Why Graphs?
Transcending the Limits of Hierarchical Thinking

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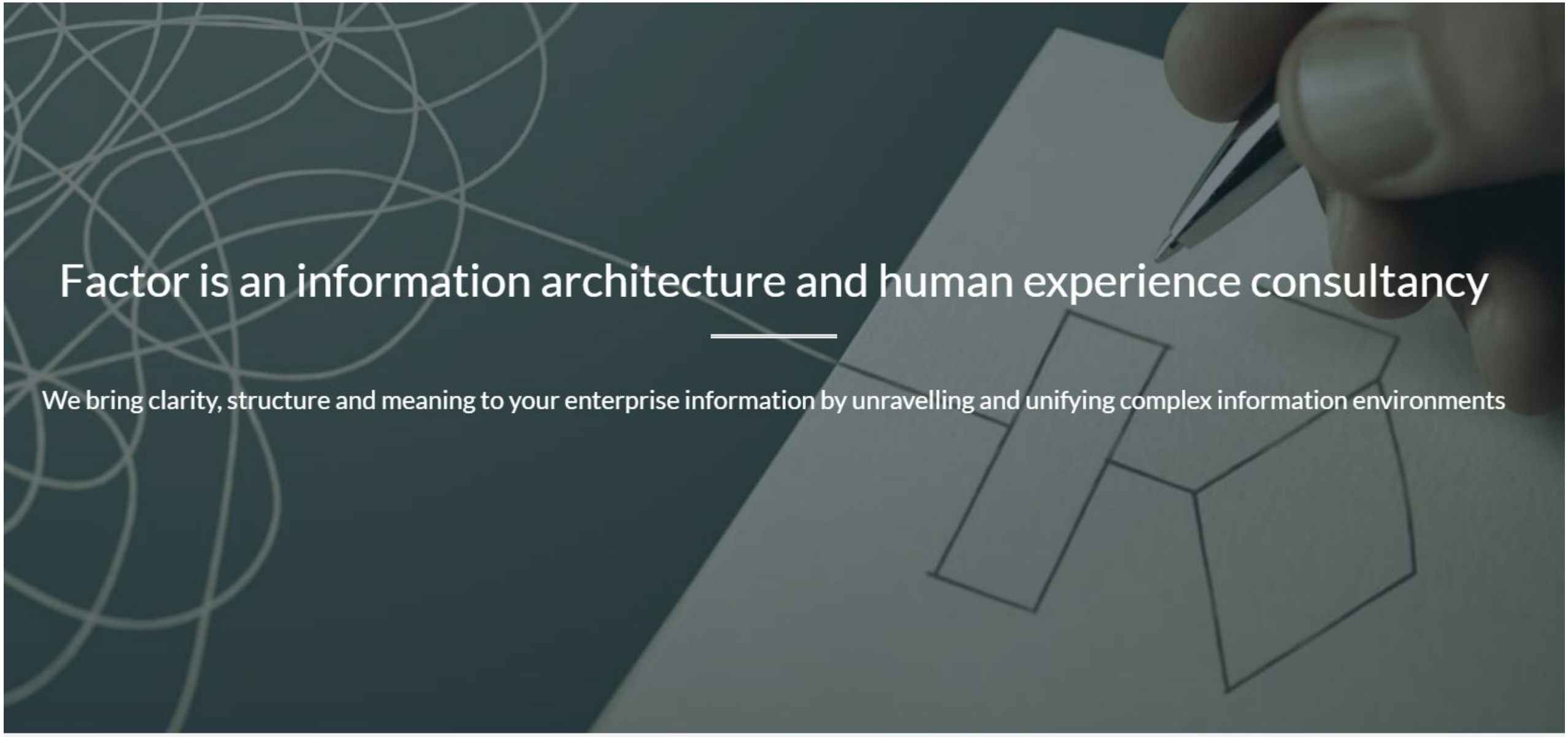
About Factor

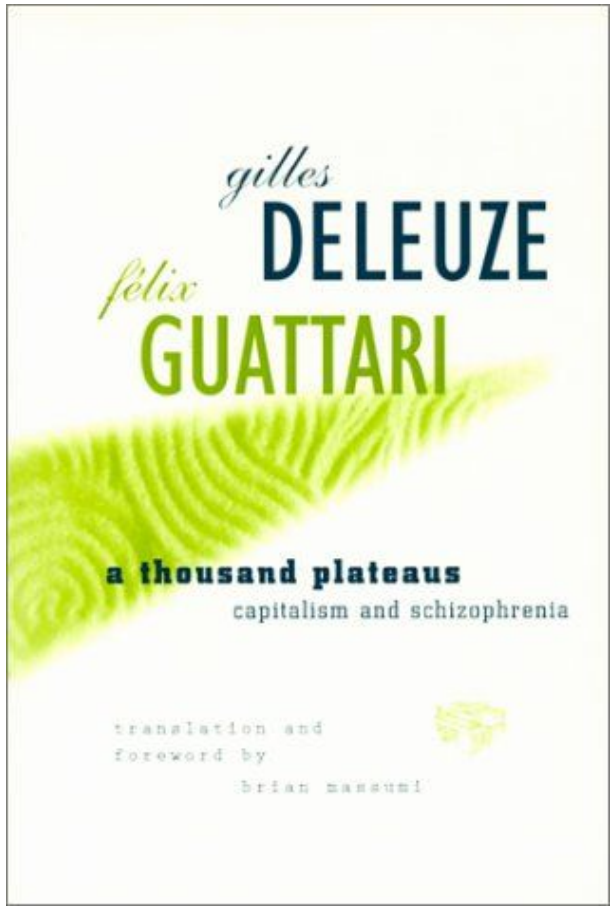


RHIZOMES

Any point of a rhizome can be connected to anything other, and must be
This is very different from the tree or root, which plots a point, fixes an order

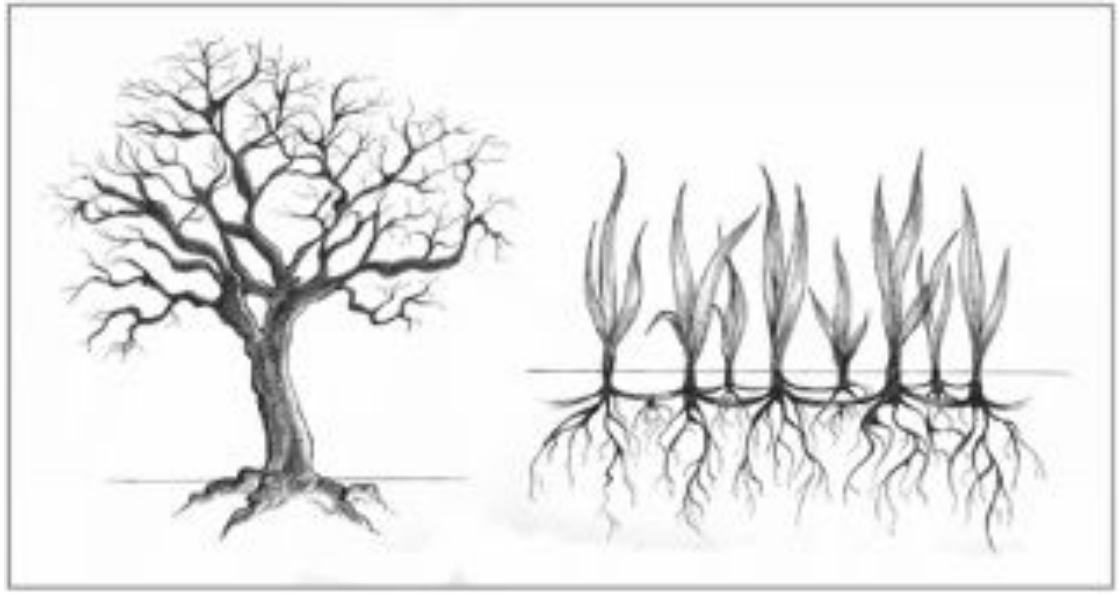
Gilles Deleuze & Félix Guattari

- *A Thousand Plateaus: Capitalism and Schizophrenia* (1987)



Gilles Deleuze & Félix Guattari

- Hierarchical trees versus (***or*** and…and…and) lateral rhizomes
- Maps versus (or and…and…and) tracings
- What Deleuze & Guattari described in 1987 sounds like *taxonomies and knowledge graphs!*



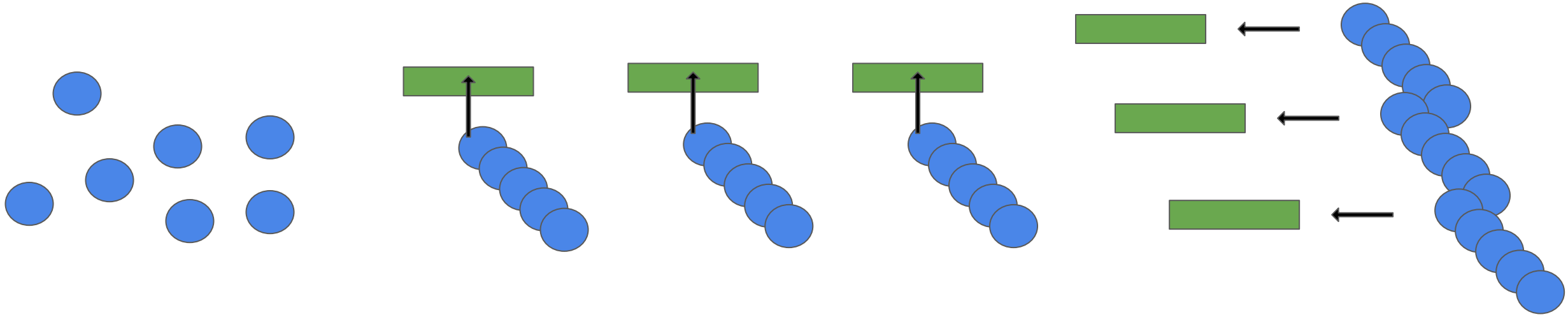
CONCEPTS

A concept is a brick. It can be used to build a courthouse of reason. Or it can be thrown through the window.

Limits of Hierarchical Thinking

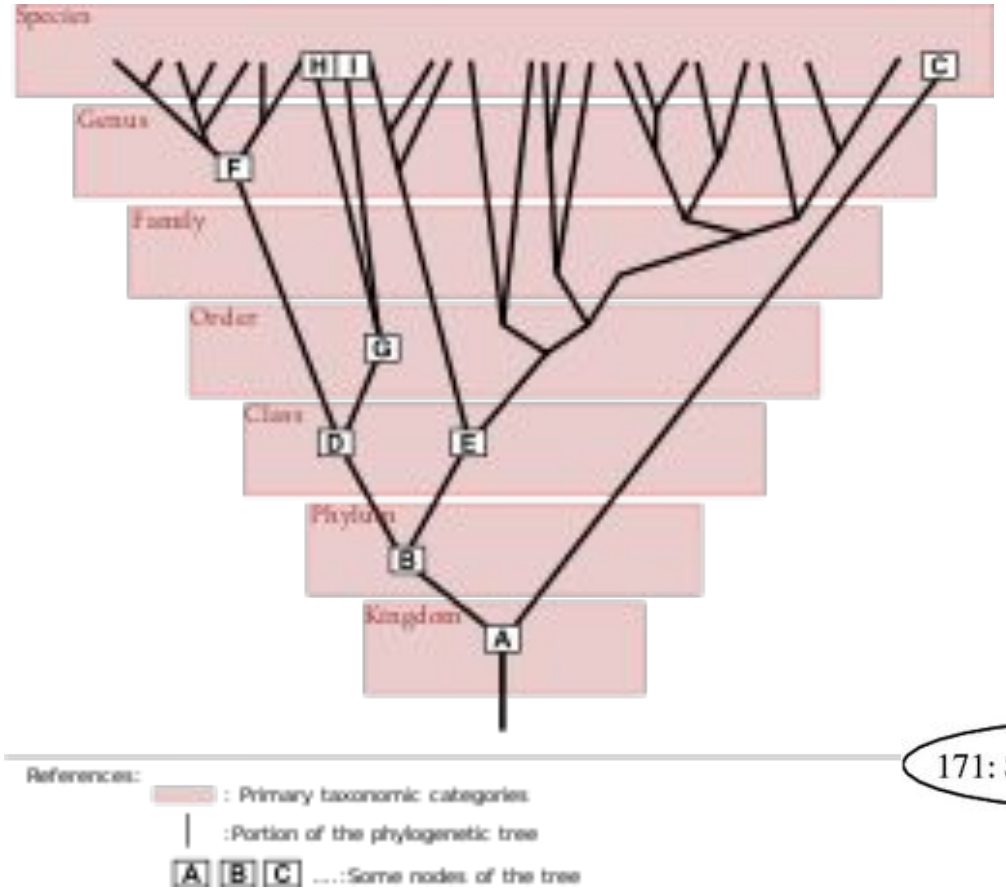
Miller's Law:

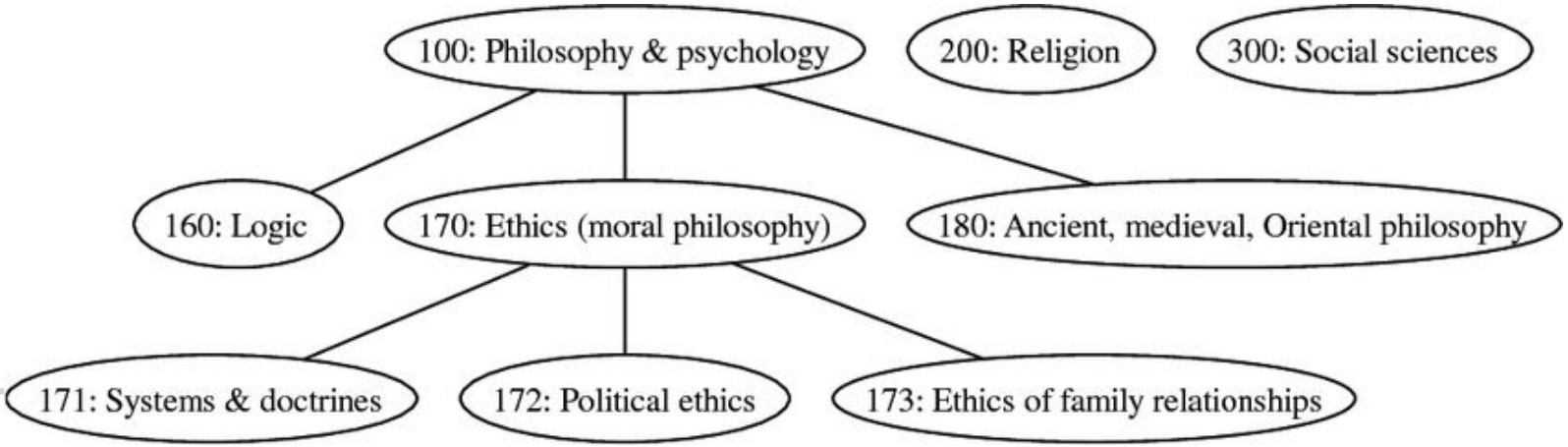
The average person can only keep 7 (plus or minus 2) items in their working memory.



Miller, G. A. (1956). "The magical number seven, plus or minus two: Some limits on our capacity for processing information". Psychological Review. 63 (2): 81–97. CiteSeerX 10.1.1.308.8071. doi:10.1037/h0043158. hdl:11858/00-001M-0000-002C-4646-B. PMID 13310704.

Limits of Hierarchical Thinking





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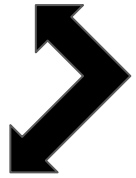
King, John & Li, Yuefeng & Tao, Xiaohui & Nayak, Richi. (2007). Mining world knowledge for analysis of search engine content. Web Intelligence and Agent Systems. 5.

Limits of Hierarchical Thinking

Pets
- **Dogs**

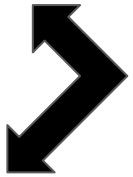
Pet food
- **Dog food**



Related Terms: RT

Laboratory instruments
- **Microscopes**

Organisms
- **Microorganisms**



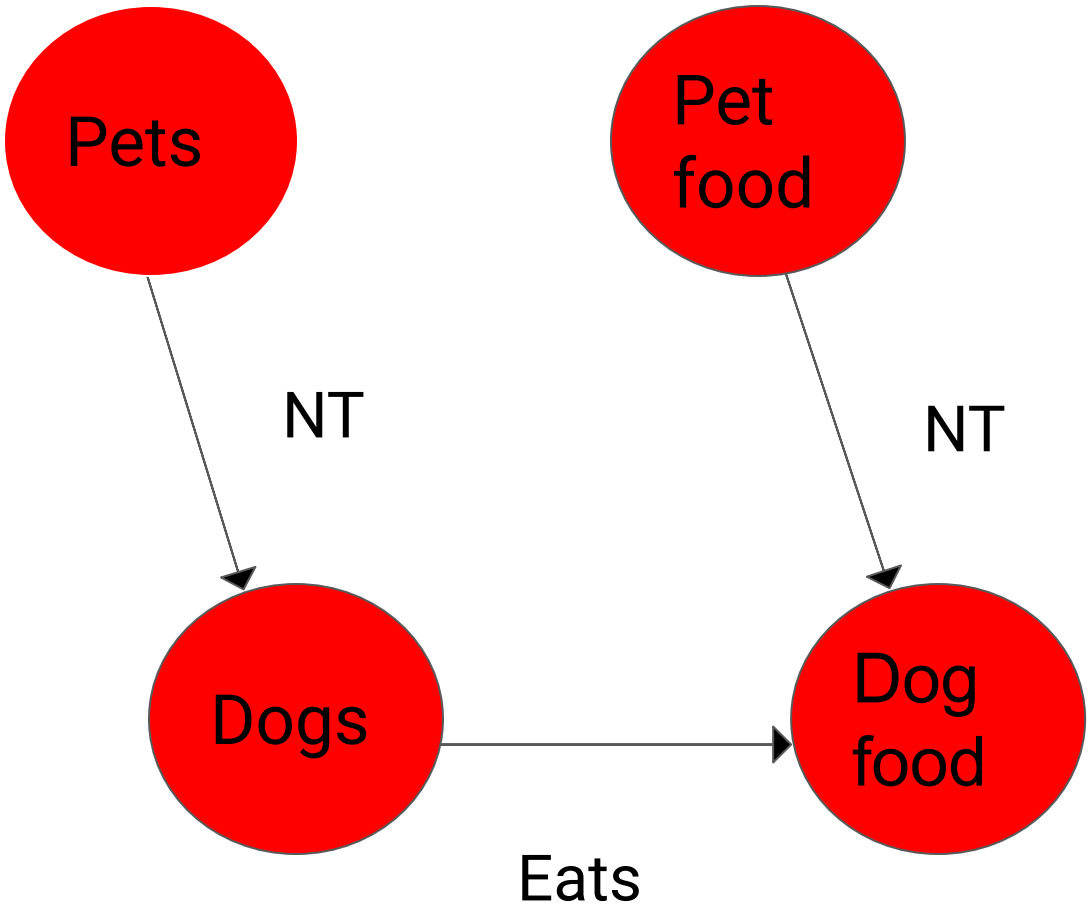
Related Terms: RT

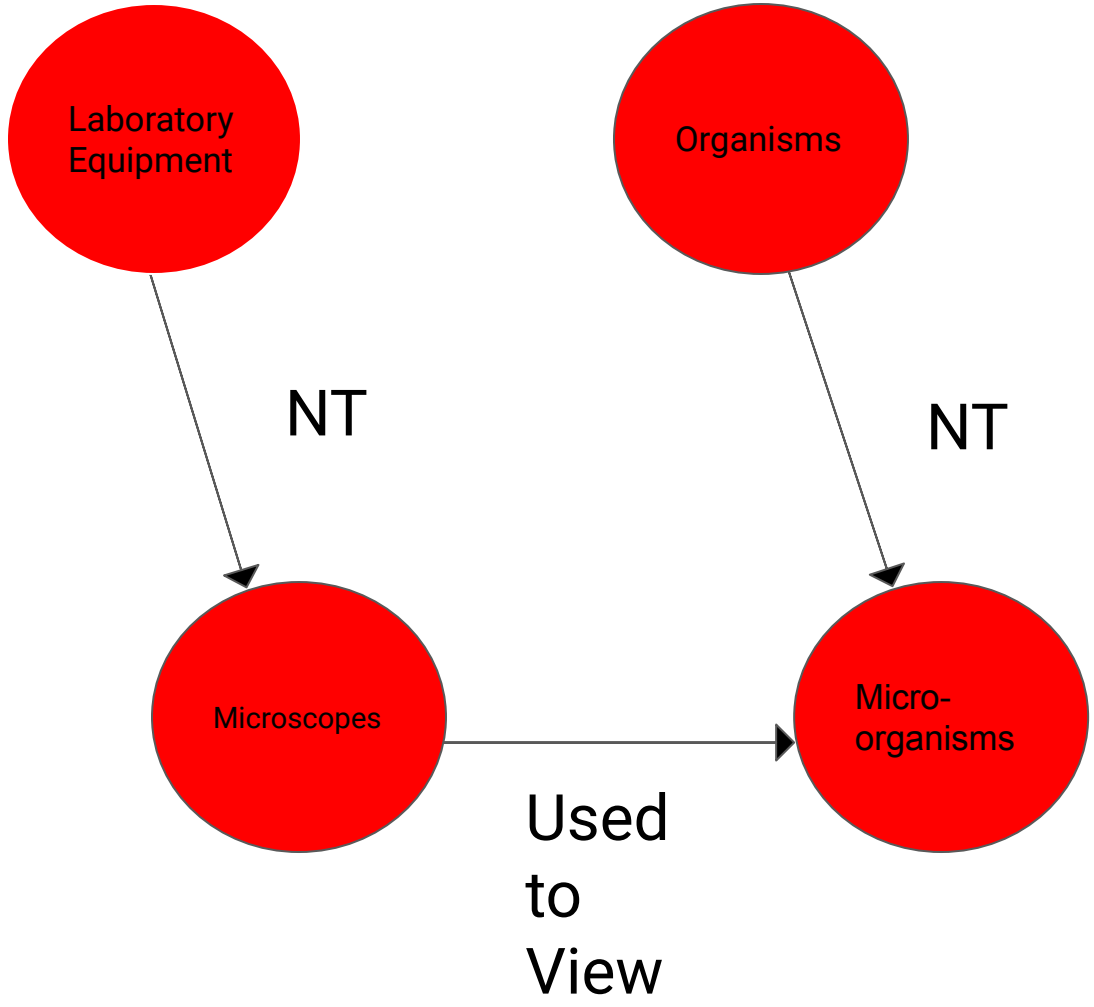
ARBORESCENCE

We should stop believing in trees, roots, and radicles.
They've made us suffer too much.

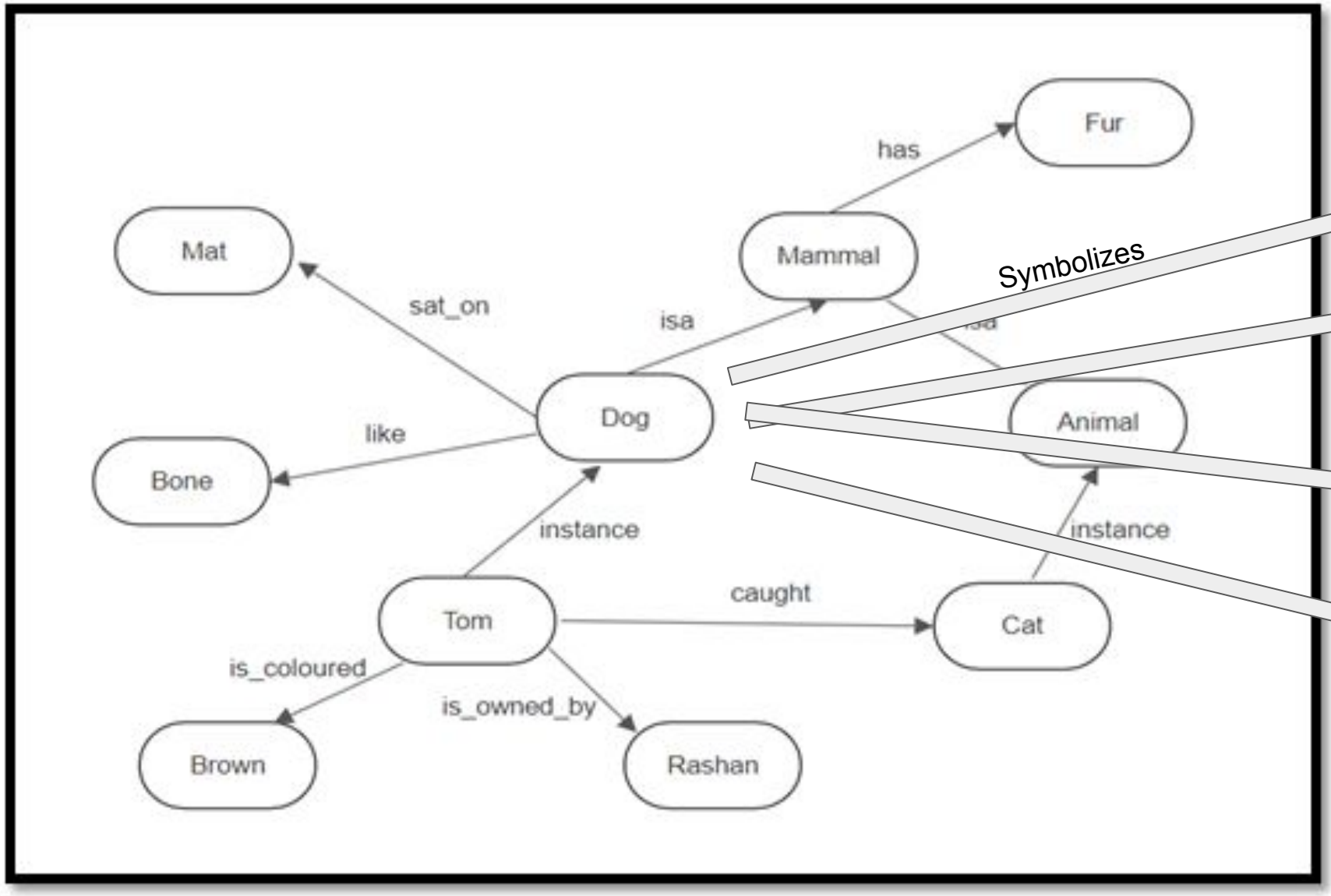
Hierarchies

Limits of Hierarchical Thinking





Hierarchies



Loyalty

Devotion

Patience

Protection

Image credit: https://rashandeepsingh.medium.com/what-is-semantic-net-give-example-1757afa43ea6

Limits of Hierarchical Thinking

Pros

- Useful for organizing categories
- Easy (relatively) to build and implement
- Great for
  - E-commerce
  - Site navigation
  - Org structures
  - Document categorization…to a point

Cons

- Ignore or flatten non-hierarchical relationships
- Limited *semantic expressivity*
- Closed text
  - Only certain relationships allowed
- Implies rigid categorization

- *Implies rigid boundaries between topics that are conceptually linked*

RHIZOMES

A rhizome has no beginning or end; it is always in the middle, between things, interbeing, intermezzo

Rhizomes

A rhizome is lateral and relational, not hierarchical

The point of the rhizome is “and…and…and”: it grows laterally, without limits

The rhizome is decentralized: there is no center or top

The rhizome is democratization: all points are equal

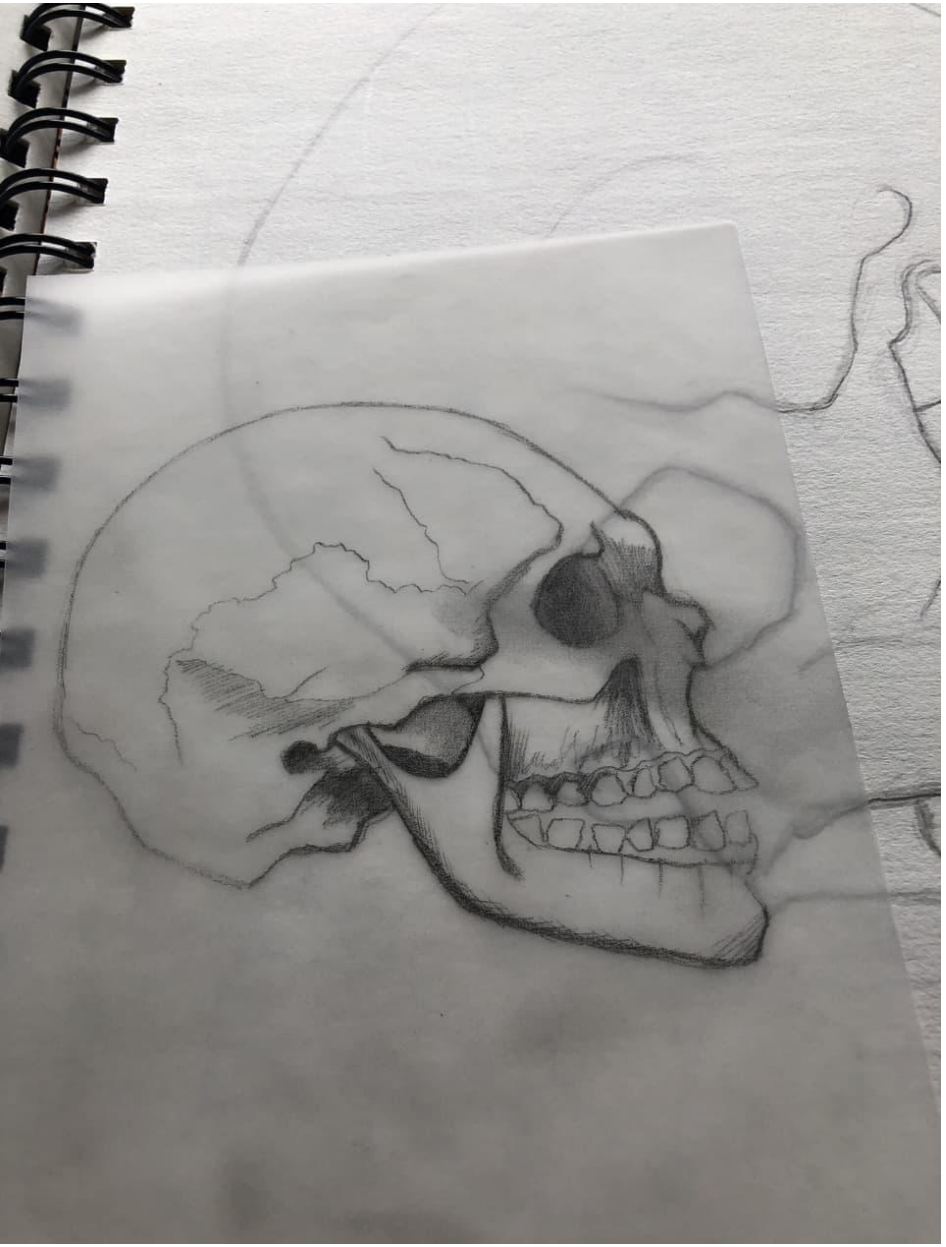
“Any point of a rhizome can be connected to any other, and must be.”

“There are no points or positions in a rhizome, such as those found in a structure, tree, or root. There are only lines.”

TREES

The tree imposes the verb "to be" but the fabric of the rhizome is the conjunction, "and ... and ... and ..."

Tracings



Tracings define a de facto state and codify a hierarchy

“All of tree logic is a logic of tracing and reproduction.”

MAPS

The rhizome is altogether different, a map and not a tracing
Make a map, not a tracing

Maps

Rhizomes form maps and *“fosters connections between fields”*

A rhizome always has multiple entryways

“The rhizome connects any point to any other point”

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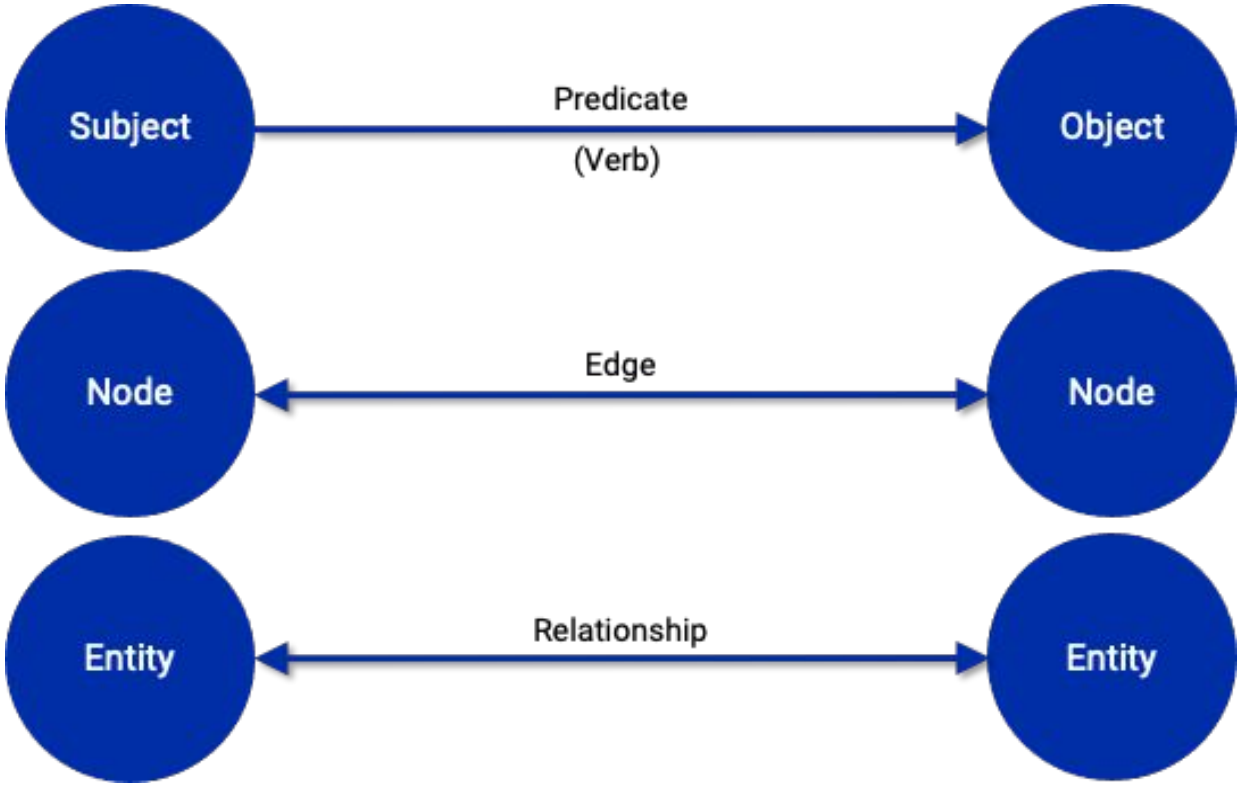
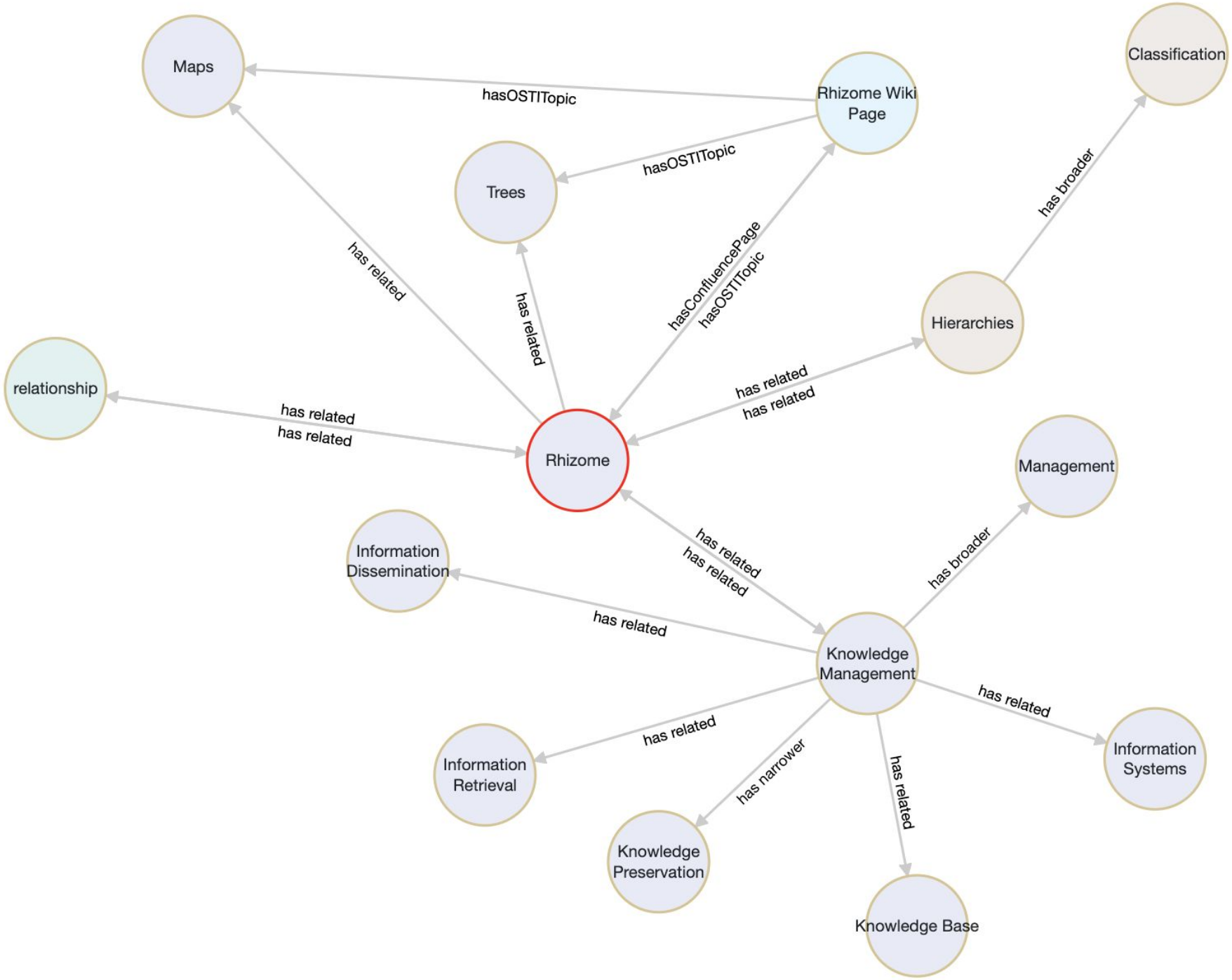
A rhizome always has multiple entryways, like a subway map with many lines

Maps & Graphs



- The map is a graph
- A graph is a set of **subjects** and **objects** connected by **vertices**
- **Subjects** and **objects** are **concepts**
- Vertices are **relationships** and are first-class data citizens
- The graph is semantic: **subject** - **predicate (verb)** - **object**
- In the graph, subjects, relationships, and objects are all important

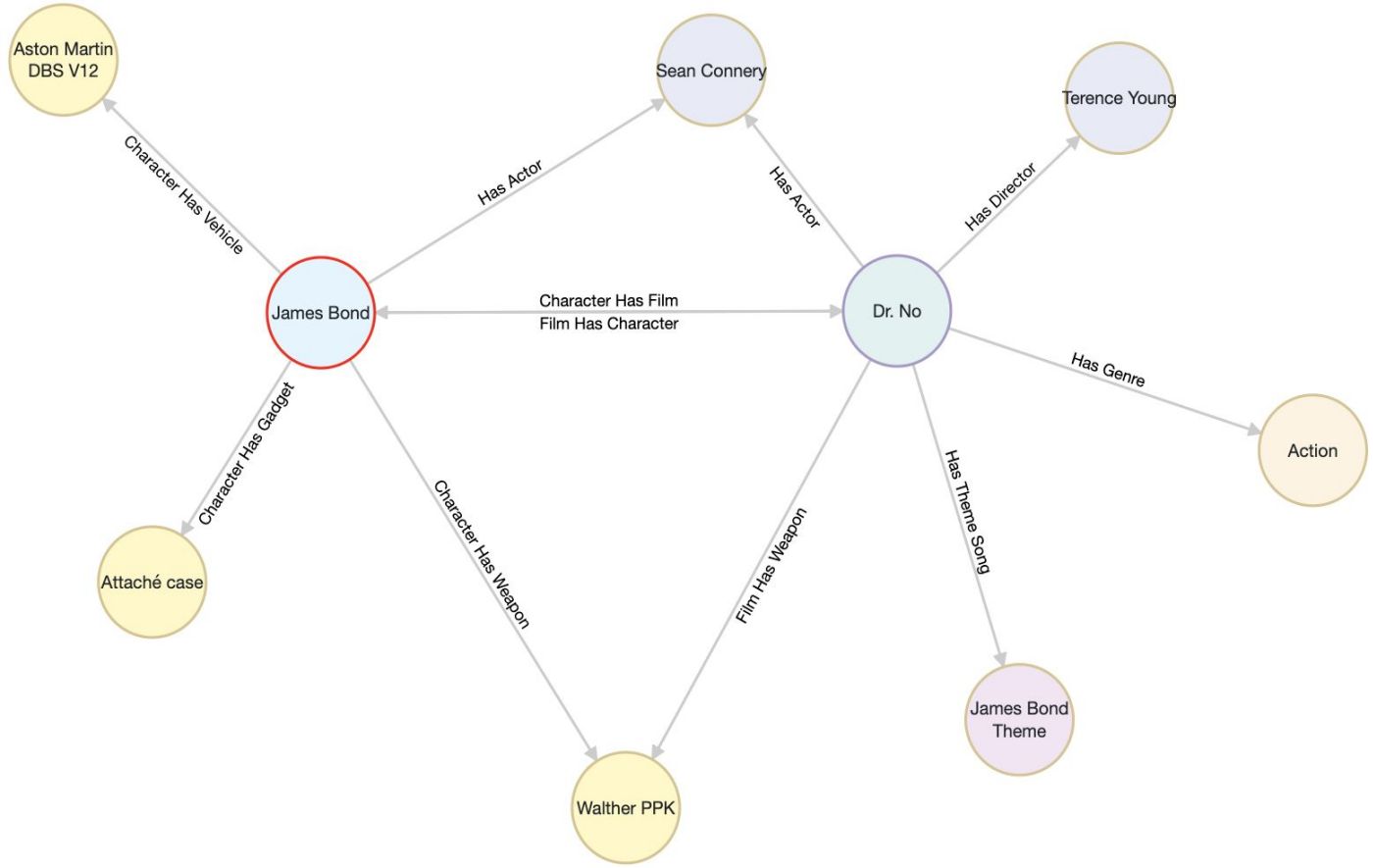


Nodes are **concepts**

Concepts are **subjects** and **objects**

Relationships are lines and are semantically defined

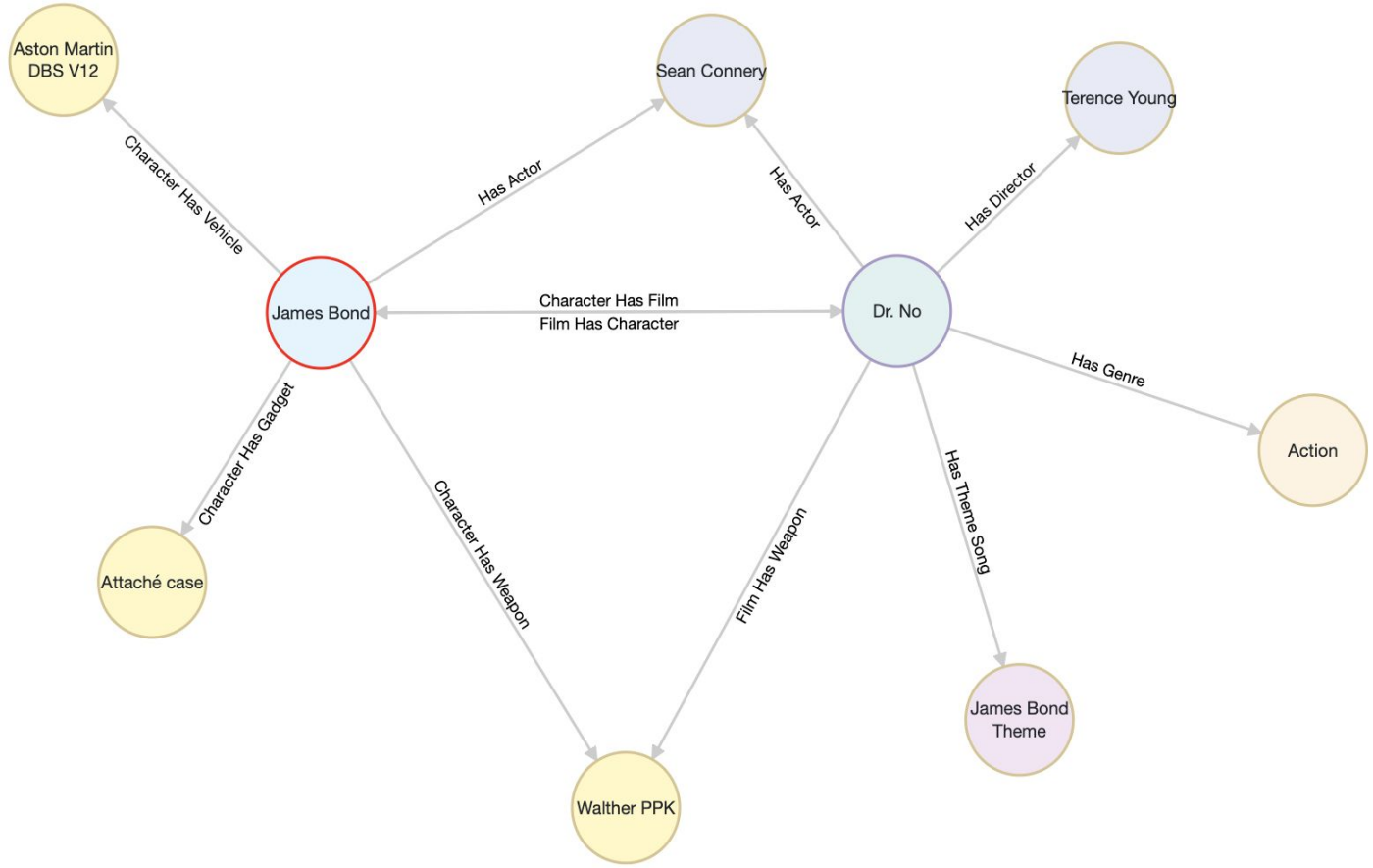
Knowledge Graphs



A knowledge graph is a cartography: a map, not a tracing

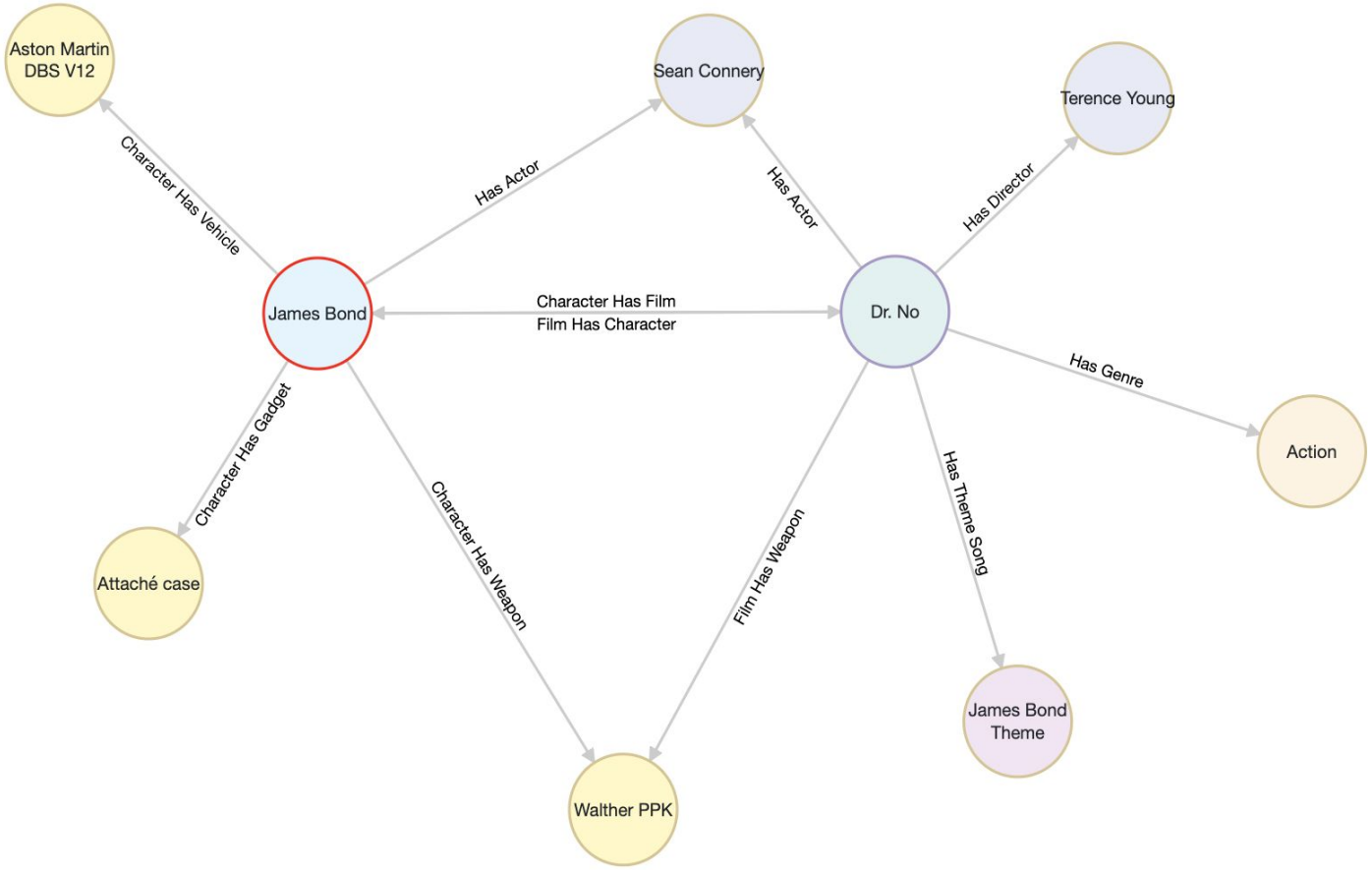
- KGs are rhizomes in the semantic space
- Like a rhizome, knowledge graphs cross domains and connect fields
- KGs allow every concept to connect to every other concept in a **taxonomy** by any number of **relationships** defined by an **ontology**
- Concepts represent things; these things can be metadata, data, and content

Ontologies



- The **ontology** is the structural underpinning of a knowledge graph
- The **ontology** is the legend to a knowledge graph map of one or more domains
- The ontology and defines the rules allowing for what **relationships** are allowed between **concepts**

Ontologies



The ontology legend to this knowledge graph map

Assigned Properties for Characters

- Bondtology Namespace
  - Photo
  - URI
- Governance Namespace
  - Approver Comment
  - Do Not Edit
  - Editor Comment
  - Pending Review
  - QC Review
  - Ready for Approver
  - Rejected by Approver
  - Review Date
  - SME Comments
- SKOS
  - alternative label *(Alt Label)*
  - definition
  - preferred label *(Pref Label)*

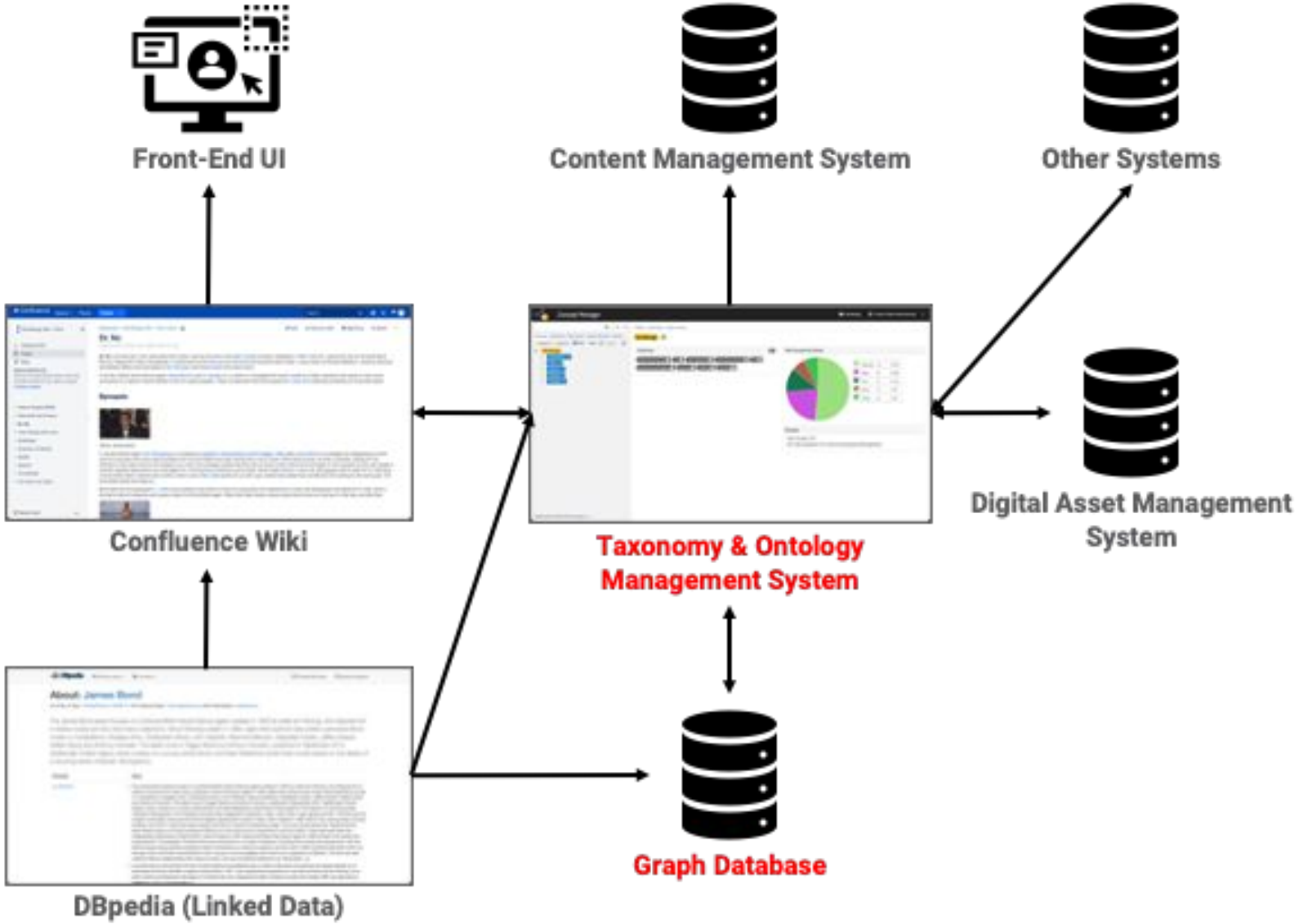
Assigned Relationships for Characters

- Characters
  - has broader (SKOS)
  - has narrower (SKOS)
- Films
  - Character Has Film (Bondtology Namesp...
- People
  - Has Actor (Bondtology Namespace)
- Technology
  - Character Has Gadget (Bondtology Nam...
  - Character Has Vehicle (Bondtology Nam...
  - Character Has Weapon (Bondtology Nam...

Relationship-Based Modeling

- You are making a map, not a tracing
- Information does not have to exist in buckets or boxes
- Connect information where it lives
- Identify subjects and objects: these are **concepts**
- Identify semantically useful **relationships** beyond *broader/narrower* and *related*
- Extend and connect your knowledge graph within and across domains: “and…and…and”

Supporting Technologies & Architecture



Taxonomy and **Ontology** Management System

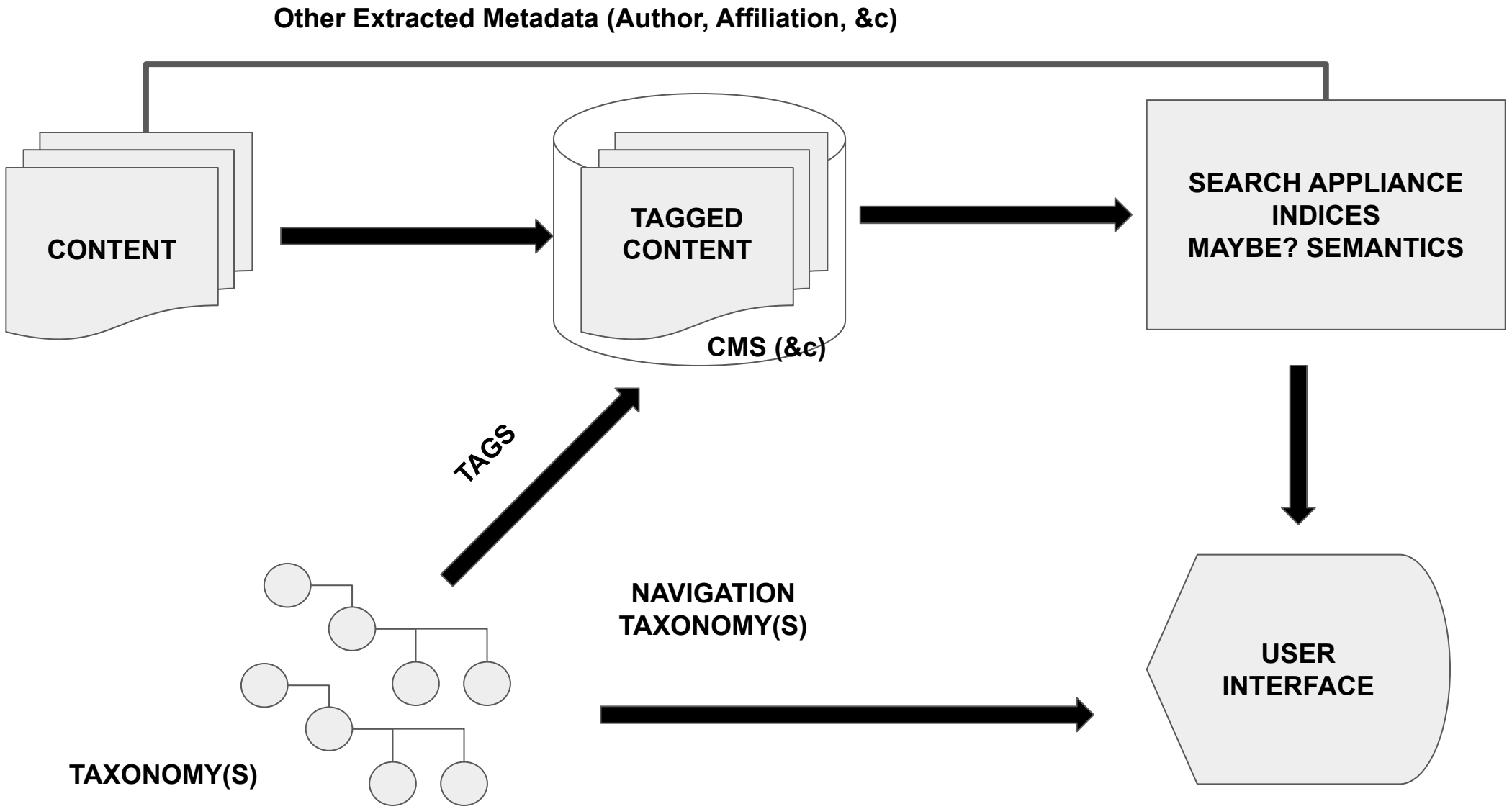
Graph database

Integrated **systems**

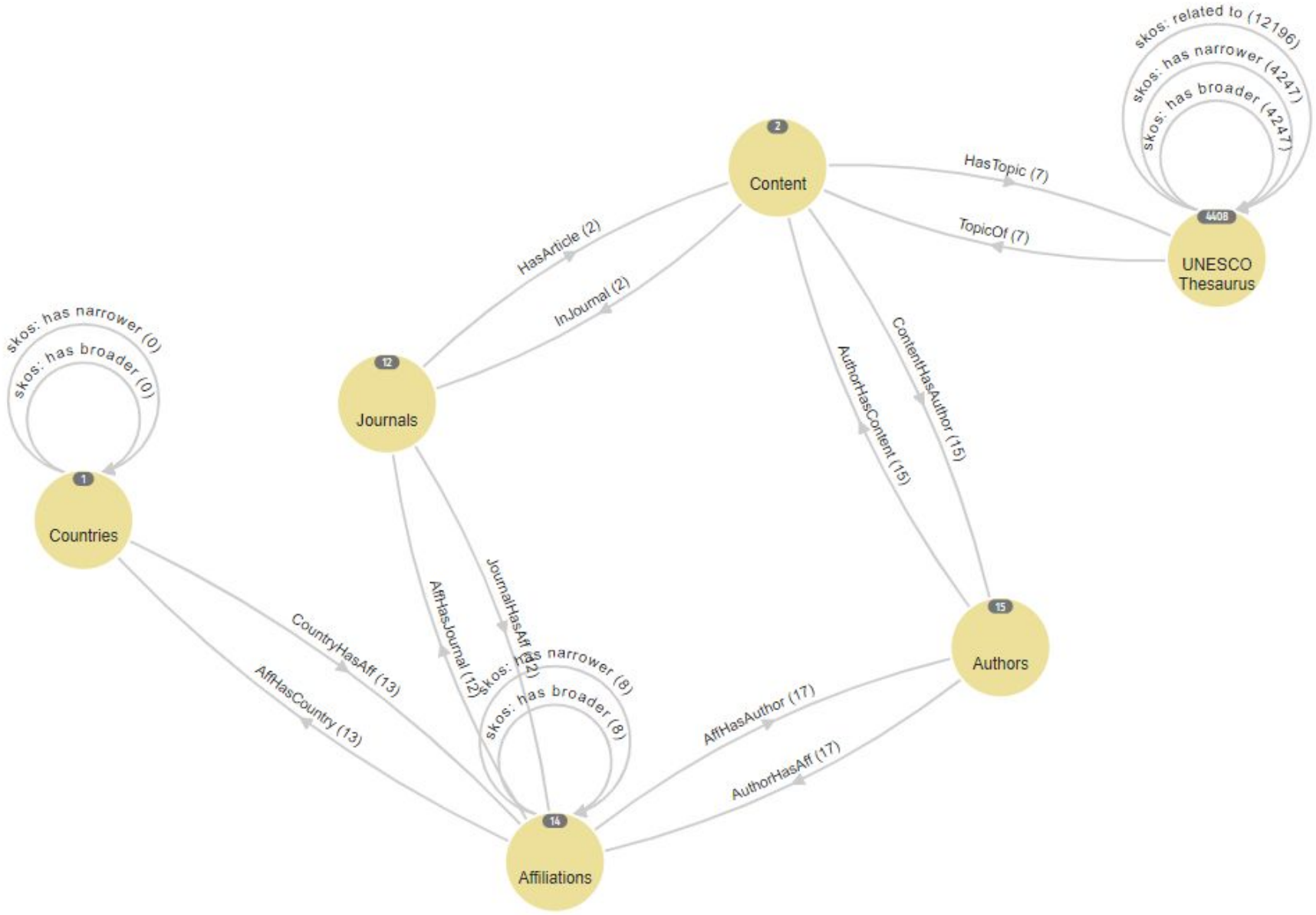
MAPS

Plug the tracings back into the map,
connect the roots or trees back up with a rhizome

Outline


Other Extracted Metadata (Author, Affiliation, &c)
CONTENT
TAGGED CONTENT
CMS (&c)
SEARCH APPLIANCE INDICES MAYBE? SEMANTICS
TAGS
NAVIGATION TAXONOMY(S)
TAXONOMY(S)
USER INTERFACE

Trees + Rhizomes



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Trees + Rhizomes

Connect to External LD and other Sources

Country

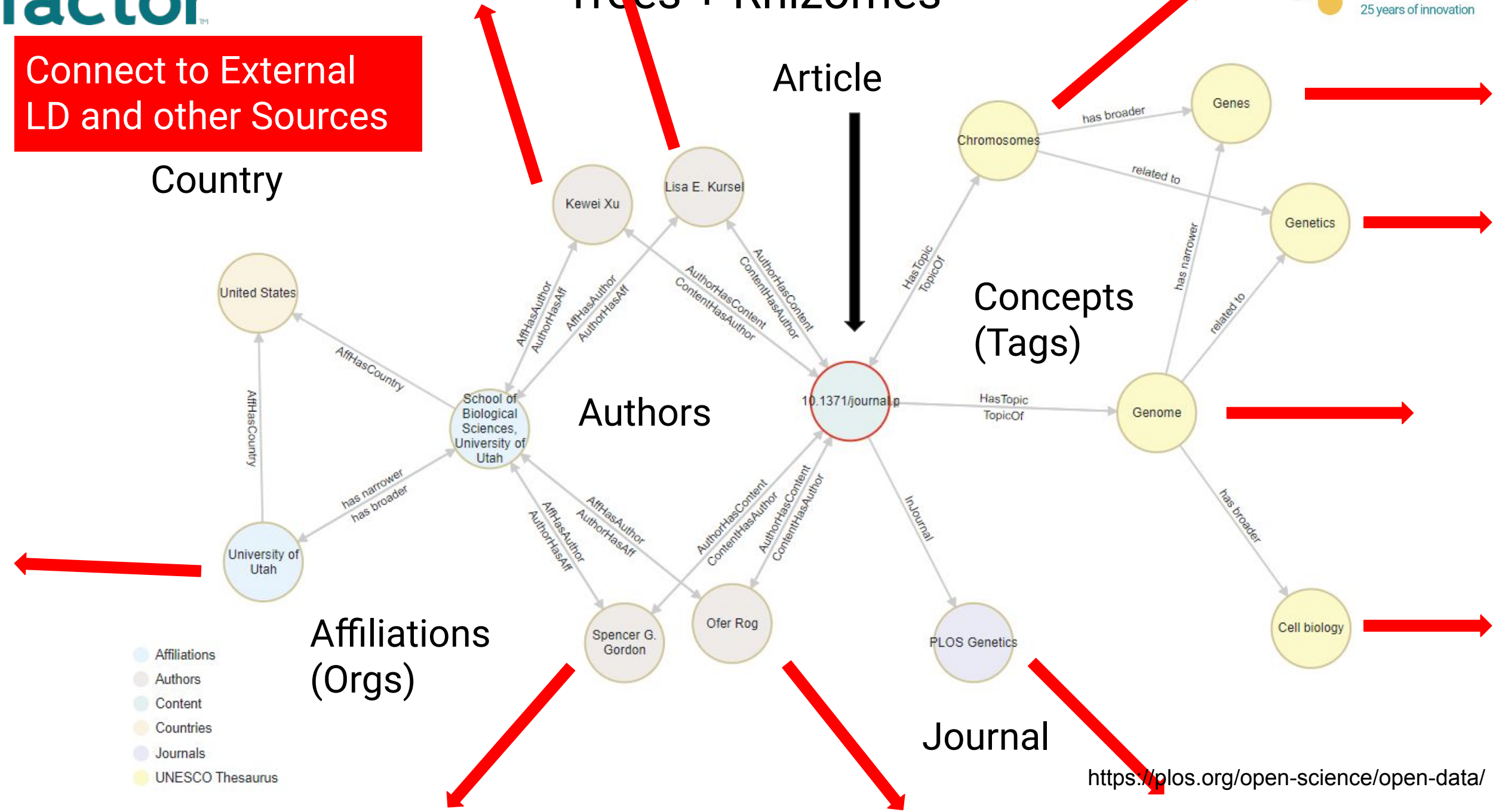
Article

Concepts (Tags)

Authors

Affiliations (Orgs)

Journal

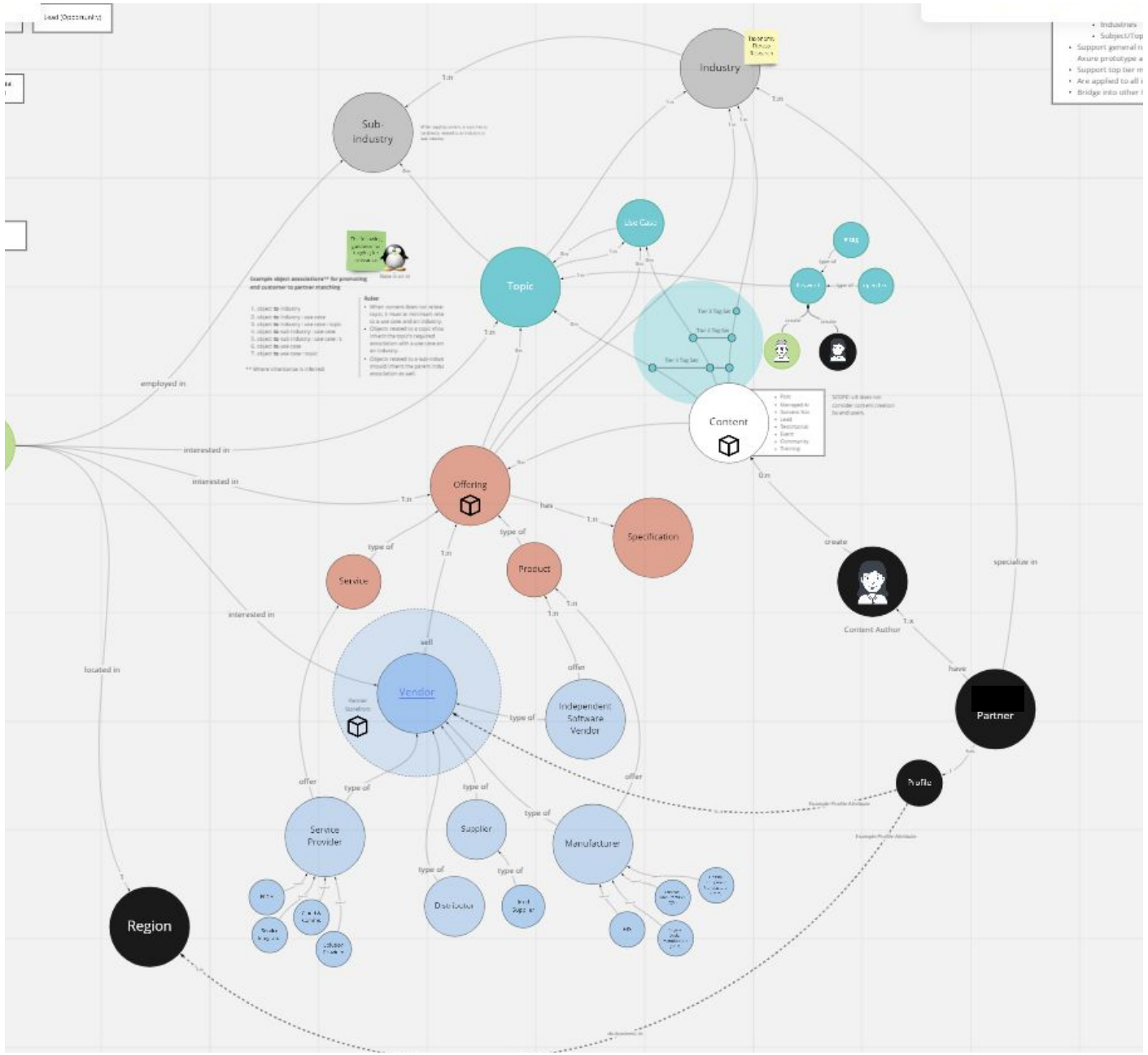


https://plos.org/open-science/open-data/

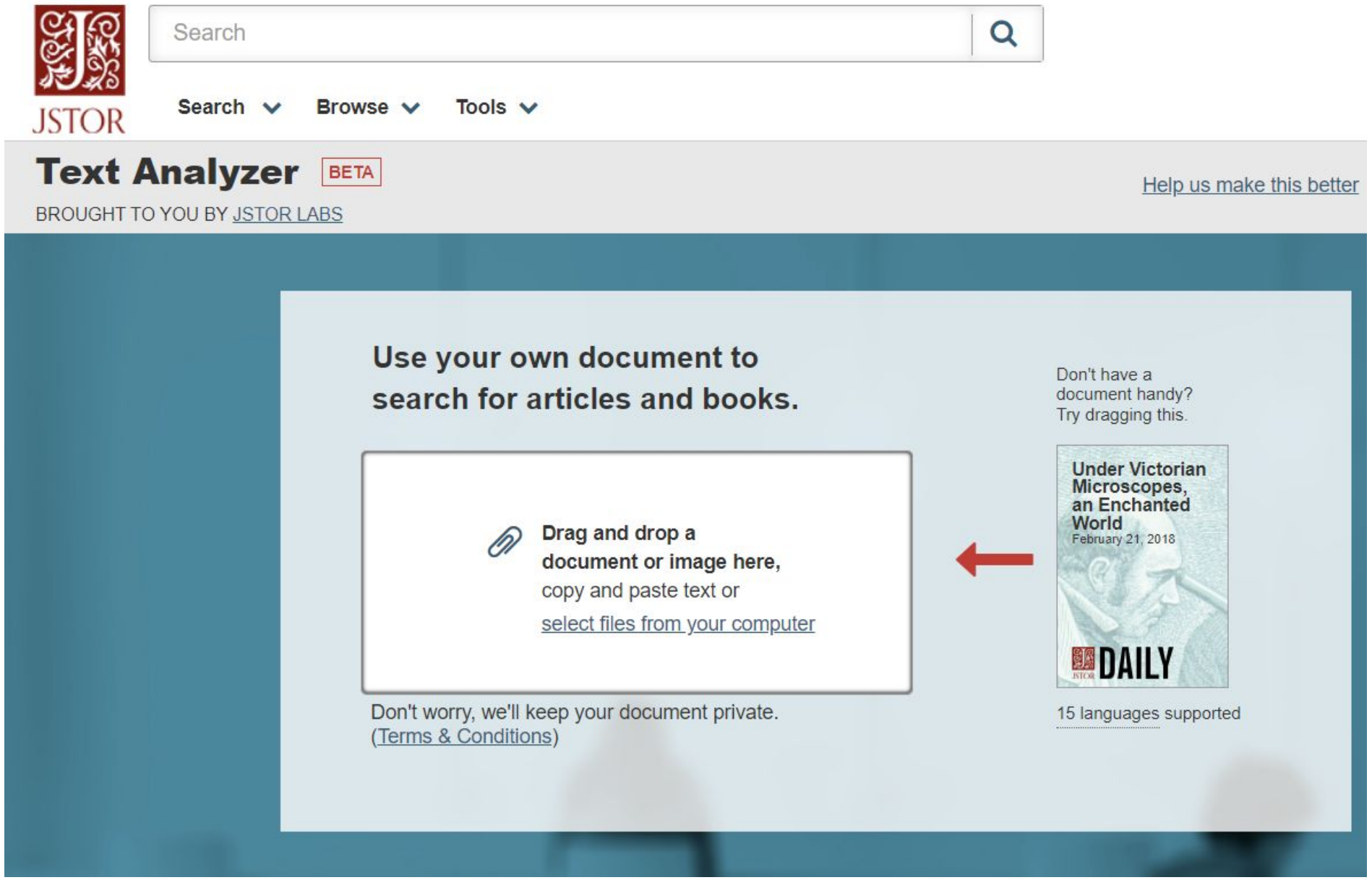
TREES

The tree imposes the verb "to be" but the fabric of the rhizome is the conjunction, "and ... and ...and..."

Trees + Rhizomes



Trees + Rhizomes



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Trees + Rhizomes

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Adjust results by changing the weights for each term.

- ✖ Psychoanalysis
- ✖ Postmodern ethics
- ✖ Bergsonism
- ✖ Philosophy
- ✖ Narcissism

Add your own term

Identified terms

Click to add to Prioritized Terms.

TOPICS

Agnosia | Attachment behavior | Bergsonism | Childrens literature | Continents | Deconstructionism | Desire | Developmental psychology | Erotic literature | Existentialism | Female homosexuality | Feminism | First loves | Heideggerianism | Idealism | Intellect | Jungian psychology | Knowledge | Lacanian philosophy | Love | Marxism | Metaphilosophy | Mountaineering | Mountains | Narcissism | Nietzschean philosophy | Phenomenology | Philosophical psychology | Philosophy of religion | Plateaus | Postmodern ethics | Psychiatric services | Psychoanalysis | Psychodynamics | Schizophrenia | Sexual orientation | Skepticism | Social epistemology | Tectonic plate interactions

Narcissism

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Jan HUTTNER

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Trees + Rhizomes

Mathematical Modeling of Intestinal Iron Absorption Using Genetic Programming

Andrea Colins, Ziomara P. Gerdtzen, Marco T. Nuñez, J. Cristian Salgado

Abstract
Introduction
Materials and Methods
Results and Discussion
Conclusions
Supporting Information
Author Contributions
References

Reader Comments
Figures

Citation: Colins A, Gerdtzen ZP, Nuñez MT, Salgado JC (2017) Mathematical Modeling of Intestinal Iron Absorption Using Genetic Programming. PLoS ONE 12(1): e0169601. https://doi.org/10.1371/journal.pone.0169601

Editor: Fanis Missirlis, CINVESTAV-IPN, MEXICO

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Data Availability: All relevant data are within the paper and its Supporting Information files.

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Competing interests: The authors have declared that no competing interests exist.

Introduction

Iron is a trace metal, key for the development of living organisms. Its presence is necessary for several processes, such as the electron transport chain [1], oxygen transport in the blood [2], and phagocytic activity of macrophages [3], among others. The concentration of this metal must be highly controlled given that both iron excess and deficit can cause diseases, such as hemochromatosis and anemia, the latter recognized by the World Health Organization as the most common and widespread nutrition related disease [4].

Iron gets into the organism through absorption in the duodenal epithelium via the type of cell

experimental data, and identification of key relevant components for this complex biological

Machine Learning Techniques

Automatically Generated

PLOS

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E SEARCH

advanced search

Subject Areas

- Simulation and modeling
- Iron
- Evolutionary algorithms
- Absorption
- Caco-2 cells
- Gastrointestinal tract
- Algorithms
- Genetic programming

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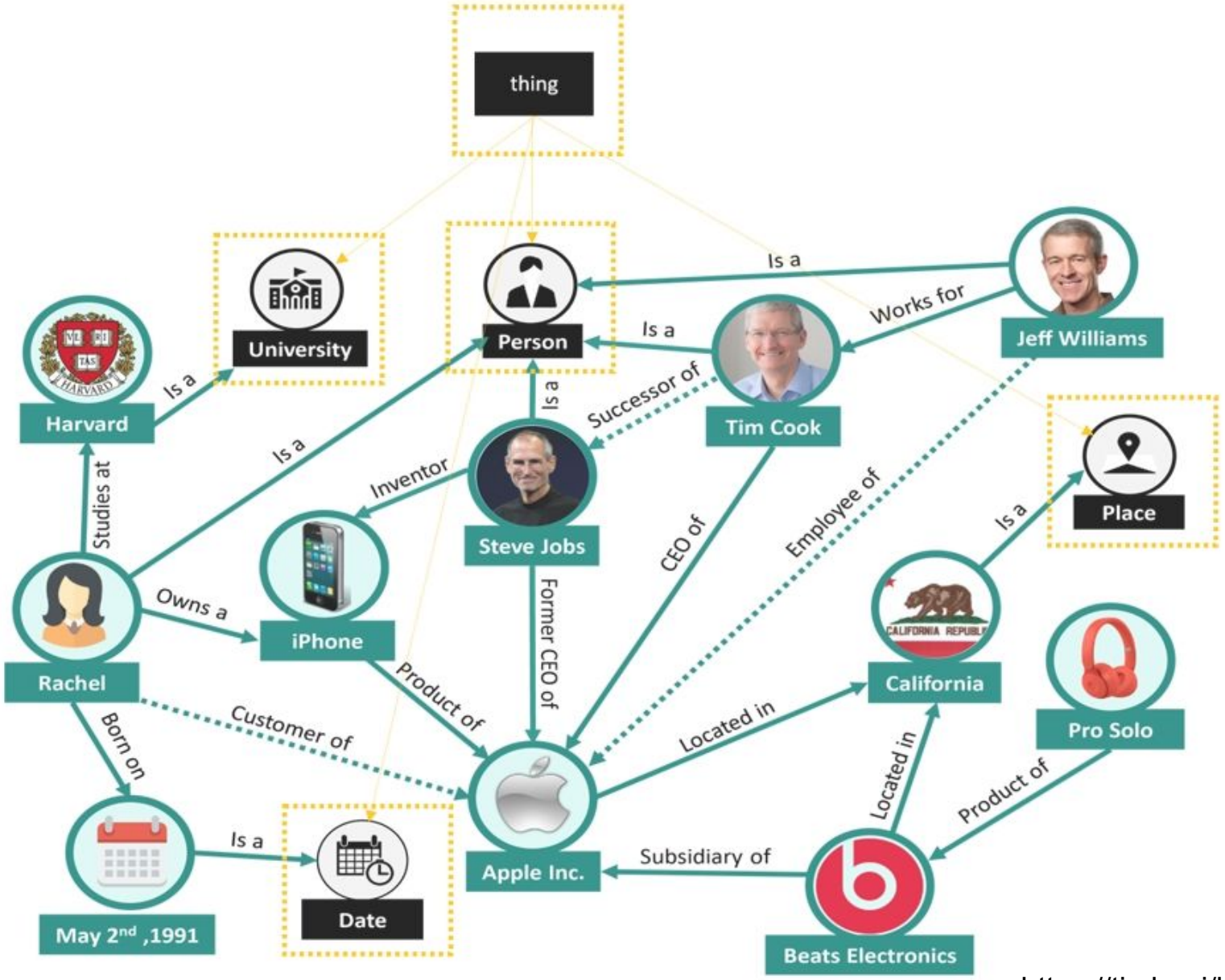
Trees + Rhizomes



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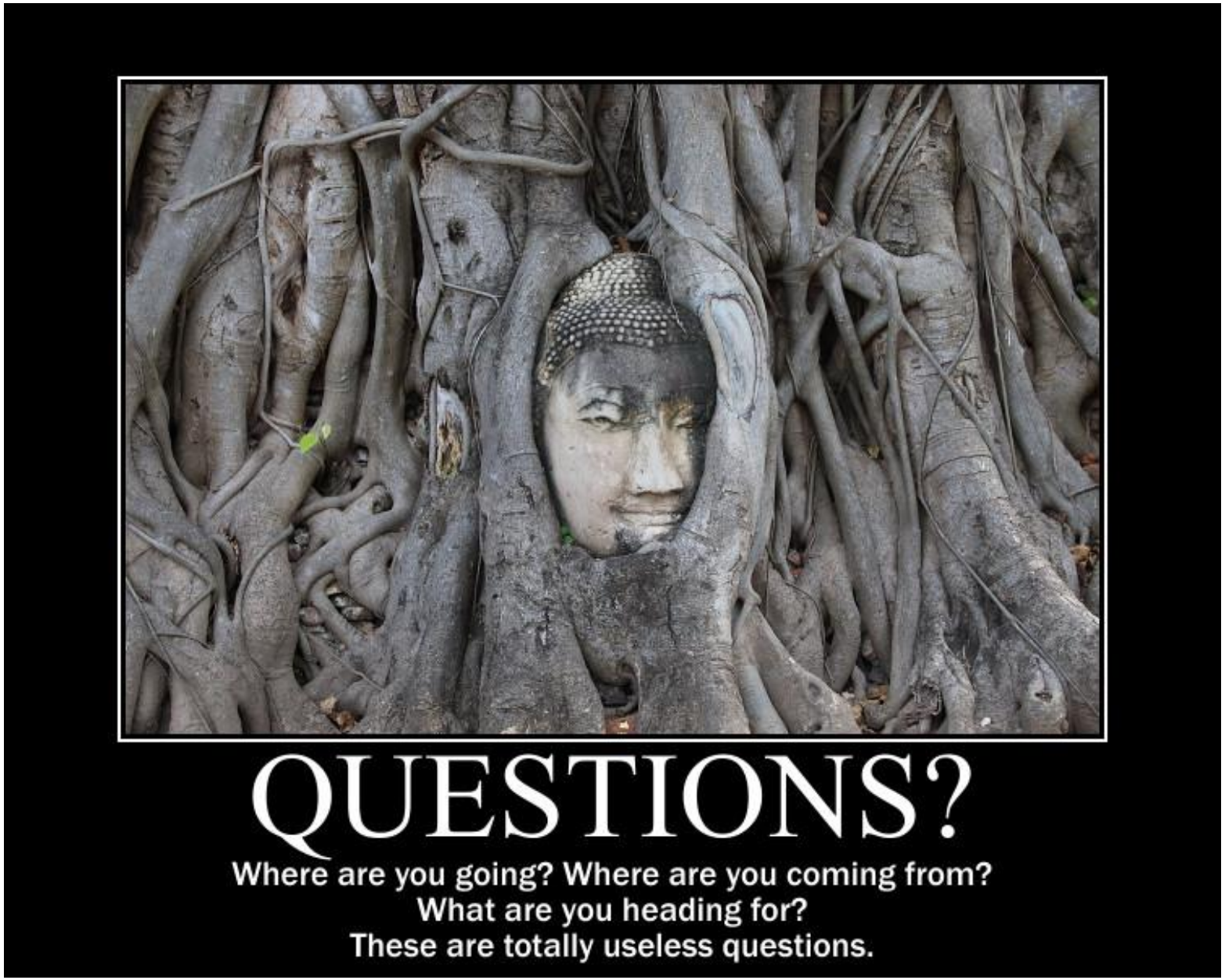
ALLIANCE

The tree is filiation, but the rhizome is alliance, uniquely alliance

Calls to Action

- Think rhizomatically
- Relationship-based modeling
- Make a map, not a tracing
- De-arborize, democratize, decentralize
- *“Connect the trees back up with a rhizome”*



All Quotes from Deleuze, Gilles, Félix Guattari, and Brian Massumi. 1987. A thousand plateaus: capitalism and schizophrenia.

Thank you!

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