UW-COSMOS

Shanan Peters, Miron Livny, Shivaram Venkataraman
Theodoros Rekatsinas

WISCONSIN
UNIVERSITY OF WISCONSIN–MADISON

Table Retrieval and Co-References

Retrieve artifacts from publications applicable to model and link as meta-data

Table 1: Parameters used in Discrete Stochastic Compartmental Model

Parameter	Guilford County	North Carolina
Import Date	2021-01-28	2021-01-23
Reproduction Number	0.97(0.88-1.03)	0.96(0.89-1.02)
Population	545,348	10,630,691
Susceptible	454,109	8,626,950
Exposed	1,964	31,944
Infected	3,928	63,888
Recovered (Natural Immunity)	76,490	1,669,565
Vaccinated	8,857	238,344
Vaccination Rate (Doses per Day)	825	21,082
Vaccine Efficiency	95%	95%
Vaccine Uptake	100%	100%
Variant Transmissibility Increase	0%, 50%, 80%	0%, 50%, 80%

Rapid Impact Analysis of B 1.1.7 Variant on the Spread of SARS-CoV-2 in North Carolina

Michael DeWitt

doi: https://doi.org/10.1101/2021.02.07.21251291

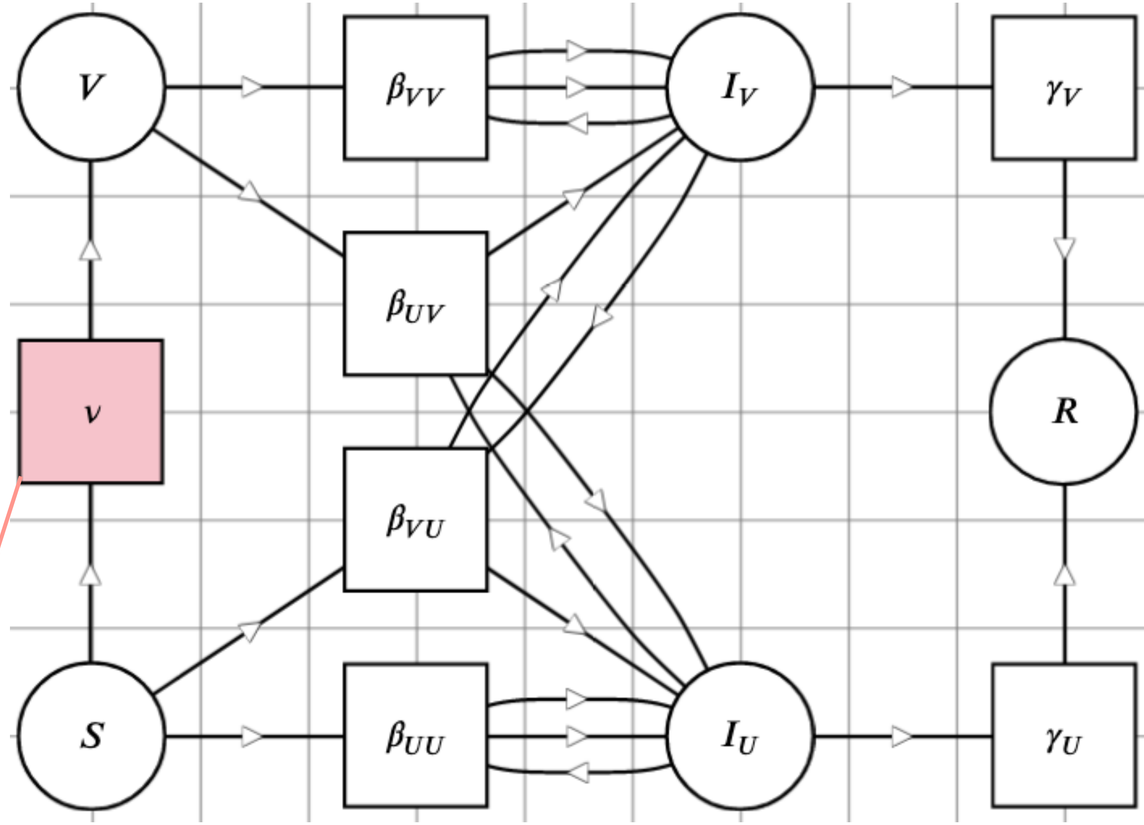
medRxiv

THE PREPRINT SERVER FOR HEALTH SCIENCES

Context search on node returns tables from literature with vaccination data.

Intervention Parameter: daily vaccination rate

SVIvR model representing vaccine intervention



UW-COSMOS

Table Retrieval and Co-References

Incorporate Body-Text Content into Table and Figure Retrieval

Table 1: Parameters used in Discrete Stochastic Compartmental Model

Parameter		
Import Date		
Reproductio		
Population		
Susceptible		
Exposed		
Infected		
Recovered (N		
Vaccinated		
Vaccination		
Vaccine Effic		
Vaccine Uptake	100%	100%
Variant Transmissibility Increase	0%, 50%, 80%	0%, 50%, 80%

Nine scenarios were evaluated for North Carolina and Guilford County. These scenarios included the 10%, 50%, and 90% quantile estimates for the effective reproduction number on the incubation time adjusted import date of B1.1.7 estimated using the EpiNow2 package.[7] The increase in transmissibility was modeled as 0% reflecting no increase, 50% increase, and 80% increase.[4,5,14] Based on the latest findings from Davies, the increase in transmissibility could be as high as 82% with the 95% credible interval including 106%.[6]. The scenarios are shown in Table 1.

Rapid Impact Analysis of B 1.1.7 Variant on the Spread of SARS-CoV-2 in North Carolina

Michael DeWitt

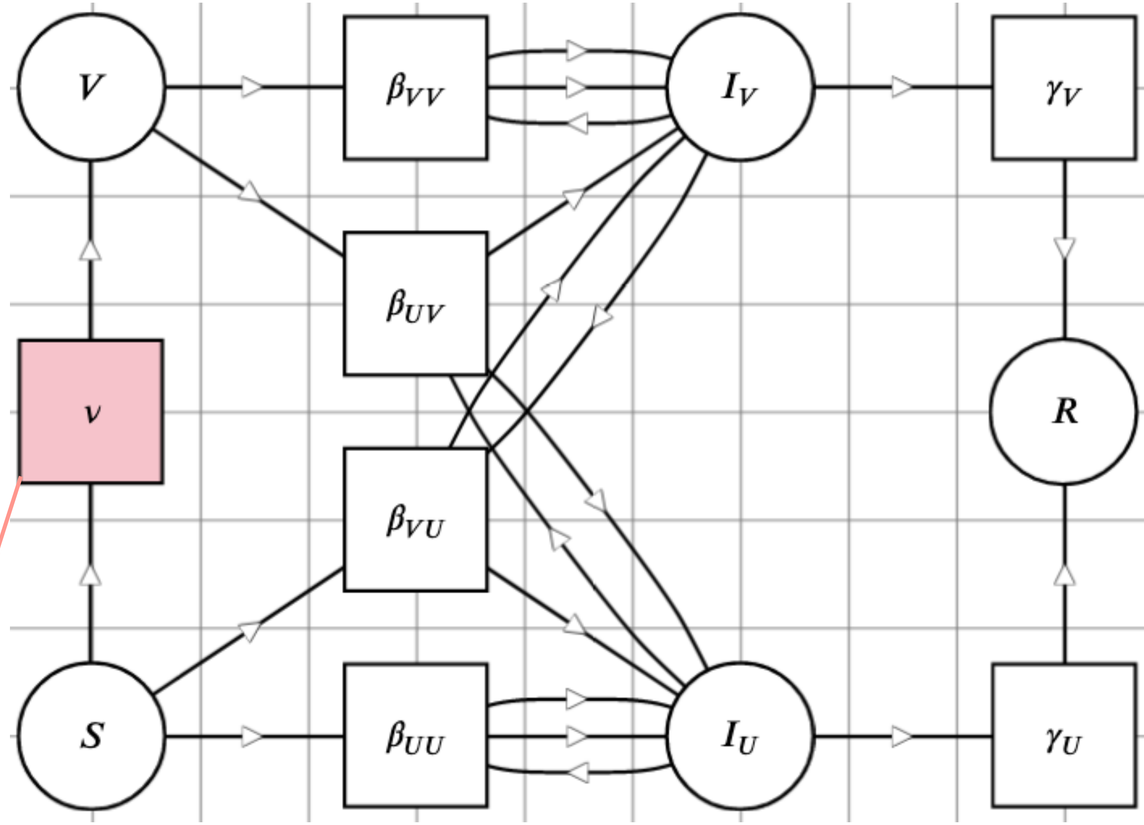
doi: https://doi.org/10.1101/2021.02.07.21251291

medRxiv

THE PREPRINT SERVER FOR HEALTH SCIENCES

Retrieval now returns additional context from full-text, providing richer domain explanations

SVIvR model representing vaccine intervention



Intervention Parameter: daily vaccination rate

UW-COSMOS

Table Retrieval and Co-References

Automated table reading turns PDF into useable data

JSON-representation ready for ingestion


```
    "cls" : "Table",
    "dataset_id" : "documents_5Feb",
    "content" : "Parameter Guilford County North Carolina Import Date 2021-01-28 2021-01-23
Reproduction Number 0.97(0.88-1.03) 0.96(0.8
9-1.02) Population 545,348 10,630,691 Susceptible 454,109 8,626,950 Exposed 1,964 31,944
Infected 3,928 63,888 Recovered (Natural Immuni
ty) 76,490 1,669,565 Vaccinated 8,857 238,344 Vaccination Rate (Doses per Day) 825 21,082
Vaccine Efficiency 95% 95% Vaccine Uptake 100%
 100% Variant Transmissibility Increase 0%, 50%, 80% 0%, 50%, 80%",
    "header_content" : "Table 1: Parameters used in Discrete Stochastic Compartmental Model",
    "context_from_text" : "in transmissibility could be as high as 82% with the 95% credible
interval including 106%.[6] The scenarios are shown in table 1 1Where \"removed\" could be
through recovery, death, or vaccination. The scenarios are shown in Table 1. Statistical
```


SVIvR model representing vaccine intervention

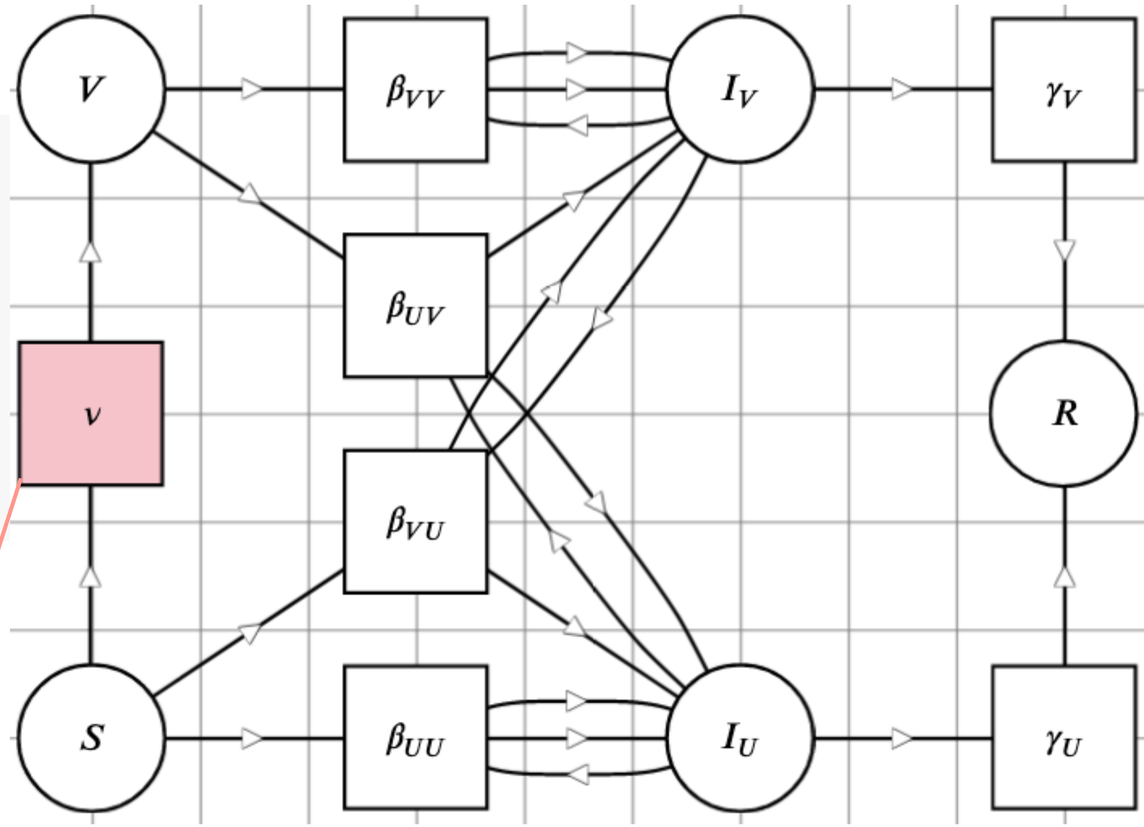


Table extraction provides direct programmatic access to data; embeddings trained over this content.

Intervention Parameter: daily vaccination rate

Rapid Impact Analysis of B 1.1.7 Variant on the Spread of SARS-CoV-2 in North Carolina

Michael DeWitt

doi: https://doi.org/10.1101/2021.02.07.21251291

medRxiv

THE PREPRINT SERVER FOR HEALTH SCIENCES

UW-COSMOS

xDD and UW-COSMOS data infrastructure overview

WILEY Publishers Since 1807 · PLOS · Canadian Science Publishing · CDC · USGS science for a changing world · The Geological Society of America · SEPM · Taylor & Francis Taylor & Francis Group · Cambridge University Press · CSH Cold Spring Harbor Laboratory · ELSEVIER

xDD automated full-pub fetching 10^3s per day

PDF · TXT

open access full-pub

abstract-only text

Europe PMC

xDD corpus
14M full texts
+
PMC abstracts

continuous updating

xDD API

xDD sets

Subsets of xDD corpus for specific projects: xdd.wisc.edu/sets

periodic updating

sets/xdd-covid-19

Text-based search and retrieval over full text of all 14M full texts in xDD corpus

xdd.wisc.edu/api

- api/snippets: string-based search over document full-text to retrieve document metadata and contextual snippets highlighting search matches.
- api/articles: similar to snippets, but article metadata focused
- api/journals: search for specific journals to assess coverage
- api/: additional routes and documentation

154,777 full-text docs

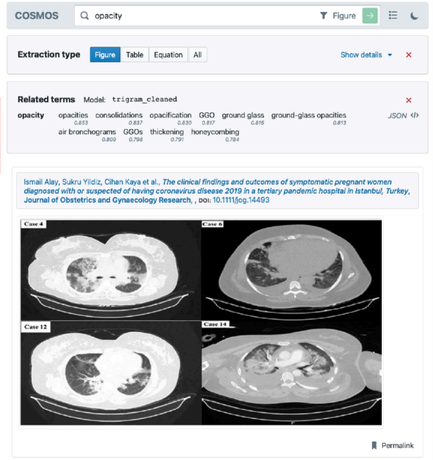
xDD-defined COVID19 doc set (CORD19, EMMAA, search-term defined): full content only

restrict API results to set:
&dataset=xdd-covid-19

Table, figure, equation, retrieval over sets via COSMOS AI assistant (cosmos.wisc.edu)

xdd.wisc.edu/sets/xdd-covid-19/cosmos/api/

- search: string-based search over document figures, tables, equations based on associated text.
- other routes available, most *require API key*



ASKE-ID

UW COSMOS API

- service for generating/ retrieving metadata and links to artifacts

word2vec API

doc2vec API

xdd.wisc.edu/sets/xdd-covid-19/word2vec/api/

- trained embeddings
- several vector operations

xdd.wisc.edu/sets/xdd-covid-19/doc2vec/api/

- document-level embeddings, doc discovery based on similarity

DARPA · USGS science for a changing world · NSF · Department of Energy

Major support by DARPA ASKE, DOE, USGS
2014-2018 by NSF-ICER 1343760

marius

A System for Large Scale Graph Embeddings

Anze Xie*, Anders Carlsson*, Jason Mohoney*, Roger Waleffe*
Shanan Peters#, Theodoros Rekatsinas*, Shivaram Venkataraman*

*Computer Sciences, #Geoscience

Our solution: Marius

- Example: human-constructed Paleobiology Database built by reading manually ~1,200 xDD scientific publications: 259,335 nodes and 3,149,181 edges
- Allows large-scale graph embedding on a single machine
- Easy-to-use config-based development framework
- An open-source system introduced in OSDI 2021

Task: Knowledge Discovery on Paleobiology Database

marius

Node label: | Node property: taxon_id | Property value: 29741 | Type of search: Equals | Results limit: 50 | Search

Traverse by edge: | Nb of layers 3 | Freeze exploration | Show labels | Clear

Get graph info | Show/hide graph info

Node properties:

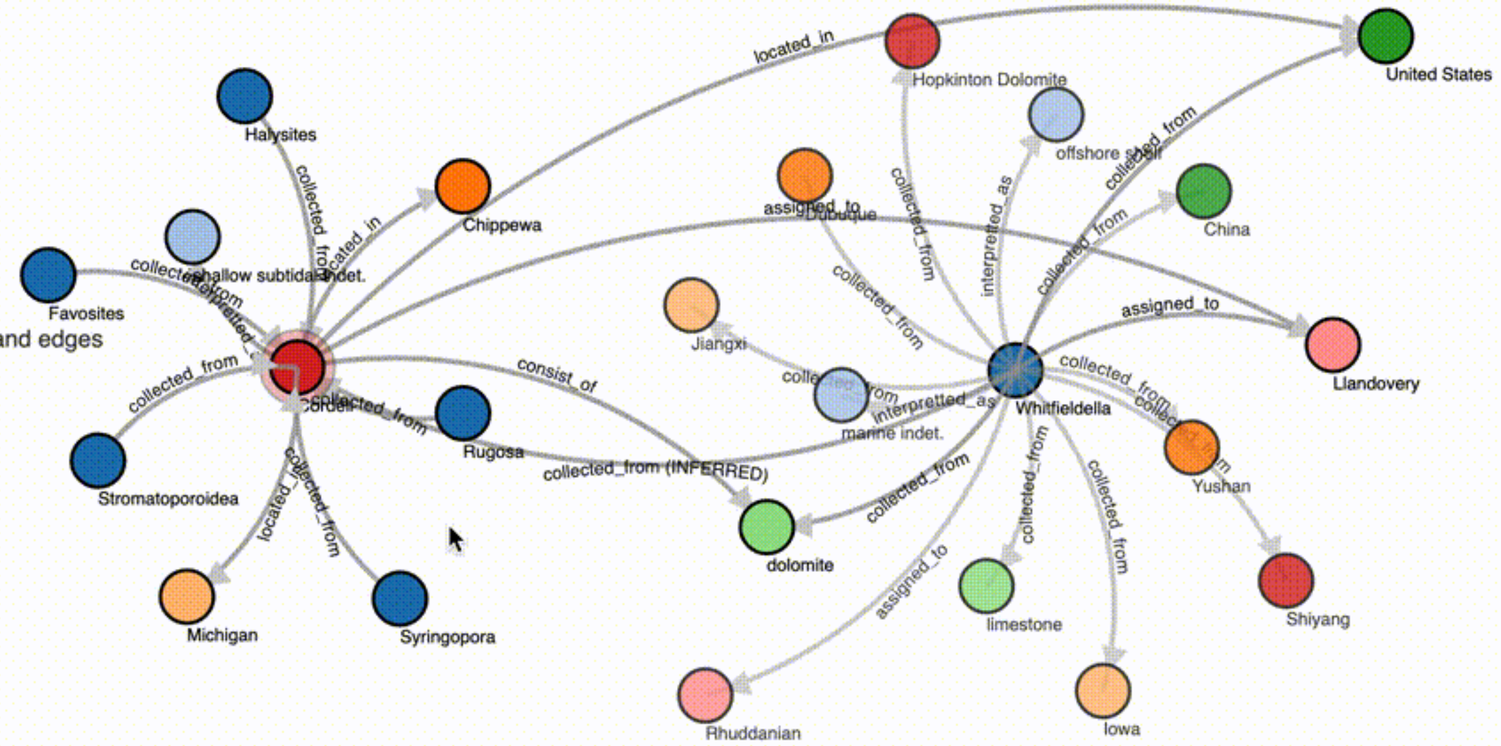
- [x] name
- [ ] interval_id
- [ ] taxon_id

Node color by: label

Graph Info

Limited to the first 10000 nodes and edges

Type	Count
Node labels	
country	77
environment	48
vertex	11
lithology	32
member	269
county	397
taxon	7602
interval	264
formation	799
state	281



Query ID: 4703

Item Info

Key	Value
id	4703
label	formation

Key	Value	Property
name	Cordell	

Embeddings Inference

Edge type: collected_from

Infer new edges

Server Address: localhost | Server port: 8182 | Protocol: REST | Gremlin version: 3.4.* | Edit Graph

Graph Explorer V 0.8.0

marius

A System for Large Scale Graph Embeddings

Anze Xie*, Anders Carlsson*, Jason Mohoney*, Roger Waleffe*
Shanan Peters#, Theodoros Rekatsinas*, Shivaram Venkataraman*

*Computer Sciences, #Geoscience