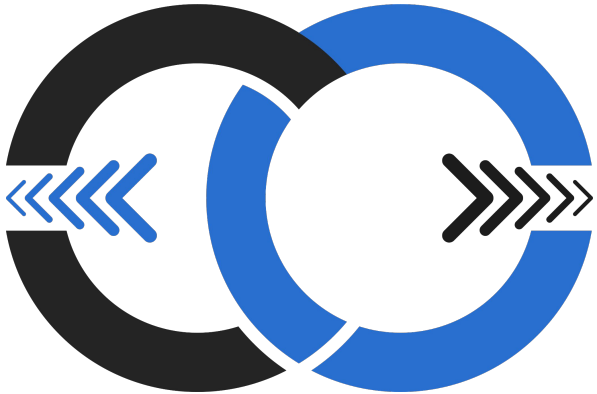

Haiphen

High-Level

haiphen maps *unstructured text entities* (e.g. biomarkers, diseases) from *academic research* papers into a structured format to answers difficult research questions

Data

Biomarker <> Disease Related Research (37,000 papers from pubmed)

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Susceptibility of *Salmonella typhimurium* and *Salmonella typhi* to oxygen metabolites

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Key words: *Salmonella typhimurium*; *Salmonella typhi*; Oxygen metabolites

1. SUMMARY

The susceptibility of *Salmonella typhimurium* LT2 and of *S. typhi* 1079 to oxygen metabolites were compared. *S. typhimurium* LT2 and *S. typhi* 1079 were killed to an equal extent (about 40%) by the xanthine–xanthine oxidase (200 mU/ml) system. Among the various scavengers of oxygen metabolites, catalase alone inhibited the killing of *S. typhimurium* LT2 and *S. typhi* 1079 by the xanthine–xanthine oxidase system, indicating that hydrogen peroxide contributed to the killing of *Salmonellae*. The respiratory burst of murine macrophages was efficiently triggered by the ingestion of *S. typhimurium* LT2, *S. typhimurium* SL1102, and *S. typhi* 1079 and all to the same extent. However, in the range of the concentration of hydrogen peroxide produced by murine macrophages, neither *S. typhimurium* LT2 nor *S. typhi* 1079 were killed. Only *S. typhimurium* SL1102, a rough mutant of *S. typhimurium* LT2, was markedly susceptible under these conditions. The findings suggest that both *S. typhimurium* LT2 and *S. typhi* 1079 are resistant to oxygen-dependent killing mechanisms.

2. INTRODUCTION

Salmonella typhimurium is a facultative intracellular pathogen that causes a systemic infection in mice, whereas *S. typhi*, the agent of human typhoid, fails to cause disease in mice [1,2]. The mechanisms responsible for the species-specific pathogenicity of *Salmonella* remain unknown.

Reactive oxygen metabolites such as superoxide anion (O_2^-), hydrogen peroxide (H_2O_2), hydroxy radical ($\cdot OH$), and singlet oxygen ($^1O_2$) derived from the phagocytic cell respiratory burst are well known to play an important part in host resistance to microorganisms [3]. Recent studies have suggested that some intracellular pathogens may prevent microbicidal activity either by being resistant to oxygen metabolites or by inhibiting the generation of oxygen metabolites from phagocytes [4,8]. These findings give rise to the possibility that the species-specific pathogenicity of *Salmonellae* could be caused by differential susceptibility to oxygen metabolites or by a differential capacity to trigger the respiratory burst of macrophages. In this study, therefore, we attempted to

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Example sensitivities and specificities for the nine FDA approved cancer biomarkers.

Marker	Disease	Cut Off	Sensitivity	Specificity	Reference
CEA	malignant pleural effusion	NA[1]	57.5%	78.6%	(Li et al. 2003)
CEA	peritoneal cancer dissemination	0.5 ng/ml	75.8%	90.8%	(Yamamto et al. 2004)
Her-2/neu	stage IV breast cancer	15 ng/mL	40%	98%[2]	(Cook et al. 2001)
Bladder Tumor Antigen	urothelial cell carcinoma	NA	52.8%	70%	(Mian et al. 2000)
Thyroglobulin	thyroid cancer metastasis	2.3 ng/ml[3]	74.5%	95%	(Lima et al. 2002)
Alpha-fetoprotein	hepatocellular carcinoma	20 ng/ml	50%	70%	(De Masi et al. 2005)
PSA	prostate cancer	4.0 ng/mL	46%	91%	(Gann et al. 1995)
CA 125	non-small cell lung cancer	95 IU/mL	84%	80%	(Dabrowska et al. 2004)
CA19.9	pancreatic cancer	NA	75%	80%	(Yamaguchi et al. 2004)
CA 15.3	breast cancer	40 U/ml	58.2%	96.0%	(Ciambellotti et al. 1993)
leptin, prolactin, osteopontin, and IGF-II	ovarian cancer	NA	95%	95%	(Mor et al. 2005)
CD98, fascin, sPIgR[4], and 14-3-3 eta	lung cancer	NA	96%	77%	(Xiao et al. 2005)
Troponin I	myocardial infarction	0.1 microg/L	93%	81%	(Eggers et al. 2004)
B-type natriuretic peptide	Congestive heart failure	8 pg/mL	98%	92%	(Dao et al. 2001)

Open in a separate window

Use-cases

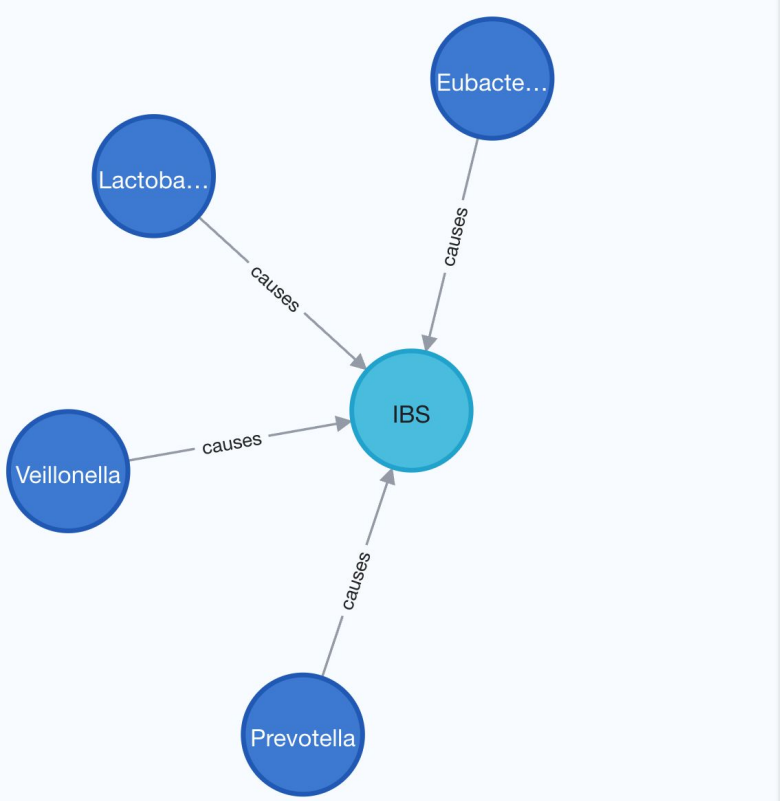
Biomarkers by Author?

Query:

Which microbiomes connected to IBS (Maccaferri, 2012) are above the average?

Response:

Source	Target	numeric	mean numeric	Paper
Prevotella	IBS	9.11	2.424	Maccaferri et al. 2012
Eubacterium	IBS	6.51	2.424	Maccaferri et al. 2012
Lactobacillaceae	IBS	2.49	2.424	Maccaferri et al. 2012
Veillonella	IBS	5.66	2.424	Maccaferri et al. 2012



[2]Maccaferri et al. 2012

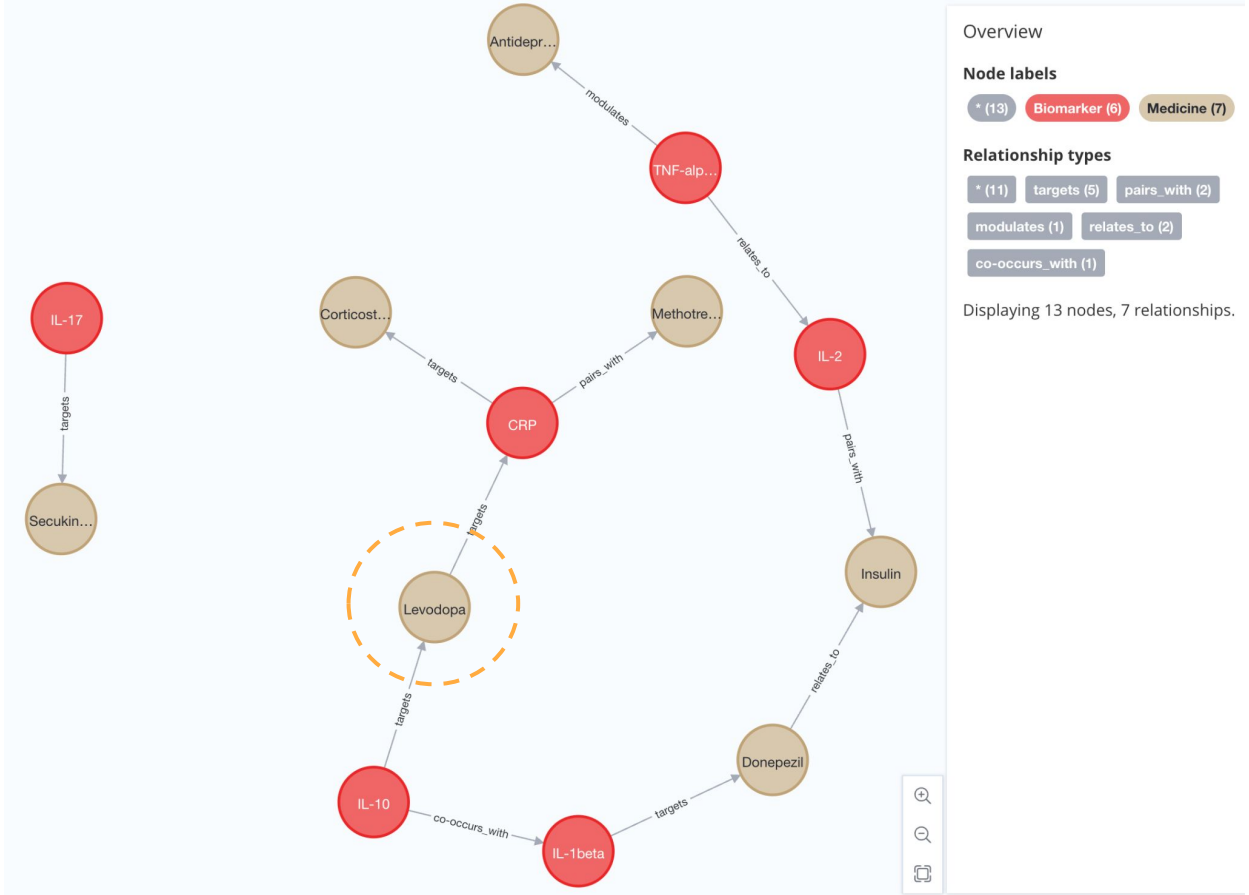
Biomarkers targeted by Levodopa?

Query:

Which biomarkers are targeted (directly or indirectly) by Levodopa?

Response:

Source	Target	RelationshipType
Levodopa	CRP	"targets"
Levodopa	IL-10	"targets"
IL-10	IL-1beta	"co-occurs_with"
Methotrexate	Eczema	"modulates"
Parkinson's	Alzheimer's	"targets"



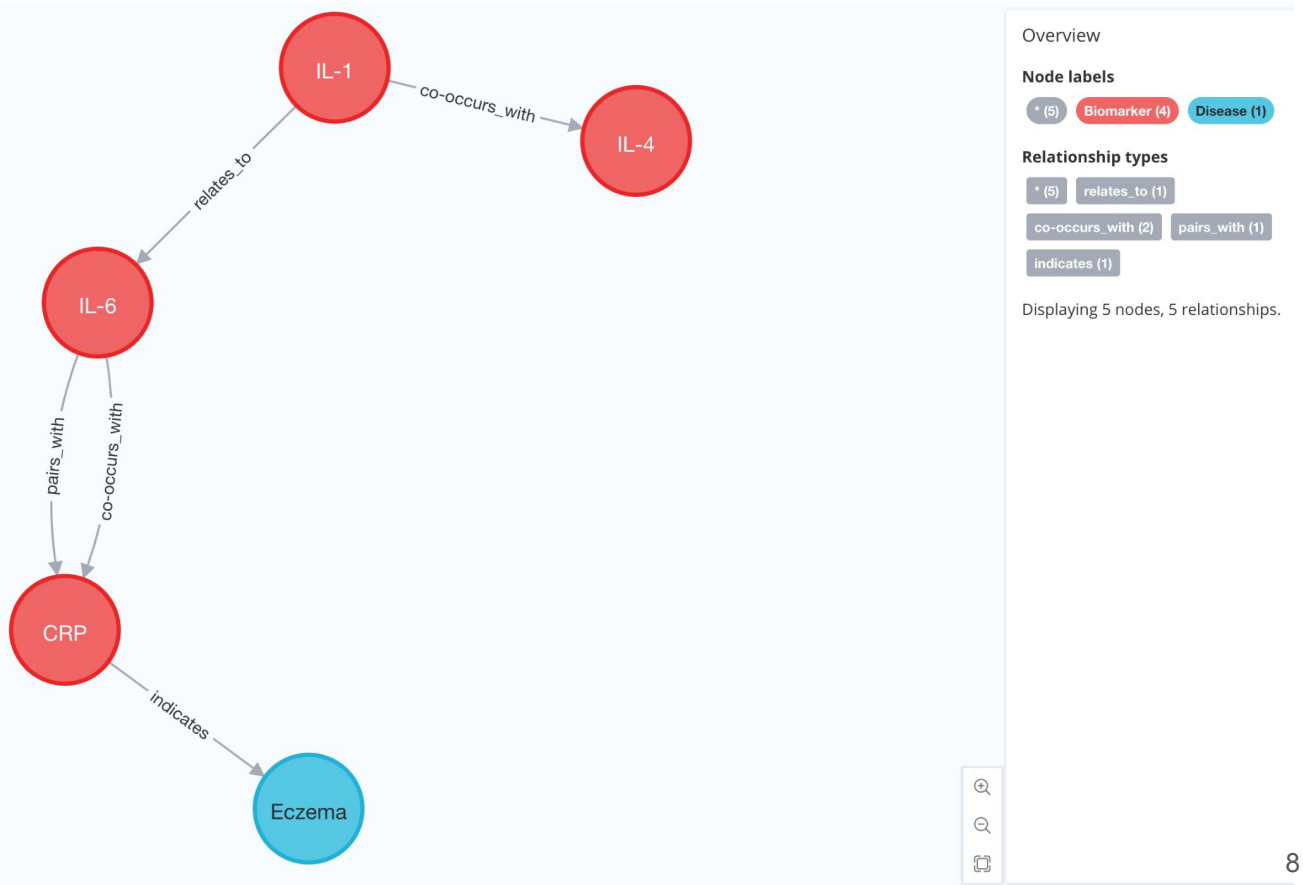
Biomarkers connected to Eczema?

Query:

Which biomarker(s) are connected (by proxy) to Eczema?

Response

Biomarker	IndicatedDiseases
"IL-4"	["Breast Cancer"]
"IL-5"	["Breast Cancer"]
"IFN-gamma"	["Rheumatoid Arthritis"]
"CRP"	["Eczema"]
"IL-6"	["Parkinson's"]
"IL-1beta"	["Alzheimer's Disease"]



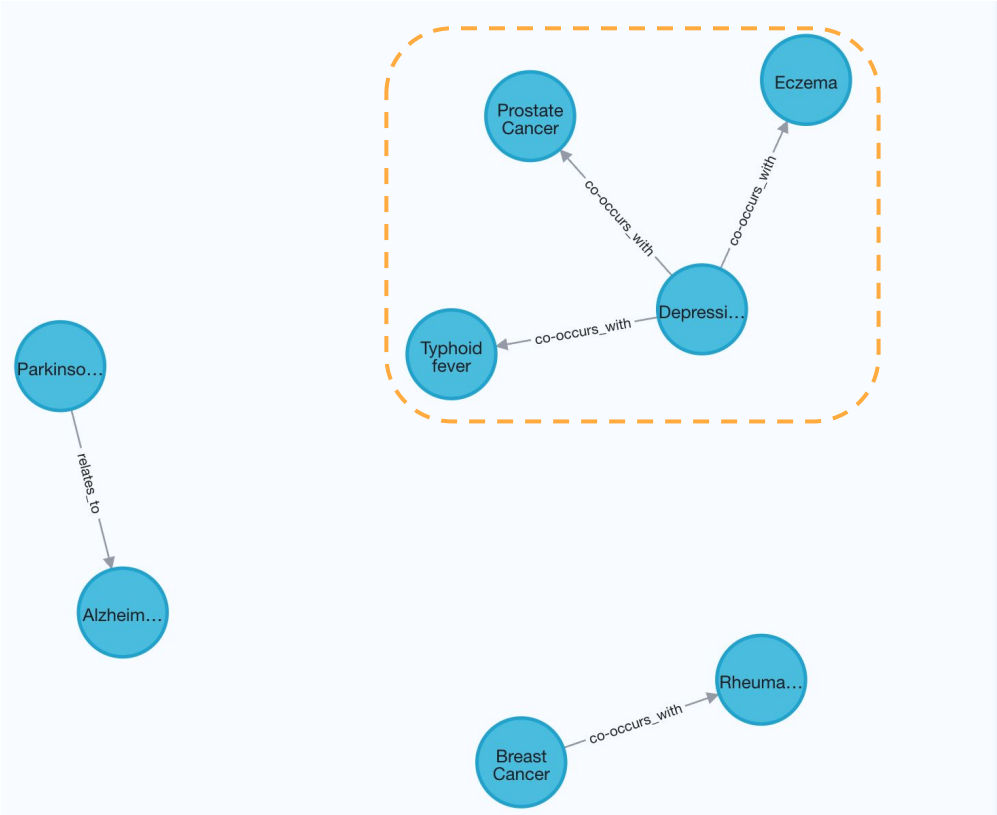
Disease co-occurrences?

Query:

What clusters exist between diseases?

Response:

Source	Target	RelationshipType
Breast Cancer	Rheumatoid Arthritis	"co-occurs_with"
Depression	Typhoid Fever	"co-occurs_with"
Depression	Prostate Cancer	"co-occurs_with"
Depression	Eczema	"co-occurs_with"
Parkinson's	Alzheimer's	"relates_to"



Overview

Node labels

* (8) Disease (8)

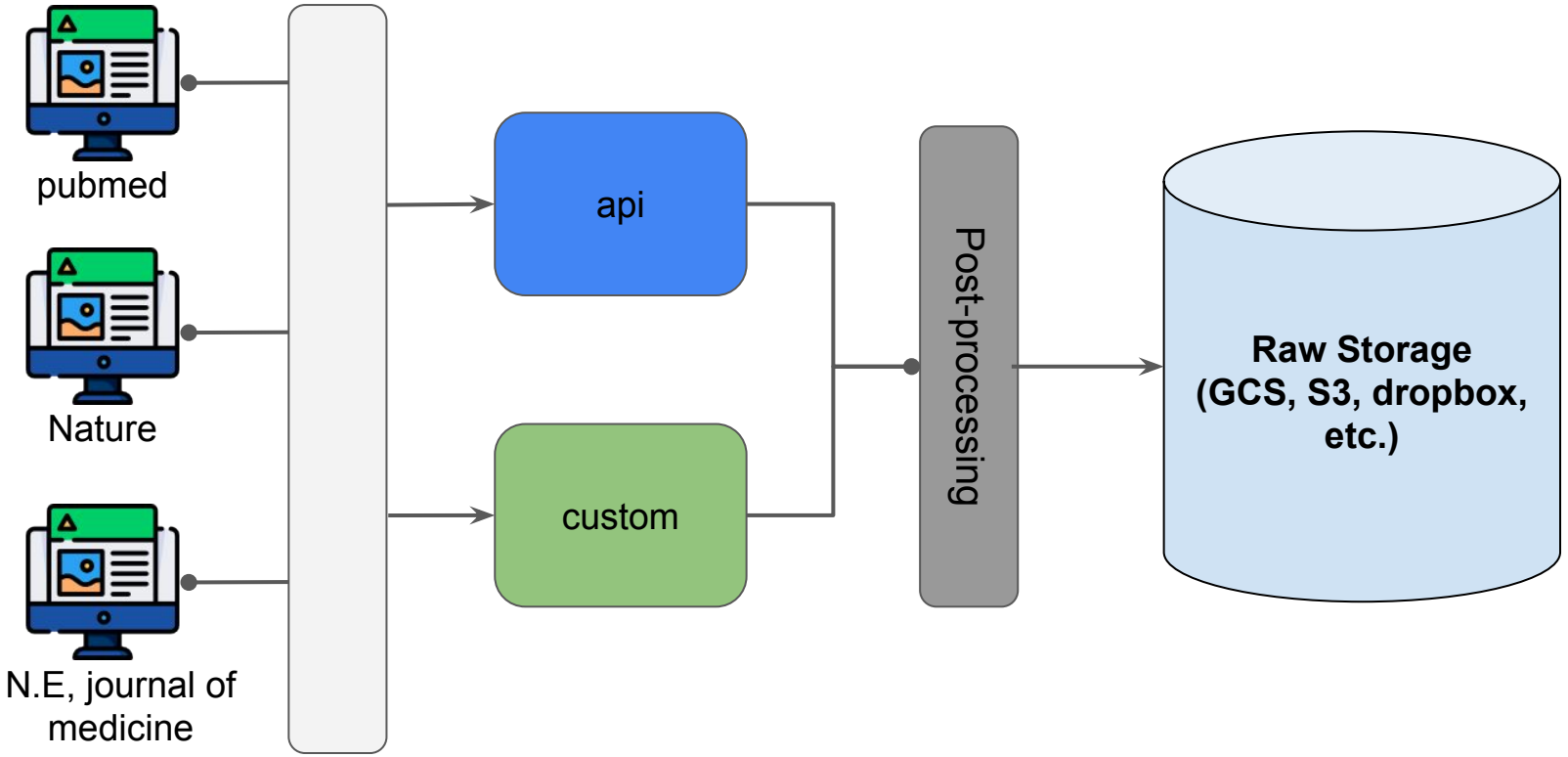
Relationship types

* (5) co-occurs_with (4) relates_to (1)

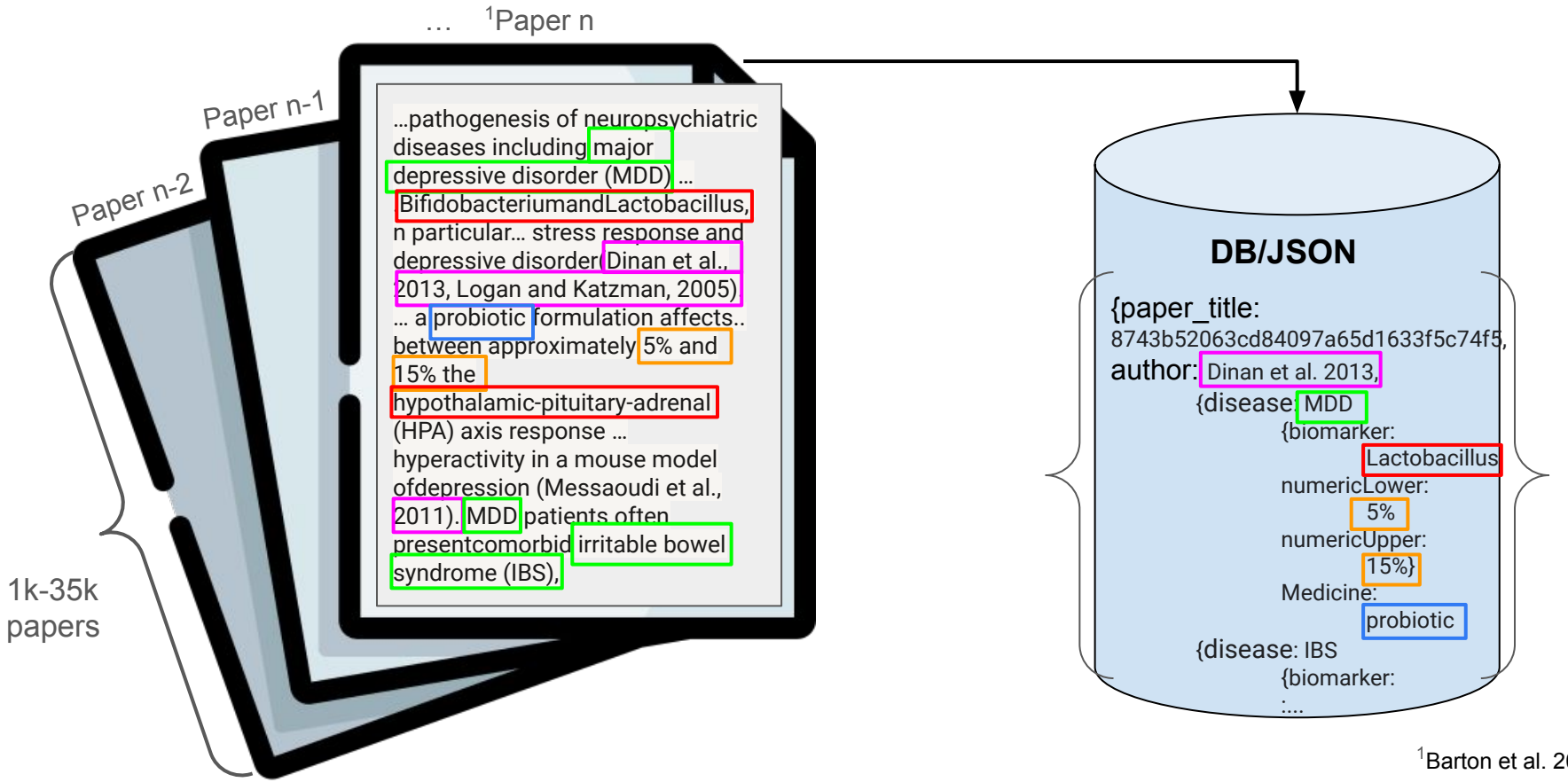
Displaying 8 nodes, 5 relationships.

Deliverables

Paper Scraper

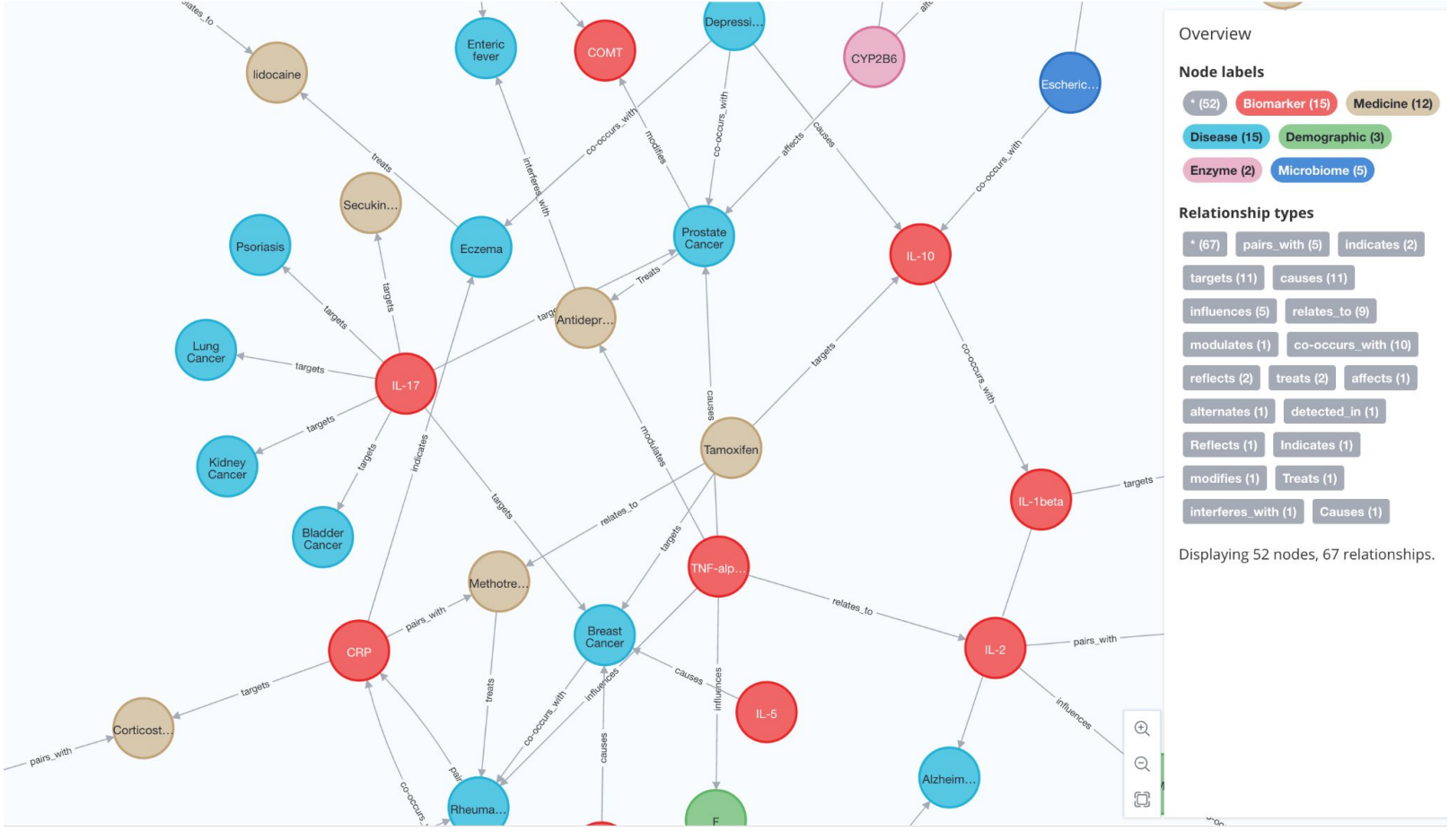


ETL & Entity Extraction



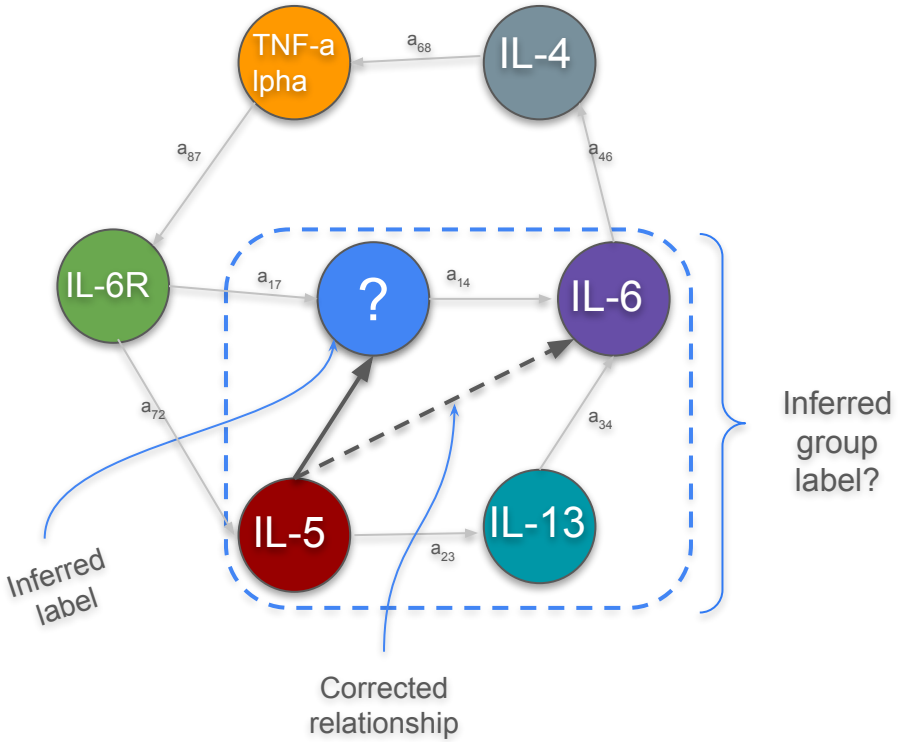
[1]Barton et al. 2022

Knowledge Graph ↔ Search Engine



LLM (& Machine Learning)

- Graph Pruning
  - Self consistency
  - Spelling correction
  - Disambiguation
- Inference
  - Subgraph identification
  - Causal inference (‘if’:’then’)
  - Node/subgraph Labeling
- User Assistance
  - Question Suggestions
  - *Question-Answering*
- Testing
  - Continuous validation of new input



Pro's

One *Knowledge Graph* query saved GM $8M in supply chain losses for a single freight by identifying equivalent replacements for lost parts

Con's

Considerable expertise and upfront planning