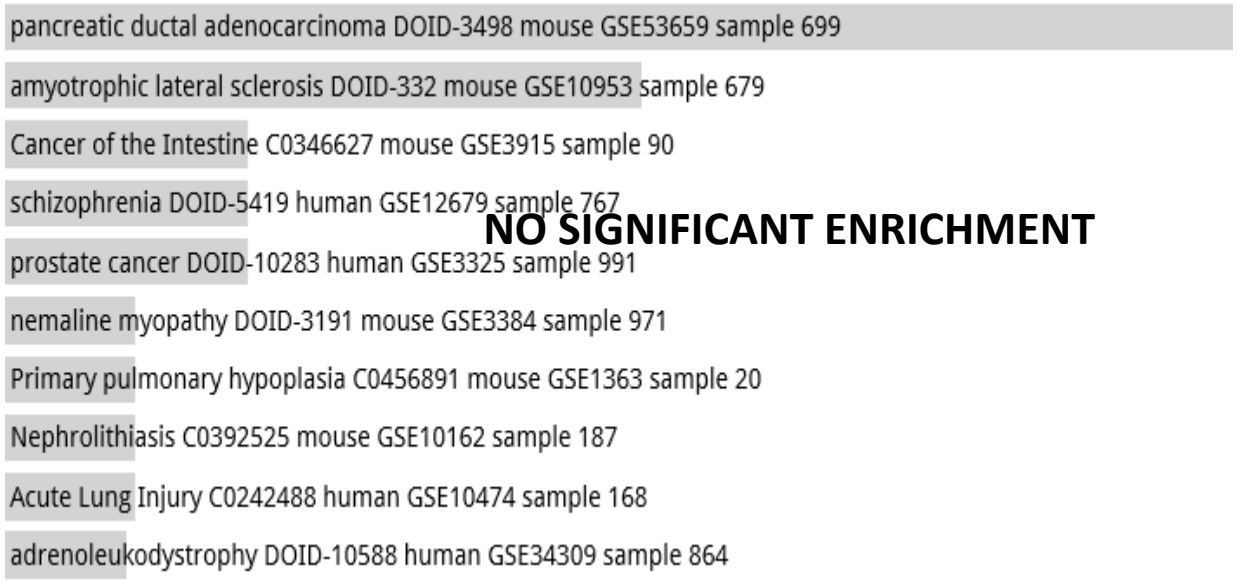
Random Set 11

Jensen DISEASES random 4000 genes



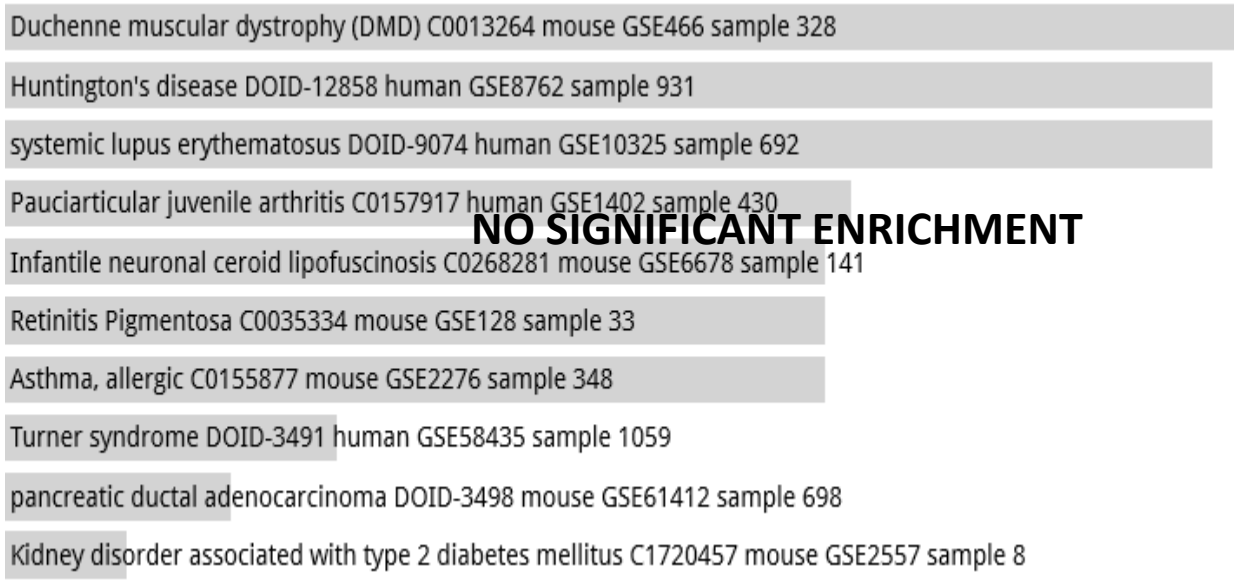
NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO up random 4000 genes



NO SIGNIFICANT ENRICHMENT

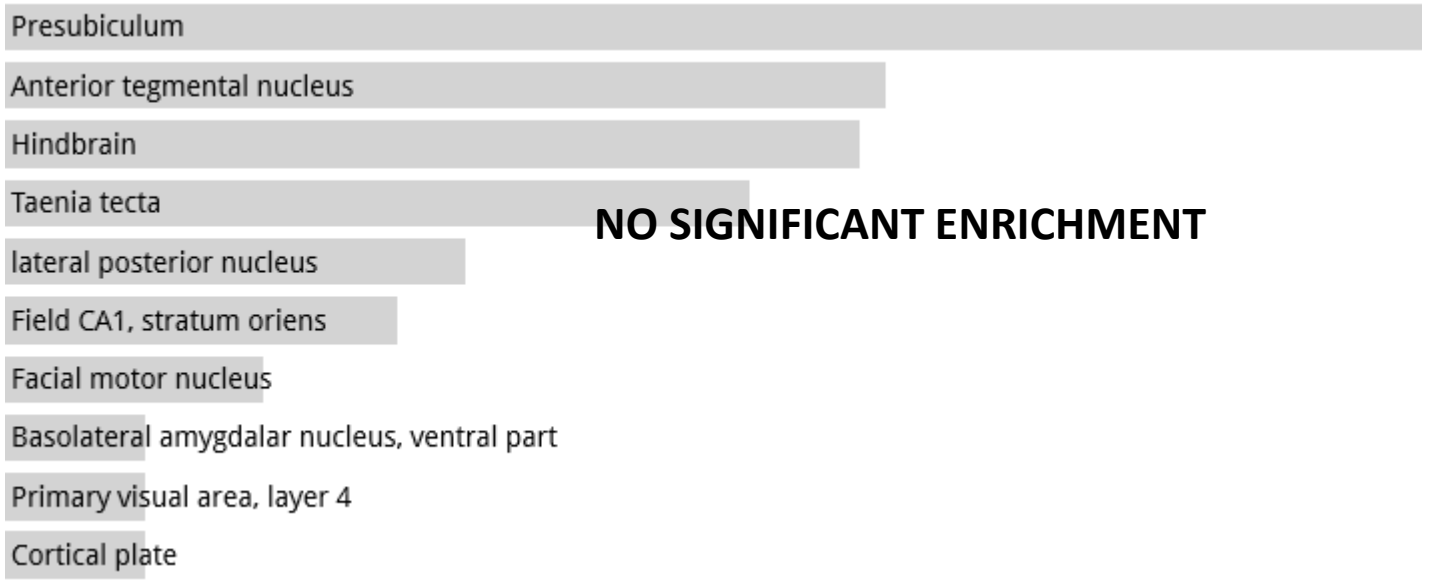
Disease Perturbations from GEO down random 4000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 11

Allen Brain Atlas up random 4000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 12

ARCHS4 Tissues random 4000 genes

GASTRIC TISSUE (BULK)
RENAL CORTEX
SKIN (BULK TISSUE)
SMALL INTESTINE (BULK TISSUE)
PANCREATIC ISLET
PREFRONTAL CORTEX
KIDNEY (BULK TISSUE)
SPINAL CORD (BULK)
PLACENTA (BULK)
SPINAL CORD

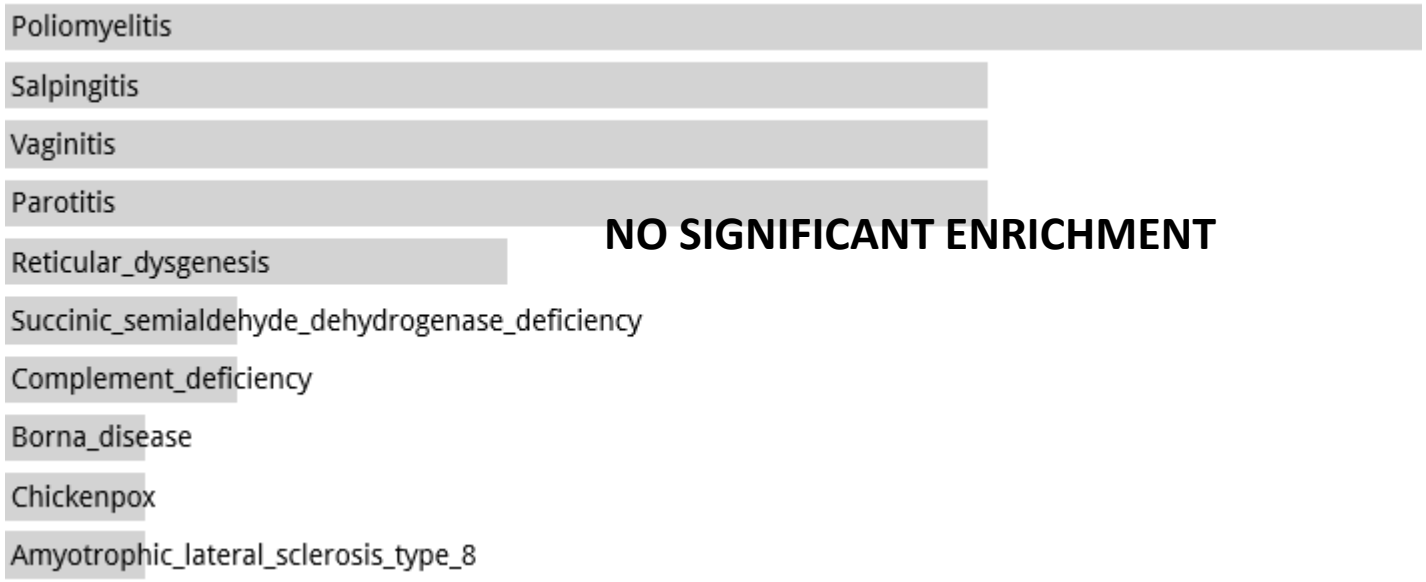
NO SIGNIFICANT ENRICHMENT

Jensen TISSUES random 4000 genes

NO DATA AVAILABLE

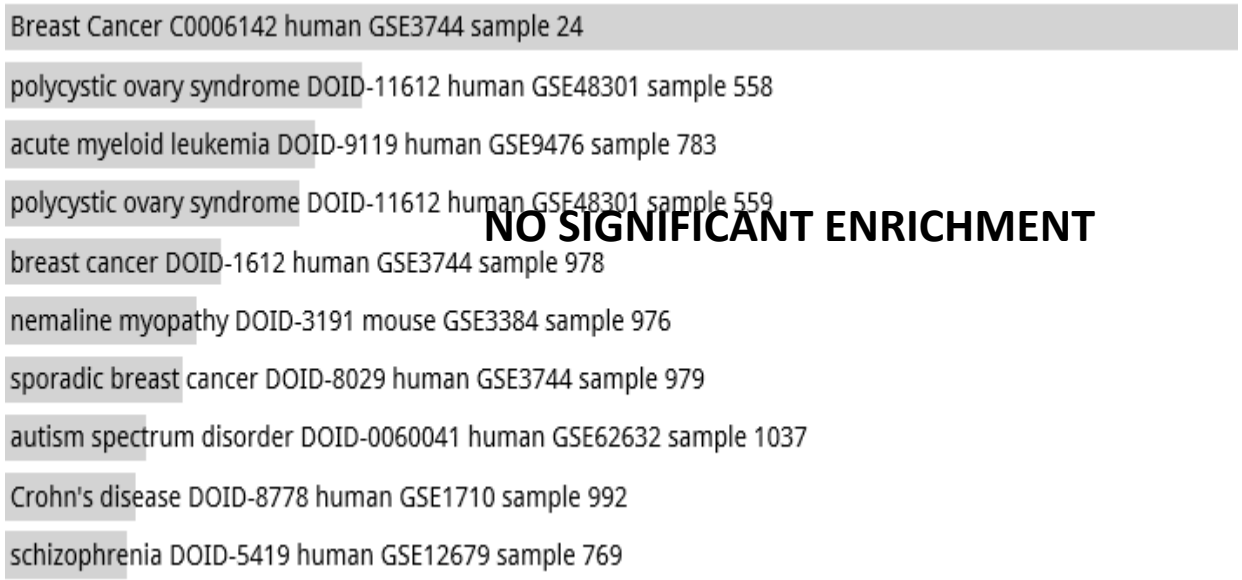
Random Set 12

Jensen DISEASES random 4000 genes



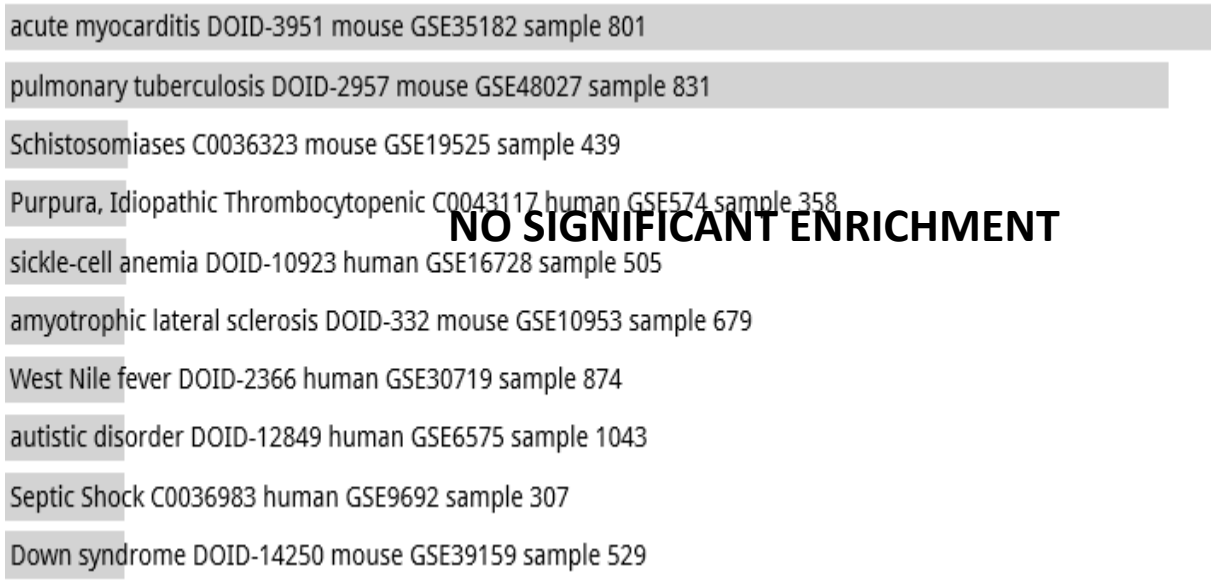
NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO up random 4000 genes



NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO down random 4000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 12

Allen Brain Atlas up random 4000 genes

dorsal juxtacommissural pretectal nucleus

periventricular stratum of JcPL

JcPL part of the periaqueductal gray

periventricular stratum of PcPL

mantle zone of JcPD

PcPL part of the periaqueductal gray

intermediate stratum of JcPD

dorsal part of JcP

CoPV part of the periaqueductal gray

periventricular stratum of CoPV

NO SIGNIFICANT ENRICHMENT

Random Set 13

ARCHS4 Tissues random 4000 genes

COLON (BULK TISSUE)

ILEUM (BULK)

SMALL INTESTINE (BULK TISSUE)

GASTRIC TISSUE (BULK)

OMENTUM

NEURONAL EPITHELIUM

SKIN (BULK TISSUE)

CEREBELLUM

PREFRONTAL CORTEX

MYOBLAST

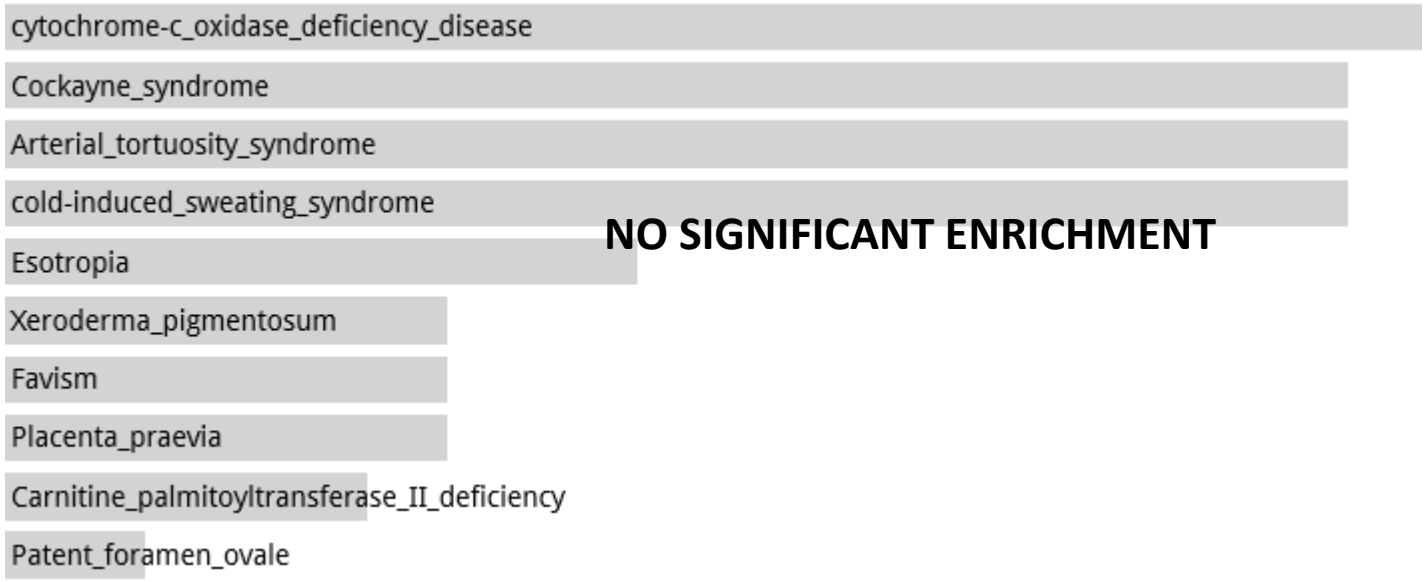
NO SIGNIFICANT ENRICHMENT

Jensen TISSUES random 4000 genes

NO DATA AVAILABLE

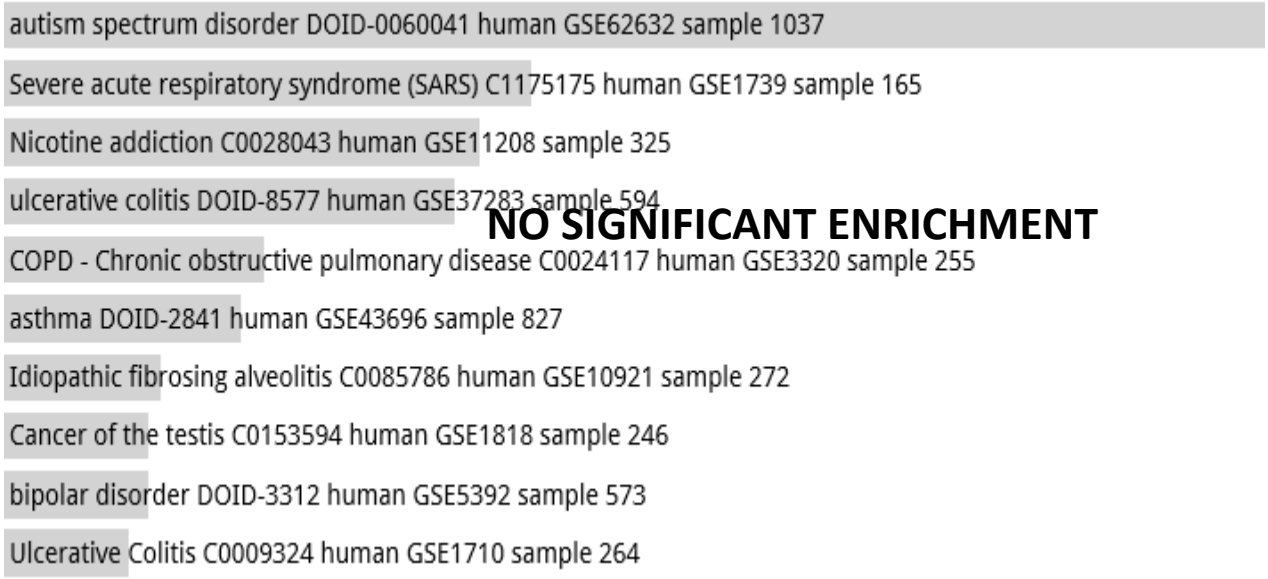
Random Set 13

Jensen DISEASES random 4000 genes



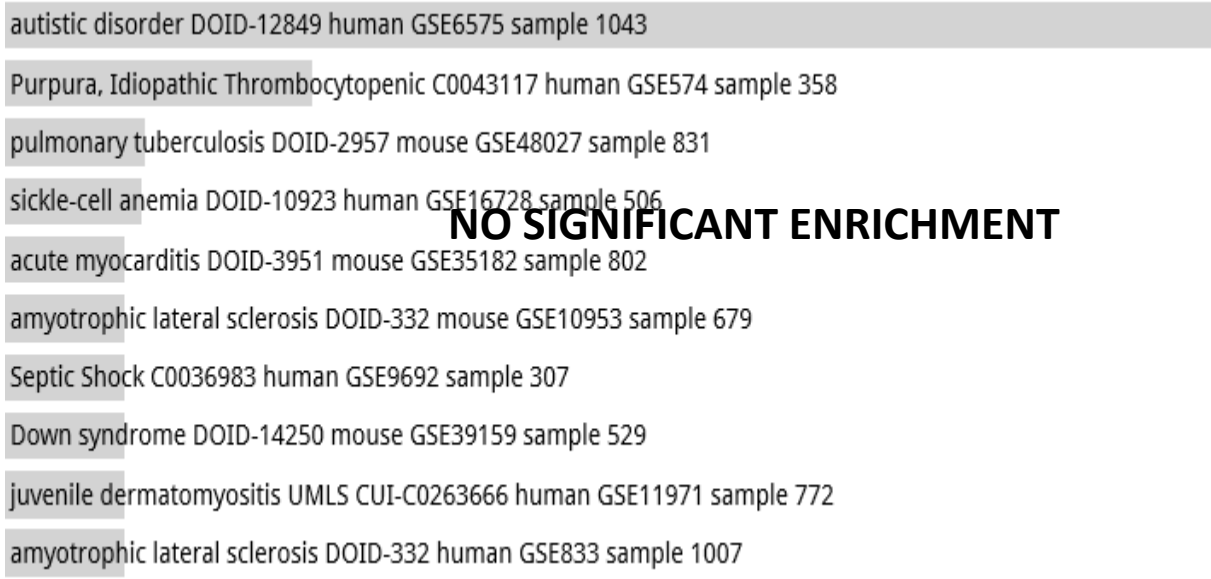
NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO up random 4000 genes



NO SIGNIFICANT ENRICHMENT

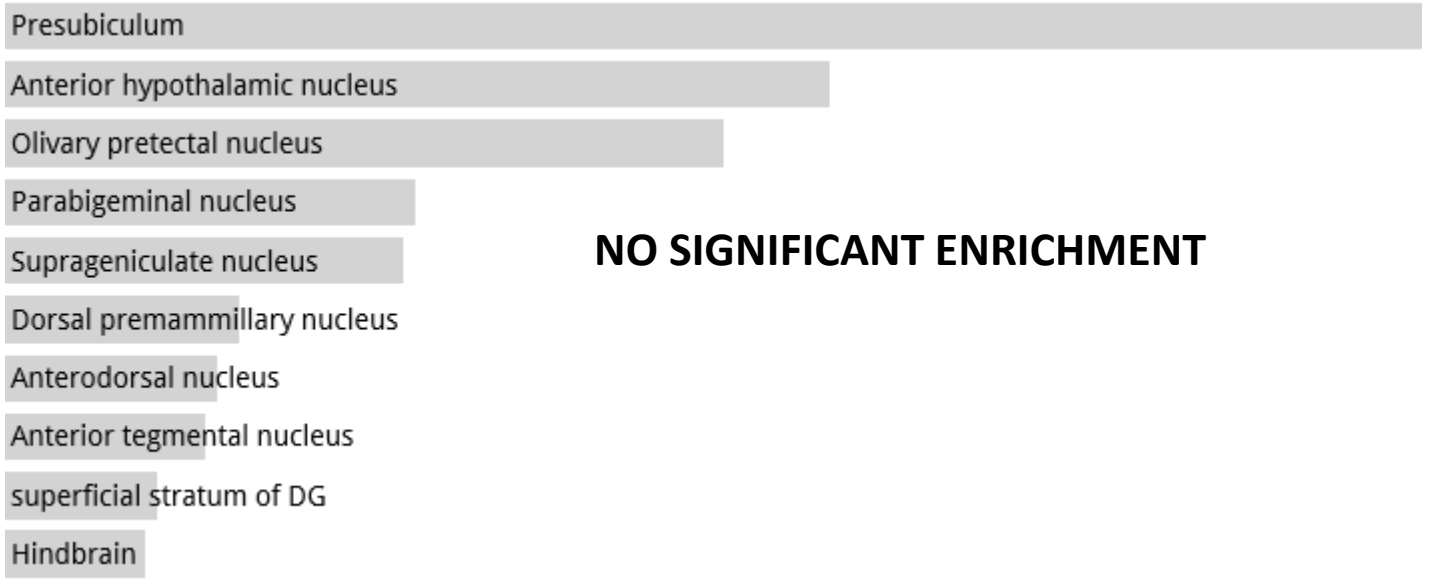
Disease Perturbations from GEO down random 4000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 13

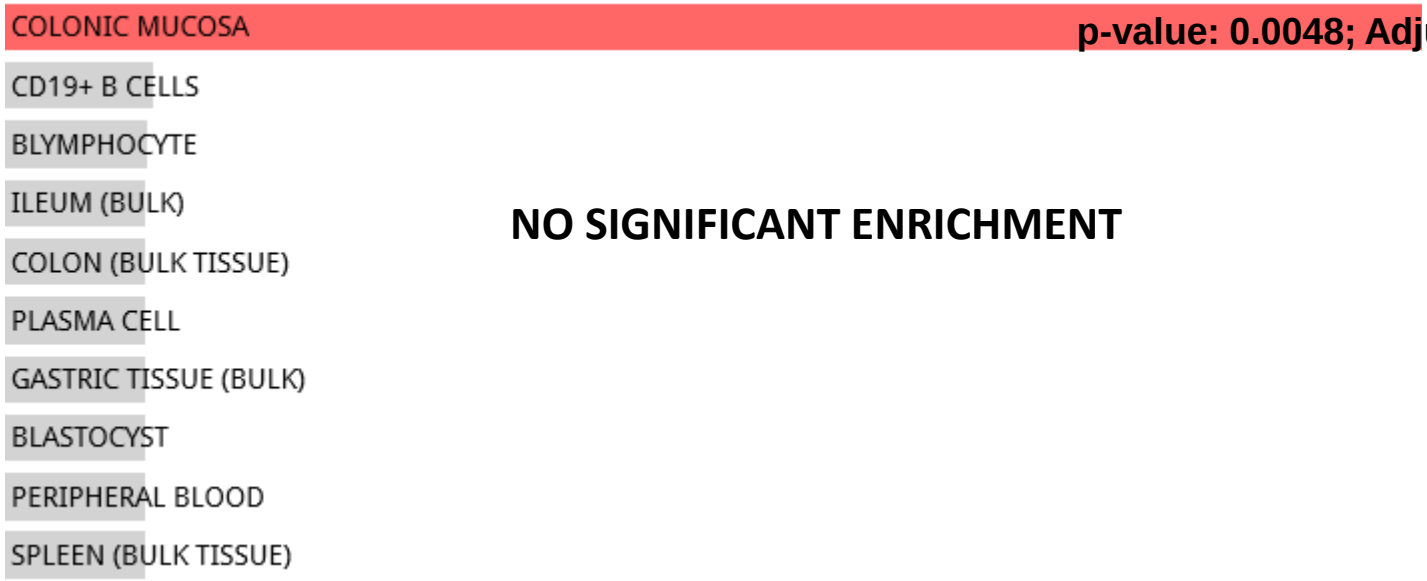
Allen Brain Atlas up random 4000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 14

ARCHS4 Tissues random 4000 genes



p-value: 0.0048; Adjusted p-value: 0.5188

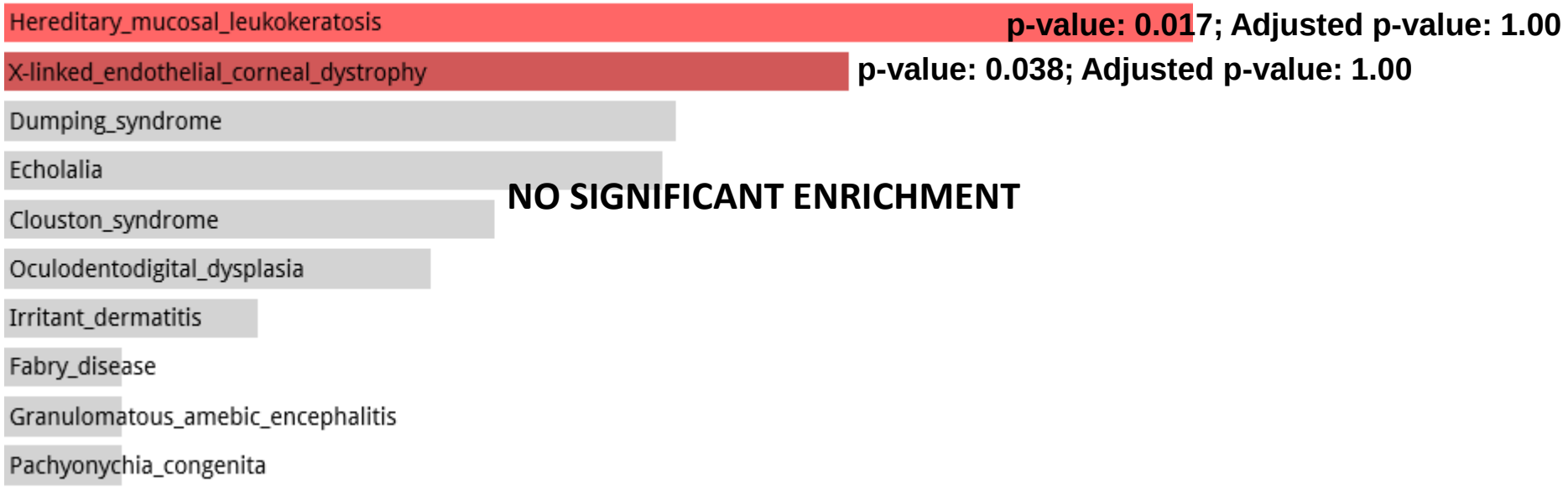
NO SIGNIFICANT ENRICHMENT

Jensen TISSUES random 4000 genes

NO DATA AVAILABLE

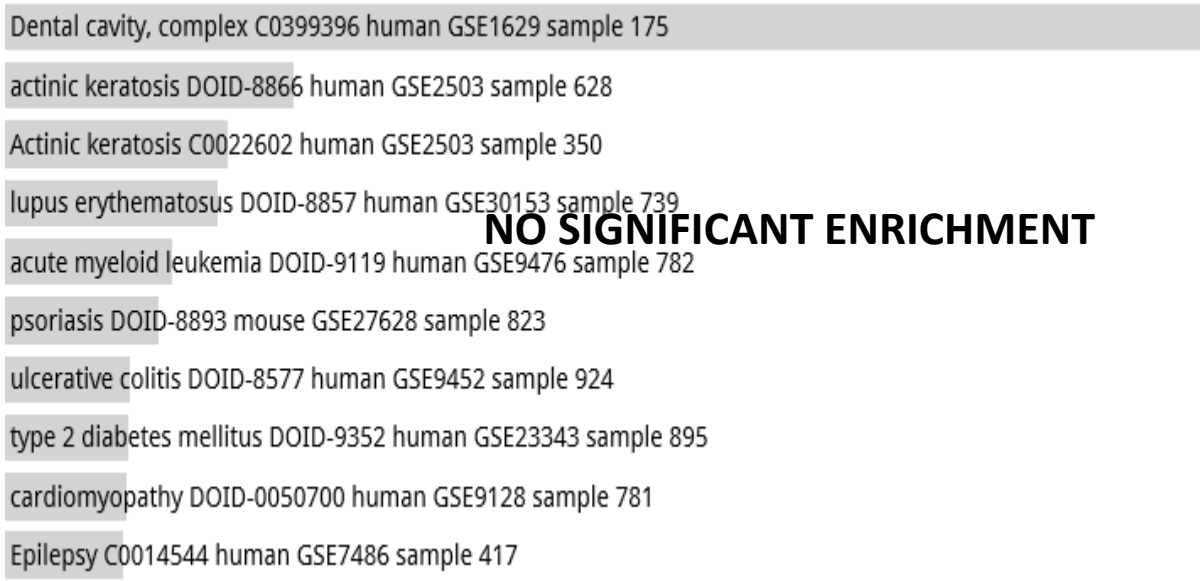
Random Set 14

Jensen DISEASES random 4000 genes



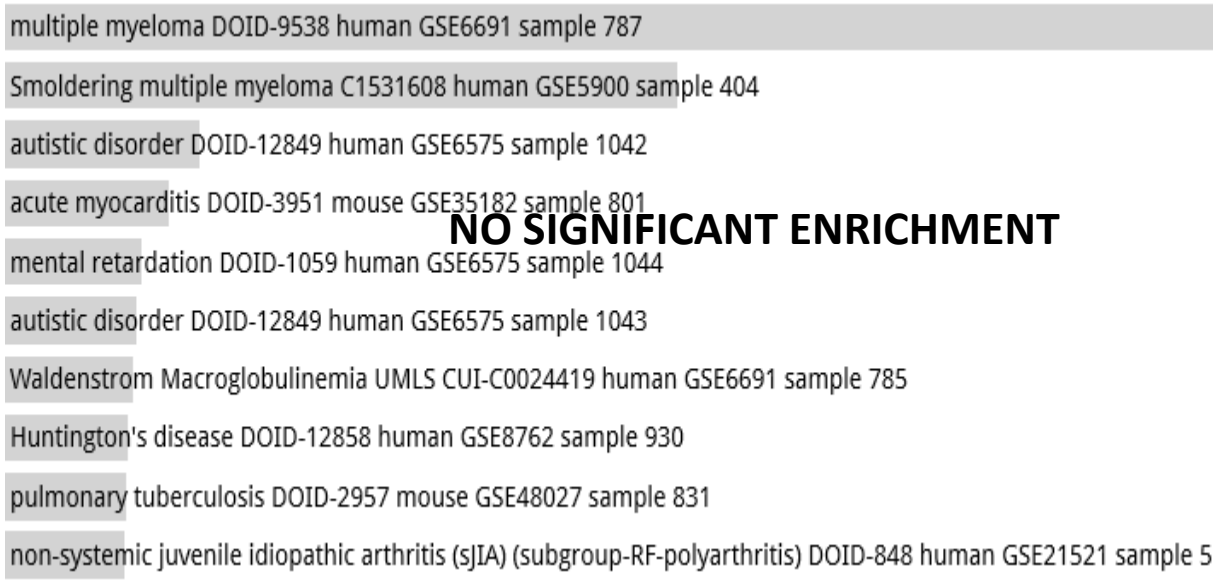
NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO up random 4000 genes



NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO down random 4000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 14

Allen Brain Atlas up random 4000 genes

periventricular stratum of the VAP

Nucleus of the solitary tract, lateral part

Lateral amygdalar nucleus

intermediate stratum of r4Ve

r9 part of the vestibular column

Lateral reticular nucleus, parvicellular part

mantle zone of r9Ve

r4 part of magnocellular medial vestibular nucleus

periventricular stratum of r8Tr

superficial stratum of r7Lim

NO SIGNIFICANT ENRICHMENT

Random Set 15

ARCHS4 Tissues random 4000 genes

COLON (BULK TISSUE)
GASTRIC TISSUE (BULK)
PREFRONTAL CORTEX
ILEUM (BULK)
LUNG (BULK TISSUE)
NEURONAL EPITHELIUM
OMENTUM
LIVER (BULK TISSUE)
AMNIOTIC FLUID
RENAL CORTEX

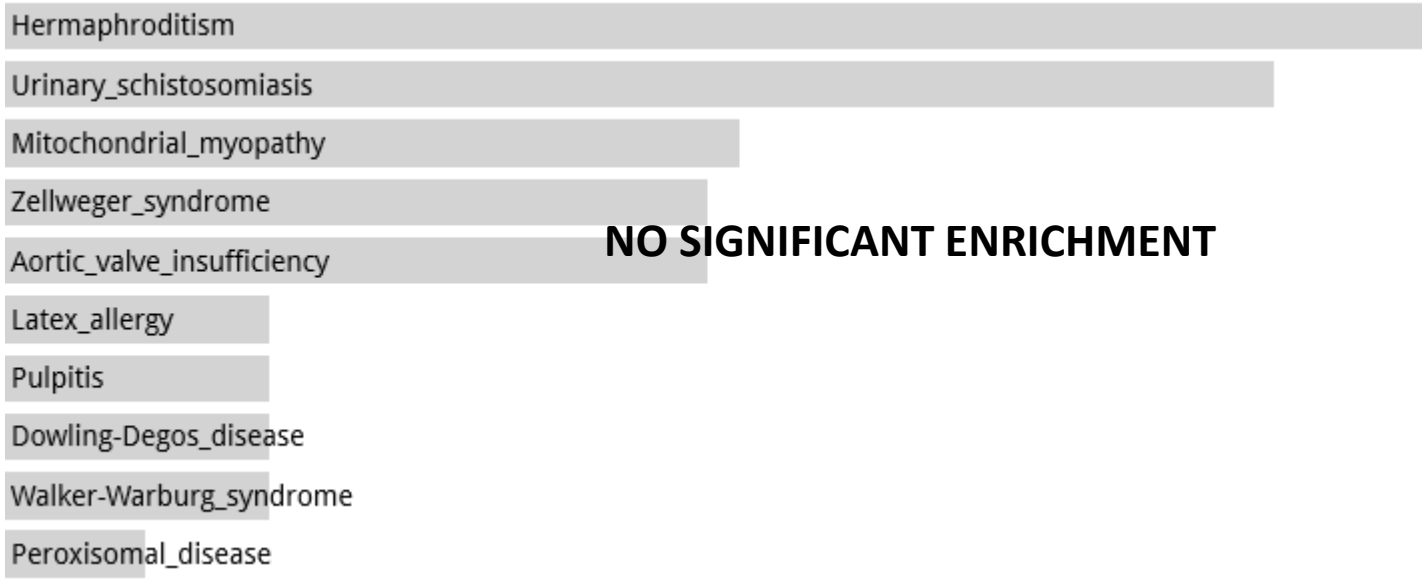
NO SIGNIFICANT ENRICHMENT

Jensen TISSUES random 4000 genes

NO DATA AVAILABLE

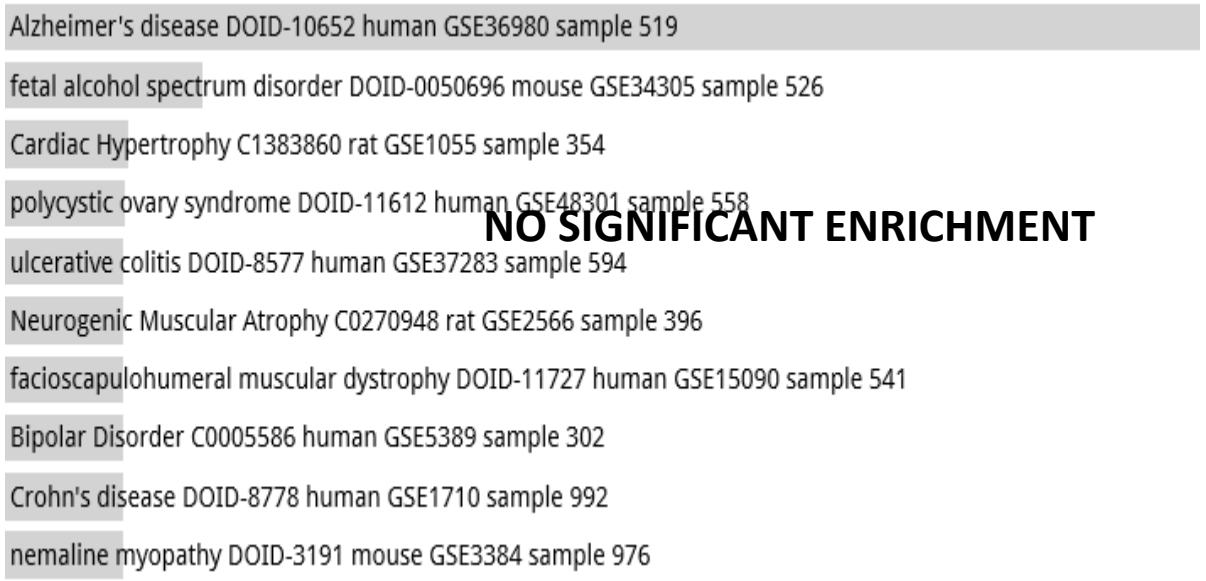
Random Set 15

Jensen DISEASES random 4000 genes



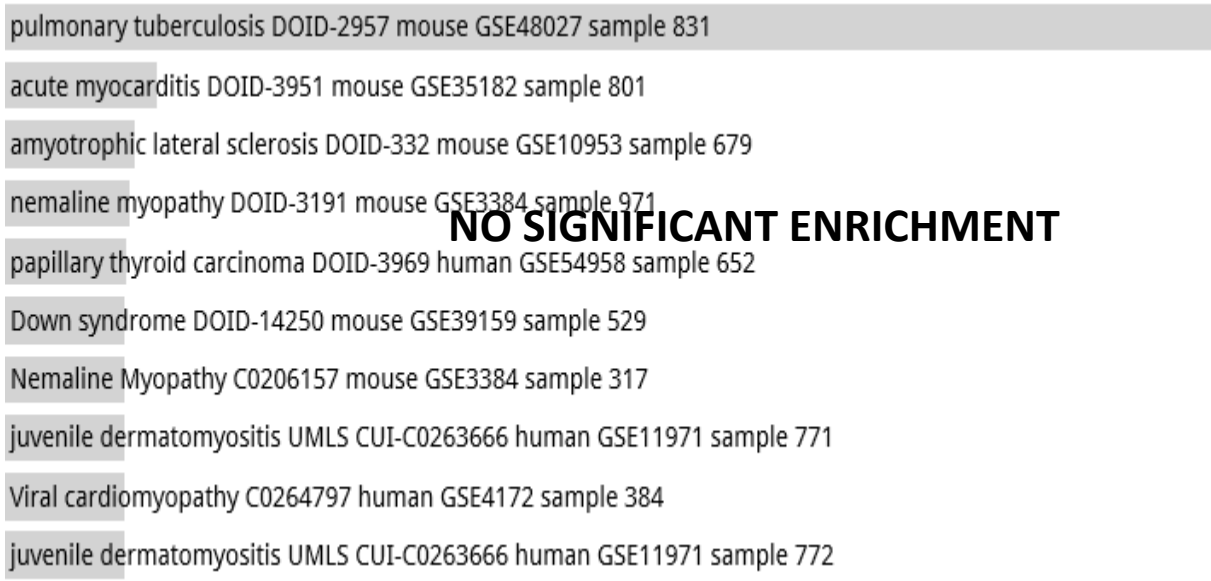
NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO up random 4000 genes



NO SIGNIFICANT ENRICHMENT

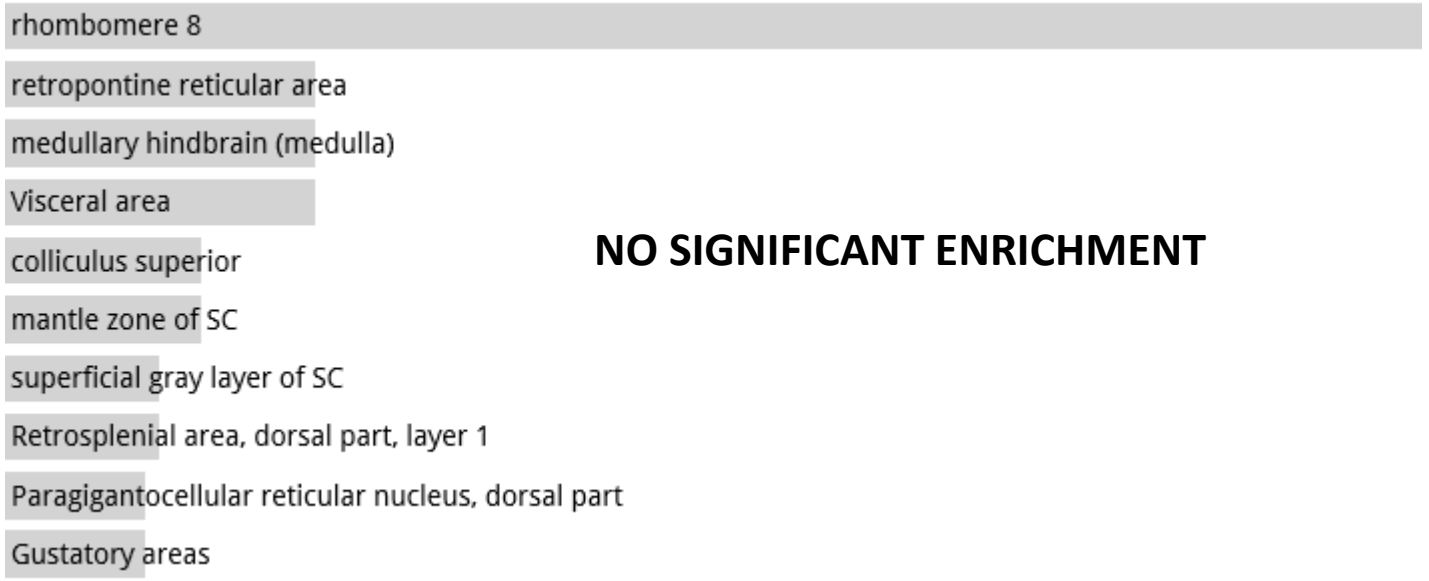
Disease Perturbations from GEO down random 4000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 15

Allen Brain Atlas up random 4000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 16

ARCHS4 Tissues random 4000 genes

PREFRONTAL CORTEX

SPINAL CORD (BULK)

SUPERIOR FRONTAL GYRUS

OMENTUM

SPINAL CORD

LUNG (BULK TISSUE)

NEURONAL EPITHELIUM

FETAL BRAIN CORTEX

ASTROCYTE

BRAIN (BULK)

NO SIGNIFICANT ENRICHMENT

Jensen TISSUES random 4000 genes

NO DATA AVAILABLE

Random Set 16

Jensen DISEASES random 4000 genes

Scimitar_syndrome
Western_equine_encephalitis
Opitz-GBBB_syndrome
Conversion_disorder
Gastric_lymphoma
Cutaneous_porphyria
Leiomyomatosis
Epididymitis
DNA_ligase_IV_deficiency
Juvenile_polyposis_syndrome

NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO up random 4000 genes

pancreatic ductal adenocarcinoma DOID-3498 mouse GSE53659 sample 699
amyotrophic lateral sclerosis DOID-332 mouse GSE10953 sample 679
autism spectrum disorder DOID-0060041 human GSE62632 sample 1037
RA (rheumatoid arthritis) C0003873 human GSE3592 sample 183
schizophrenia DOID-5419 human GSE27383 sample 548
Cancer of the Intestine C0346627 mouse GSE3915 sample 90
schizophrenia DOID-5419 human GSE12679 sample 767
Duchenne muscular dystrophy (DMD) C0013264 mouse GSE1472 sample 62
swine influenza DOID-0050211 human GSE48466 sample 498
psoriasis DOID-8893 human GSE26952 sample 982

NO SIGNIFICANT ENRICHMENT

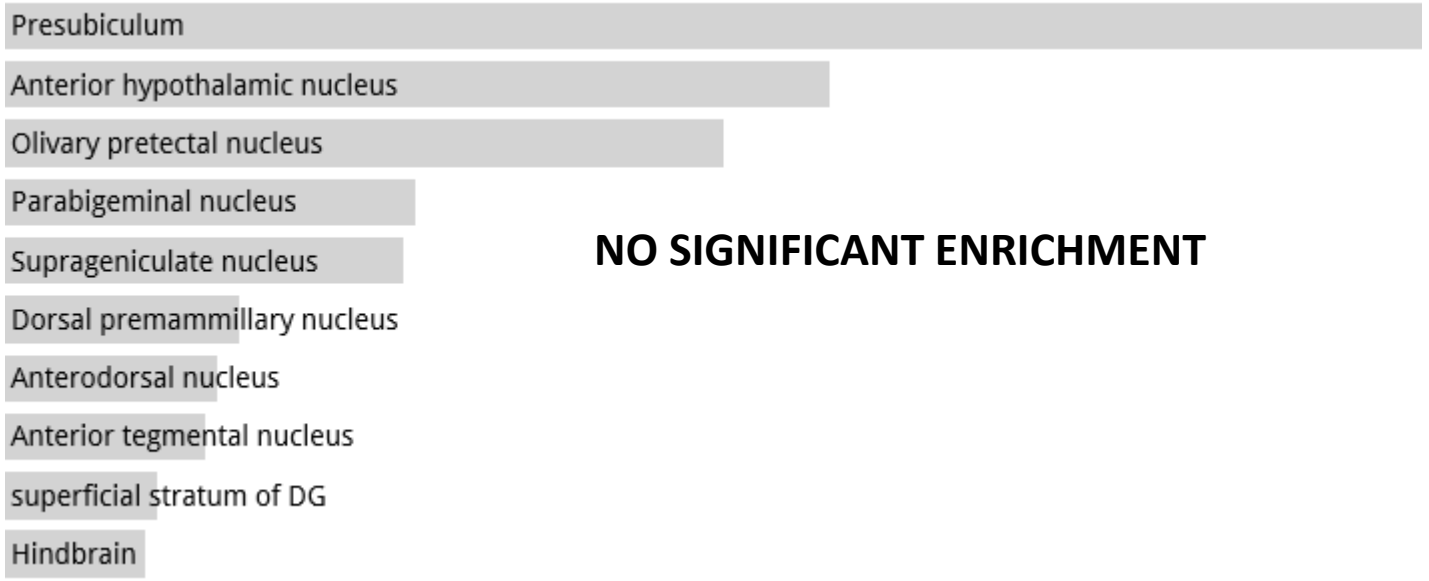
Disease Perturbations from GEO down random 4000 genes

pulmonary tuberculosis DOID-2957 mouse GSE48027 sample 831
Purpura, Idiopathic Thrombocytopenic C0043117 human GSE574 sample 358
West Nile fever DOID-2366 human GSE30719 sample 874
amyotrophic lateral sclerosis DOID-332 mouse GSE10953 sample 679
Down syndrome DOID-14250 mouse GSE39159 sample 529
pancreatic ductal adenocarcinoma DOID-3498 mouse GSE53659 sample 699
Cardiomyopathy, Dilated C0007193 human GSE3586 sample 323
nemaline myopathy DOID-3191 mouse GSE3384 sample 971
juvenile dermatomyositis UMLS CUI-C0263666 human GSE11971 sample 772
Schistosomiases C0036323 mouse GSE19525 sample 439

NO SIGNIFICANT ENRICHMENT

Random Set 16

Allen Brain Atlas up random 4000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 17

ARCHS4 Tissues random 4000 genes

SMALL INTESTINE (BULK TISSUE)
VASCULAR SMOOTH MUSCLE
SKIN (BULK TISSUE)
THYROID (BULK TISSUE)
STROMAL CELL
RESPIRATORY SMOOTH MUSCLE
RENAL CORTEX
SKELETAL MUSCLE (BULK TISSUE)
REGULATORY T CELLS
PANCREATIC ISLET

NO SIGNIFICANT ENRICHMENT

Jensen TISSUES random 4000 genes

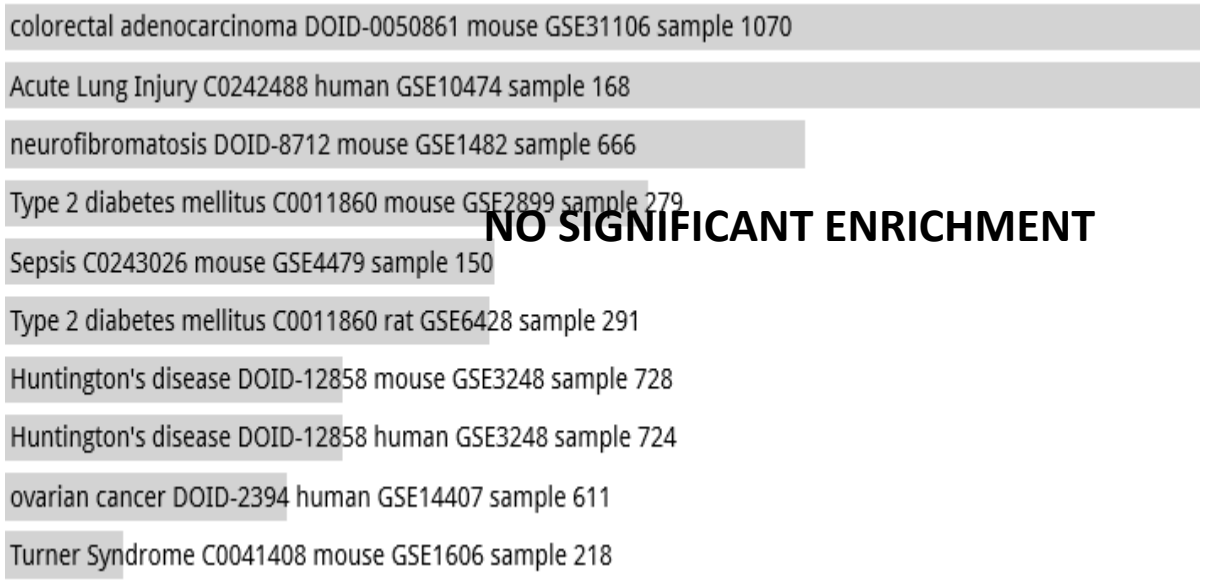
NO DATA AVAILABLE

Random Set 17

Jensen DISEASES random 4000 genes

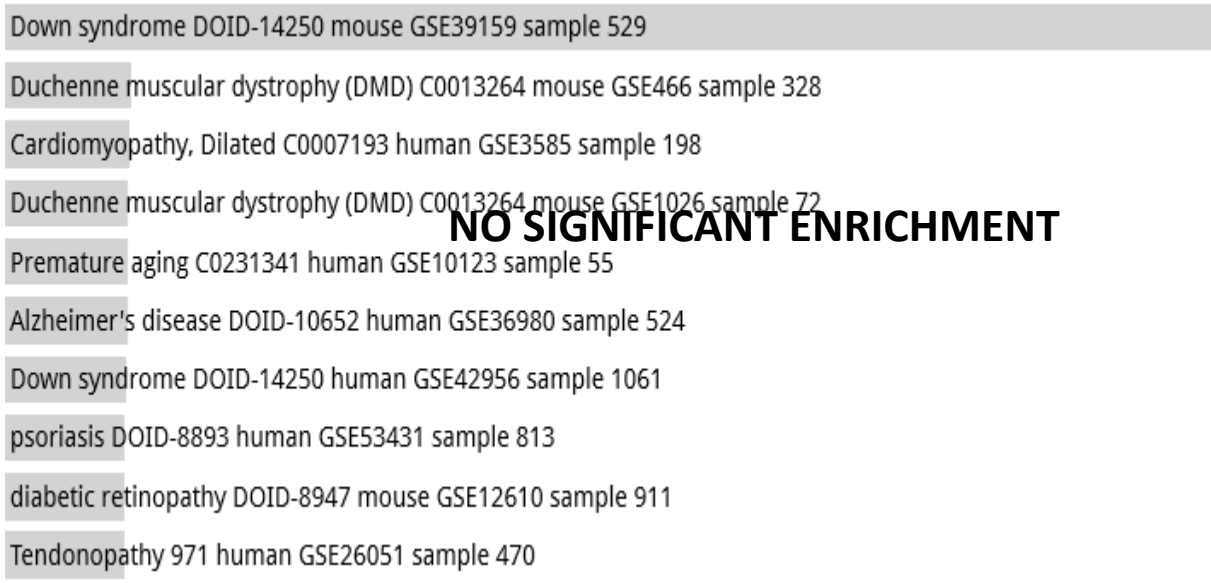
NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO up random 4000 genes



NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO down random 4000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 17

Allen Brain Atlas up random 4000 genes

Presubiculum
Endopiriform nucleus, dorsal part
dorsal endopiriform nucleus
Copula pyramidis
bed nucleus of the external capsule
mantle zone of r7Co
Agranular insular area, posterior part, layer 6a
Entorhinal area, medial part, dorsal zone, layer 5
corticoid layer of TuStr
Infralimbic area, layer 6b

NO SIGNIFICANT ENRICHMENT

Random Set 18

ARCHS4 Tissues random 4000 genes

NO DATA AVAILABLE

Jensen TISSUES random 4000 genes

NO DATA AVAILABLE

Random Set 18

Jensen DISEASES random 4000 genes

NO DATA AVAILABLE

Disease Perturbations from GEO up random 4000 genes

NO DATA AVAILABLE

Disease Perturbations from GEO down random 4000 genes

NO DATA AVAILABLE

Random Set 18

Allen Brain Atlas up random 4000 genes

NO DATA AVAILABLE

Random Set 19

ARCHS4 Tissues random 4000 genes

NO DATA AVIALABLE

Jensen TISSUES random 4000 genes

NO DATA AVAILABLE

Random Set 19

Jensen DISEASES random 4000 genes

NO DATA AVAILABLE

Disease Perturbations from GEO up random 4000 genes

NO DATA AVAILABLE

Disease Perturbations from GEO down random 4000 genes

NO DATA AVAILABLE

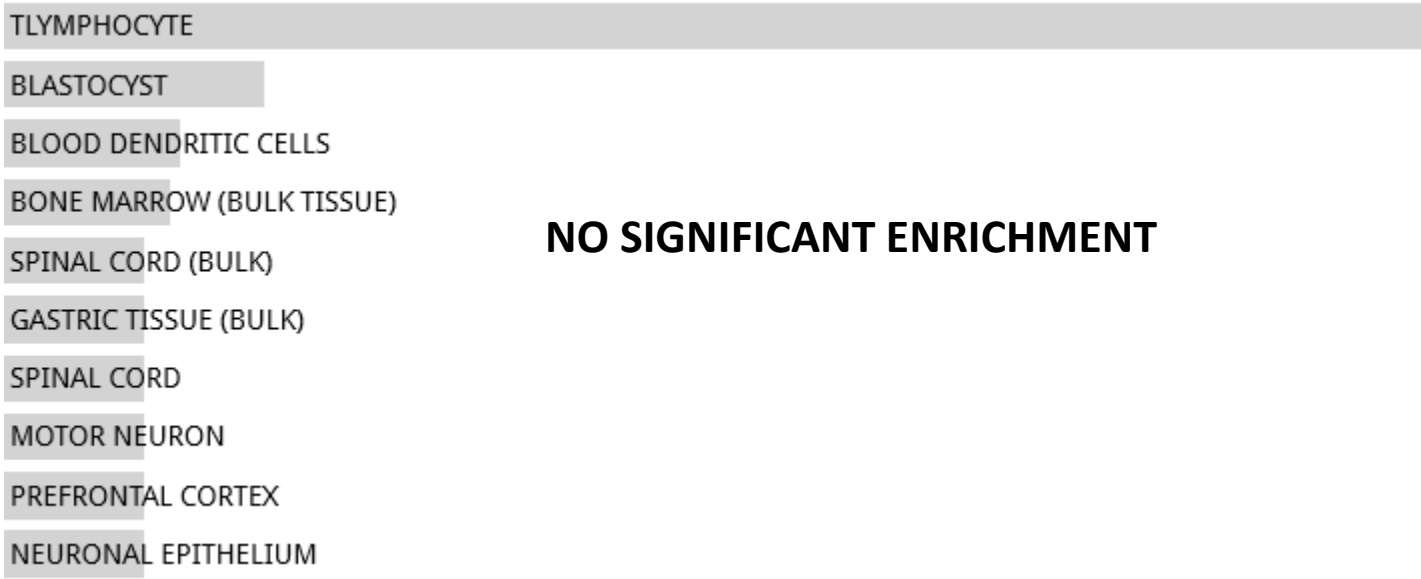
Random Set 19

Allen Brain Atlas up random 4000 genes

NO DATA AVAILABLE

Random Set 20

ARCHS4 Tissues random 4000 genes



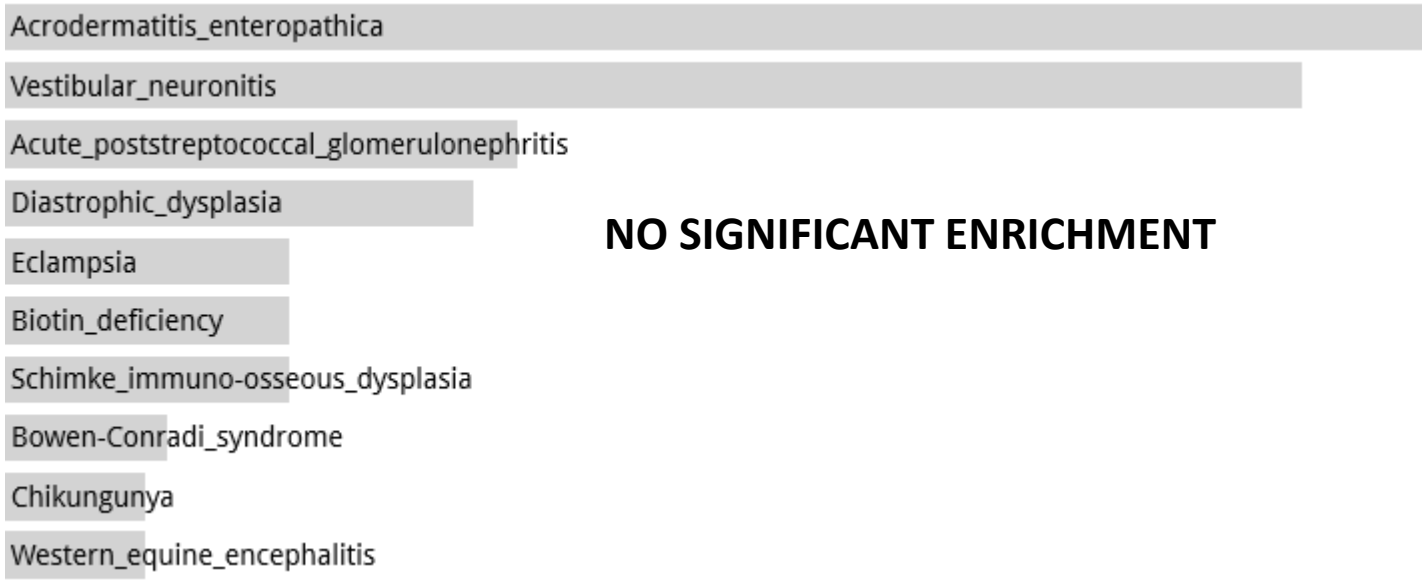
NO SIGNIFICANT ENRICHMENT

Jensen TISSUES random 4000 genes

NO DATA AVAILABLE

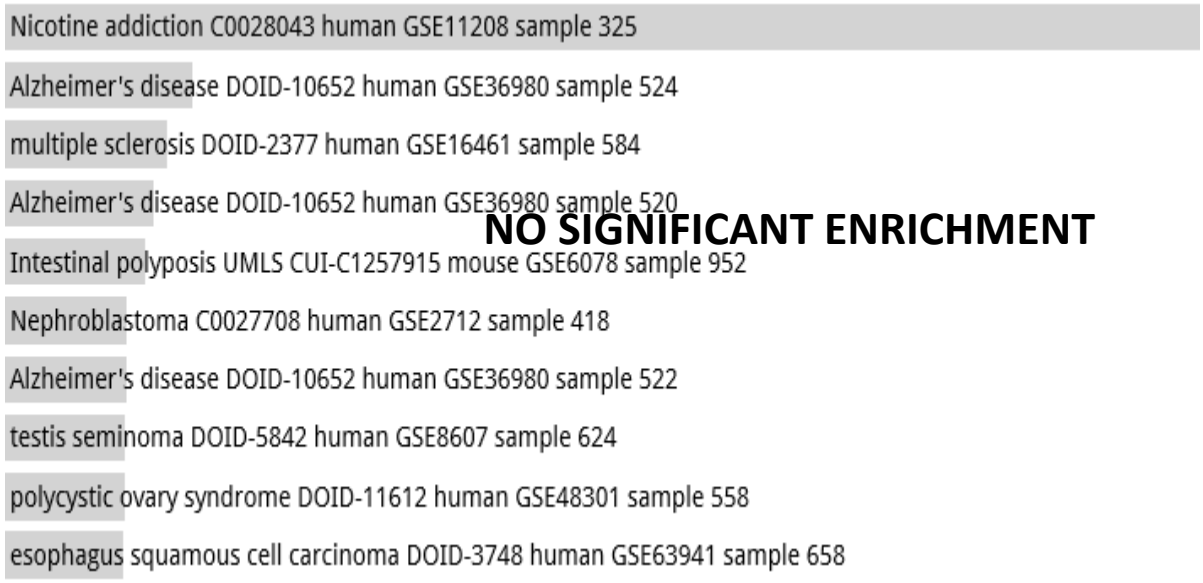
Random Set 20

Jensen DISEASES random 4000 genes



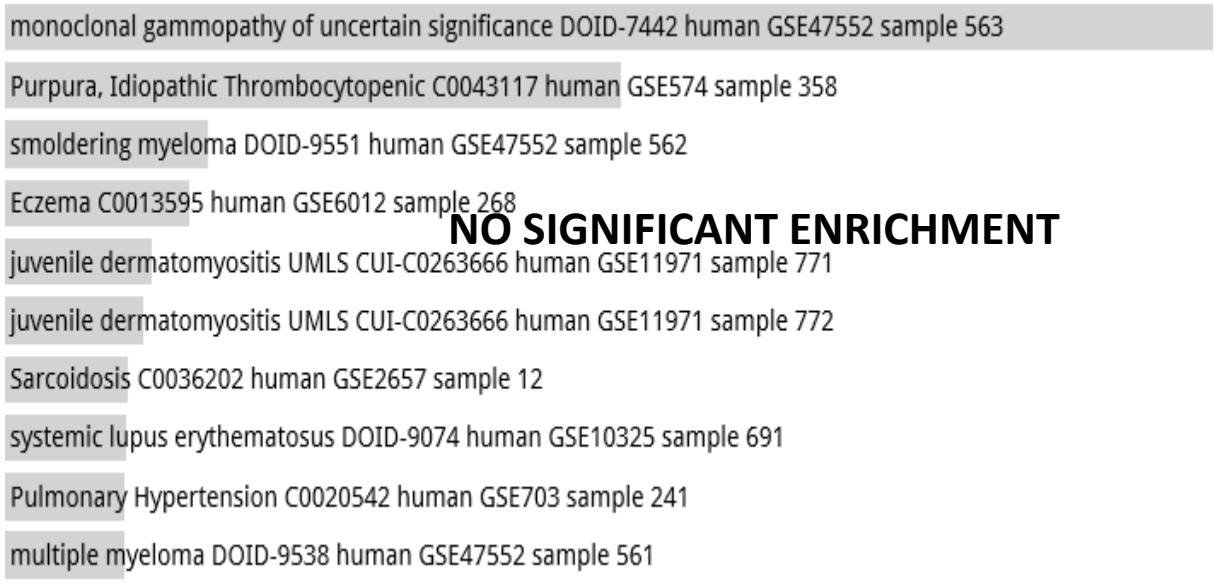
NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO up random 4000 genes



NO SIGNIFICANT ENRICHMENT

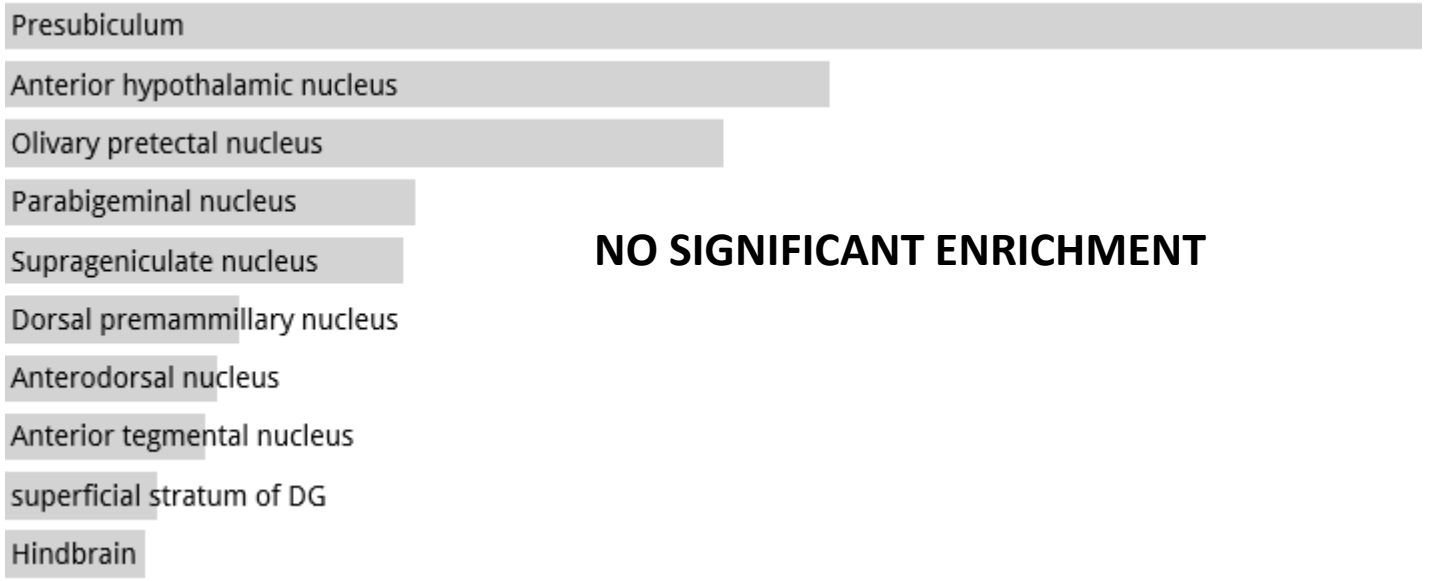
Disease Perturbations from GEO down random 4000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 20

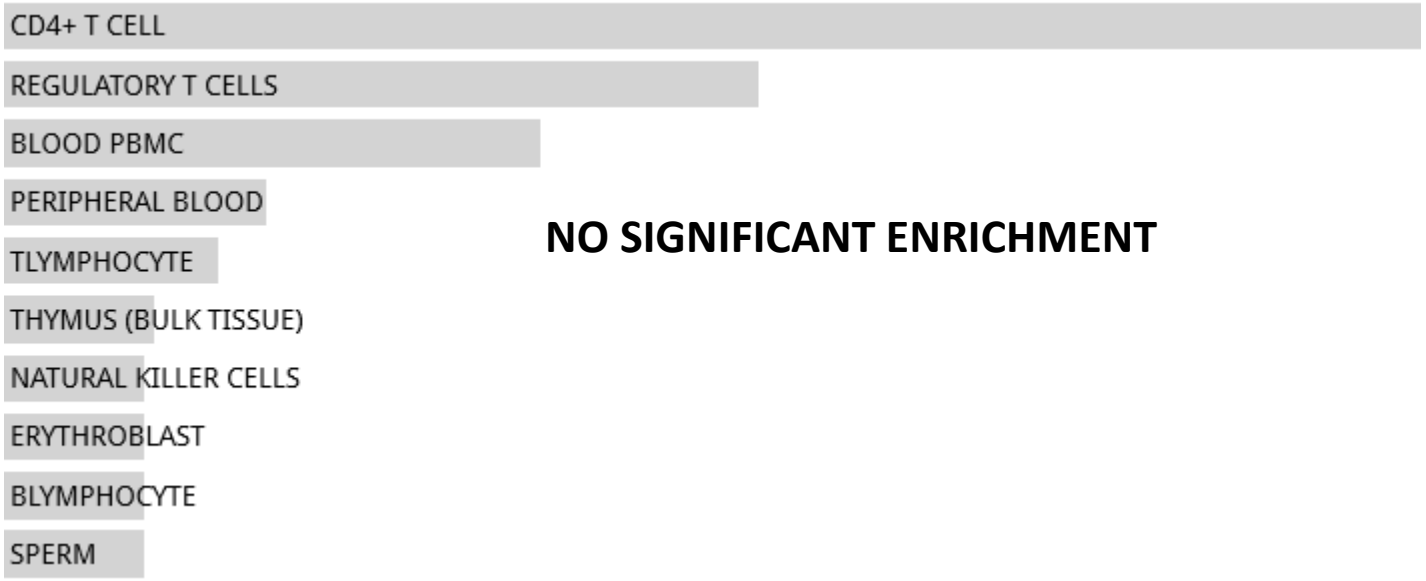
Allen Brain Atlas up random 4000 genes



NO SIGNIFICANT ENRICHMENT

Random Set 21

ARCHS4 Tissues random 2847 genes



NO SIGNIFICANT ENRICHMENT

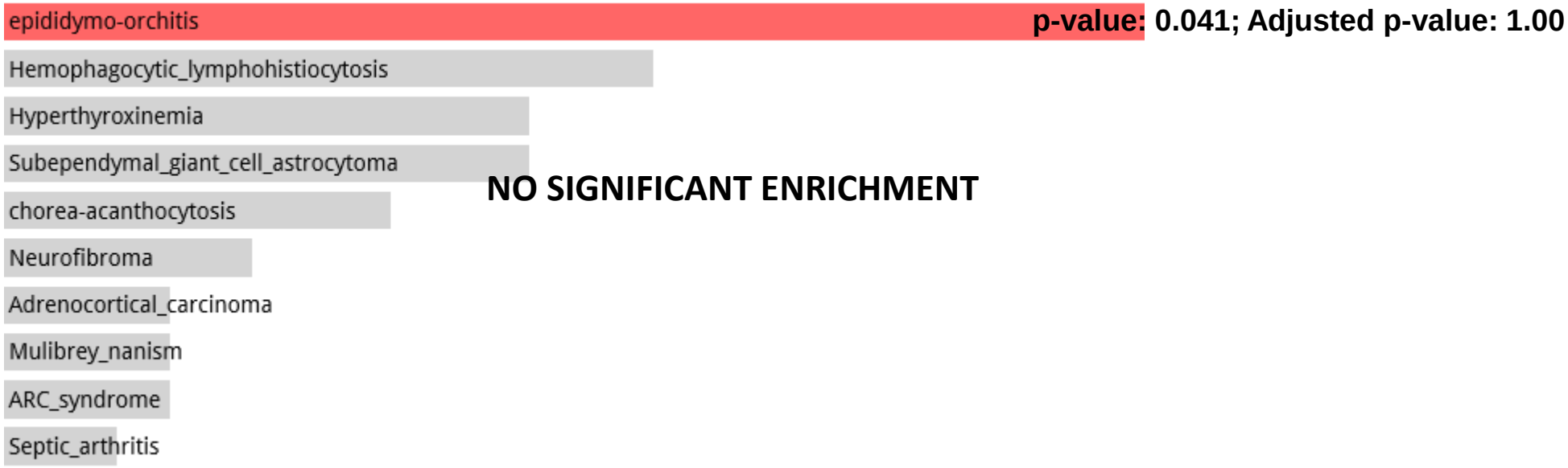
Jensen TISSUES random 2847 genes

p-value: 0.042; Adjusted p-value: 1.00

NO SIGNIFICANT ENRICHMENT

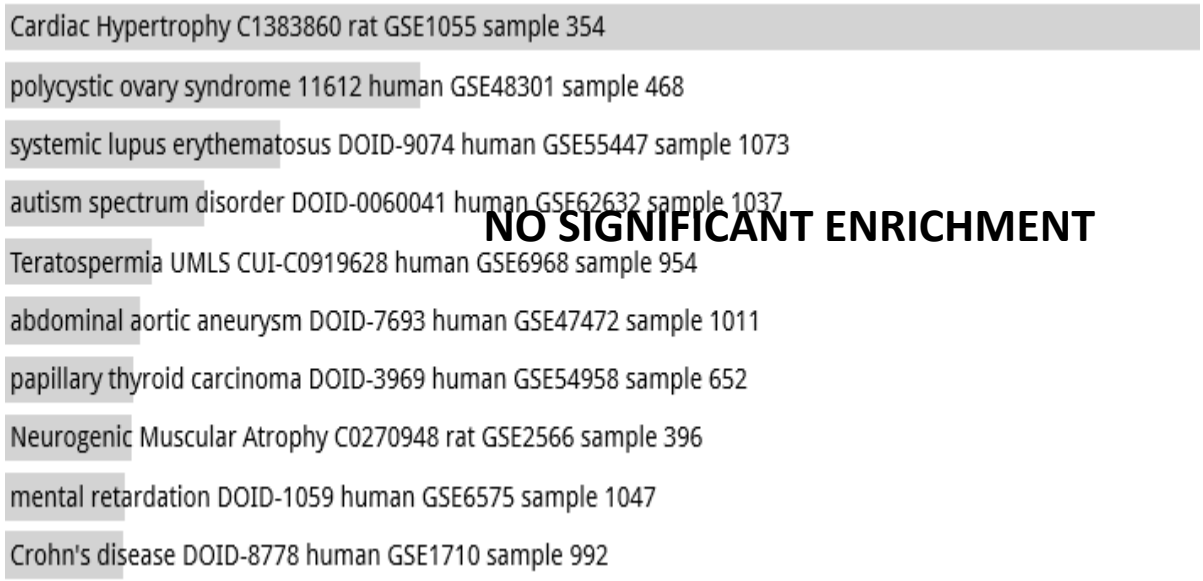
Random Set 21

Jensen DISEASES random 2847 genes



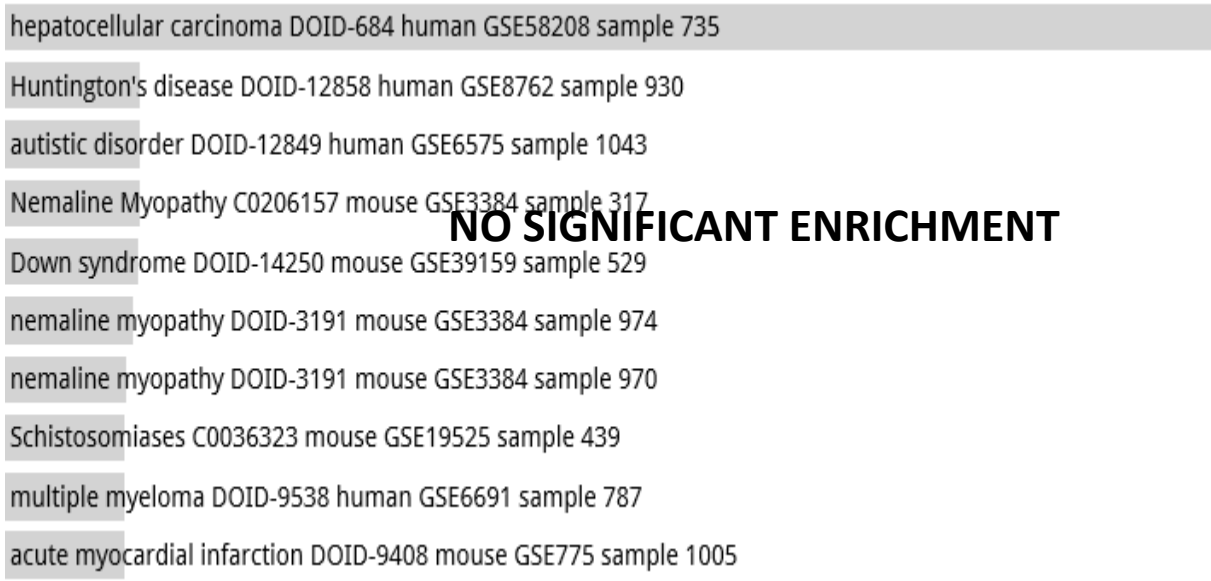
NO SIGNIFICANT ENRICHMENT

Disease Perturbations from GEO up random 2847 genes



NO SIGNIFICANT ENRICHMENT

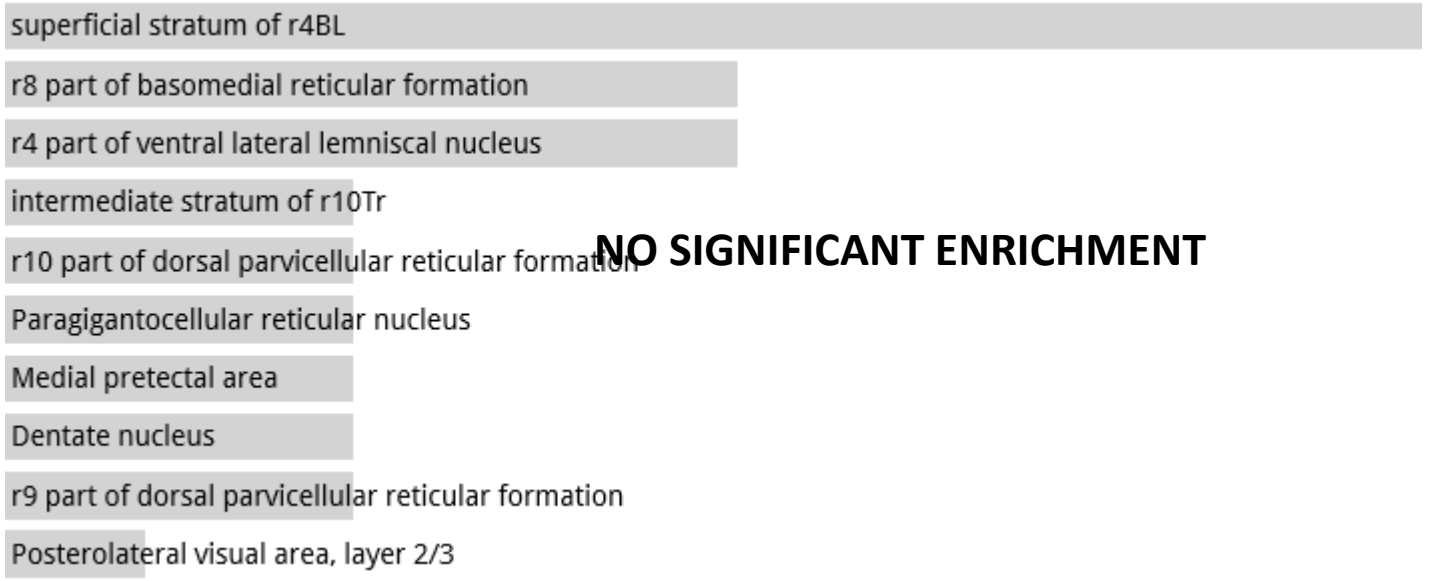
Disease Perturbations from GEO down random 2847 genes



NO SIGNIFICANT ENRICHMENT

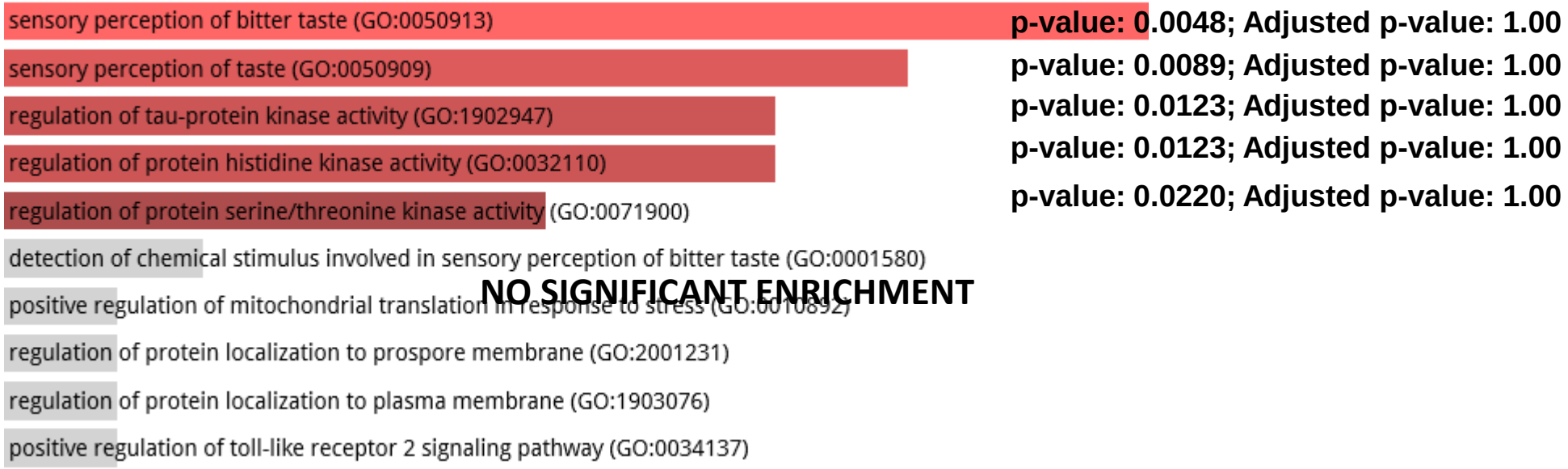
Random Set 21

Allen Brain Atlas up random 2847 genes



NO SIGNIFICANT ENRICHMENT

GO Biological Process 2017b 2847 genes

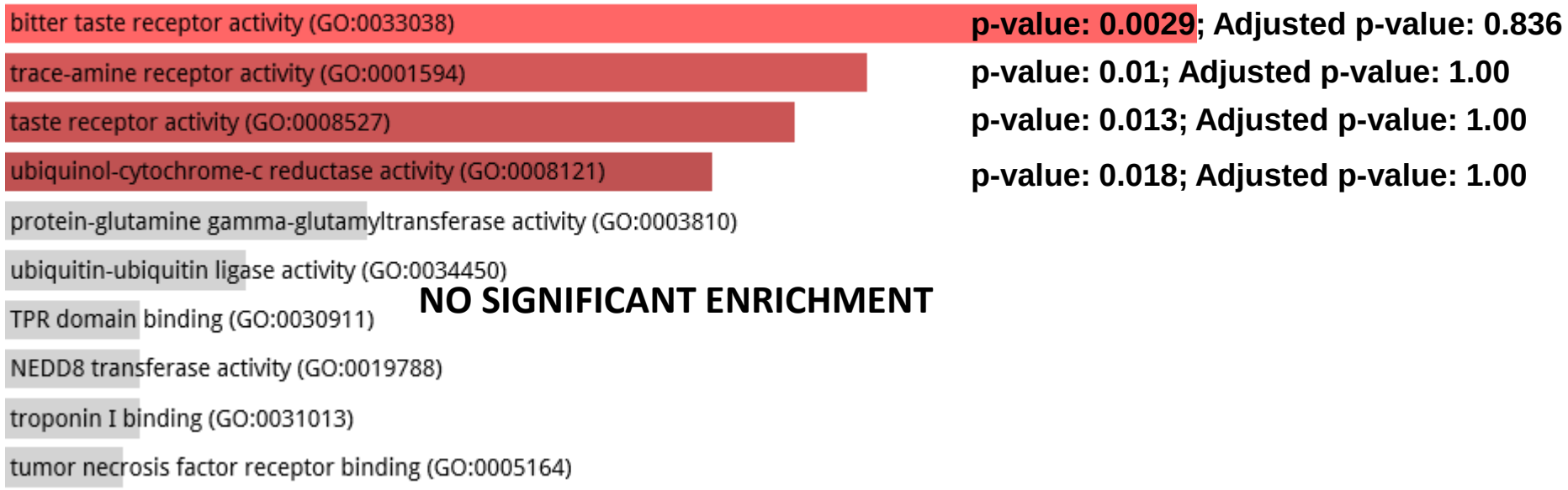


p-value: 0.0048; Adjusted p-value: 1.00
p-value: 0.0089; Adjusted p-value: 1.00
p-value: 0.0123; Adjusted p-value: 1.00
p-value: 0.0123; Adjusted p-value: 1.00
p-value: 0.0220; Adjusted p-value: 1.00

NO SIGNIFICANT ENRICHMENT

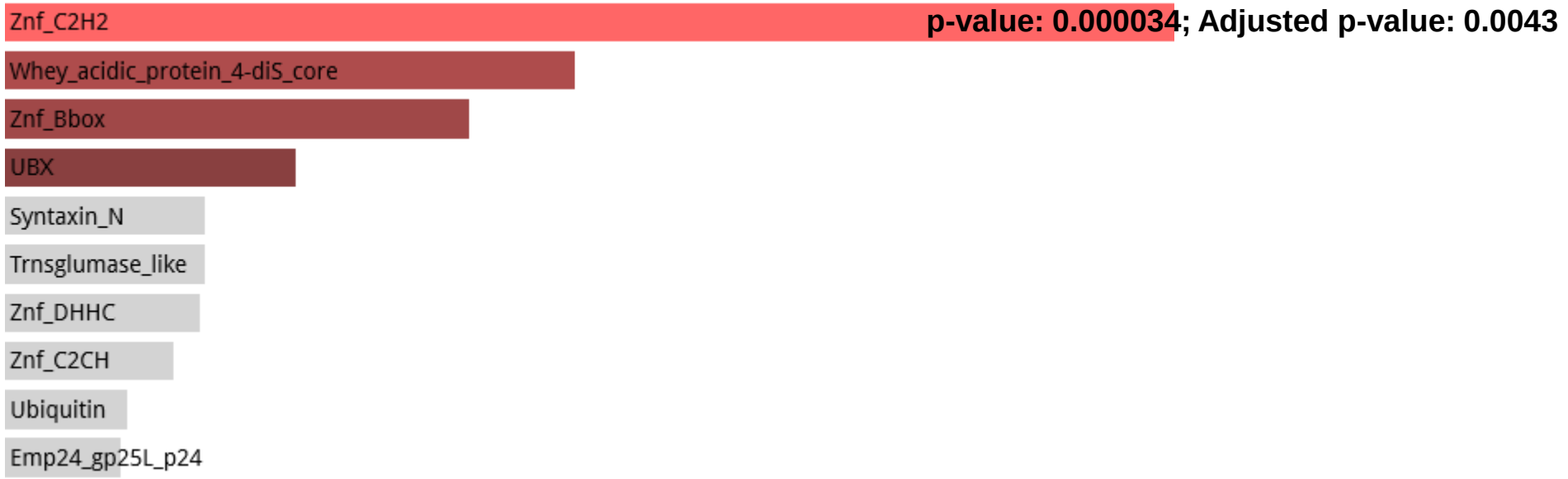
Random Set 21

GO Molecular Function 2017 2847 genes



NO SIGNIFICANT ENRICHMENT

Pfam InterPro Domains 2847 genes



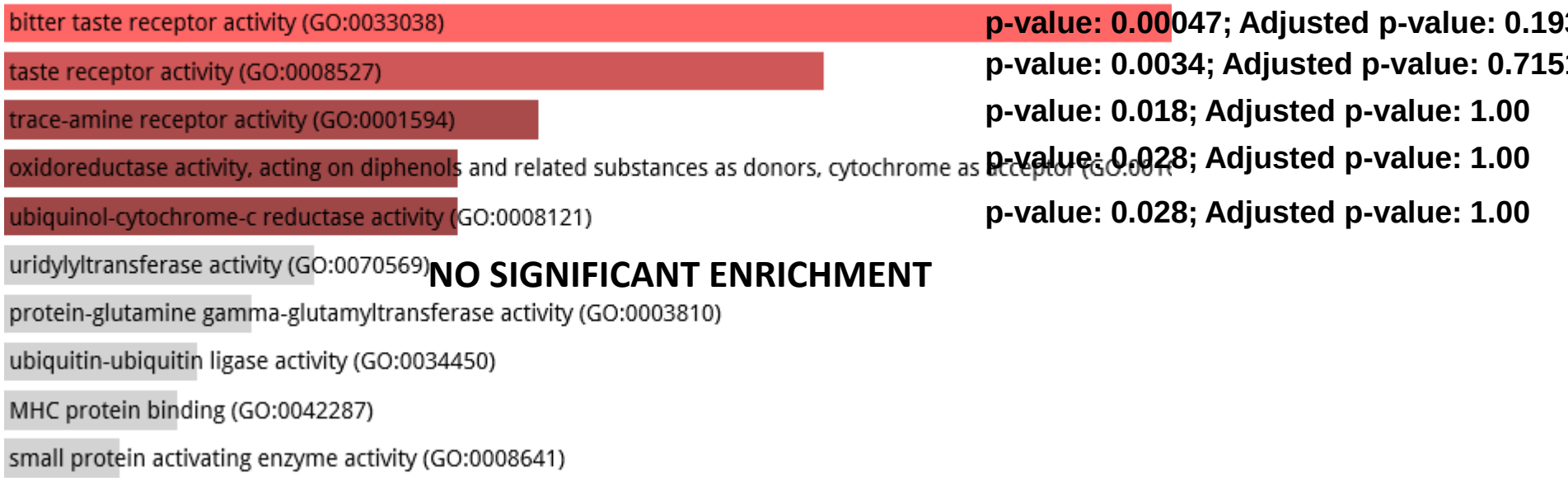
Random Set 21

GWAS Catalog 2019 2847 genes

p-value: 0.00049; Adjusted p-value: 0.31

NO SIGNIFICANT ENRICHMENT

GO Biological Process 2018 2847 genes



p-value: 0.00047; Adjusted p-value: 0.1939

p-value: 0.0034; Adjusted p-value: 0.7151

p-value: 0.018; Adjusted p-value: 1.00

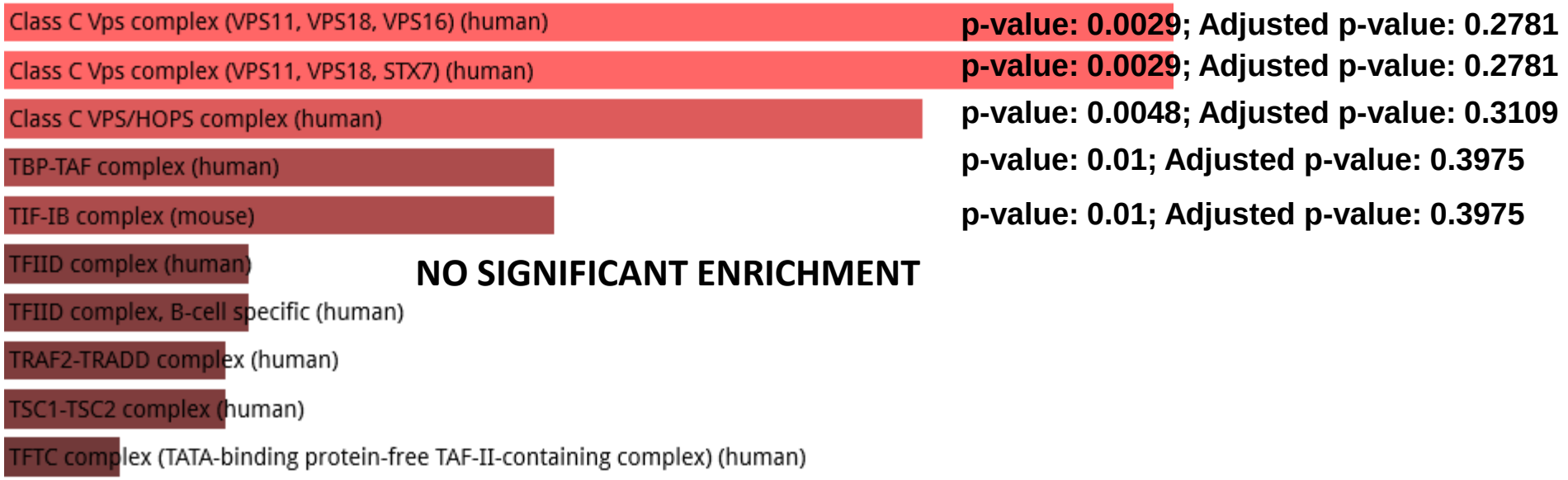
p-value: 0.028; Adjusted p-value: 1.00

p-value: 0.028; Adjusted p-value: 1.00

NO SIGNIFICANT ENRICHMENT

Random Set 21

CORUM 2847 genes



p-value: 0.0029; Adjusted p-value: 0.2781

p-value: 0.0029; Adjusted p-value: 0.2781

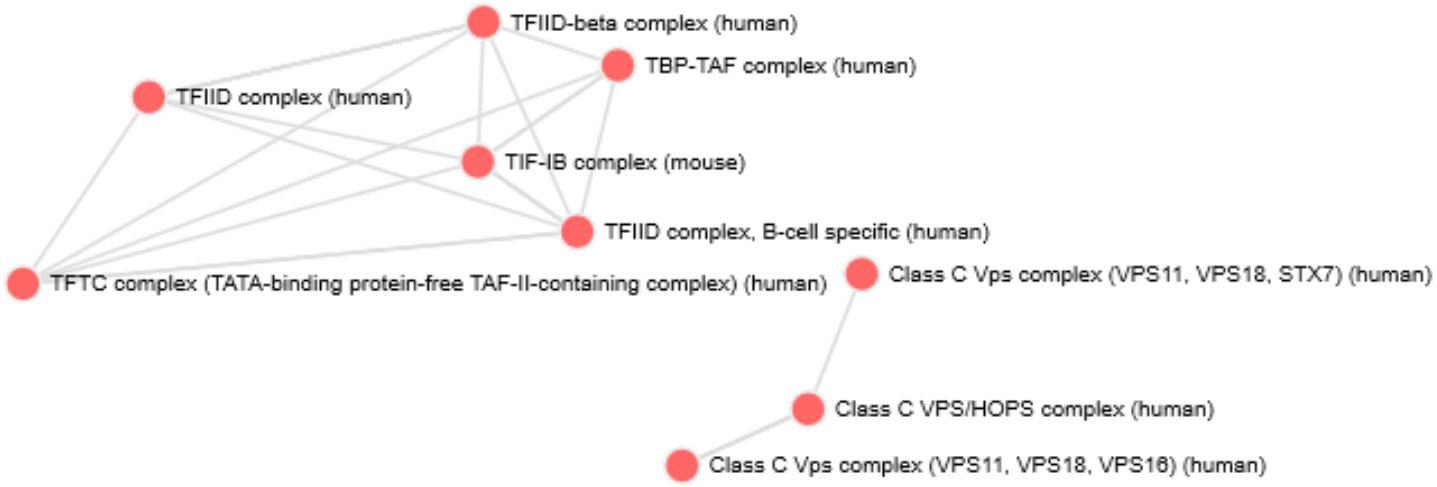
p-value: 0.0048; Adjusted p-value: 0.3109

p-value: 0.01; Adjusted p-value: 0.3975

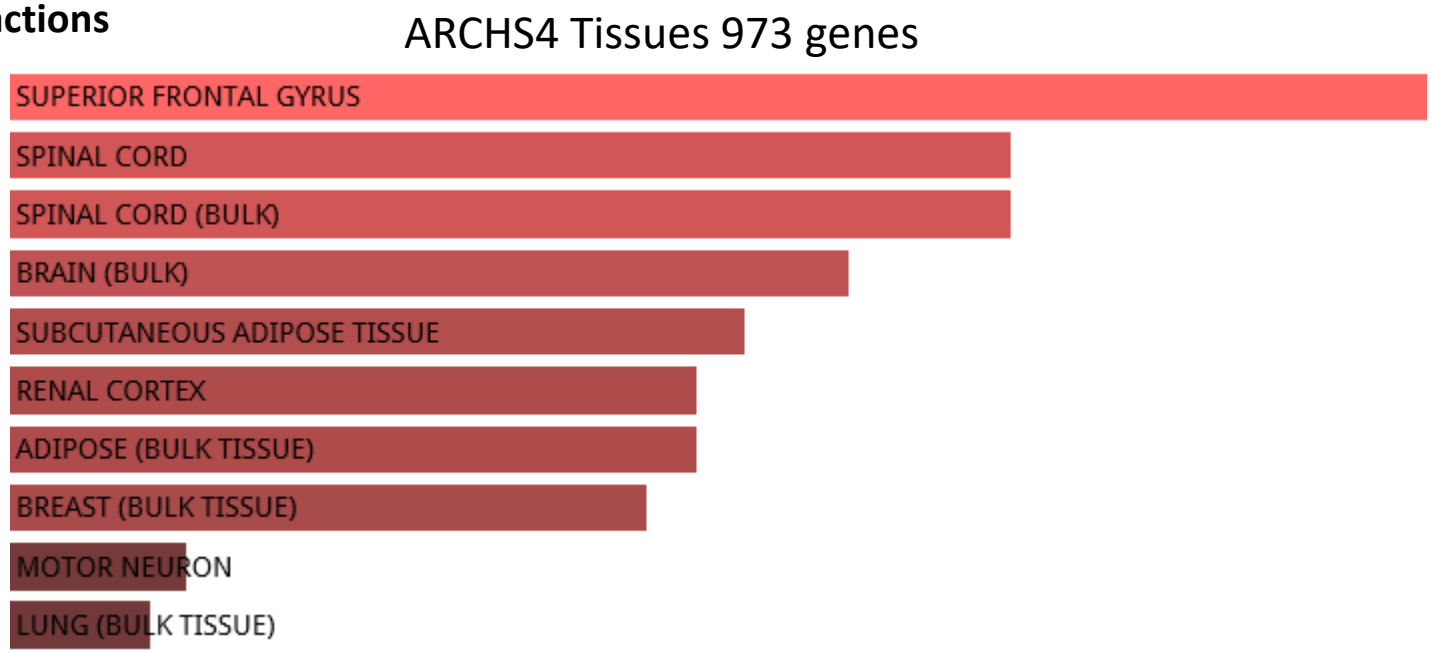
p-value: 0.01; Adjusted p-value: 0.3975

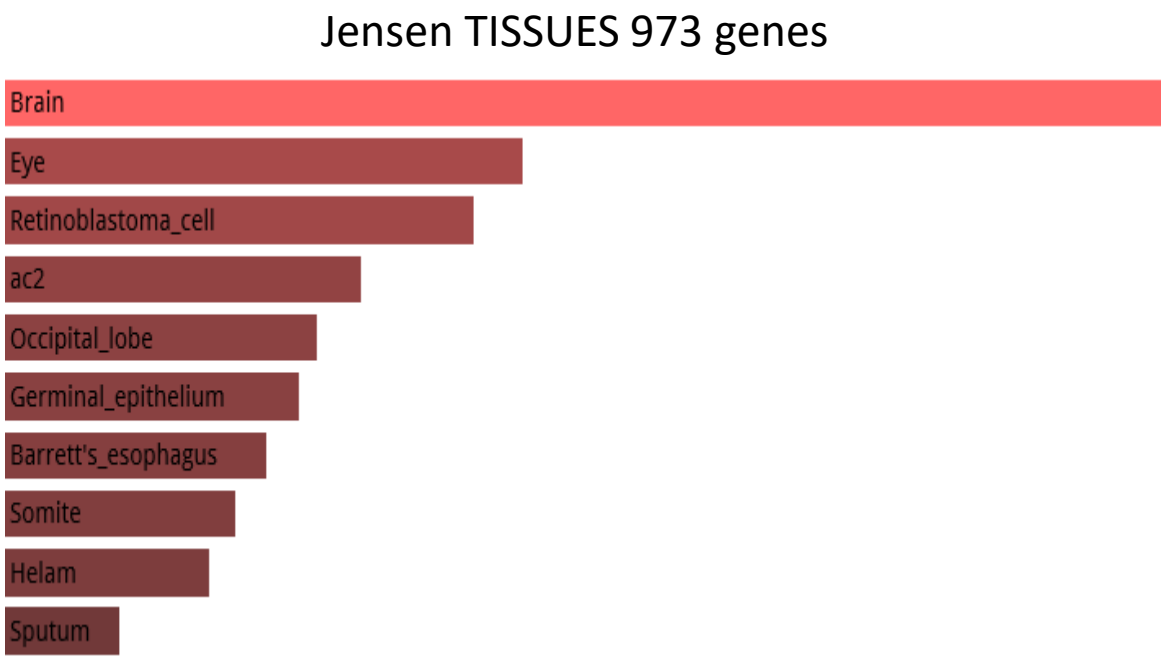
NO SIGNIFICANT ENRICHMENT

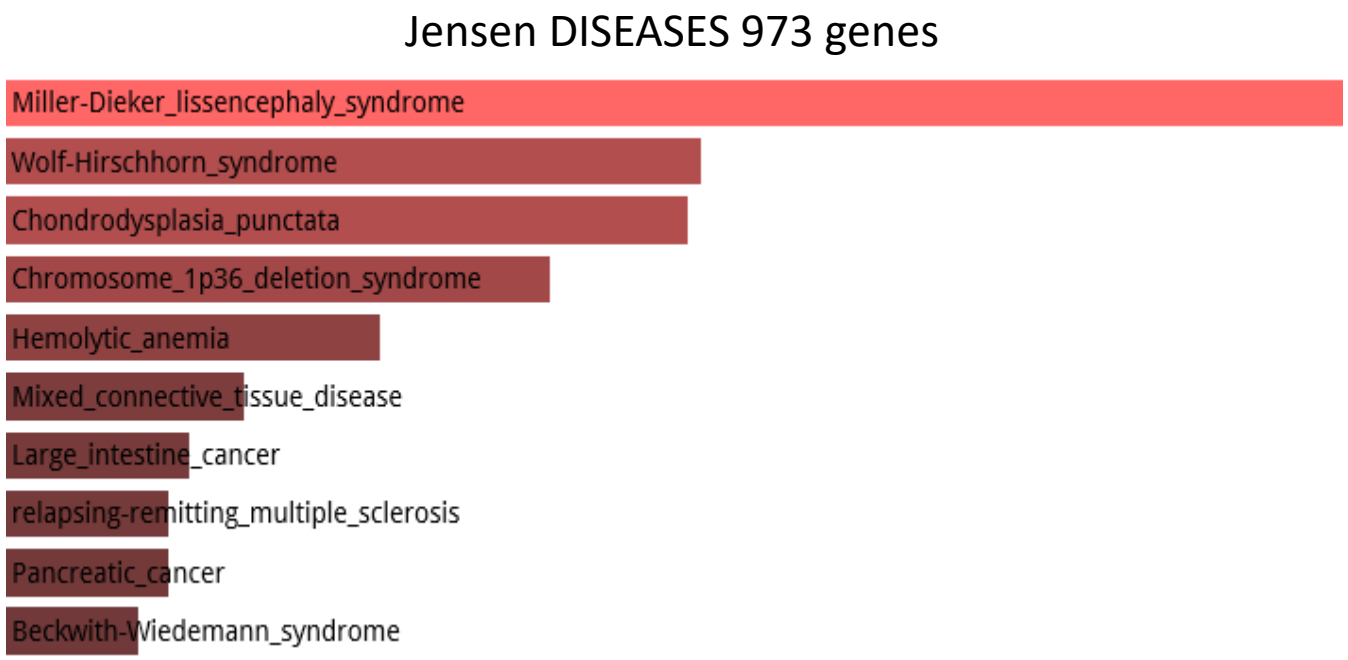
CORUM database of protein complexes identified by mass spectrometry



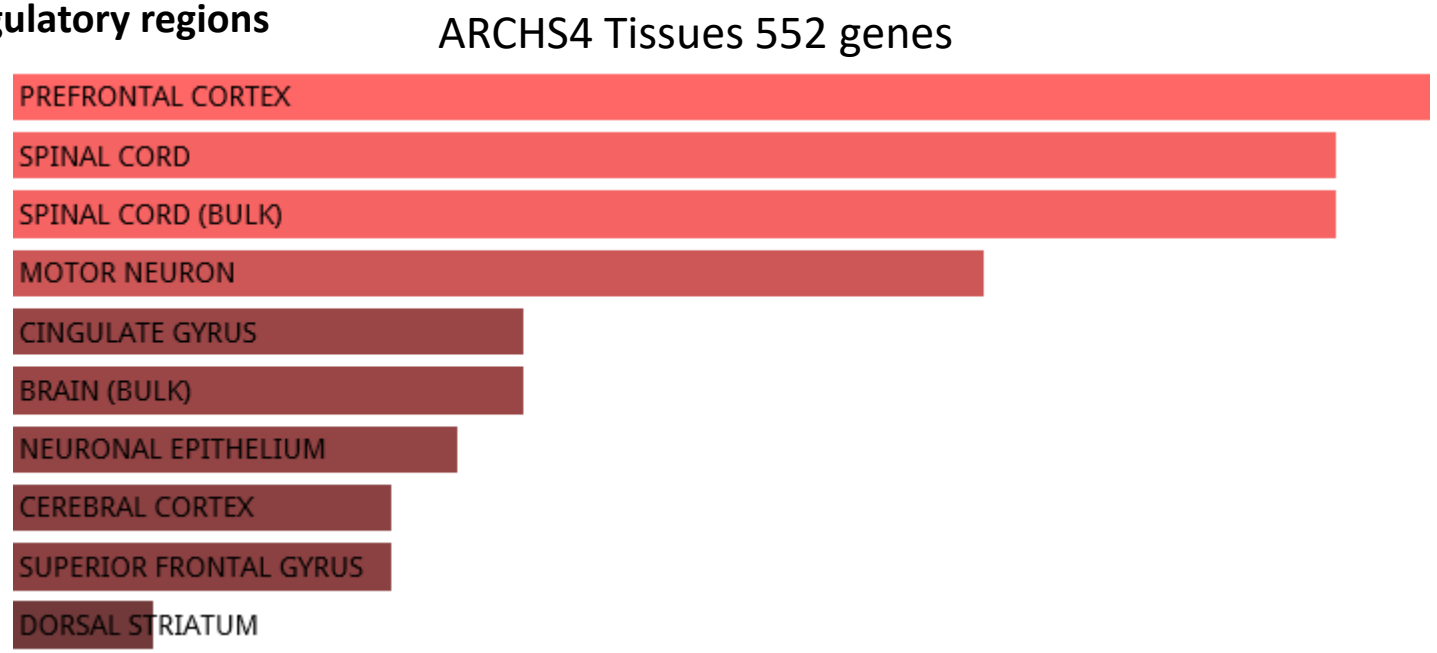
1,279 human-specific STR contractions







2,118 fixed human-specific regulatory regions (non-hESC DHS)



410 H3K4me3 sites with human-specific enrichment in prefrontal cortex neurons