The Network Data Exchange in 2017

Trey Ideker, Dexter Pratt, UCSD

aka the "Cytoscape Cloud"

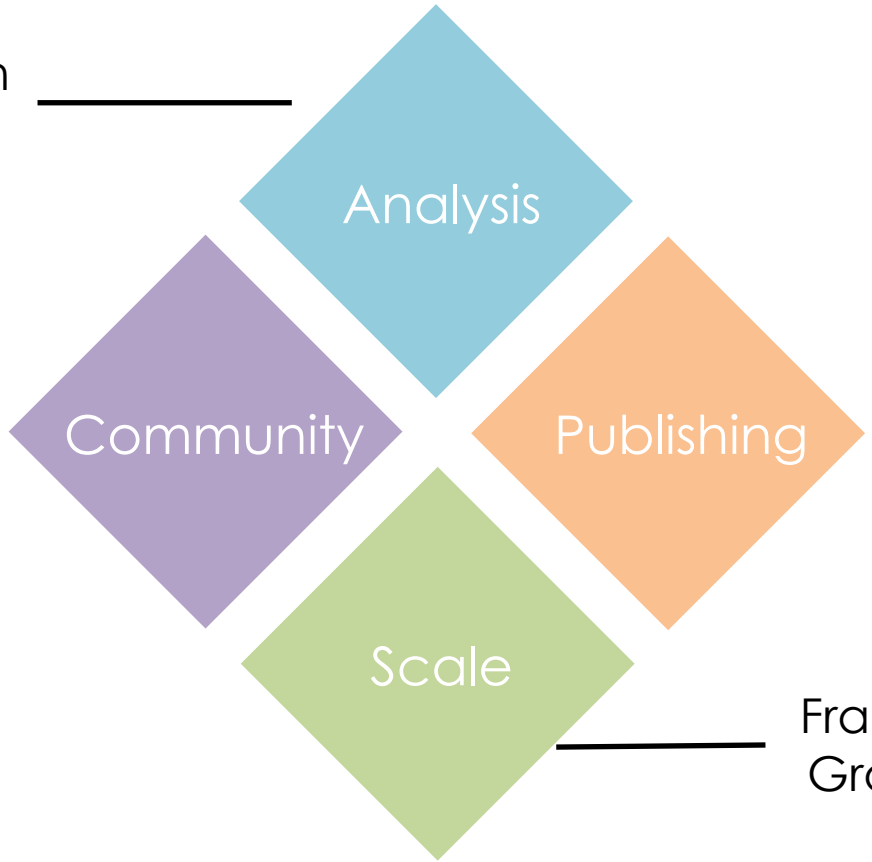
NDEx is a public commons, where users store, share, and publish their networks.

Scientists can search for networks and access them from the NDEx site or with their own scripts and applications.

NDEx networks have stable, unique identifiers and URIs, enabling reference from publications.

NDEx Project Goals

Networks in Next-Generation Cancer Genome Analysis

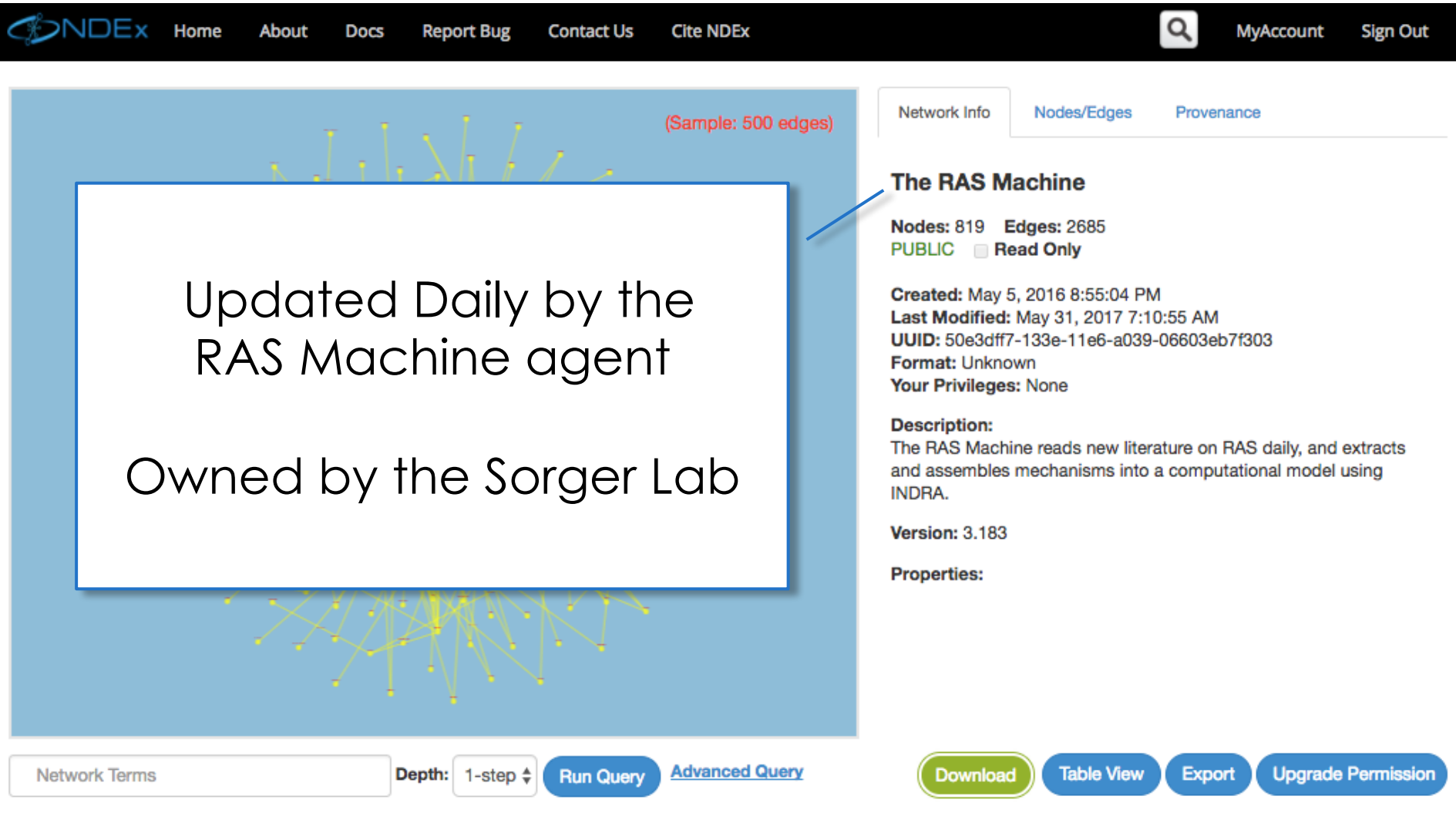


Hallmark Cancer Pathways via Social Organization and Automation

Publishing of Interactive Networks on Journal Websites

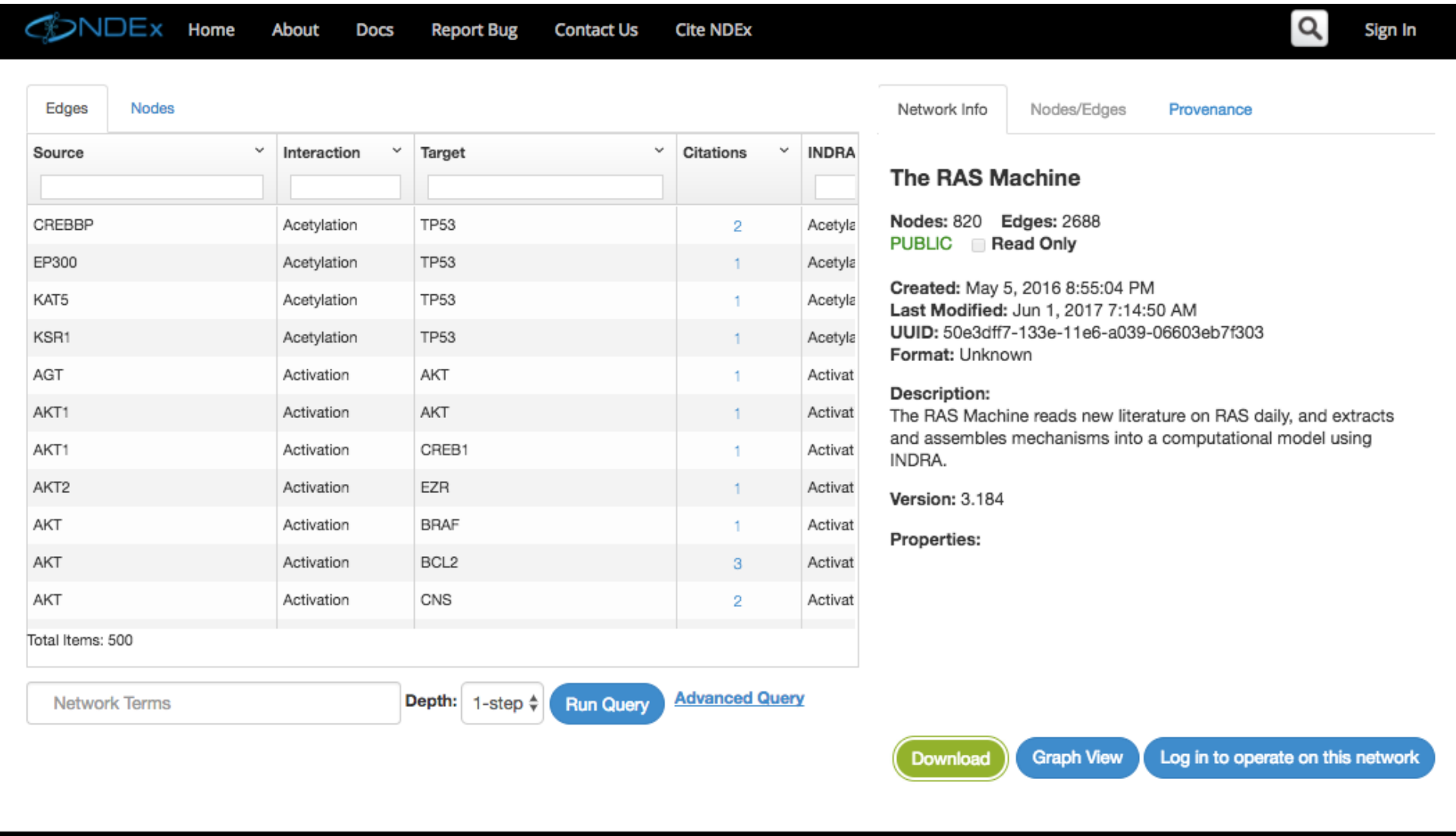
Scaling the NDEx Framework to Support a Growing Community of Users and Tools.

Access by Users and Applications

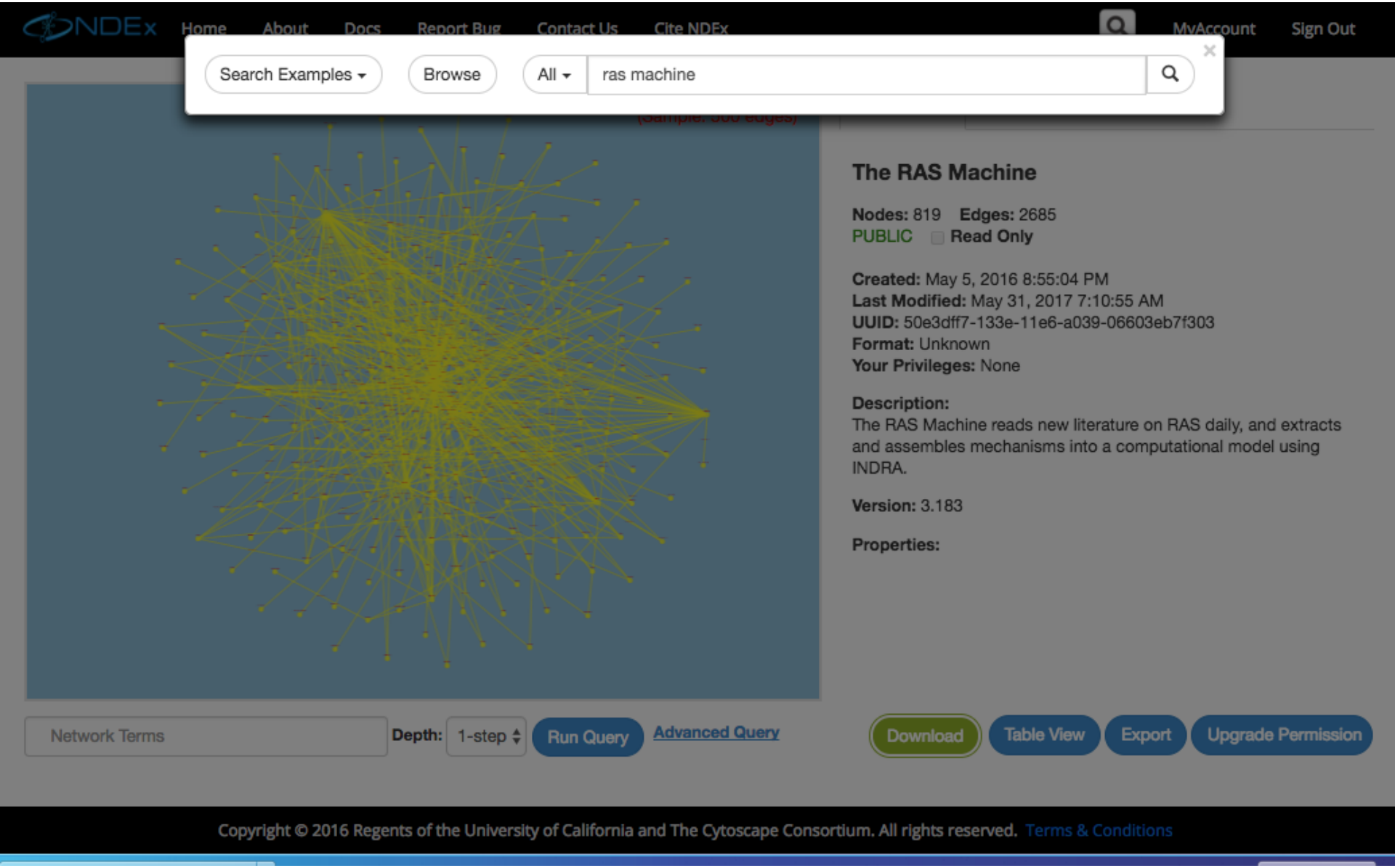


Unpublished work by Ben Gyori, John Bachman, Peter Sorger and others in the Sorger Lab at HMS

Access by Users and Applications



Search


NDEx
Home
About
Docs
Report Bug
Contact Us
Cite NDEx
MyAccount
Sign Out
Search Examples
Browse
All
ras machine
The RAS Machine
Nodes: 819 Edges: 2685
PUBLIC Read Only
Created: May 5, 2016 8:55:04 PM
Last Modified: May 31, 2017 7:10:55 AM
UUID: 50e3dff7-133e-11e6-a039-06603eb7f303
Format: Unknown
Your Privileges: None
Description:
The RAS Machine reads new literature on RAS daily, and extracts and assembles mechanisms into a computational model using INDRA.
Version: 3.183
Properties:
Network Terms
Depth:
1-step
Run Query
Advanced Query
Download
Table View
Export
Upgrade Permission
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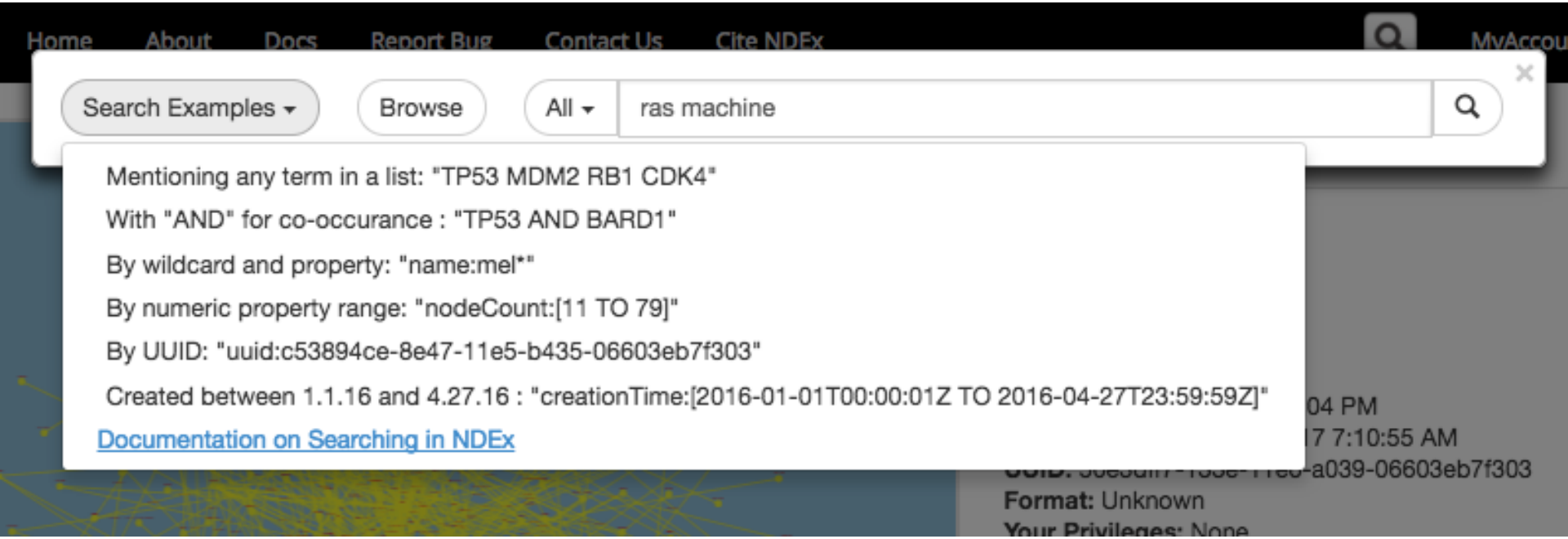
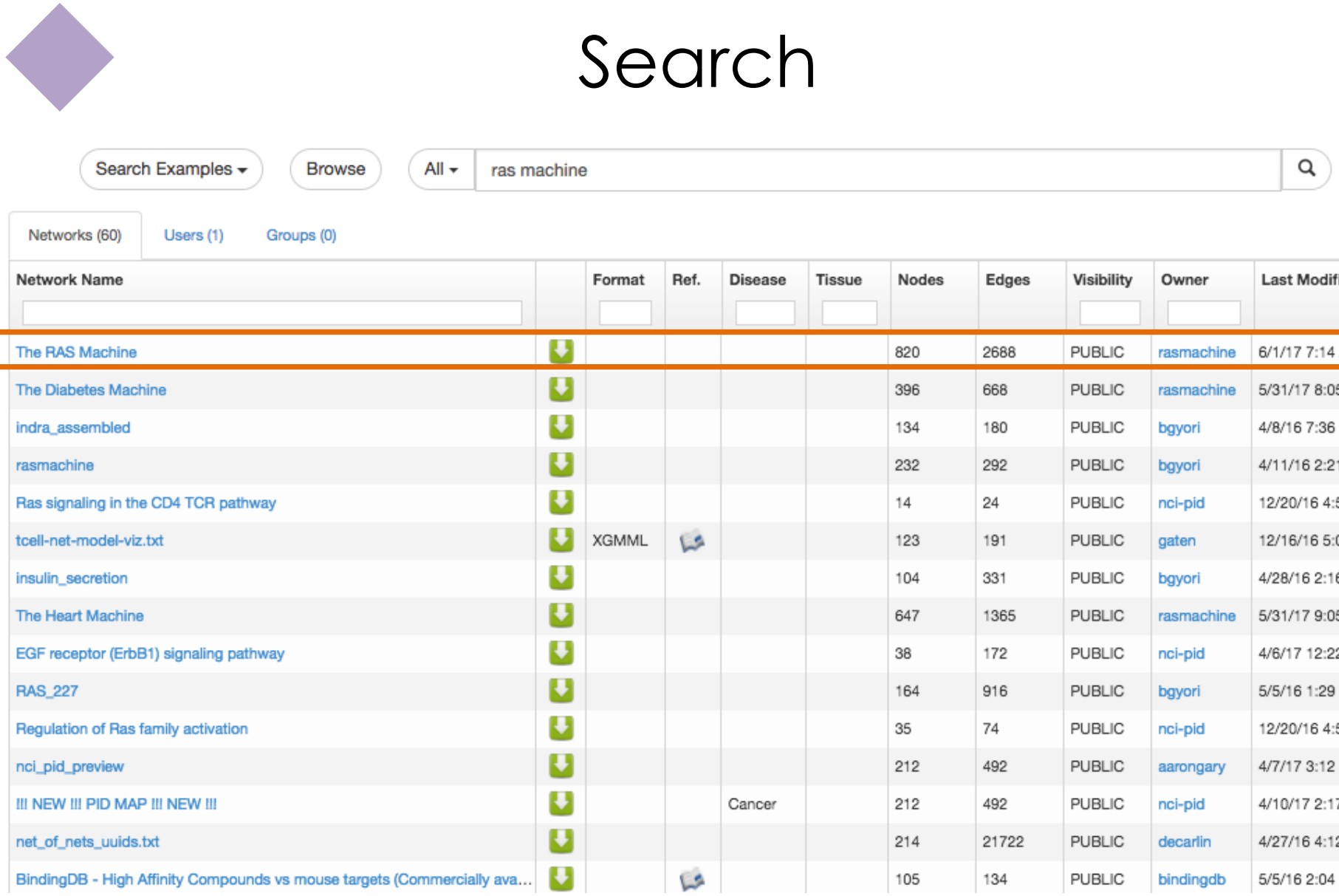
Search


Home
About
Docs
Report Bug
Contact Us
Cite NDEx
MyAccou
Search Examples
Browse
All
ras machine
Mentioning any term in a list: "TP53 MDM2 RB1 CDK4"
With "AND" for co-occurance : "TP53 AND BARD1"
By wildcard and property: "name:mel*"
By numeric property range: "nodeCount:[11 TO 79]"
By UUID: "uuid:c53894ce-8e47-11e5-b435-06603eb7f303"
Created between 1.1.16 and 4.27.16 : "creationTime:[2016-01-01T00:00:01Z TO 2016-04-27T23:59:59Z]"
Documentation on Searching in NDEx
04 PM
7 7:10:55 AM
a039-06603eb7f303
Format: Unknown

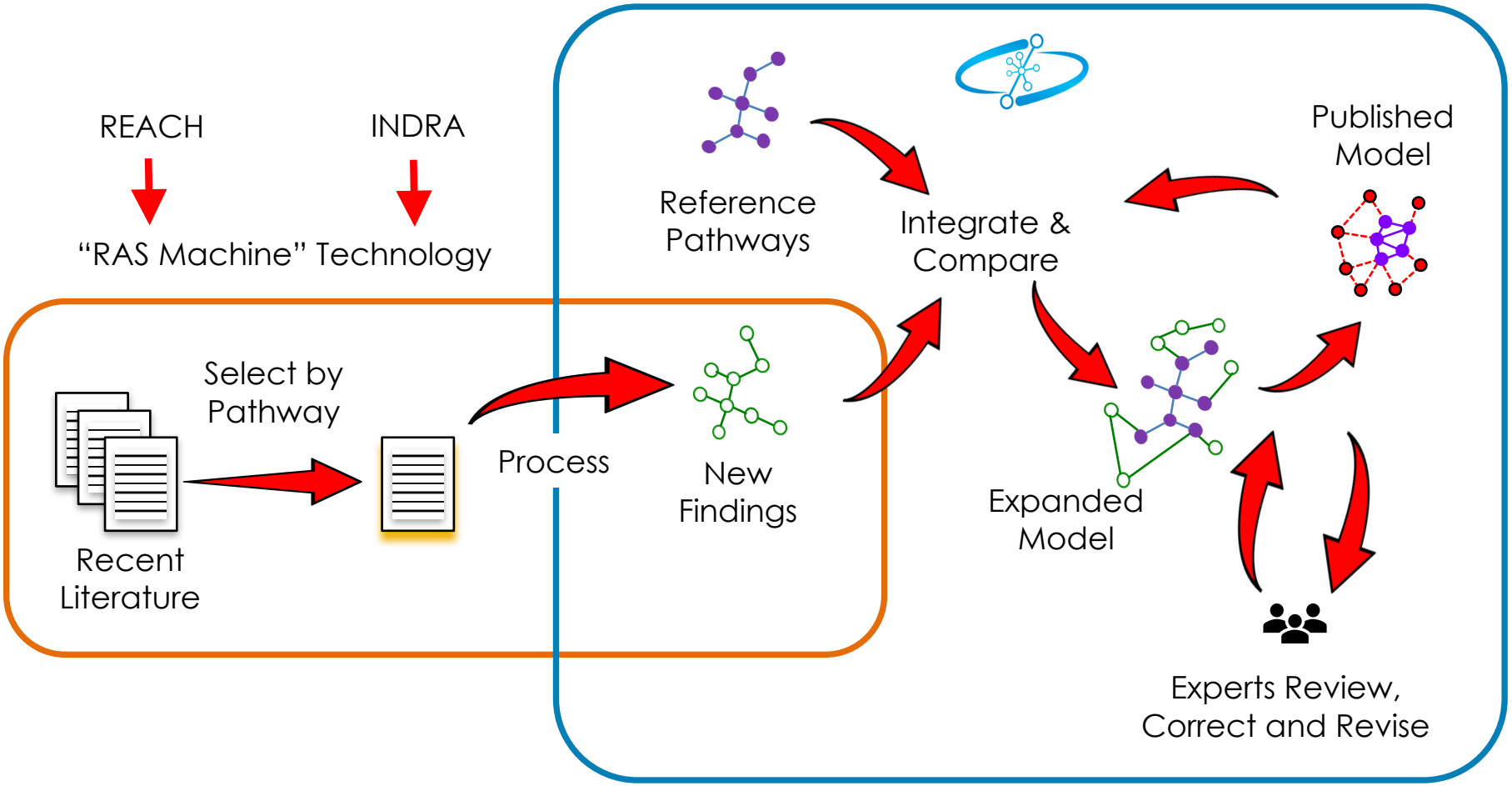
Search



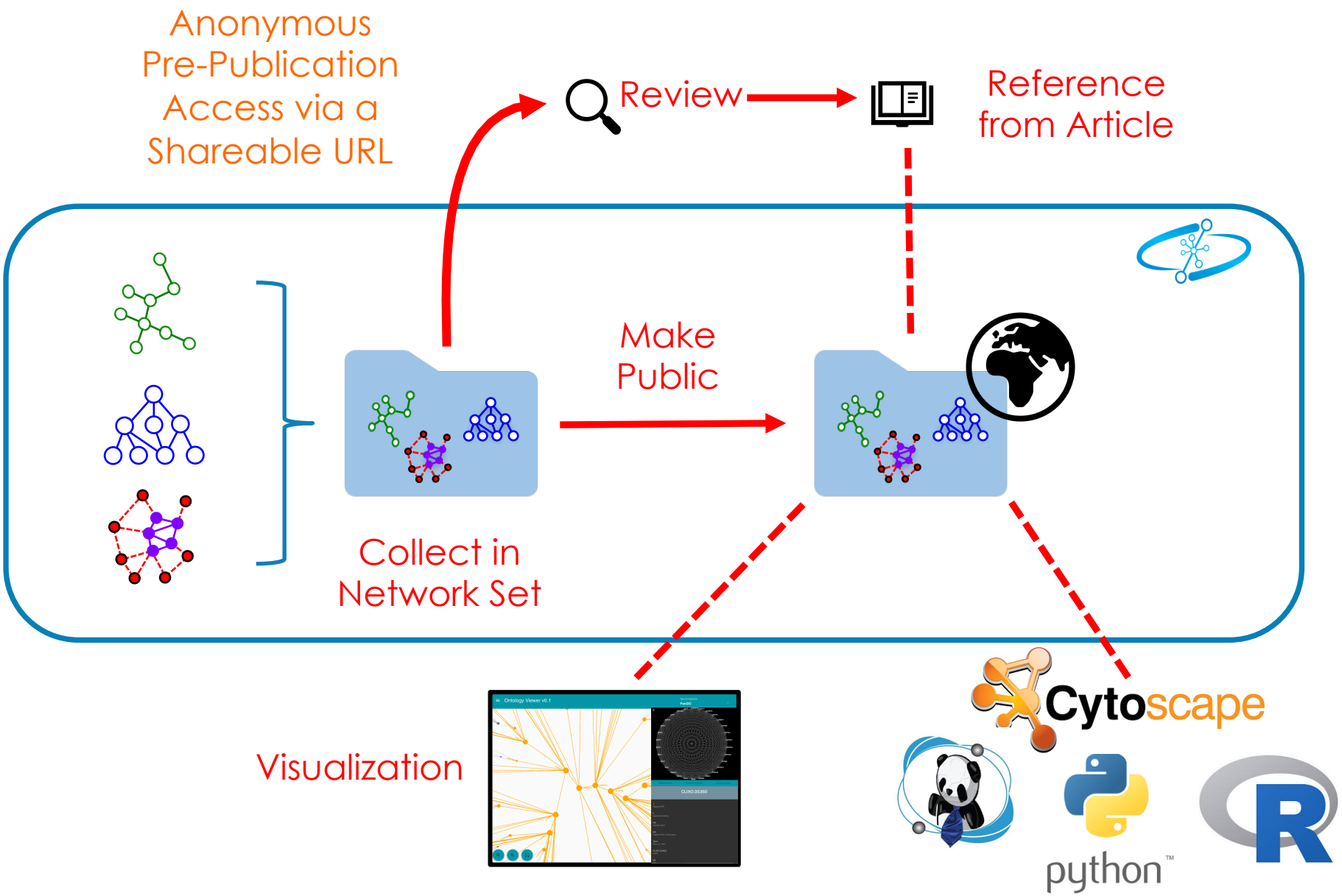
Network Name		Format	Ref.	Disease	Tissue	Nodes	Edges	Visibility	Owner	Last Modified
The RAS Machine						820	2688	PUBLIC	rasmachine	6/1/17 7:14 AM
The Diabetes Machine						396	668	PUBLIC	rasmachine	5/31/17 8:05 AM
indra_assembled						134	180	PUBLIC	bgyori	4/8/16 7:36 PM
rasmachine						232	292	PUBLIC	bgyori	4/11/16 2:21 PM
Ras signaling in the CD4 TCR pathway						14	24	PUBLIC	nci-pid	12/20/16 4:59 PM
tcell-net-model-viz.txt		XGMML				123	191	PUBLIC	gaten	12/16/16 5:08 AM
insulin_secretion						104	331	PUBLIC	bgyori	4/28/16 2:16 PM
The Heart Machine						647	1365	PUBLIC	rasmachine	5/31/17 9:05 AM
EGF receptor (ErbB1) signaling pathway						38	172	PUBLIC	nci-pid	4/6/17 12:22 PM
RAS_227						164	916	PUBLIC	bgyori	5/5/16 1:29 PM
Regulation of Ras family activation						35	74	PUBLIC	nci-pid	12/20/16 4:59 PM
nci_pid_preview						212	492	PUBLIC	aarongary	4/7/17 3:12 PM
!!! NEW !!! PID MAP !!! NEW !!!				Cancer		212	492	PUBLIC	nci-pid	4/10/17 2:17 PM
net_of_nets_uuids.txt						214	21722	PUBLIC	decarlin	4/27/16 4:12 PM
BindingDB - High Affinity Compounds vs mouse targets (Commercially ava...						105	134	PUBLIC	bindingdb	5/5/16 2:04 PM

Hallmark Pathway^2 Hypothesis

Social pathways to enable molecular pathways



Review and Publish



ndexr : Access from R

- Successful Outreach and Collaboration with Bioconductor
- Special thanks to Frank Kramer[1], Florian Auer[1], Aleksandar Ishkin[2]

NDEx R client library

Bioconductor version: Development (3.6)

This package offers an interface to NDEx servers, e.g. the public server at http://ndexbio.org/. It can retrieve and save networks via the API. Networks are offered as RCX object and as igraph representation.

Author: Frank Kramer <frank.kramer at med.uni-goettingen.de>, Florian Auer <florian.auer at med.uni-goettingen.de>, Alex Ishkin <aleksandr.ishkin at thomsonreuters.com>, Dexter Pratt <depratt at ucsc.edu>

Maintainer: Florian Auer <florian.auer at med.uni-goettingen.de>

Citation (from within R, enter `citation("ndexr")`):

Kramer F, Auer F, Ishkin A and Pratt D (2017). *ndexr: NDEx R client library*. R package version 0.99.14, https://github.com/frankkramer-lab/ndexr.

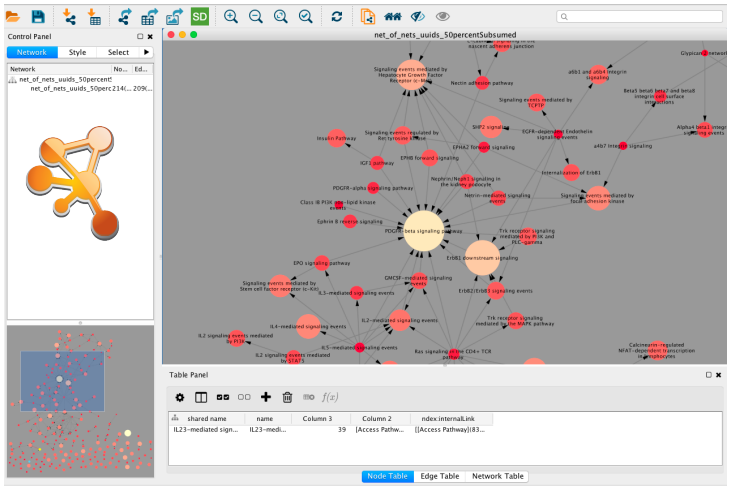
[1]Department of Medical Statistics, University Medical Center Göttingen, Humboldtallee 32, 37099 Göttingen, Germany.
[2]Discovery Science, Clarivate Analytics, 22 Thomson Pl, Boston, MA 02210, US

Cytoscape and NDEx

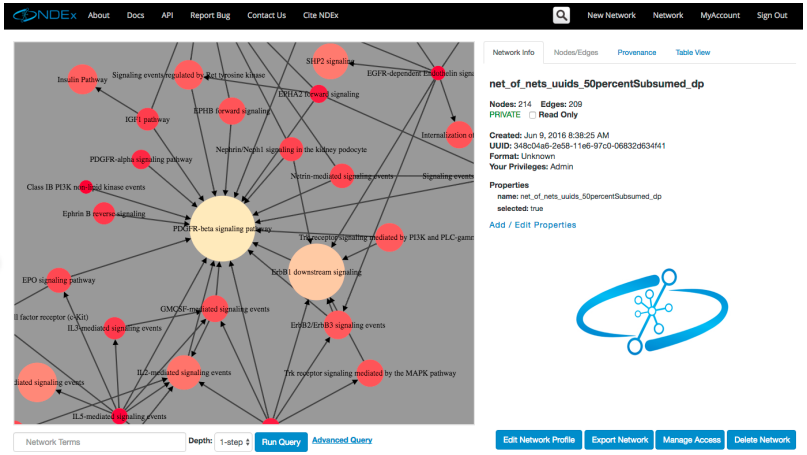
CyNDEx

Cytoscape App Store

CyNDEx allows users to seamlessly transfer networks between NDEx and Cytoscape and , in certain cases, even perform network updates in NDEx.



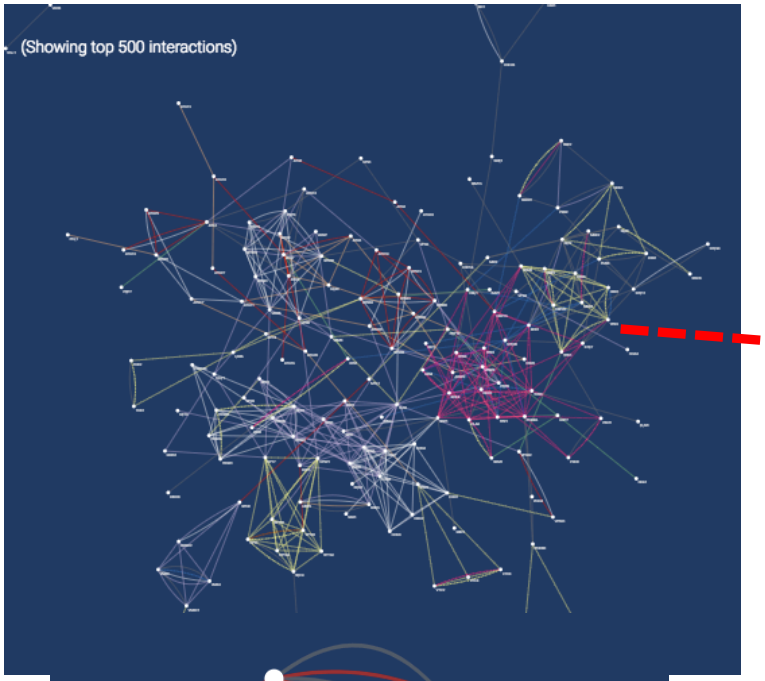
CX

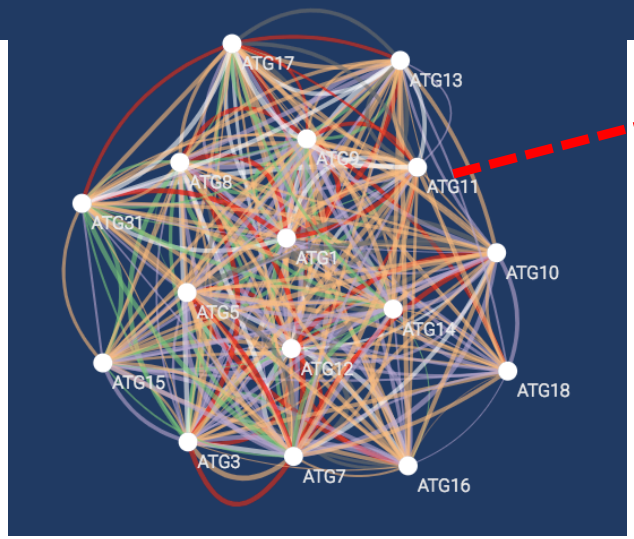


Cytoscape and NDEx communicate via the novel CX exchange format. Seamless integration with Cytoscape core in Summer 2017.

Hierarchical Organization of a Large Network

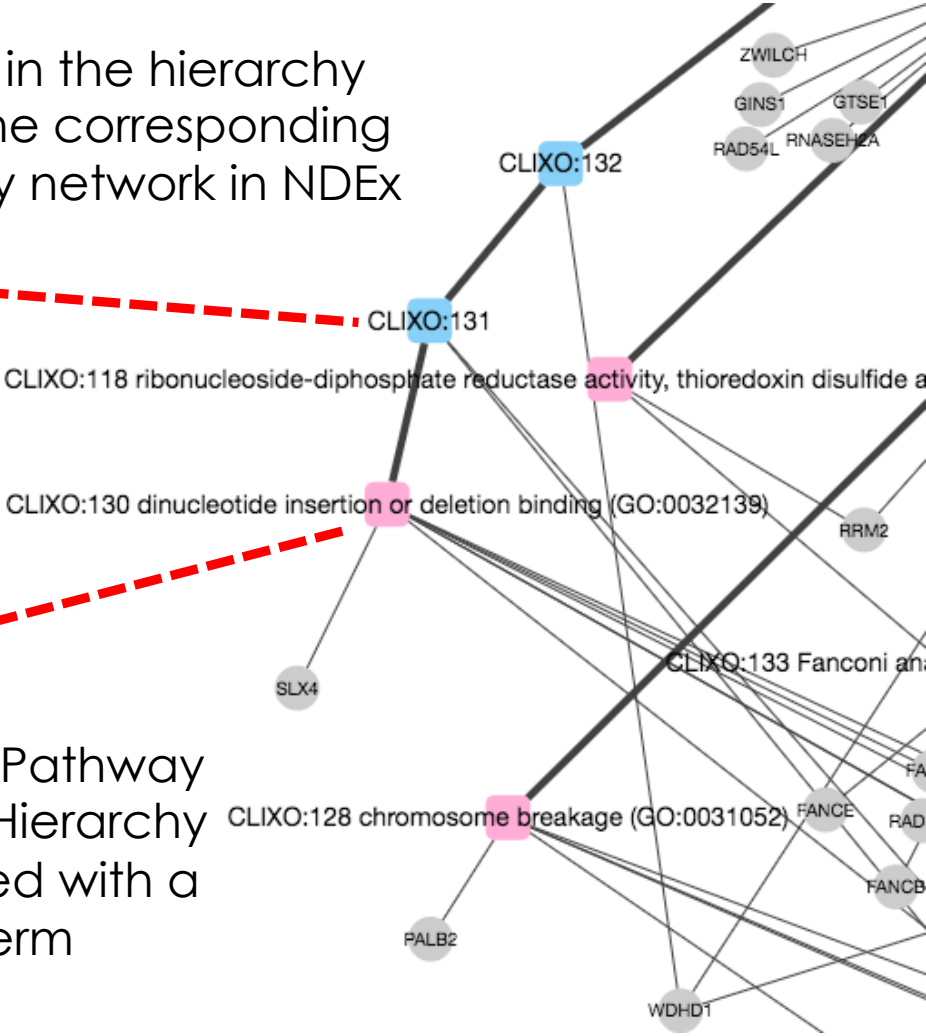
Dutkowski et al. *Nat Biotech* 2013; Kramer et al. *Mol Cell* 2017





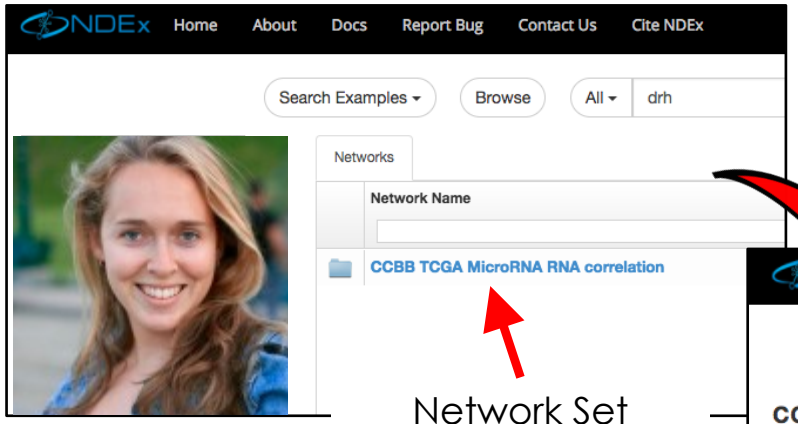
Nodes in the hierarchy link to the corresponding pathway network in NDEx

Supporting Pathway Aligned to Hierarchy Term Aligned with a GO Term



Scaling with Network Sets

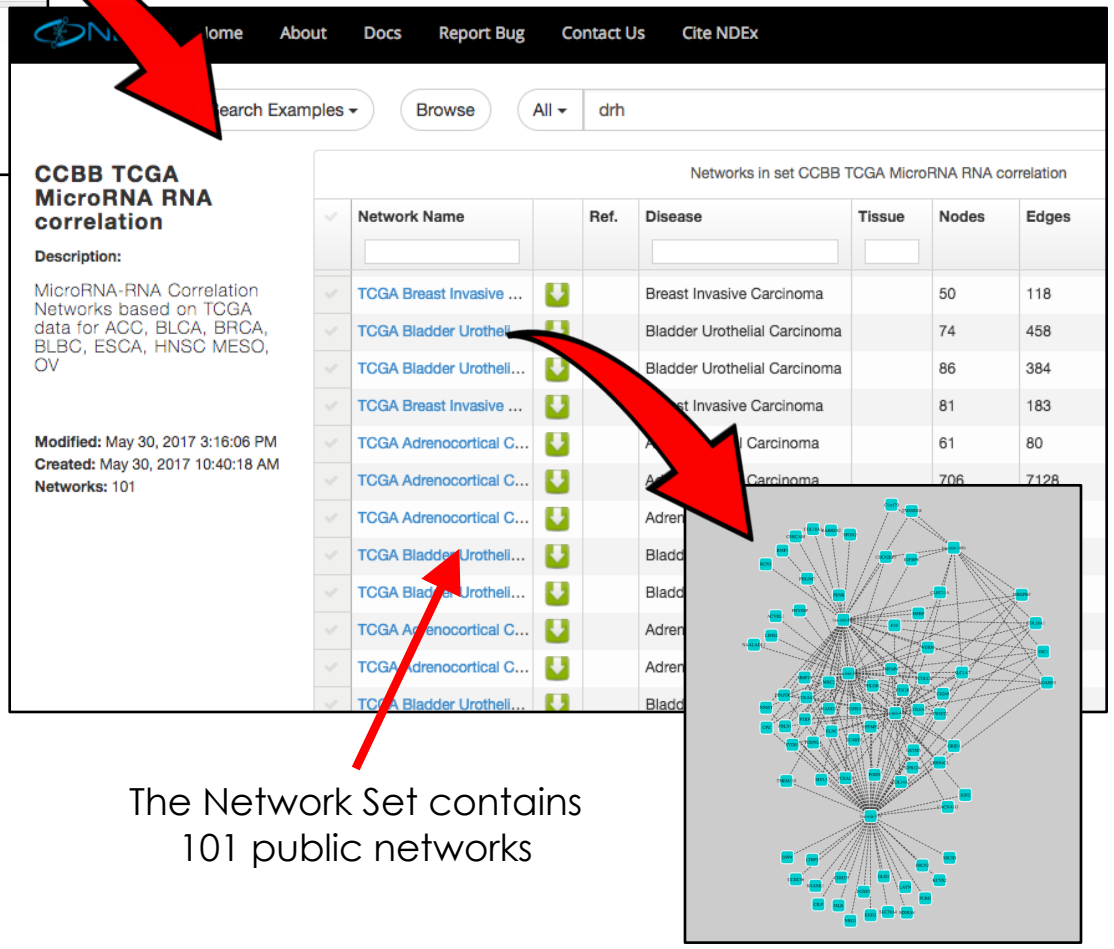
Sets provide user-driven structure as NDEx grows to very large numbers of networks.



Network Set showcased on user's homepage

Network Sets are named, collections: destinations with unique IDs and URLs.

Network Sets can be published resources, such as collections reviewed by an organization.



The Network Set contains 101 public networks

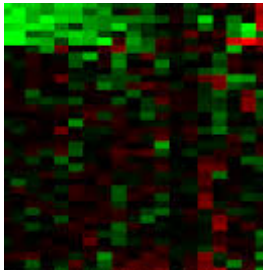
Thanks to Brin Rosenthal for sharing excerpts from work in progress..

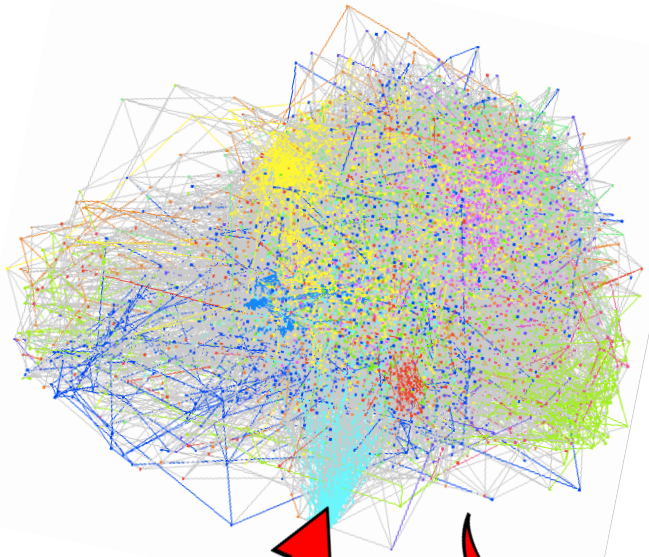
Patient Similarity Networks

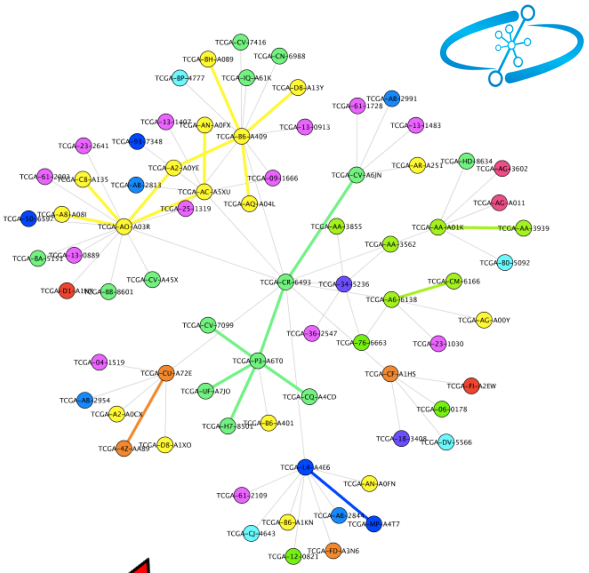
Very Large:
Genome-Scale Patient Data

Large:
Patient Similarity Network

Small:
Patients Most Similar to Patient X







Compute Similarity and Filter to Create a Sparse Network

Query for Patient X

NDEx 2.0 Server Handles Networks that Span a Broad Range of Sizes

Thanks to Dan Carlin and Justin Huang for sharing excerpts from work in progress..

NDEx

NDEx Team




Ideker Lab


CCBB


And thanks to collaborators at the Karchin and Sorger Labs

Institute for Genomic Medicine

Informatics Technology for Cancer Research

U24 CA1884427

NRNB

Janssen Pharmaceutical Companies of Johnson & Johnson

Network Pharmacology

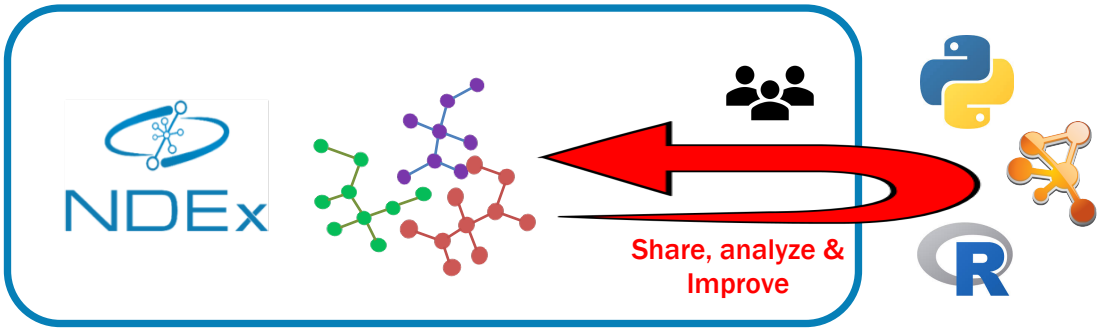
Pfizer

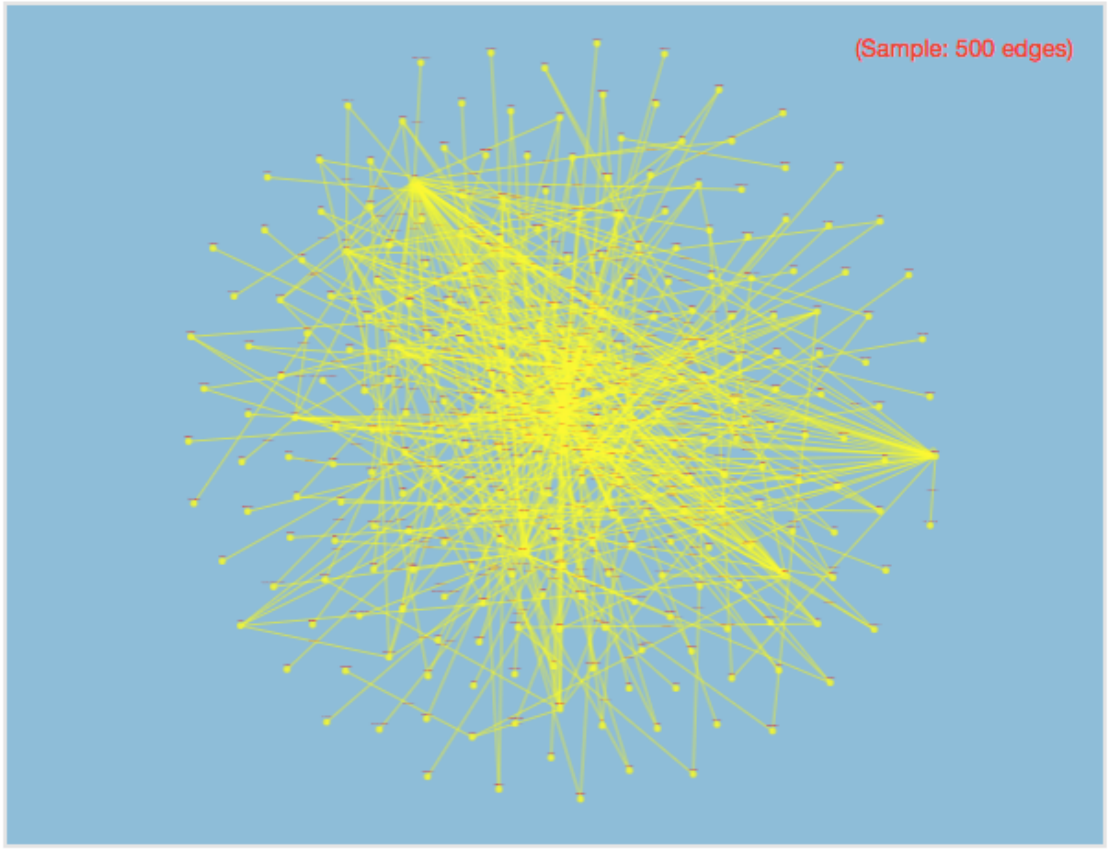
Roche

SUPPLEMENTARY SLIDES ➔

Integration with Analysis Tools (rachel)

- Python client
- R Client
- Outreach at hackathons
  - Use-case driven feedback and prototyping
- NDEx access built into next Cytoscape release





Network Info | Nodes/Edges | Provenance

The RAS Machine

Nodes: 819 **Edges:** 2685
PUBLIC **Read Only**

Created: May 5, 2016 8:55:04 PM
Last Modified: May 31, 2017 7:10:55 AM
UUID: 50e3dff7-133e-11e6-a039-06603eb7f303
Format: Unknown
Your Privileges: None

Description:
The RAS Machine reads new literature on RAS daily, and extracts and assembles mechanisms into a computational model using INDRA.

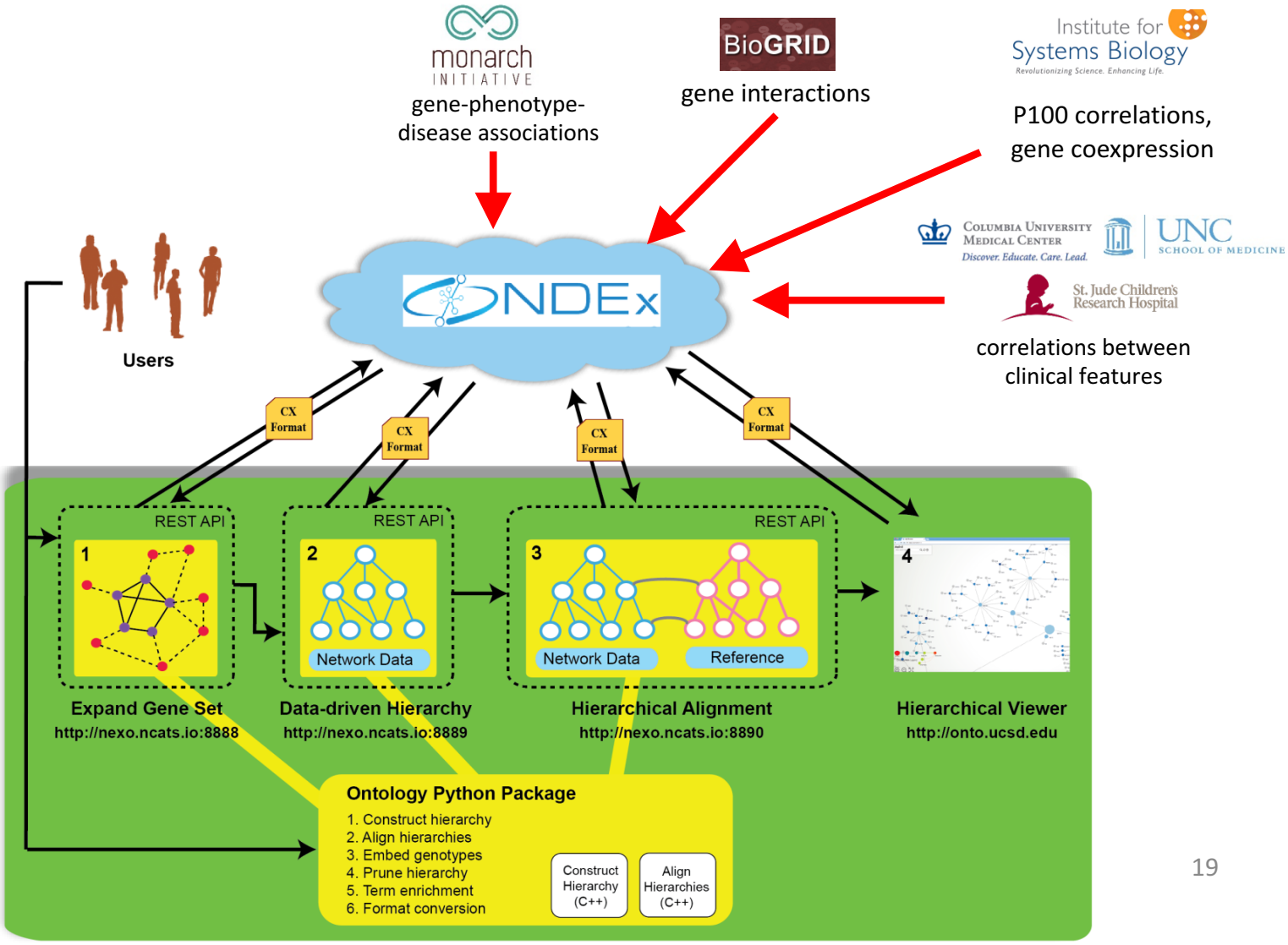
Version: 3.183

Properties:

Network Terms **Depth:** 1-step Run Query Advanced Query

Download Table View Export Upgrade Permission

Architecture for Reproducing the FanGO Analysis for Any Disease



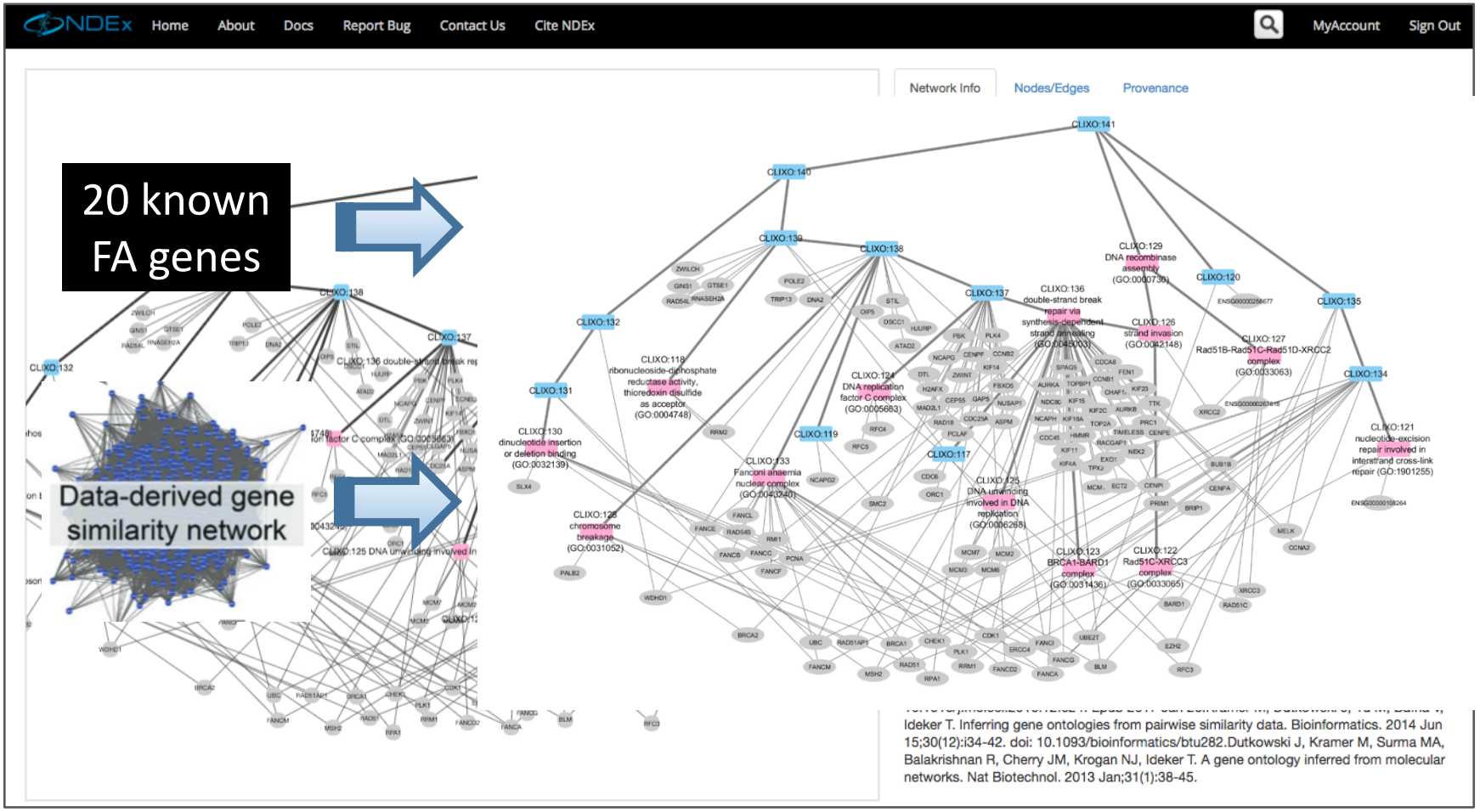
NDEx:
Upload data and call REST API
(or run your own server instance)

Local machine:
Python package

Dutkowski et al. "NeXO Web". *Nucleic Acids Res*. (2014)
Pratt et al. "NDEx, the Network Data Exchange". *Cell Systems.* (2016)

FanGO: Fanconi Anemia Hierarchy

Hierarchical Pathway Models Managed in NDEx



CLIXO Term (match in GO)

CLIXO Term (no match in GO)

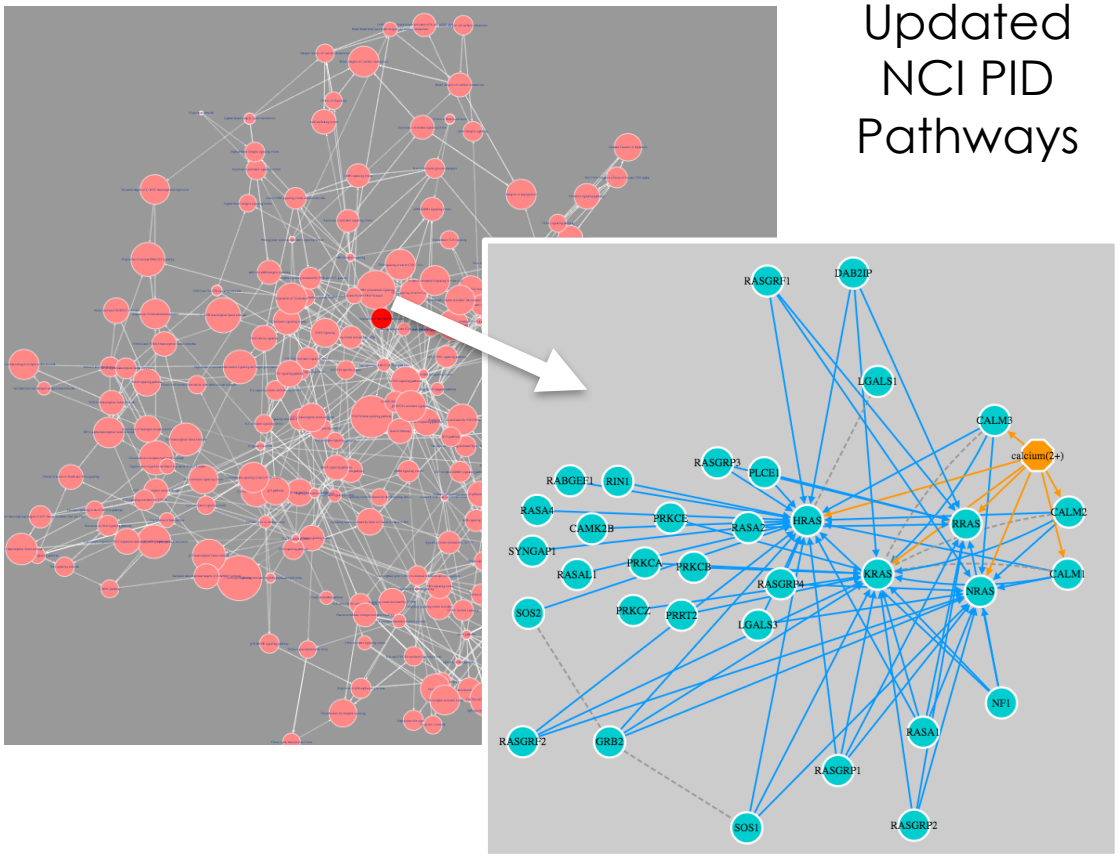
Gene

Thanks to Mike Yu for sharing excerpts from work in progress..

Automation

Python Utilities:

- Apply Style Templates Created in Cytoscape
- Apply a Layout to All Networks in a Set



Updated NCI PID Pathways

Next:

- Automated Update from Tabular Data Sources and Literature Mining