Supporting Online Materials

Enrichr-KG: Bridging Enrichment Analysis across Multiple Libraries

John Erol Evangelista¹, Zhuorui Xie¹, Giacomo B. Marino¹, Nhi Nguyen¹, Daniel J. B. Clarke¹, Avi Ma'ayan^{1,*}

¹Department of Pharmacological Sciences, Mount Sinai Center for Bioinformatics, Icahn School of Medicine at Mount Sinai, New York, NY

^{*}To whom correspondence should be addressed:

E-mail: avi.maayan@mssm.edu Tel: 001-212-281-1153 Fax: 001-212-849-2456

Supporting Figures

Enrichr-KG	Queries Submitted: 54616 🗮	
GWAS Catalog	CLE COMPANY DISEASES (
Submit your gene set for enrichment analysis with Enrichr		
Paste a set of valid Entrez gene symbols (e.g. STAT3) on each row in the text-box	Select maximum of five libraries Top terms to include (Scroll for more)	
	FANTOM6 IncRNA KD DEGs	
	Jensen DISEASES	
	Pfam Domains 2019	
	ChEA 2022	
Trans exemple	Tabula Sapiens	
Submit Iry an example	GO Biological Process 2021 - 5	
Description	CCLE Proteomics 2020	
Minimum libraries per gene 🌒	Human Phenotype Ontology	
Minimum links per gene 🌑	GWAS Catalog 2019	
Minimum links per term 🔵	Search an Enrichr term and expand it to a gene set:	
Subgraph size limit 100	Search Enrichr Term	

Fig. S1 The Enrichr-KG gene set enrichment analysis input form. Gene IDs are

automatically validated. Users can change the minimum libraries per gene, the minimum links per gene, the minimum links per term, and set the subgraph maximum size. In addition, users can select up to five gene set libraries to include in their analysis.



Fig. S2 The Enrichr-KG gene set enrichment analysis subnetwork display. Results from enrichment analysis queries are first returned as subnetworks that connect genes (green) to enriched terms (red - GO biological processes; blue - MGI phenotypes; orange - KEGG pathways).

🔆 Enrichr-K	G Queries Submitted: 54617 ≡
Project Achilles minimuman	
GWAS Catalog	OTabula Sapiens OTabula Muris Image: Colleman Discale Image: Colleman Image: Co
于 Input Gene Set	
Sample Input	
Enrichment Bar Charts Enrichmer	nt Table
GO_Biological_Process_2021-	mitochondrial transcription (GO:0006390)
MGI_Mammalian_Phenotype_Level_4_2021-	increased liver glycogen level MP:0010400
GO_Biological_Process_2021-	glucan biosynthetic process (GO:0009250)
GO_Biological_Process_2021-	glycogen biosynthetic process (GO:00009/8)
MGI Mammalian Phenotype Level 4 2021-	abnormal mitochondrial ATP synthesis coupled electron transport MP:0010956
GO_Biological_Process_2021- aromatic amino acid family catabolic process (GO:0009074)	
MGI_Mammalian_Phenotype_Level_4_2021-	abnormal hepatocyte morphology MP:0000607
KEGG_2021_Human-	Tyrosine metabolism
KEGG_2021_Human-	Starch and sucrose metabolism

Fig. S3 The Enrichr-KG gene set enrichment analysis bar chart visualization. The

enrichment results are visualized as a bar chart where the colors of the bars denote the source library. In this example, red bars represent GO biological processes; blue - MGI phenotypes; and orange - KEGG pathways. The size of the bars is proportional to the -log(p-value) of the enrichment score computed by the Fisher exact test.

Enrichr-KG	Queries Submitted: 55092 🛛 🗮
Project Achilles Projec	SigCom SigCom LINCS APCCS ⁴ Transciption Factors
GWAS Catalog C	DISEASES 🕜 🤣
Start with Gene Iabel APOE Example: C	OPB2 / SDF2L1
Find Shortest Paths between Two Nodes	
Select relation: WikiPathways, Tabula 👻 Size: 🔷 — 25 🚦 👗 🖽 🖬 🗣 😒 💿	ō 8 🖿 Q
Legend Search Term WikiPathway 2021 Human Gene Tabula Muris Cado 2021 Human Gene Latonin metabolism and effects WP3298 Azheimer's disease WP2059 Gene Mathinibilition of cholesterol production WP430 Cholesterol metabolism Metabolism Metabolism Metabolism Cholesterol metabolism Metabolism diffects WP328 Metabolism children of the cholesterol production WP430 Metabolism diffects WP328 Metabolism WP1533 Metabolism WP1534 Metabolism diffects WP328 Metabolism diffects WP328	

Fig. S4 The Enrichr-KG visualization centered around a specific gene or a specific term. The example shows associations for the gene APOE in the KEGG, WikiPathways and Tabula Muris gene set libraries.

Queries Submitted: 55102 =	
GWAS I MAR Catalog Tabula Sapiens Tabula Muris Acceletion descartes DigNetion III DISEASES (
Start with Gene label KCNJ11 Example: COPB2 / SDF2L1 	
End with Gene Iabel <th <="" td="" th<=""></th>	
Select relation: DisGeNET Association, 🛪 Size: 🗨 — 25 🖸 🔥 🖽 🖬 🖬 💭 😒 💿 🙆 🖉 🐚 🍳	
Legend Sarch Tern DisGeNET Gene ChEA 2022 Human Phenotype Ontology Gisens DISEASES GWAS Catalog 2019 Model Catalog 2019 Model Catalog 20	

Fig. S5 The Enrichr-KG visualization of a search between two terms. The example shows the shortest paths between the genes KCNJ11 and HNF1B (larger red nodes).