TECHNISCHE
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Reinventing (Literary) Operationalization

Introducing KatKit, a toolkit for modeling humanistic concepts in Python

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DH2024   August 09, 2024

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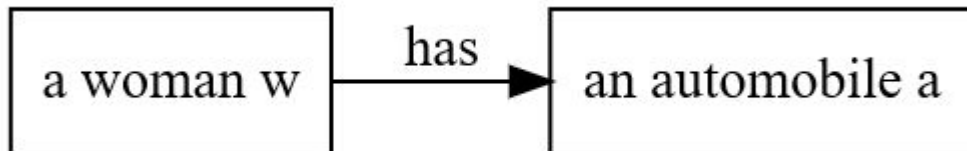
1. Operationalization

2. (Applied) Category Theory

3. KatKit – Use Case

4. Outlook

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1. Operationalization

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"Operationalizing means building a bridge from concepts to measurement, and then to the world."

(Moretti, 2013: 1)

"[Operationalization] consists of developing the necessary steps to unambiguously assign the instantiations of a concept to this very concept and thus measure it. Accordingly these steps can be used to detect the instantiations of the concept, allowing its subsequent quantification, manual inspection and/or downstream processing."

(Pichler and Reiter, 2022: 2)

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Evaluation criteria (selection)

- Generalizability

- Explicitness

- Validity

- Implementability

(Pichler and Reiter, 2022)

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'Bridging the gap' and measuring literature

"Gregor Samsa one morning from uneasy dreams awoke, found he himself in his bed into a monstrous insect-like creature transformed."
(*The Metamorphosis*, Franz Kafka)

→ **events** in literary texts
(Gius and Vauth, 2022)

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2. (Applied) Category Theory

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category theory is about abstraction

"Abstraction is the process of deciding on some details to ignore in order to ensure that our logic does work perfectly."

(*The Joy of Abstraction*, Eugenia Cheng)

category theory is about communication

"Different branches of mathematics can be formalized into categories. These categories can then be connected by functors. And the sense in which these functors provide powerful communication of ideas is that facts and theorems proven in one category can be transferred through a connecting functor to yield proofs of analogous theorems in another category."

(*Category Theory for the Sciences*, David I. Spivak)

Category Theory

- category
  - objects
  - morphisms

- reflexivity

  a == a

- transitivity

  a ≤ b ∧ b ≤ c

  a ≤ c
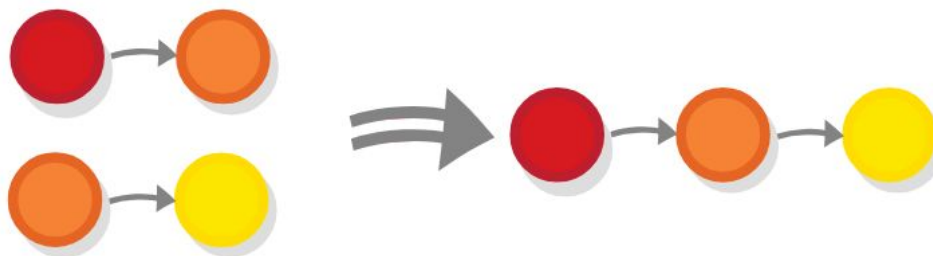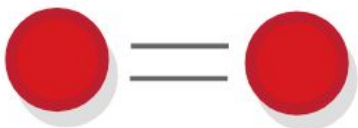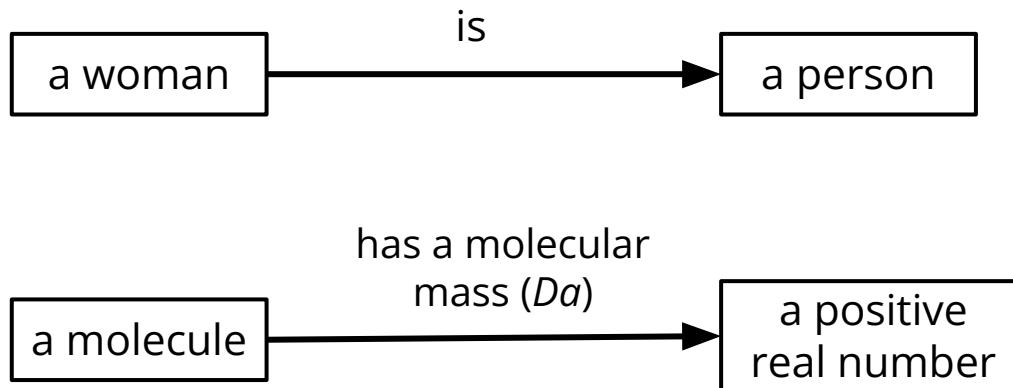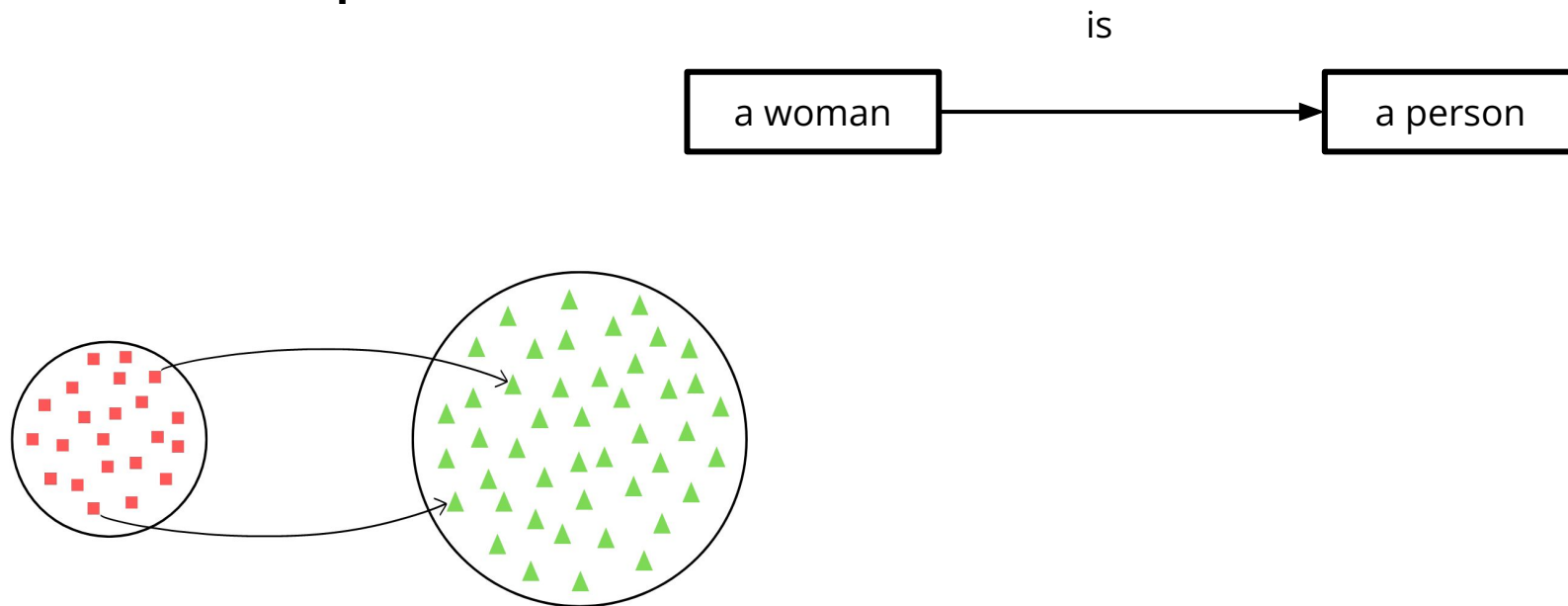

(*Category Theory Illustrated*, Boris Marinov)

Category Theory	Programming
object	type
morphism	function
domain	inputs
codomain	outputs

www.datascienceontology.org/help/math

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Ologs

```
┌──────────┐      is       ┌──────────┐
│ a woman  │──────────────▶│ a person │
└──────────┘               └──────────┘


                   has a molecular
                     mass (Da)
┌────────────┐               ┌──────────────┐
│ a molecule │──────────────▶│  a positive  │
└────────────┘               │ real number  │
                             └──────────────┘
```

Functional relationships

is

a woman → a person

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Functional relationships

a mechanical pencil

uses

a piece of lead

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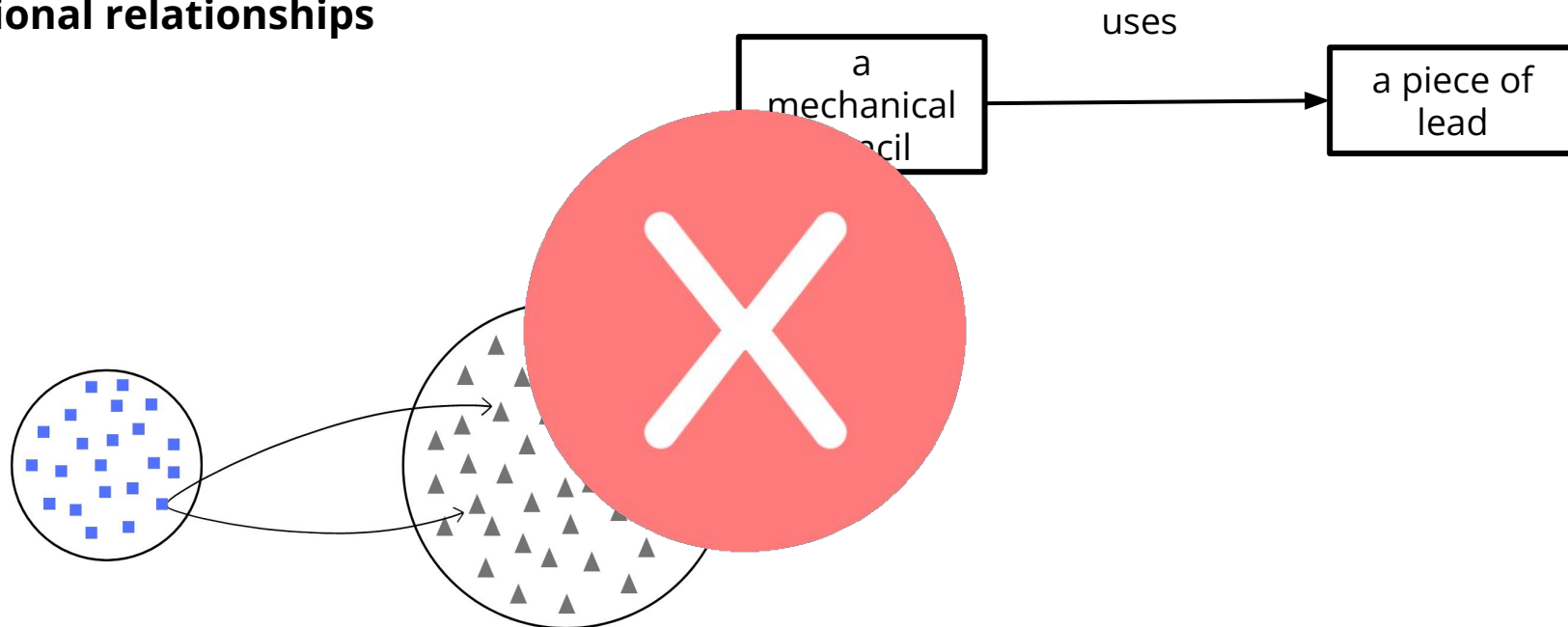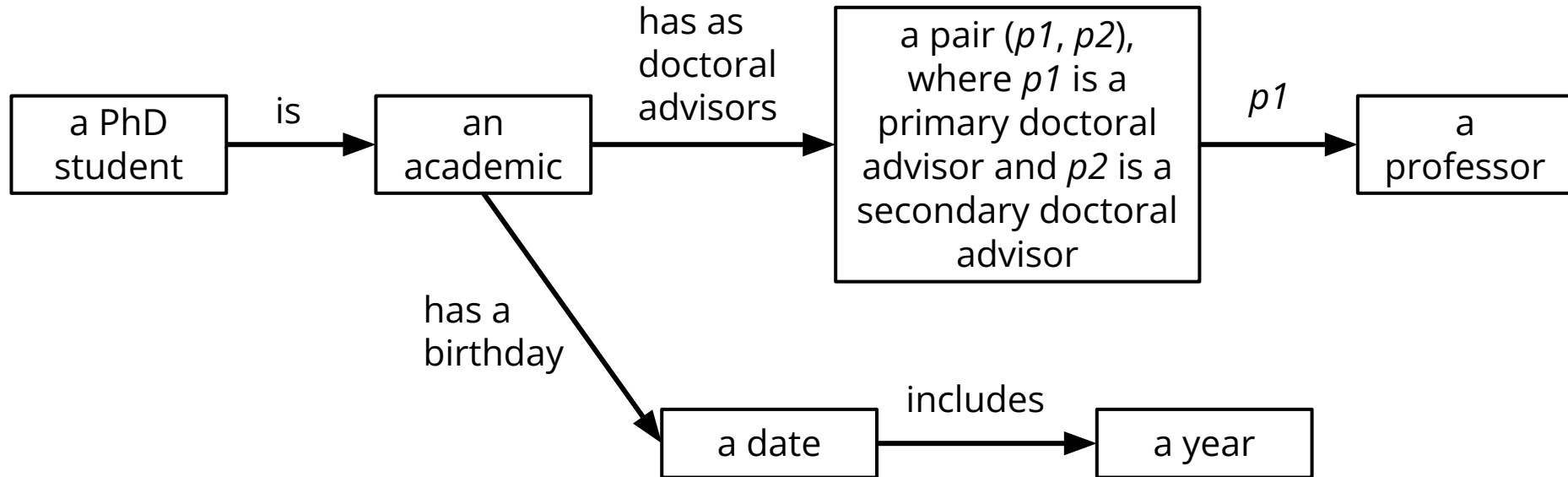
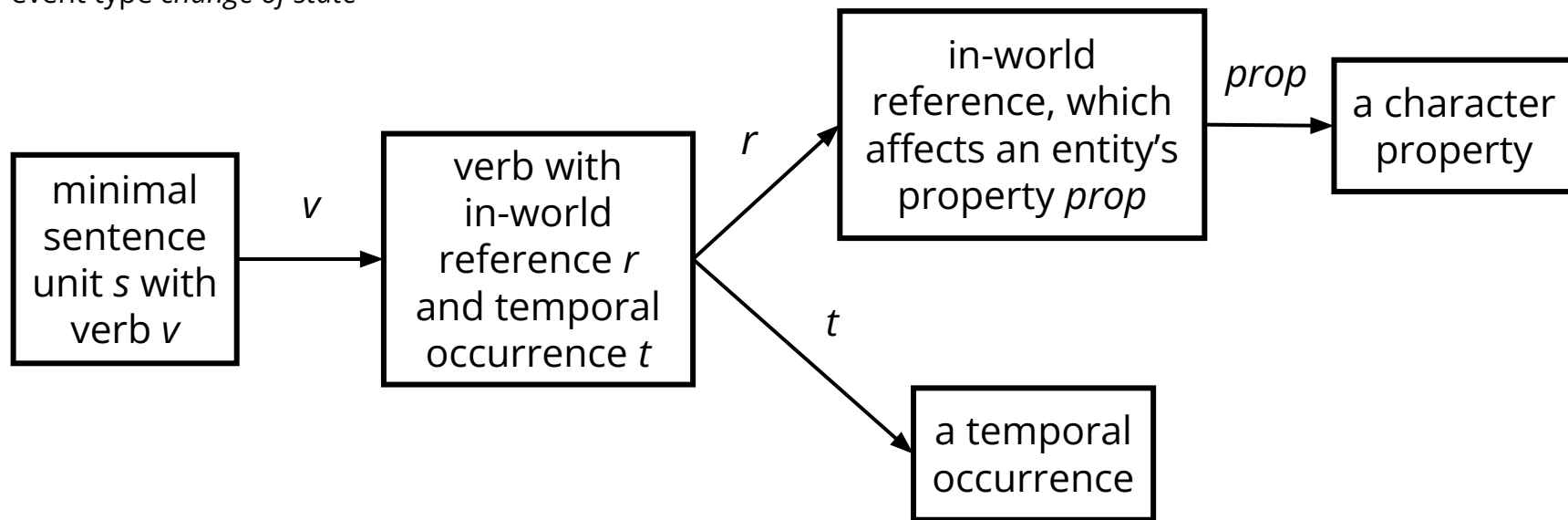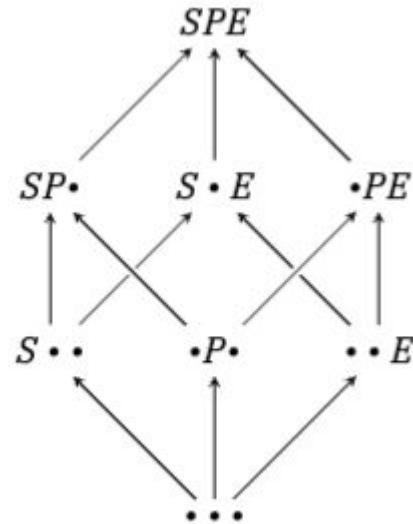"| **As Gregor Samsa awoke one morning from uneasy dreams** | he found himself transformed in his bed into a gigantic insect. |"
(*The Metamorphosis*, Franz Kafka)

→ event type *change of state*

```
┌─────────────┐        ┌──────────────┐           ┌──────────────────┐              ┌─────────────┐
│   minimal   │   v    │  verb with   │     r     │     in-world     │    prop      │ a character │
│  sentence   │ ─────▶ │  in-world    │ ────────▶ │ reference, which │ ───────────▶ │  property   │
│ unit s with │        │ reference r  │           │ affects an       │              │             │
│   verb v    │        │ and temporal │           │ entity's         │              │             │
└─────────────┘        │ occurrence t │           │ property prop    │              └─────────────┘
                       └──────────────┘           └──────────────────┘
                              │
                              │   t
                              ▼
                       ┌──────────────┐
                       │  a temporal  │
                       │  occurrence  │
                       └──────────────┘
```

To take this one step further (orders):

- Change of state
- Process
- Stative event
- Non event

   (Gius and Vauth, 2022)

Start point

Process

Endpoint

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To take this one step further (orders):
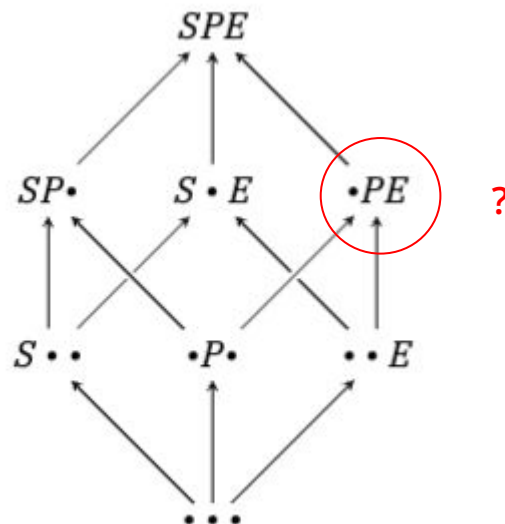
- Change of state
  (Gius and Vauth, 2022)

**As Gregor Samsa awoke one
morning from uneasy dreams**

3. The KatKit Toolbox

```
e = Olog()
e.addType('s','a minimal sentence unit',compound_form='one_component', compounds=[['v','a
verb']])
e.addType('v','a verb v',compound_form='two_components', compounds=[['r','an in-world
reference'],['t','a temporal occurrence']])
e.addType('r','an in-world reference',compound_form='one_component', compounds=[['p','an
entity property']])
e.addType('p','an entity property')
e.addType('t','a temporal occurrence')
e.addAspect('s','v','v')
e.addAspect('v','r','r')
e.addAspect('v','t','t')
e.addAspect('r','p','p')
visualize_dot(e.get_dot())
```

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```
print(e.get_dot())

digraph viz {
dpi=300;
rankdir=LR;
s [label="a minimal sentence unit s\nwith a verb v", shape=box];
v [label="a verb v v\nwith an in-world reference r\nand a temporal occurrence r", shape=box];
r [label="an in-world reference r\nwith an entity property p", shape=box];
p [label="an entity property p", shape=box];
t [label="a temporal occurrence t", shape=box];
s -> v  [label=v];
v -> r  [label=r];
v -> t  [label=t];
r -> p  [label=p]
}
```
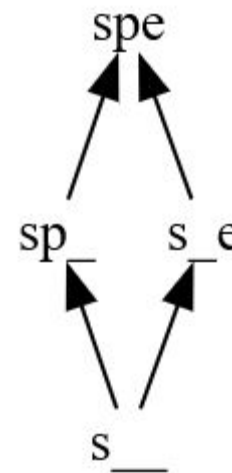
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```
c = Concept(concept_form='triples')
c.autoAddNodes([' rich ',' white ',' male '])
visualize_dot(c.get_dot())
```

fortext lab
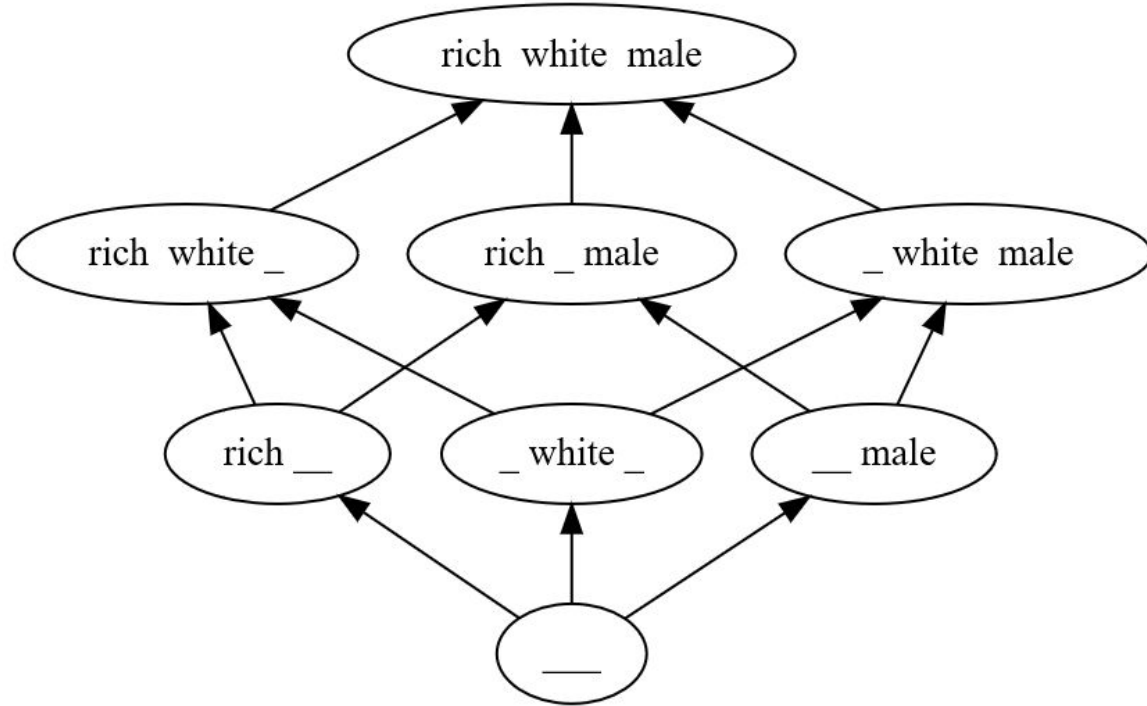
```
KatKit.ipynb

e = Concept(concept_form='triples')
e.addNode(Node('s__'))
e.addNode(Node('sp_'))
e.addNode(Node('s_e'))
e.addNode(Node('spe'))
visualize_dot(e.get_dot())
```


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4. Outlook

Database schema

S	P	E	Example
	X	X	Gregor Samsa one morning…
	X		he found himself transformed…
…	…	…	…

start
process
end

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Thank you for listening!

Have fun trying out

*KatKit***!**

https://github.com/
forTEXT/katkit_toolbox

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References

Cheng, Eugenia. 2023. *The Joy of Abstraction: An Exploration of Math, Category Theory, and Life*. Cambridge: Cambridge University Press.

Gius, Evelyn, and Michael Vauth. 2022. "Towards an Event Based Plot Model. A Computational Narratology Approach." *Journal of Computational Literary Studies* 1 (1). https://doi.org/10.48694/jcls.110.

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Moretti, Franco. 2013. "'Operationalizing': Or, the Function of Measurement in Literary Theory." *Stanford Literary Lab Pamphlets* 2. https://litlab.stanford.edu/LiteraryLabPamphlet6.pdf.

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Spivak, David I. 2014. *Category Theory for the Sciences*. Cambridge, Massachusetts: The MIT Press.