



Capturing Complex
Heritage Knowledge

Marieke van Erp



merpeltje

Challenges in heritage knowledge modelling

- Different genres/traditions
- Data from different time spans
- Literal vs figurative depictions



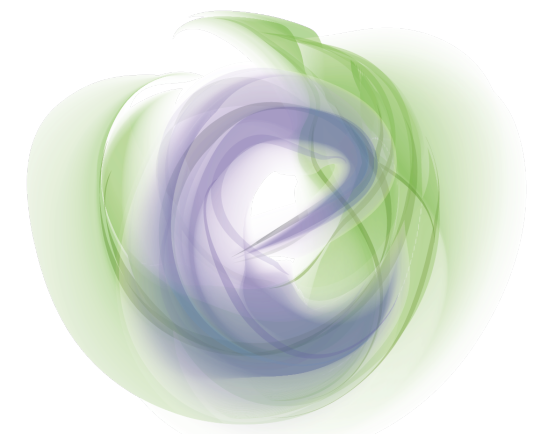
Image: John William Waterhouse - The Soul of the Rose

Use cases

- Modelling smell
- Modelling symbolic knowledge
- Modelling sea voyages
- Towards polyvocal and contextual data modelling



Image: Willem van de Velde - Storm at Sea



Odeuropa

Modelling Smell





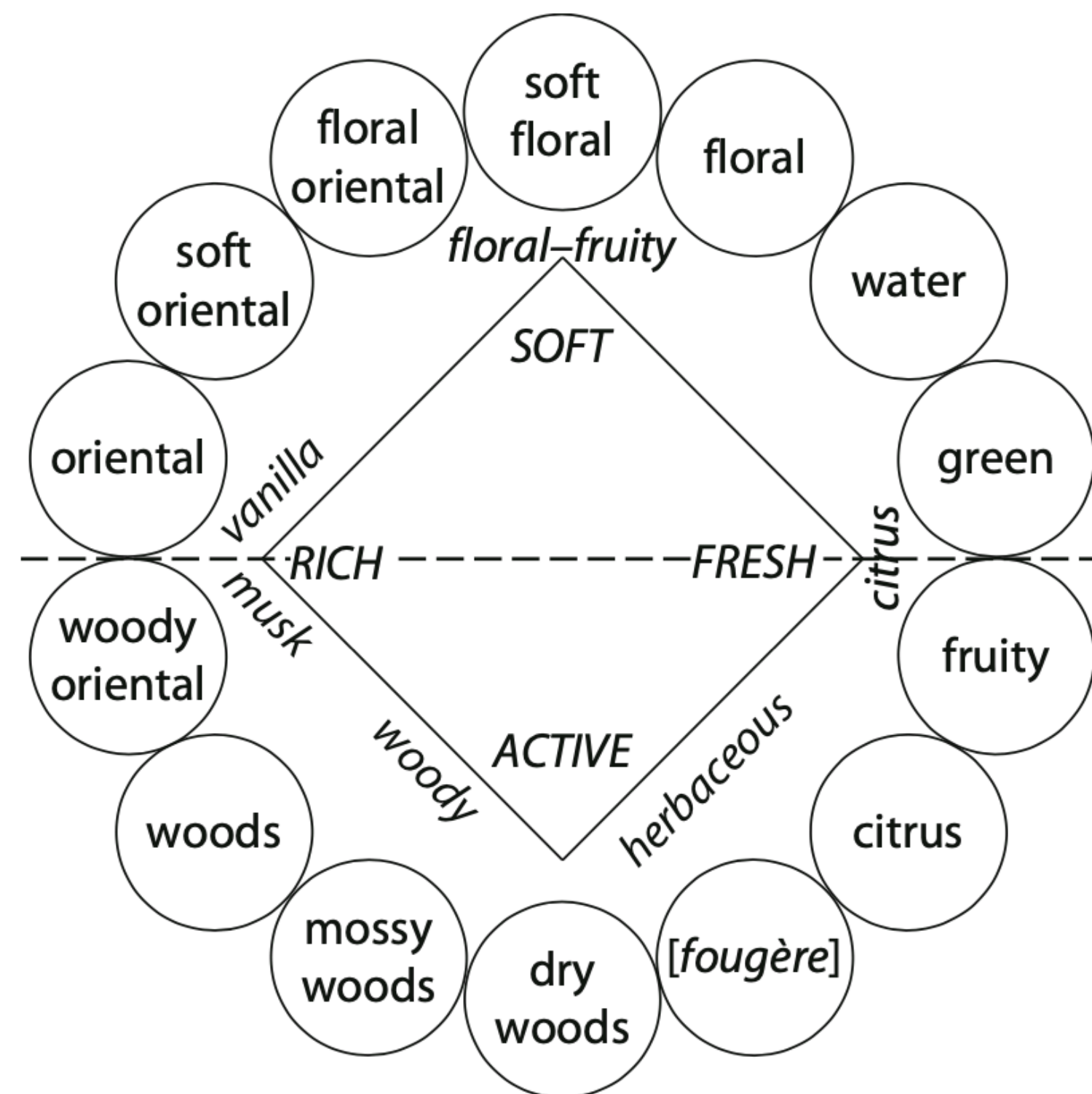
Odeuropa traces smells through time:

- *How is smell expressed in language?*
- *How is smell represented visually?*
- *To what events and practices is smell linked?*
- *What emotions did smells evoke?*



Challenges

- Smell **intensity** is hard to measure (cf. decibels of sounds). Hard to recognise & classify scents. No independent **taxonomy**, various classification schemes



Fragrance wheel (Zarzo and Stanton, 2008)

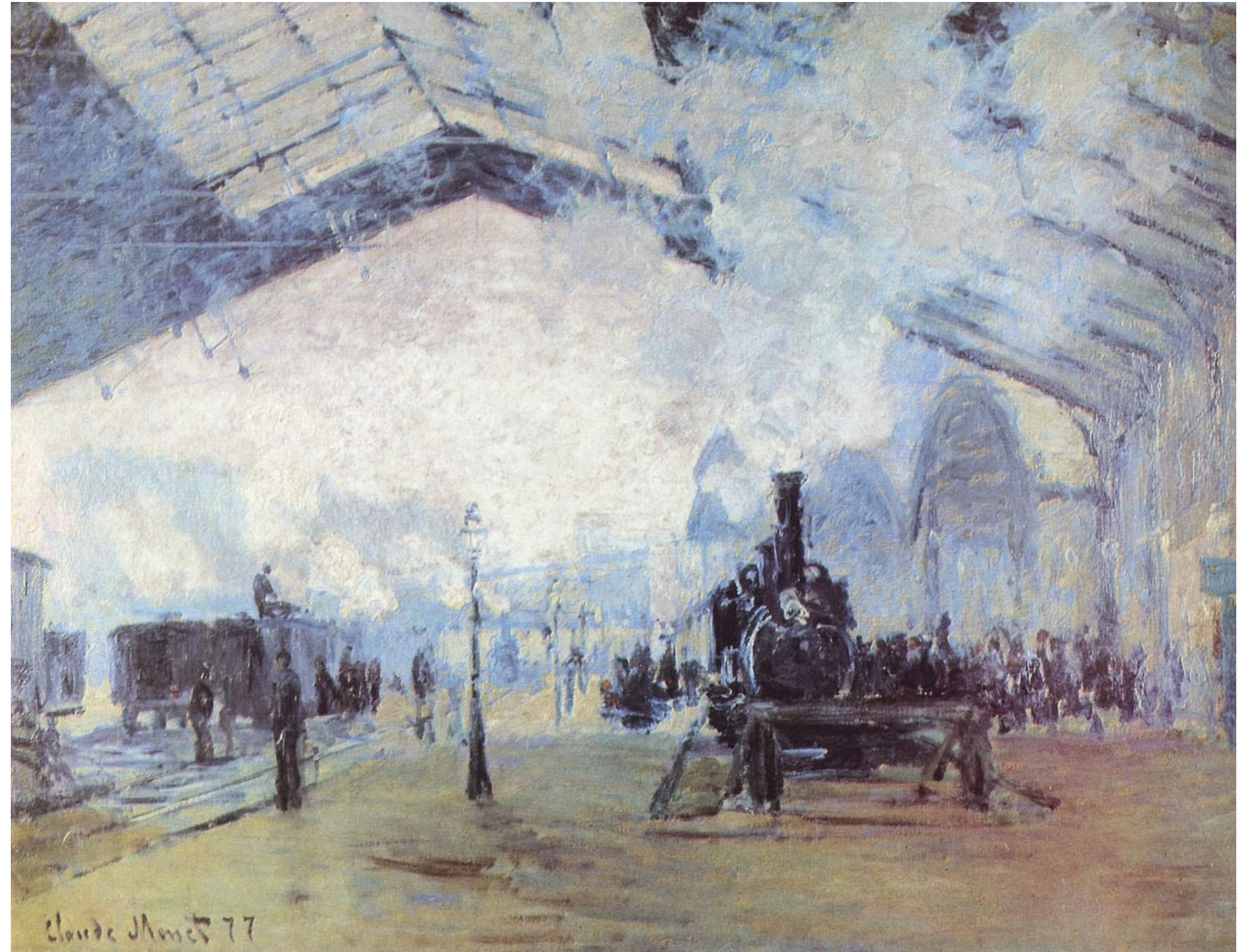
- Discourses on smell reflect '*a maze of fascinating taboos and mysterious attractions*' (Corbin 1994: 8) [e.g. about health, morality, otherness, physiology, seduction, sexuality, ..]

Which information to capture?

- Sources
- Practices
- People involved
- Artefacts
- Places

and especially

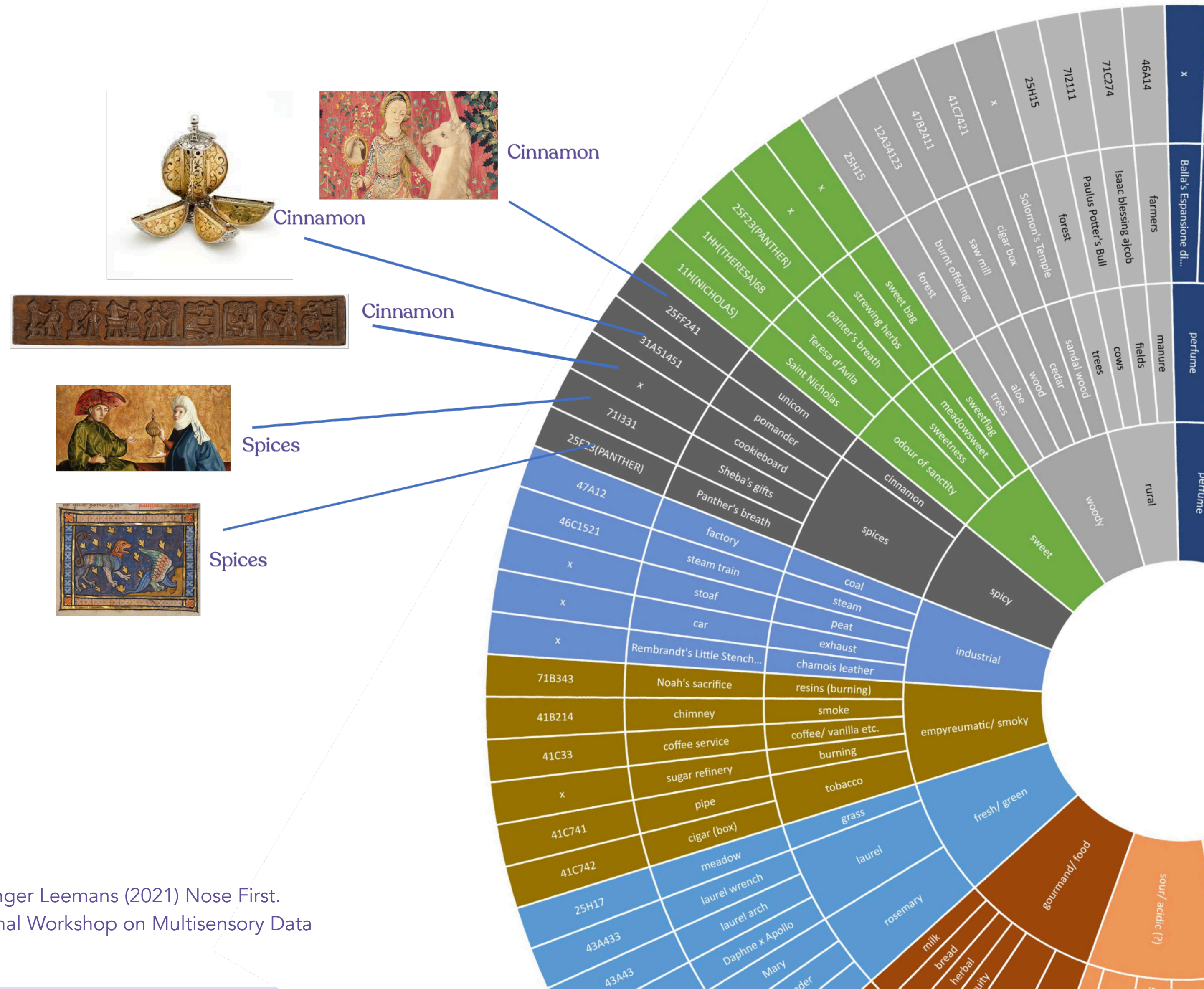
- Meanings
- Identities
- Storylines



C. Monet, Arrival of the Normandy Train, Gare Saint-Lazare, 1877, Art Institute of Chicago, [commons.wikimedia.org](https://commons.wikimedia.org/wiki/File:Arrival_of_the_Normandy_Train_-_Claude_Monet.jpg)

Nose-first art-historical odour wheel

- Connects scents to historical depictions and meanings
- Created by (olfactory) art historians
- Used as input for computer vision annotation



Sofia Collette Ehrich, Caro Verbeek, Mathias Zinnen, Lizzie Marx, Cecilia Bembibre and Inger Leemans (2021) Nose First. Towards an Olfactory Gaze for Digital Art History . In: Proceedings of The First International Workshop on Multisensory Data & Knowledge. Zaragoza, Spain, 1 September 2021.

What is a Smell?

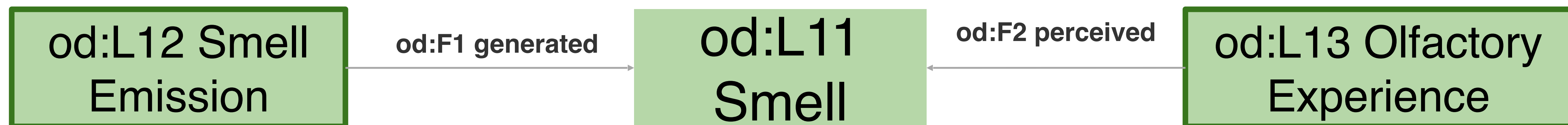


Event



subclass of
property

- In this model, we consider a **smell as a unique and non-repeatable entity**
 - Two roses have two distinct (but similar) smells
 - A smell is normally connected to time and space
 - The “smell of roses” exists only as a generalisation of the smells of all roses
- A given smell can be experienced by multiple people
 - Each person can describe the same smell differently



Text example

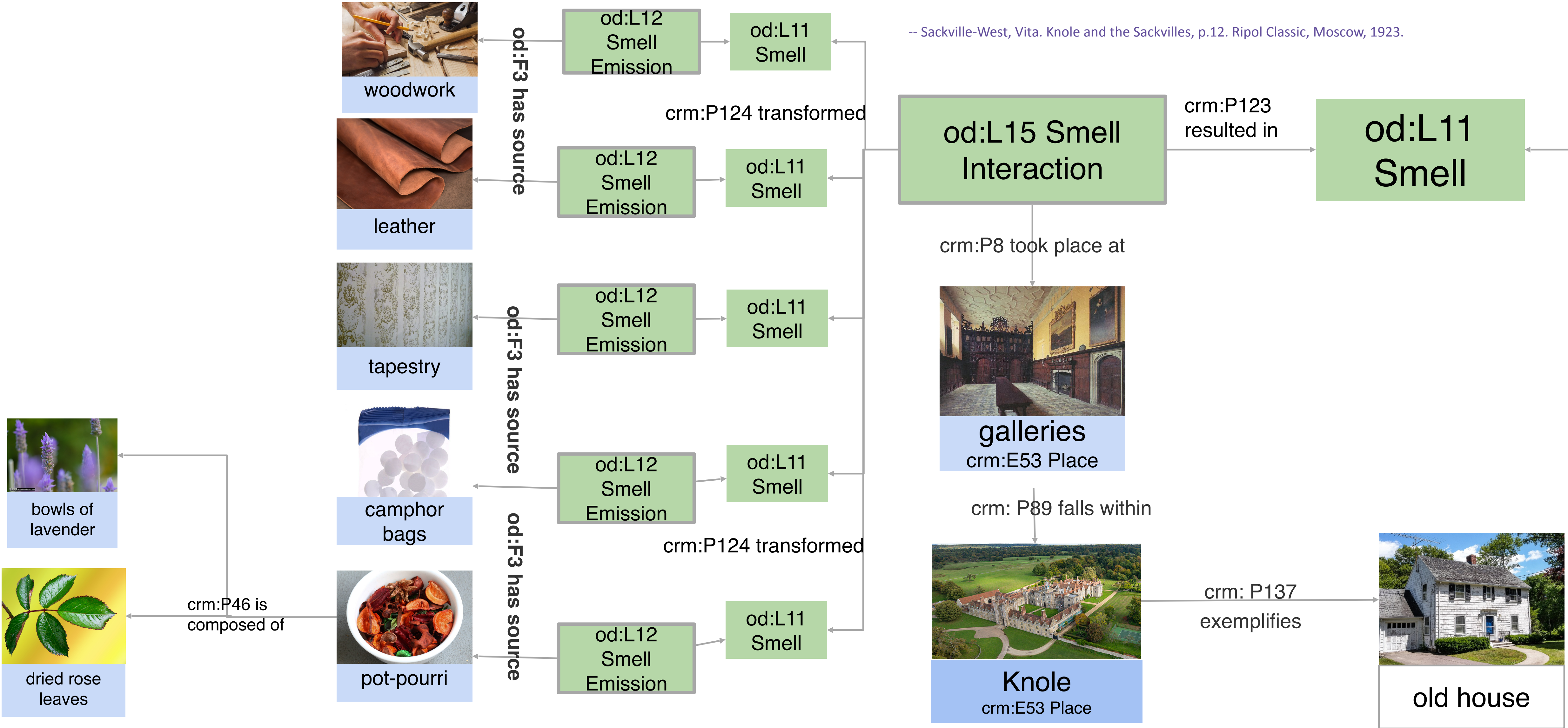
They [**galleries** of Knole, ed.] have the **old, musty** smell which to **me**, whenever I met it, would bring back **Knole**. I suppose it is really the smell of **all old houses** – a mixture of **woodwork, pot-pourri, leather, tapestry**, and the little **camphor bags** which keep away the moth, and specifically about the pot pourri: **bowls of lavender** and **dried rose-leaves** stand on the window-sills; and if you stir them up you get the quintessence of the smell, a sort of **dusty** fragrance, **sweeter** in the under layers where it has held the damp of the spices.

-- Sackville-West, Vita. Knole and the Sackvilles, p.12. Ripol Classic, Moscow, 1923.

Text example

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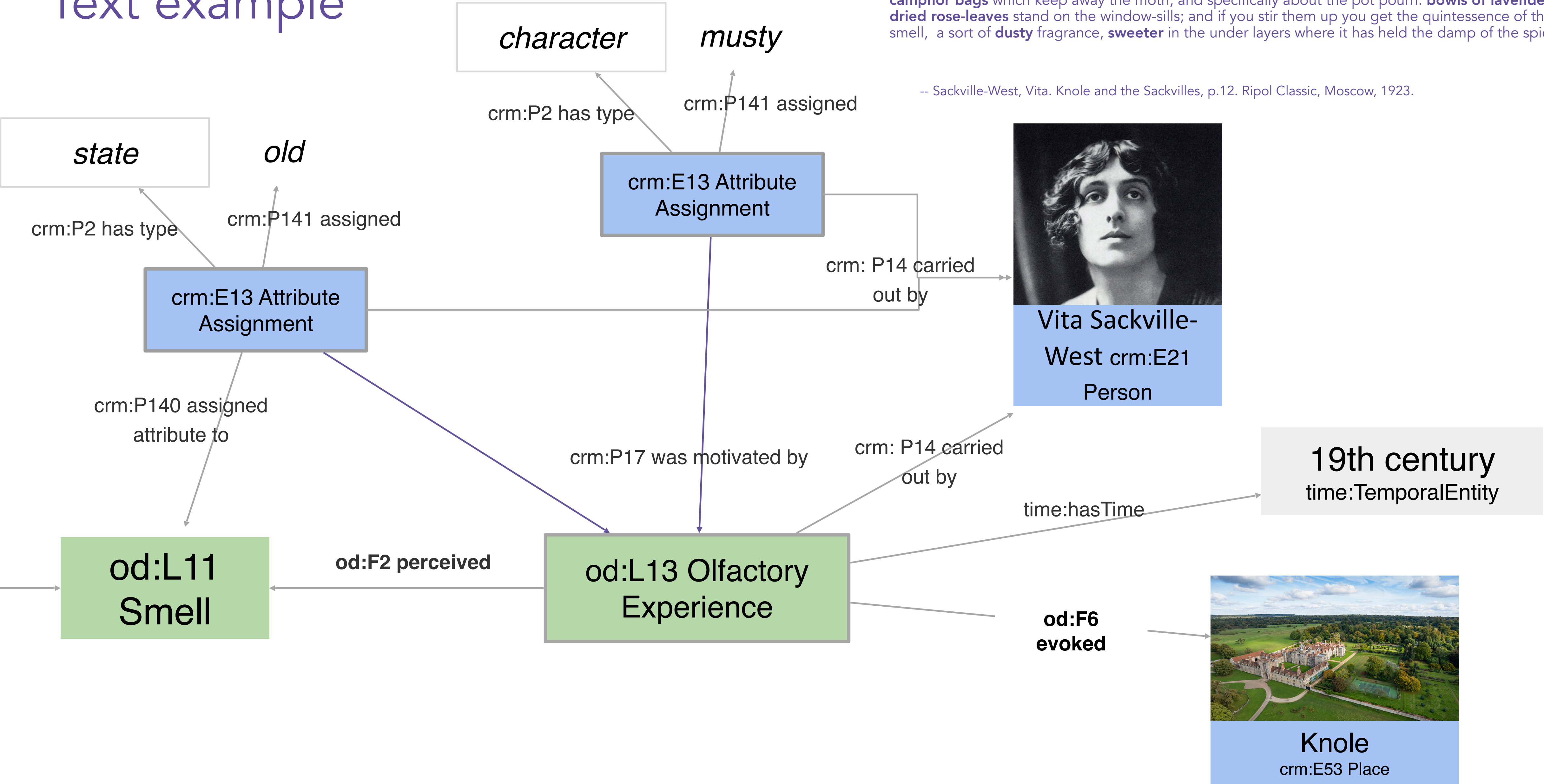
-- Sackville-West, Vita. Knole and the Sackvilles, p.12. Ripol Classic, Moscow, 1923.



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Text example

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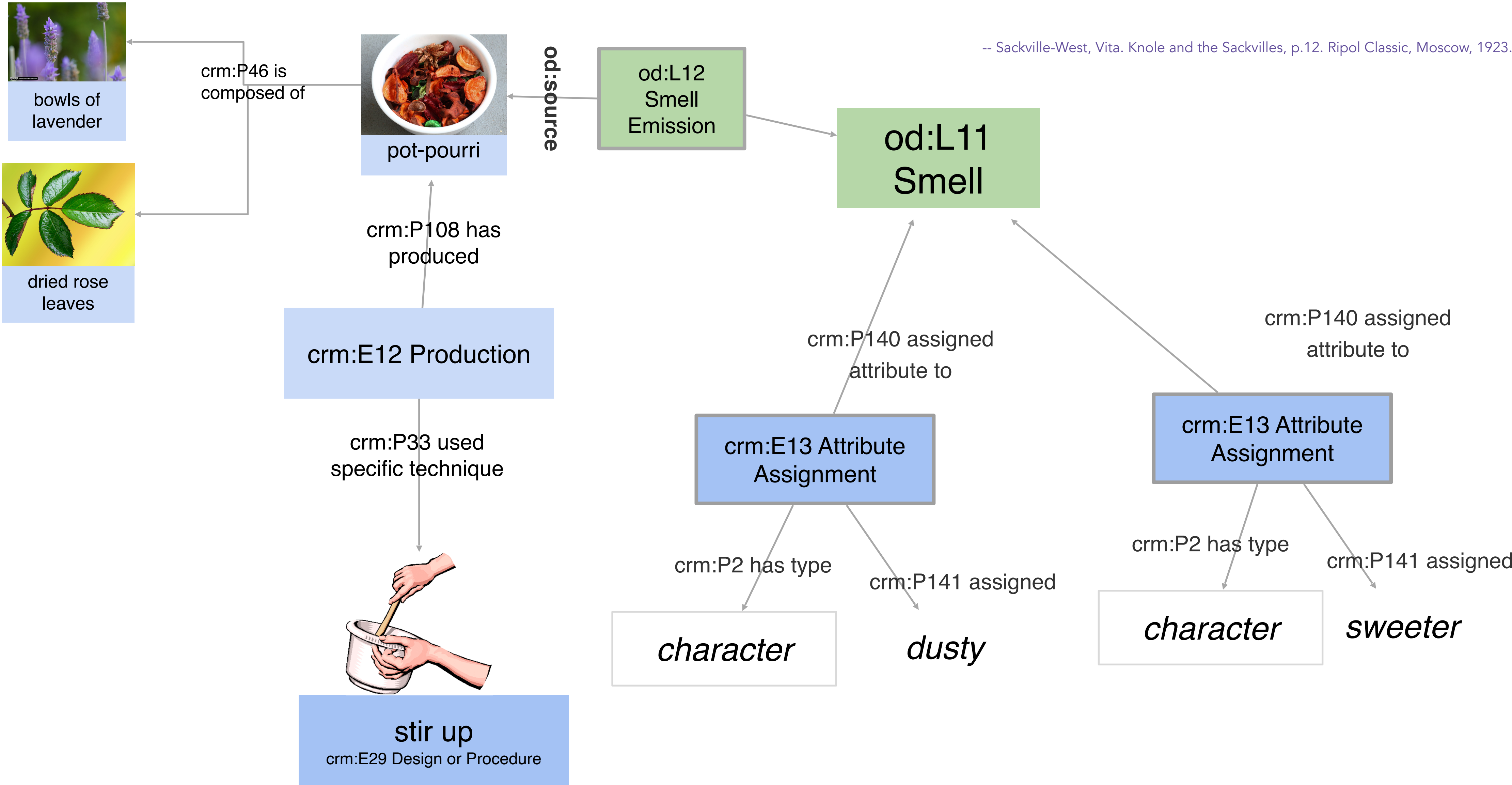


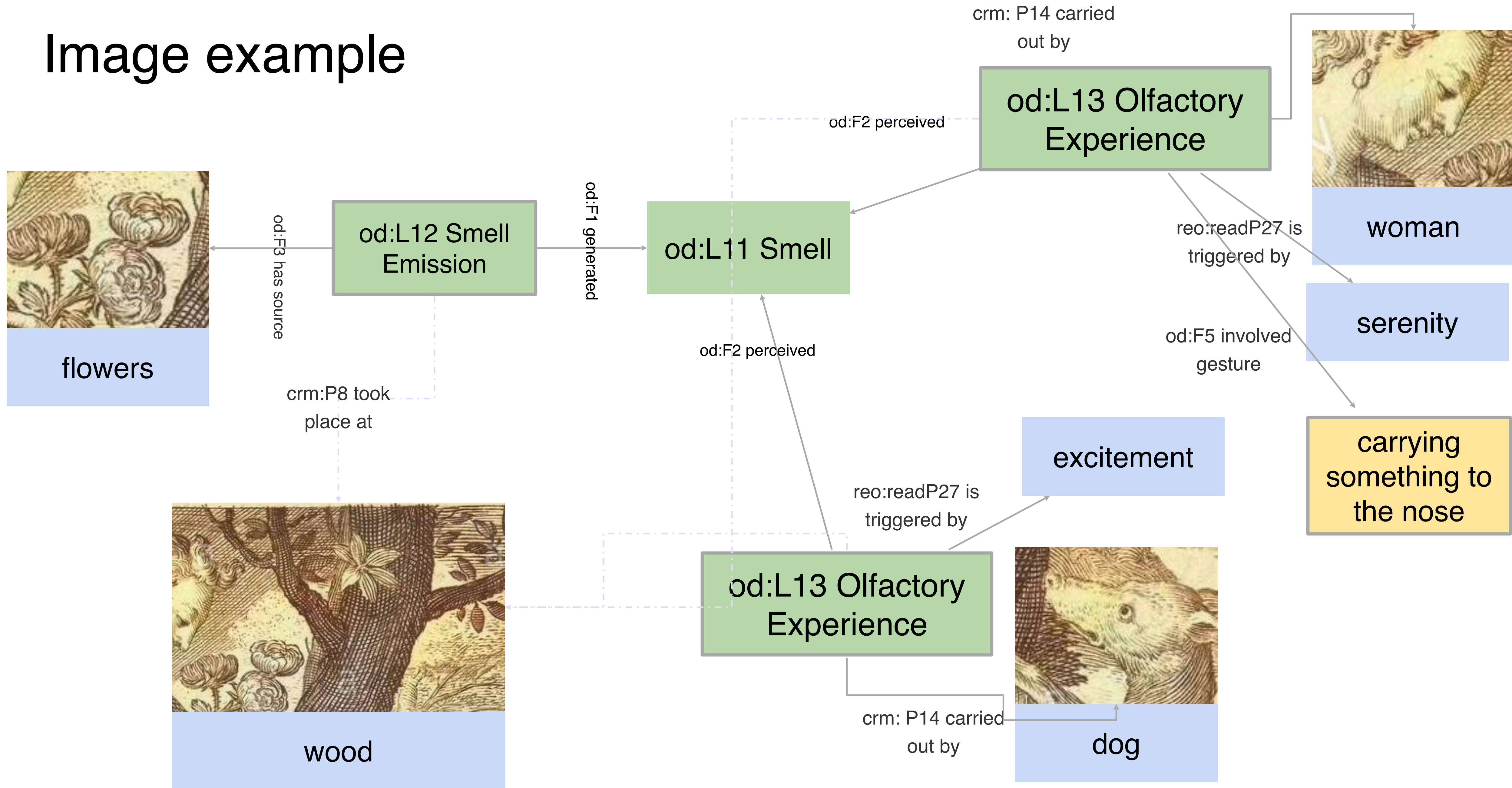
Image example

**Smell, Nicolaes de
Bruyn (1581-1656)**



Olfactus florum gratique Adamator odoris Quam dulcis Deus hunc homini cum conditus esset
Ille amor Hybla tuus floride Hymette tuus Infudit vitæ ac Munera, magna suæ
M de vos Inuent N de B feci...F... 1656

Image example





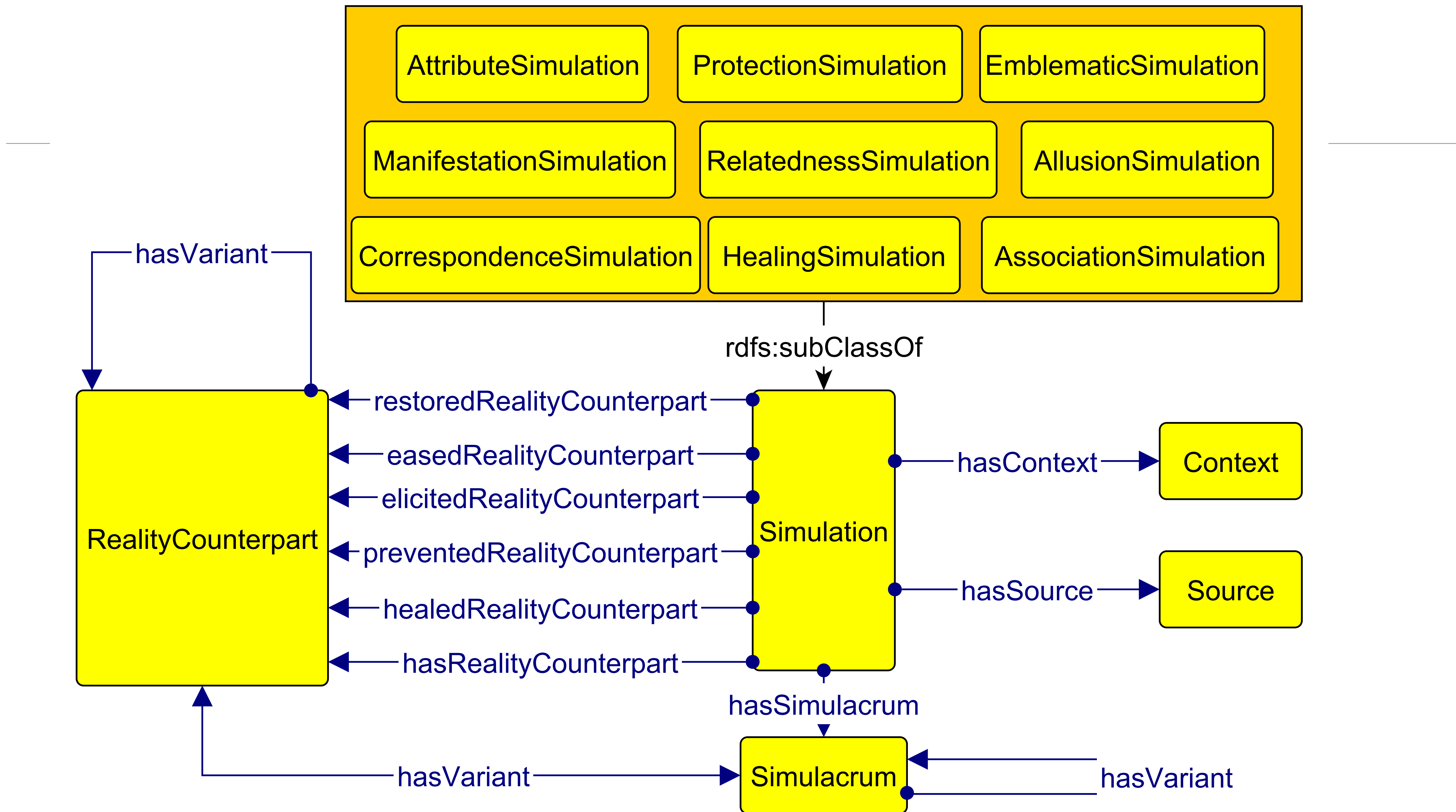


Modelling Symbolism

Bruno Sartini, Aldo Gangemi, Marieke van Erp

Why we should capture symbolic meanings

- Symbols are ingrained in human culture
- Often shorthand for conveying emotions or ideas
- Currently not described adequately in linked data resources
- New ontology available at: <https://raw.githubusercontent.com/br0ast/simulationontology/main/Ontology/simulationontology.owl>



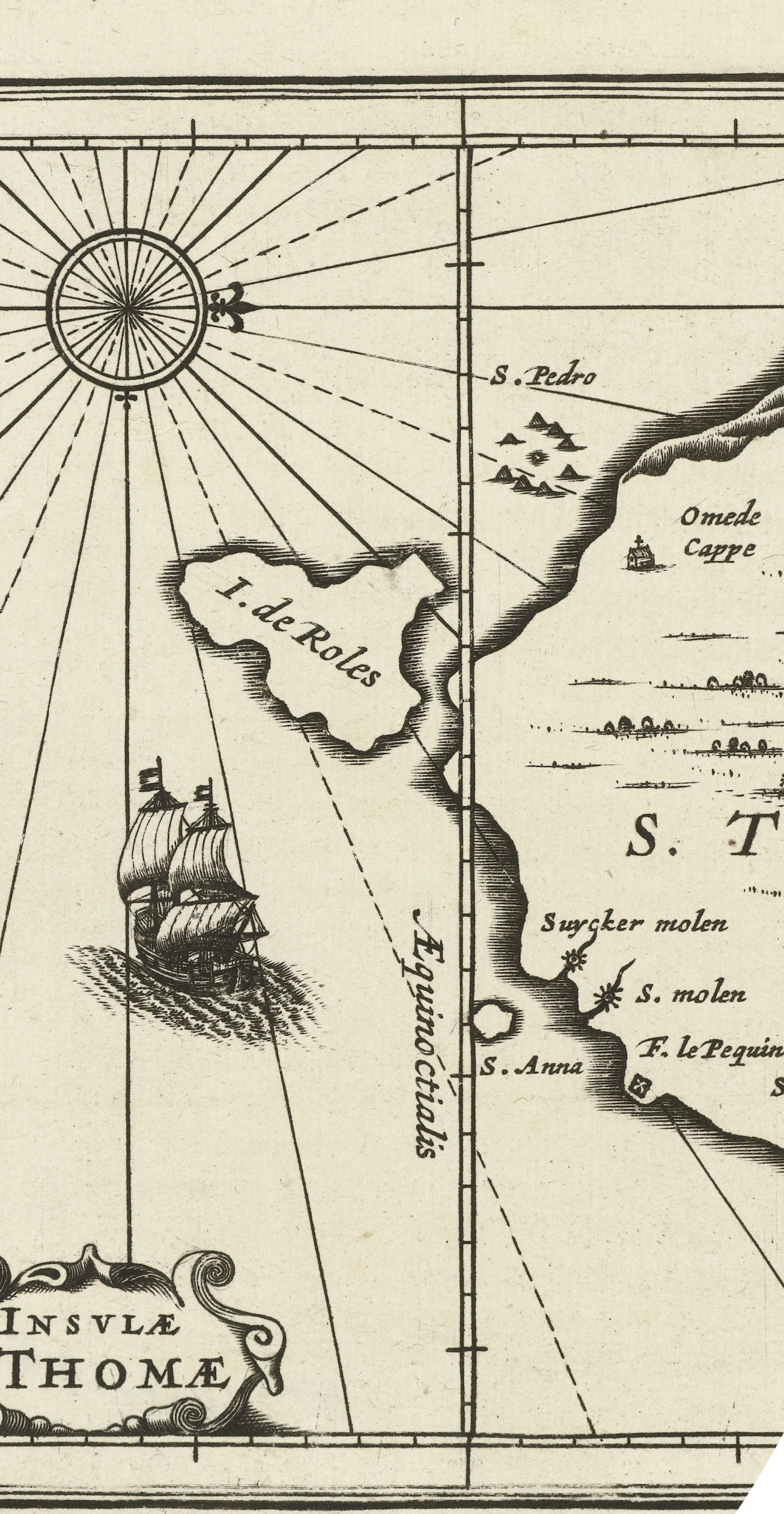


Image: Insulae St. Thomae
Rijksmuseum Amsterdam

Modelling Ship Voyages

Stijn Schouten, Victor de Boer, Lodewijk Petram, Marieke van Erp



UNIVERSITY
AMSTERDAM

Dutch East India Company

- Big globally operating trading company (1602 - 1799)
- Many records have been preserved
 - *Dutch-Asiatic Shipping* - information regarding voyages from the Netherlands to Asia (4700 ships) and back (3400 ships)
 - *Bookkeeper General Batavia* - 55 volumes detailing how many and which products were shipped
 - *VOC Opvarenden* - rank and salary information of 650k VOC crew members
 - *Places* - mappings between old toponyms and standardised place names



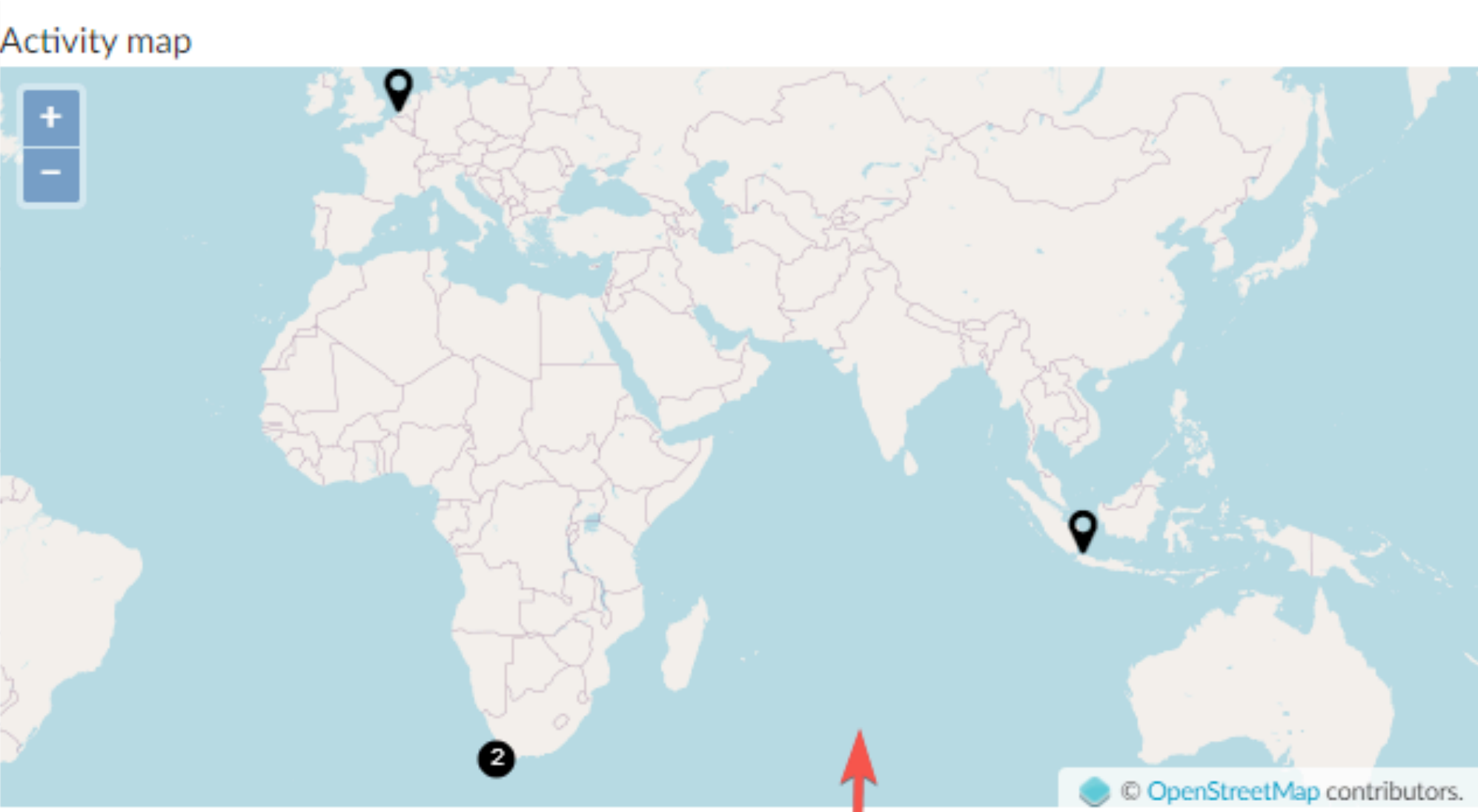
Heterogeneous objects

- voyages
 - ships
 - persons
 - companies
-
- entity-centric vs event-centric modelling?



Part of the voyage	Measurement	Number	Unit	Date (if available) ↓	Place (if available)
95701_1	Seafarers-95701_1	13	count_dying		
95701_1_1	Seafarers-95701_1_1	213	count_boarded	1790-01-18	Fort_Rammekens_NL
95701_1_1	Soldiers-95701_1_1	77	count_boarded	1790-01-18	Fort_Rammekens_NL
95701_1_1	Craftsmen-95701_1_1	10	count_boarded	1790-01-18	Fort_Rammekens_NL
95701_1_1	Passengers-95701_1_1	5	count_boarded	1790-01-18	Fort_Rammekens_NL
95701_1_2	Seafarers-95701_1_2	55	count_left	1790-04-22	Cape_of_Good_Hope_ZA
95701_2_2	Seafarers-95701_2_2	191	count_onboard	1790-08-09	Jakarta_ID
95701_2_2	Soldiers-95701_2_2	38	count_onboard	1790-08-09	Jakarta_ID
95701_2_2	Craftsmen-95701_2_2	6	count_onboard	1790-08-09	Jakarta_ID
95701_2_2	Passengers-95701_2_2	5	count_onboard	1790-08-09	Jakarta_ID

Dataset DAS



Dataset DAS + Places

participants

Quick search

Person entity	Name of person	Rank	Category
406674	Karel_Alexander_Keulenbroeg	soldier	MILITARY
398312	Johan_Klav	soldier	MILITARY
386974	Francois_Verag	soldier	MILITARY
851012	Migaal_Sgmit	fusilier	MILITARY

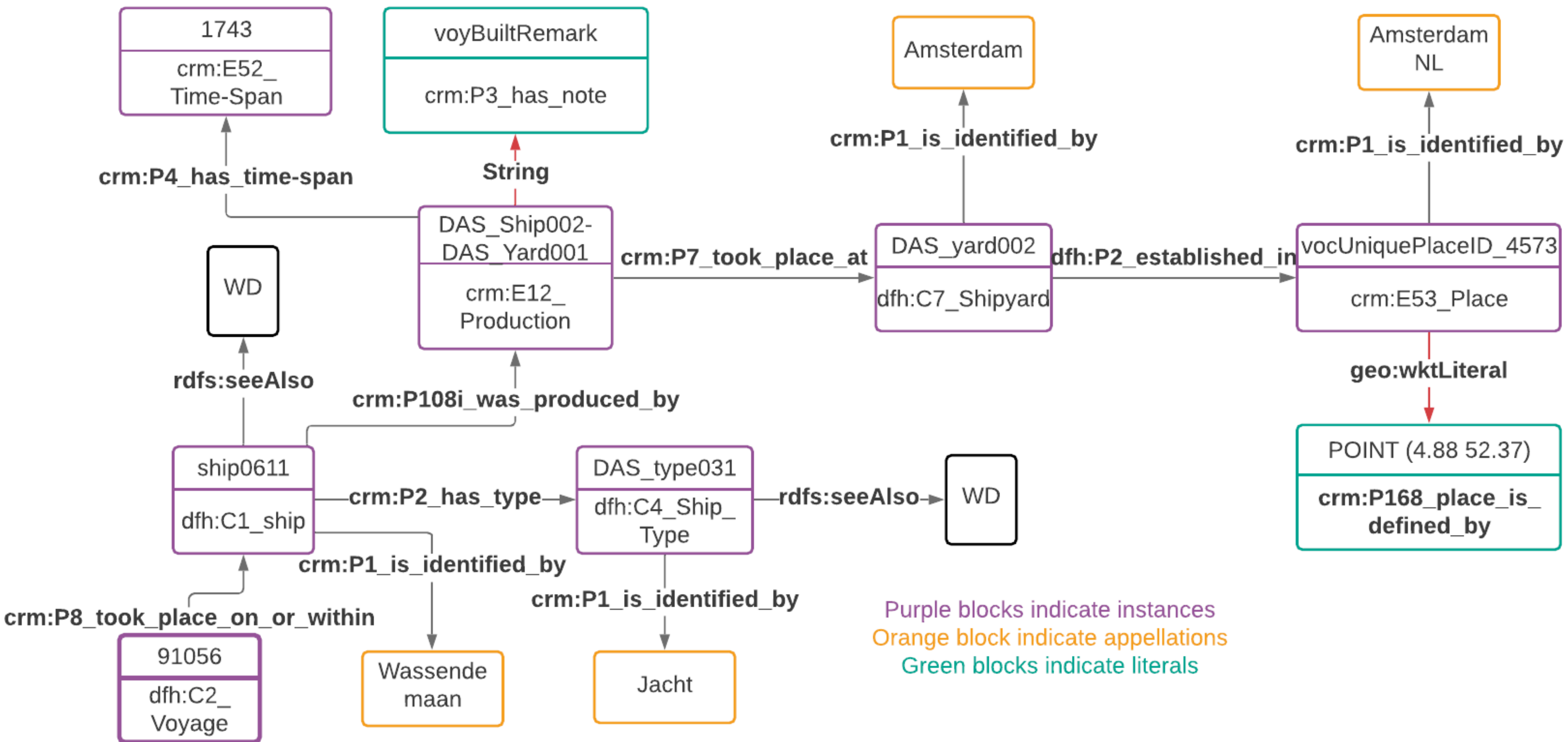
Dataset VOCOP

Goods shipped

Quick search

Good entity	Appellation	Measurement Unit	Measured Amount	Currency
1119-95701-3	lead	lb	13992	
1290-95701-9	together			
1024-95701-8	drink			
1164-95701-7	commission			

Dataset BGB



Purple blocks indicate instances
Orange block indicate appellations
Green blocks indicate literals

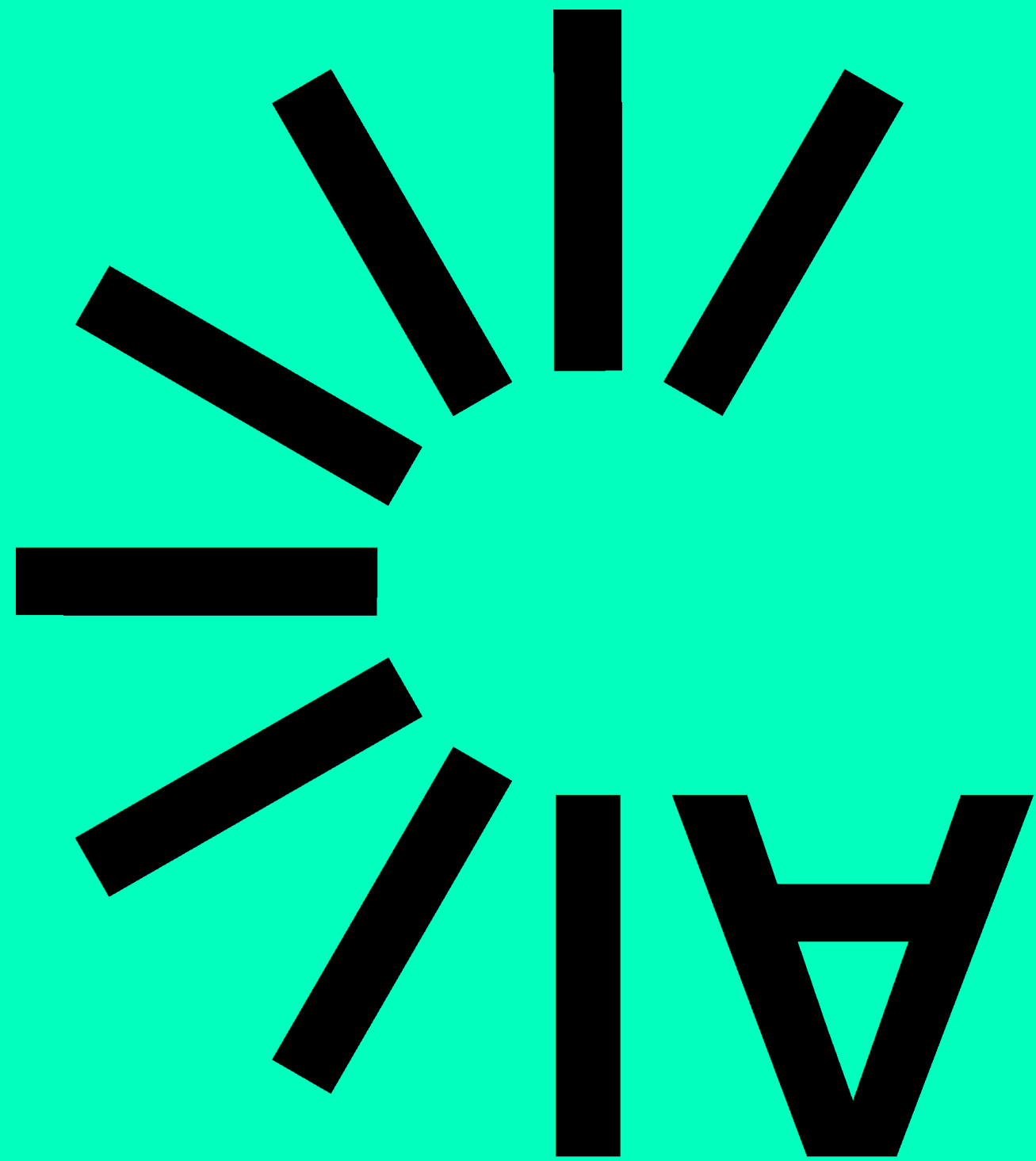


The Common Thread

Domain expertise is key!

- *Modelling smell*: olfactory & art historians are actively involved in creating the data model;
- *Modelling symbolic knowledge*: both top-down & bottom up creation;
- *Modelling sea voyages*: maritime historians, data curators & data scientists provided input to the model and reviewed the final result;
- Competency questions are a helpful tool in crossing interdisciplinary boundaries.

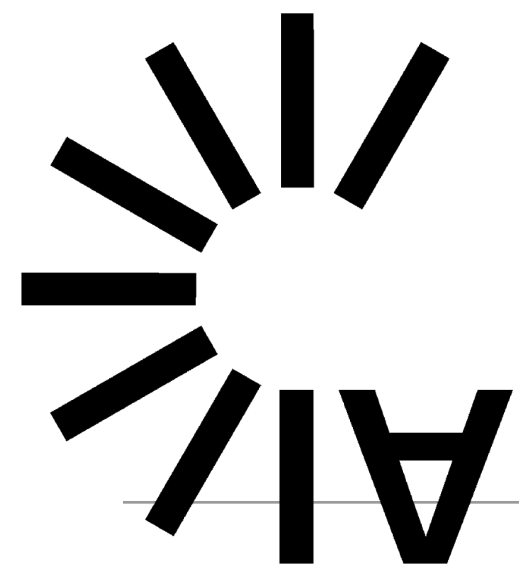




Cultural AI

a lab for
culturally
valued AI





What's next - Polyvocality

Applications using single-perspective, contemporary knowledge graphs cannot adequately deal with other perspectives and/or diachronic knowledge

Problematic in for example:

Information retrieval and machine learning

What is a *voice*?

The Dutch maritime and military prowess laid the foundations for the first global multinational corporation

Dutch scientific advancements from this era were among the most acclaimed in the world

Era of unbridled opportunity and wealth in the Dutch Republic

The Dutch Golden Age shaped Amsterdam and Dutch architecture



What is a *voice*?

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What about the other side of the coin?

Slavery
Colonialism

What is a *voice*?

Het Kasteel Batavia gezien van Kali Besar west met op de voorgrond de vismarkt -



Dhr. A. (Andries) Beeckman (Vervaardiging)

Nu te zien in Vaste opstelling Tropenmuseum:
heden)

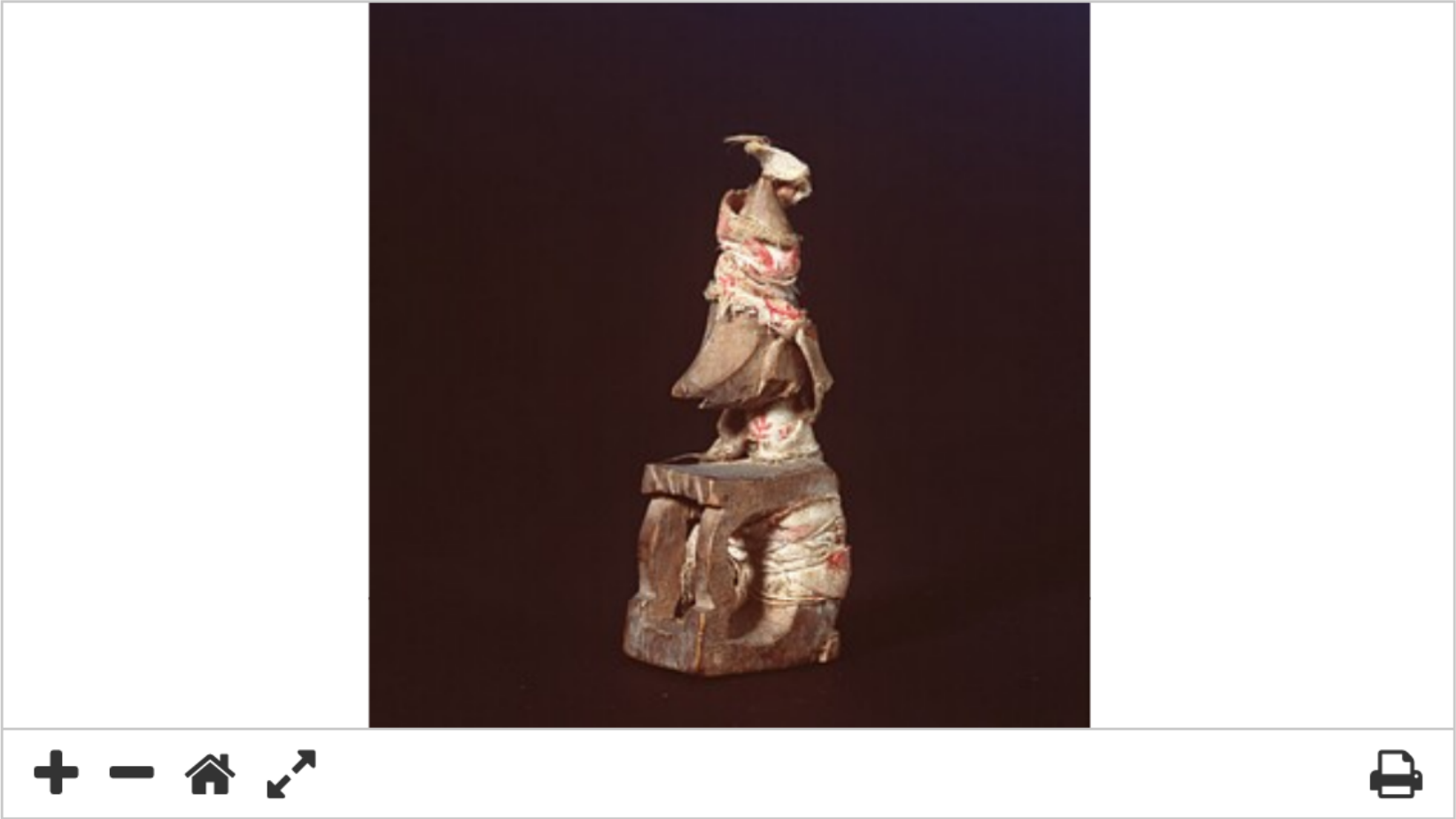
Culture : Nederlands
Javaans

Origin :
- Zuidoost-Azië: Insulair / Indonesië / Jawa
- Zuidoost-Azië: Insulair / Indonesië / Jawa / I
ca. 1662

144 × 209cm (excl lijst) 158,7 × 223 × 8,2cm,

Op de achtergrond het kasteel Batavia, het Az
waaruit de landvoogd en zijn dienaren hun me
ten tijde van het bestuursperiode van gouvern

Voorouderbeeldje om op reis mee te nemen - *sokke* ?



Culture : Damar

Origin : Zuidoost-Azië: Insulair / Ind
/ Maluku Barat Daya (regentschap) ,
1899 (voor)

6,5 cm

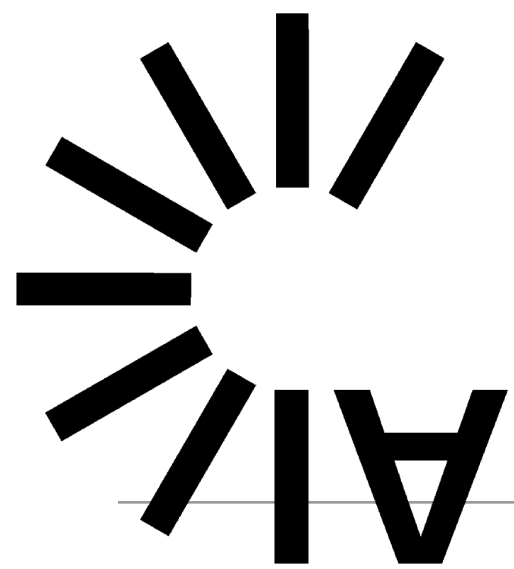
In Maluku Tenggara wordt de mens
levenskracht, verbonden met het lic
vergeleken met de ziel of geest en c
bestaat dat met de dood het lichaam
van de dode blijft voortbestaan.
Om met deze 'schaduw' te kunnen
in het begin van de twintigste eeuw
voor de 'ziel' en stelde de nabestaa
raadplegen; de voorouders speelde

Three challenges for *polyvocal* knowledge graphs

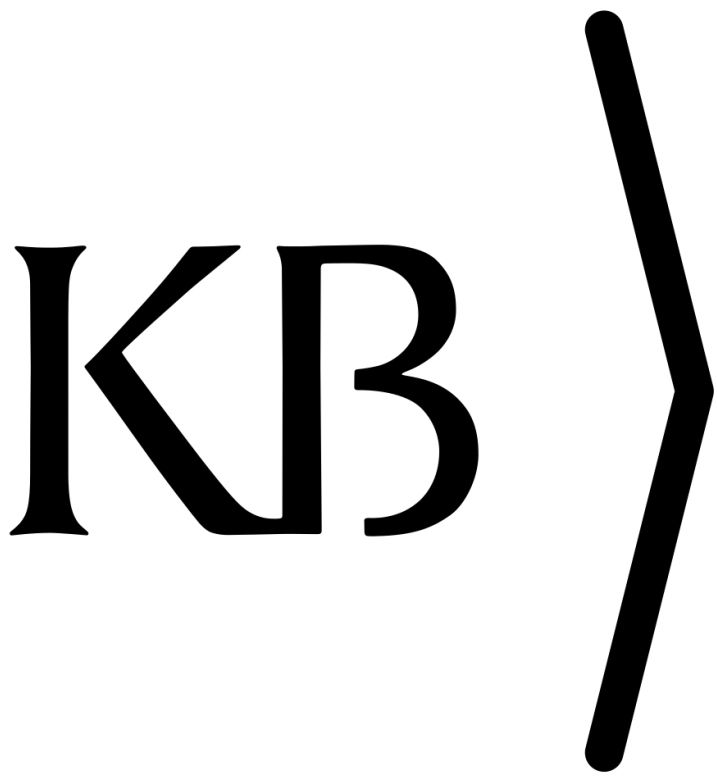
Identifying and acquiring polyvocal knowledge

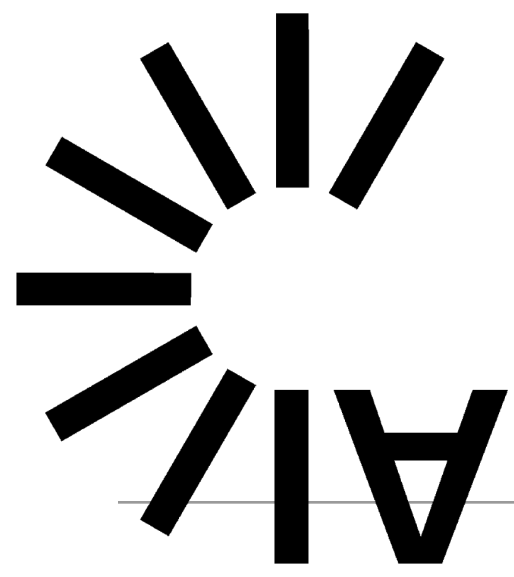
Representation of polyvocality: datamodels and formalisms

Presentation and usage of polyvocal knowledge



Culturally Aware AI



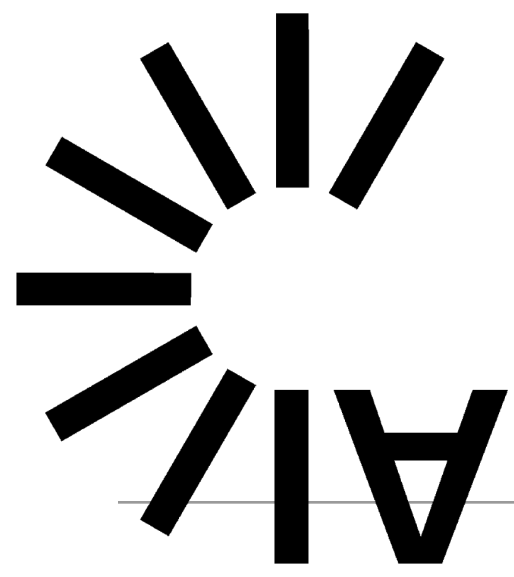


Culturally Aware AI

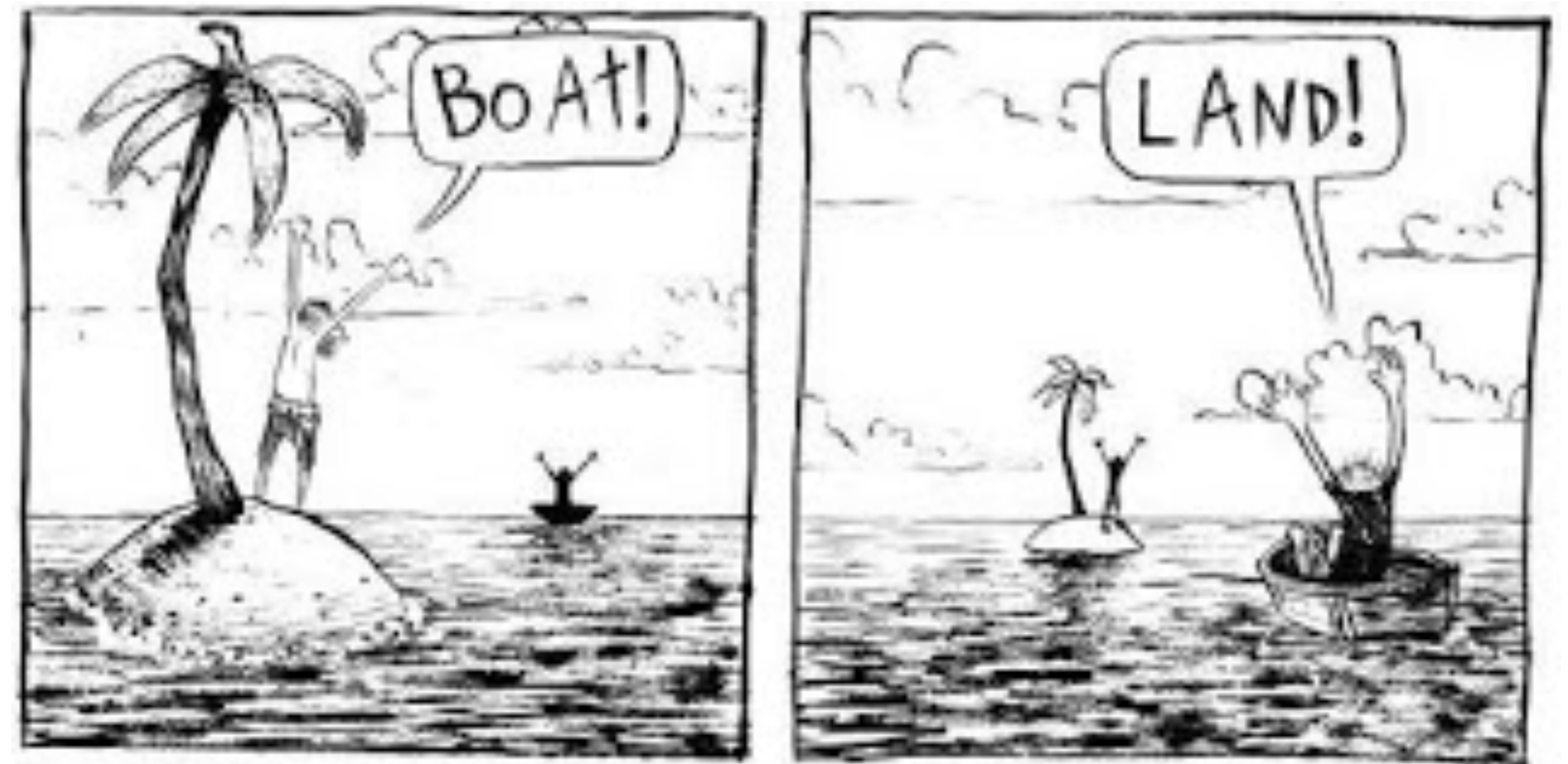
Automatically analysing and enriching
object-level collection descriptions

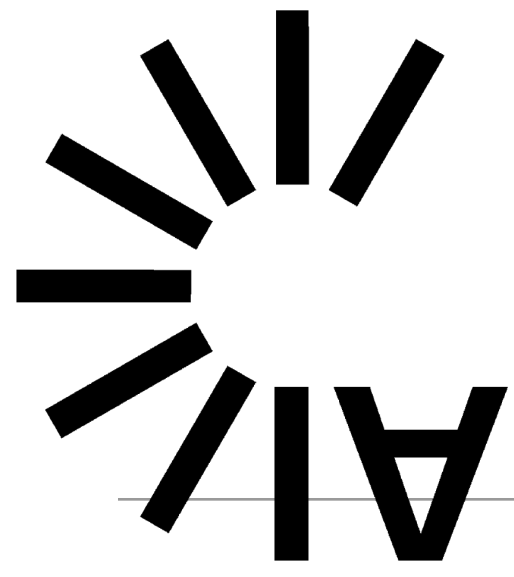


Ryan Brate
PhD student
KNAW HuC
DHLab



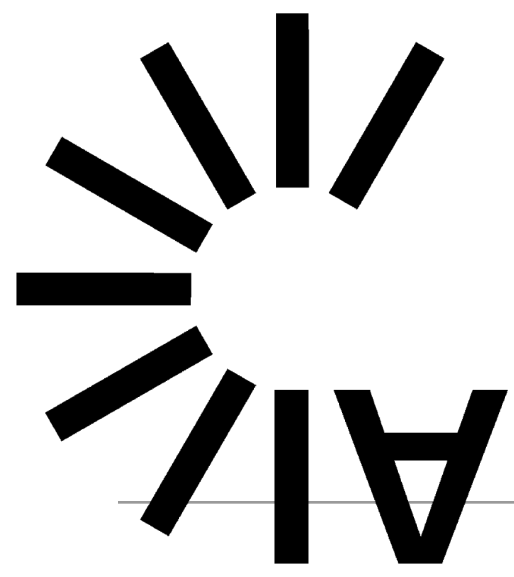
- Biased terminology
e.g., “Dutch Golden Age”
= “17th Century”?
- Complex narratives





Research Question

*How can AI **interpret** and **represent** the contents of a heritage collection in a way that captures polyvocality?*

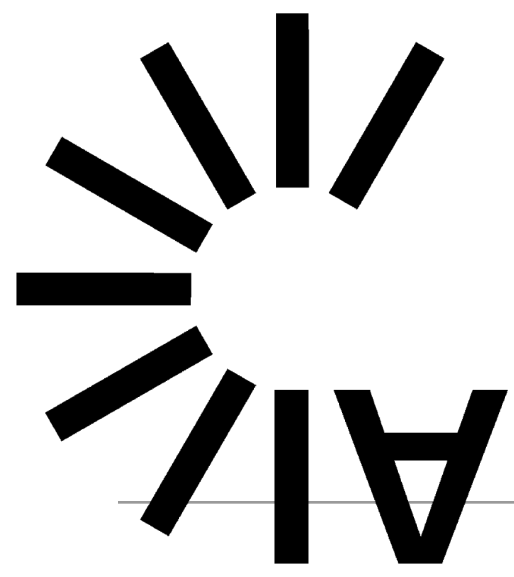


A first step

predicting biased terms

potential insights?



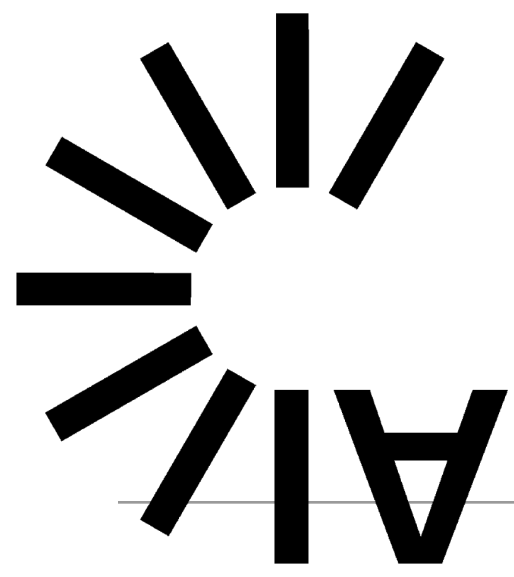


Culturally Aware AI

Transparent Data Stories: putting heritage data in perspective

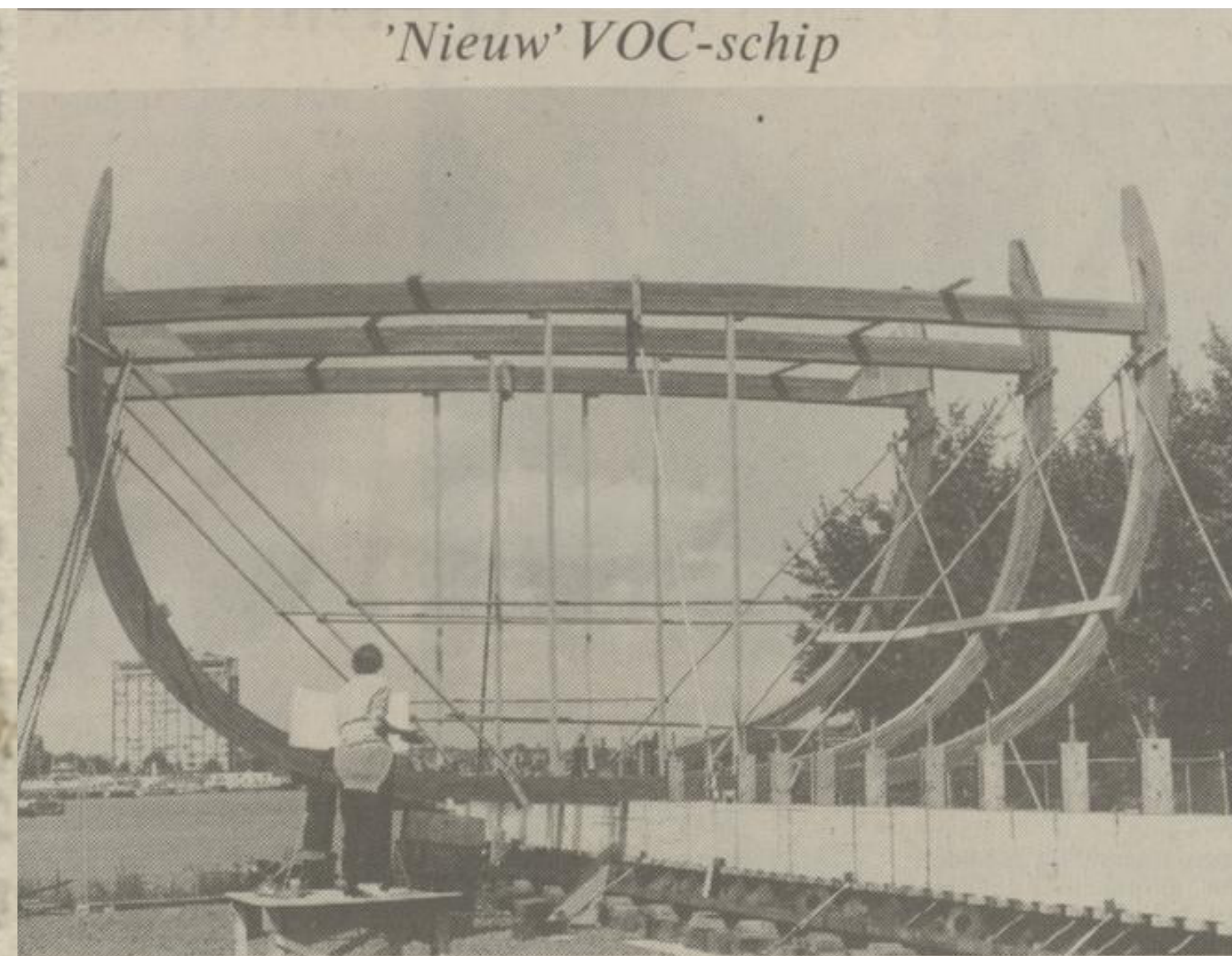


Andrei Nesterov
PhD Student
Centrum Wiskunde & Informatica
Human-Centered Data Analytics group



Transparent Data Stories: putting heritage data in perspective

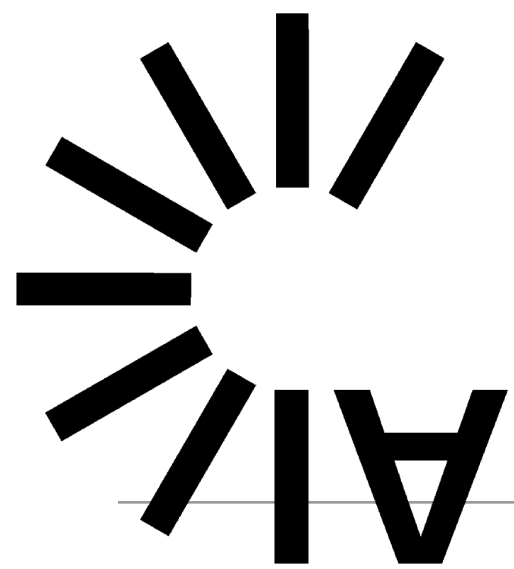
oude gheboemde Kontick int Landt te Holstein/
Dennemarcken ende ander plaetsen sterck Crijchs
volck doen aenneemen / alsoo dat dyp hups-lupden
eenen Soldaet onderhouden moeten.
Dese daghen hebben eenighe Cooplieden tot
Amsterdam / vande Oost-Indische Compagnie
eene groote quantiteyt aen Beper ghekocht / van
ontrent 10. duysendt Baelen/ twelcke wel inde 24
Tonnen Gouts bedragen soude.



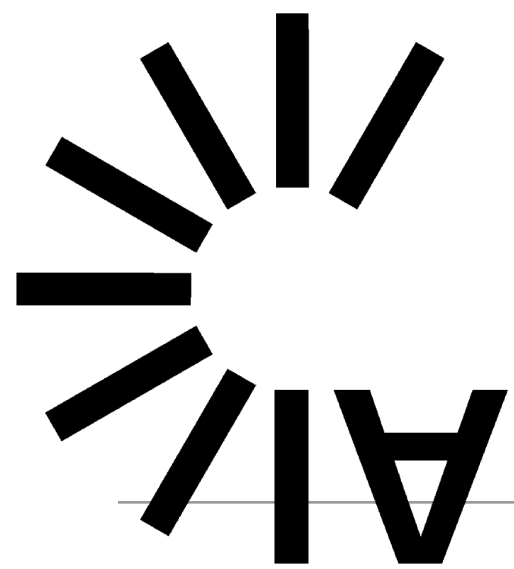
1. "Van Wesel, den 1. Iuny.". "Courante uyt Italien, Duytslandt, &c.". Amsterdam, 04.06.1622, p. 2. Geraadpleegd op [Delpher](#).

2. "'Nieuw' VOC-schip". "NRC Handelsblad". Rotterdam, 16.07.1985, Geraadpleegd op [Delpher](#)

3. "VOC-schip, series Waterschap", 24.06.1992, foto's i.o.v. KRO, [Nederlands Instituut voor Beeld en Geluid](#).

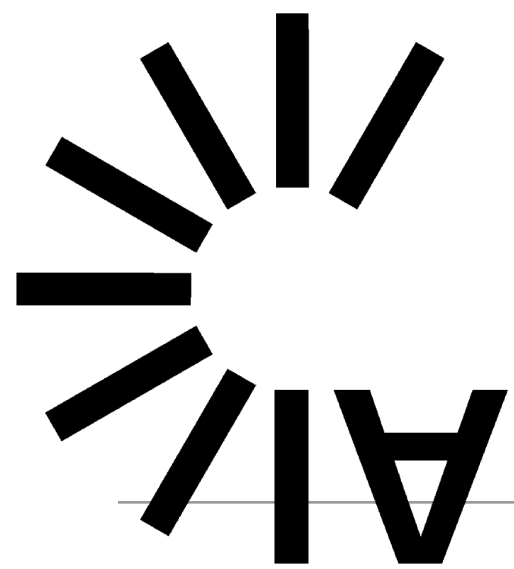


*How can AI represent **multiple perspectives** on cultural objects?*



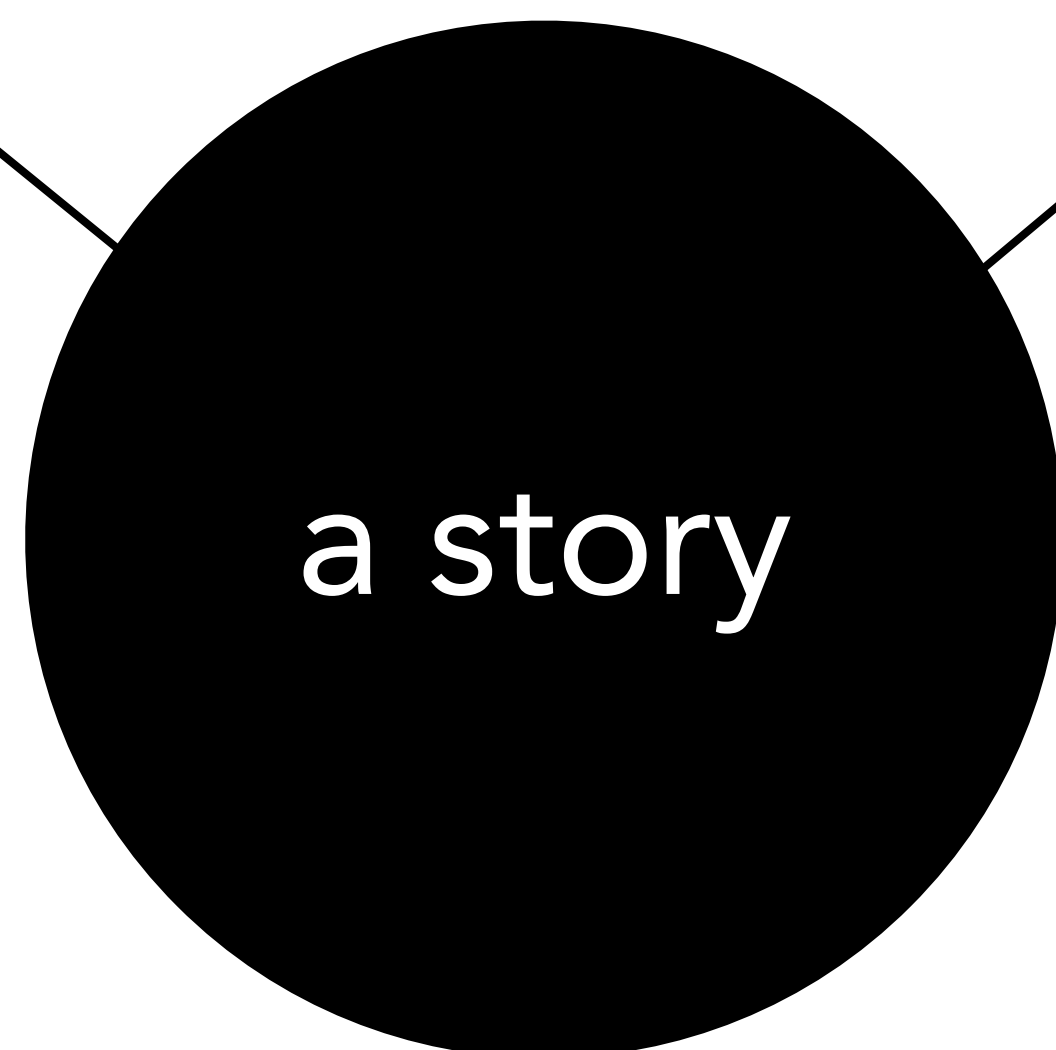
How can AI represent multiple perspectives on cultural objects?

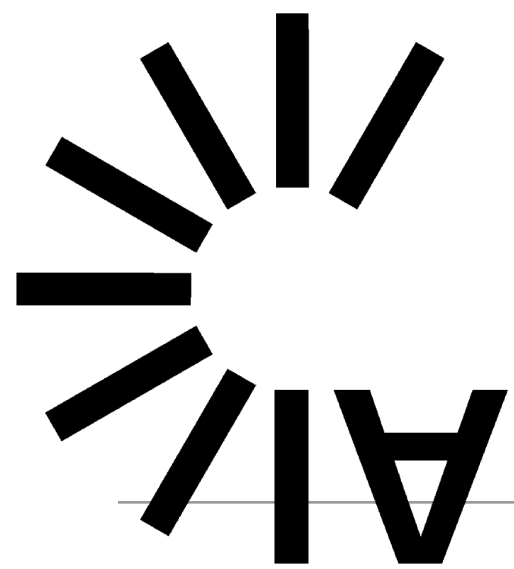
a story



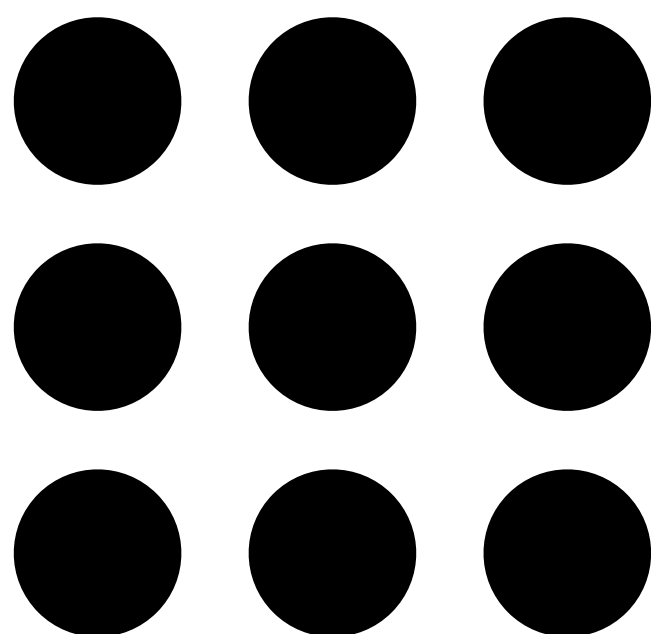
provides context and
different perspectives

accessible and widely
understood by users

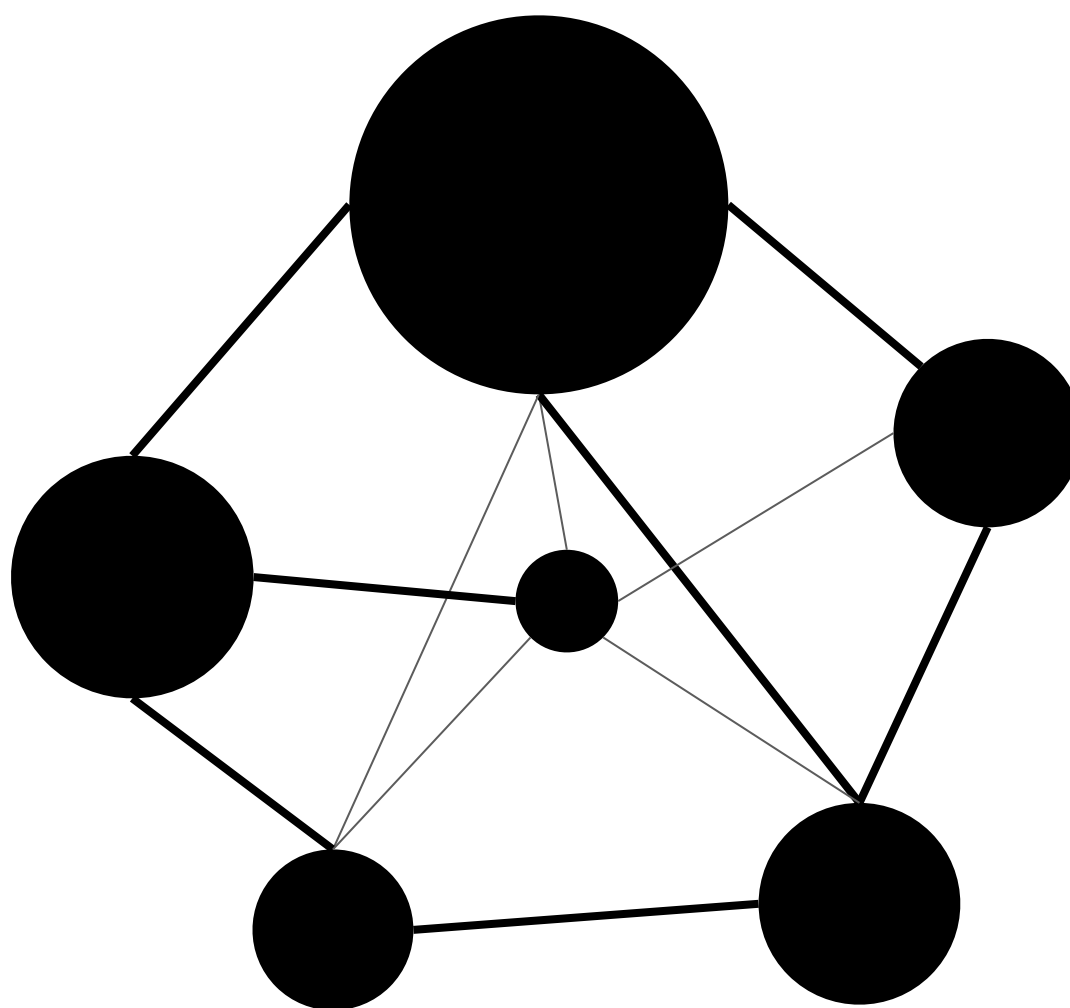
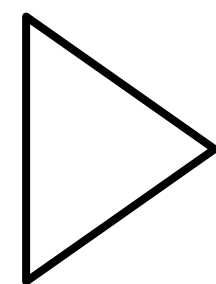




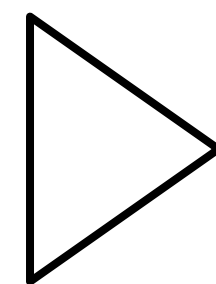
Challenge 1. How to form the story content?

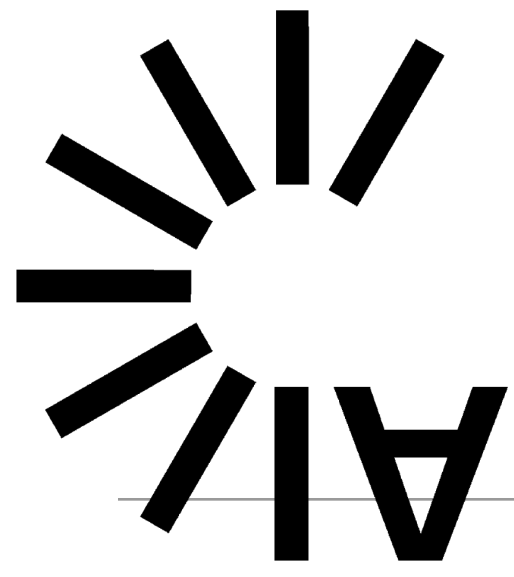


dataset

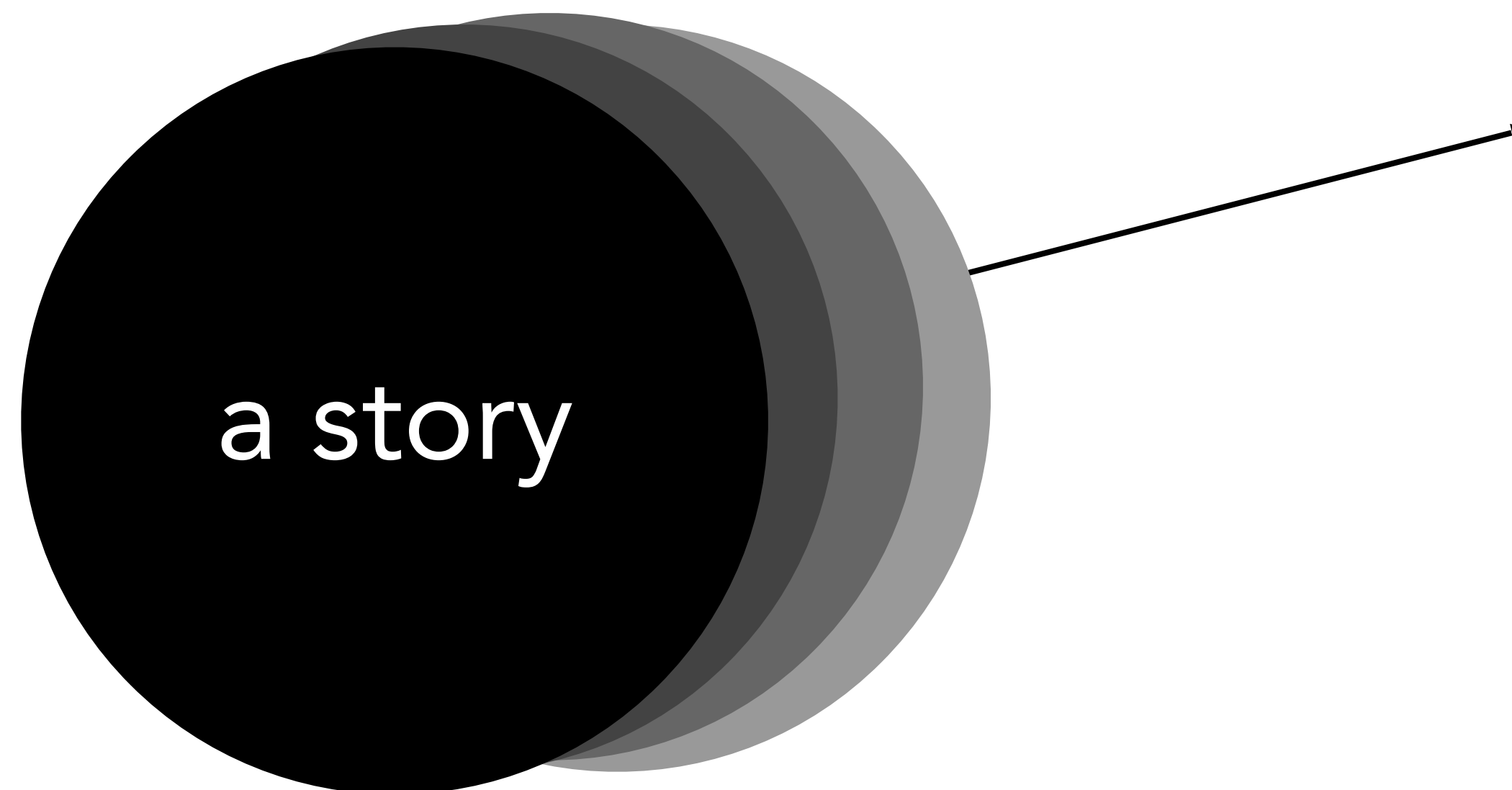


knowledge graph

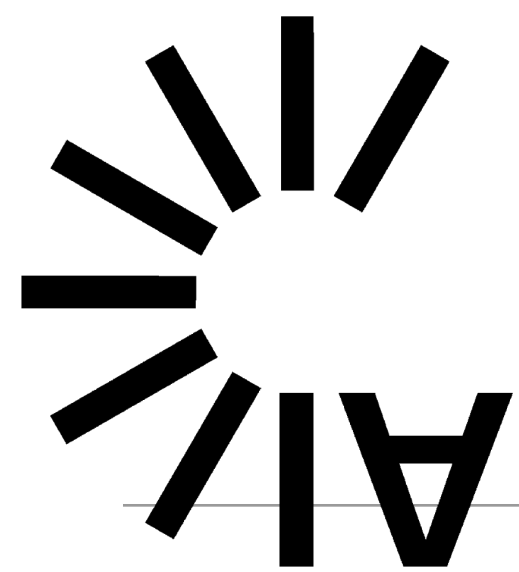




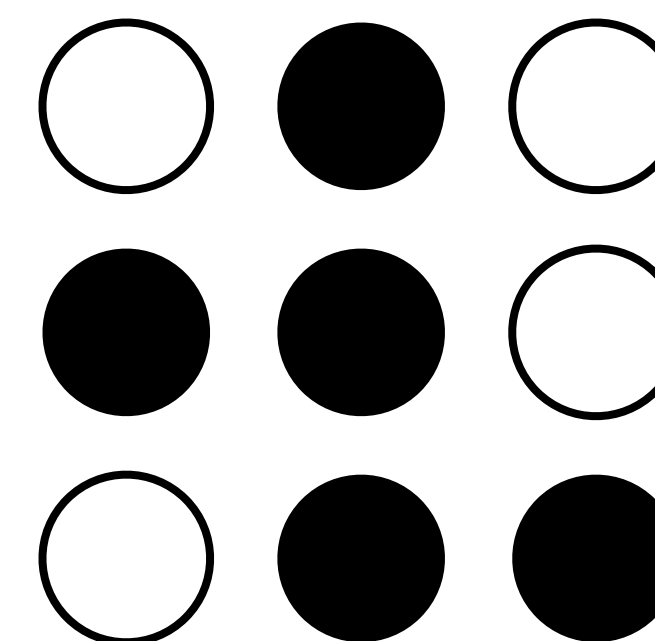
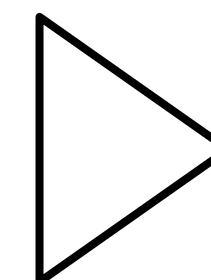
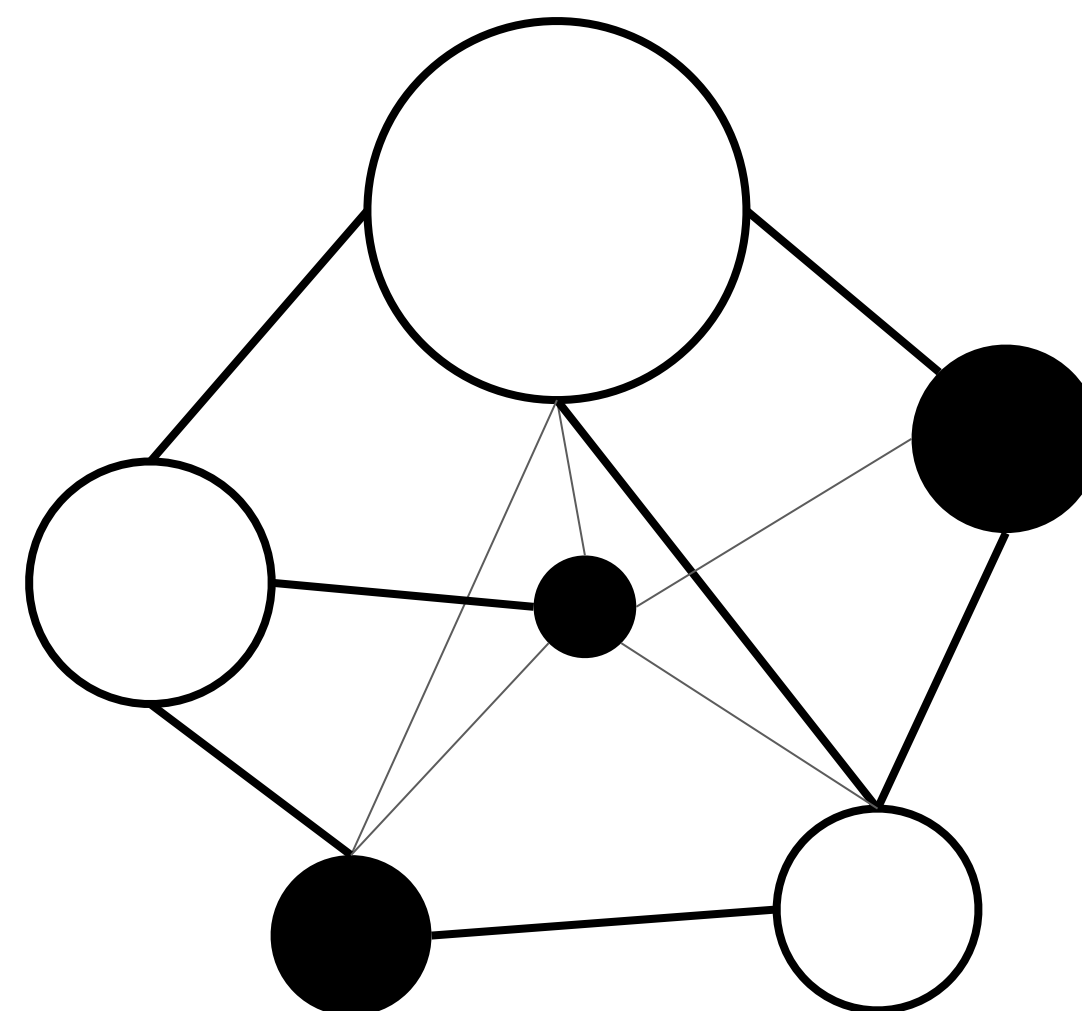
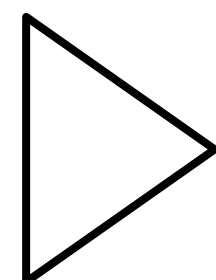
Challenge 2. How to put different perspectives in a story?



alternative storylines
about one object

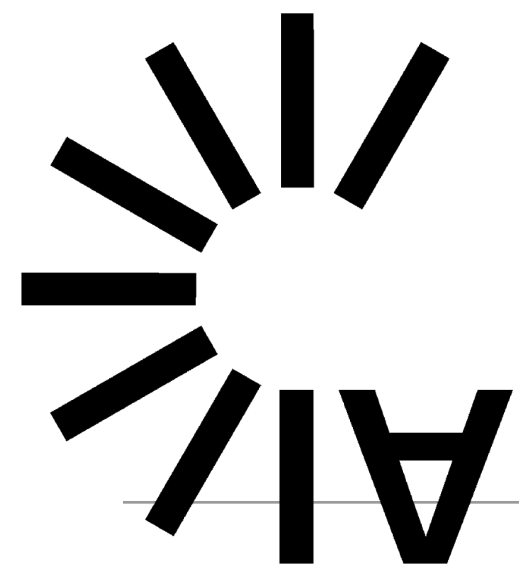


Challenge 3. How to make the story transparent?



knowledge graph

dataset



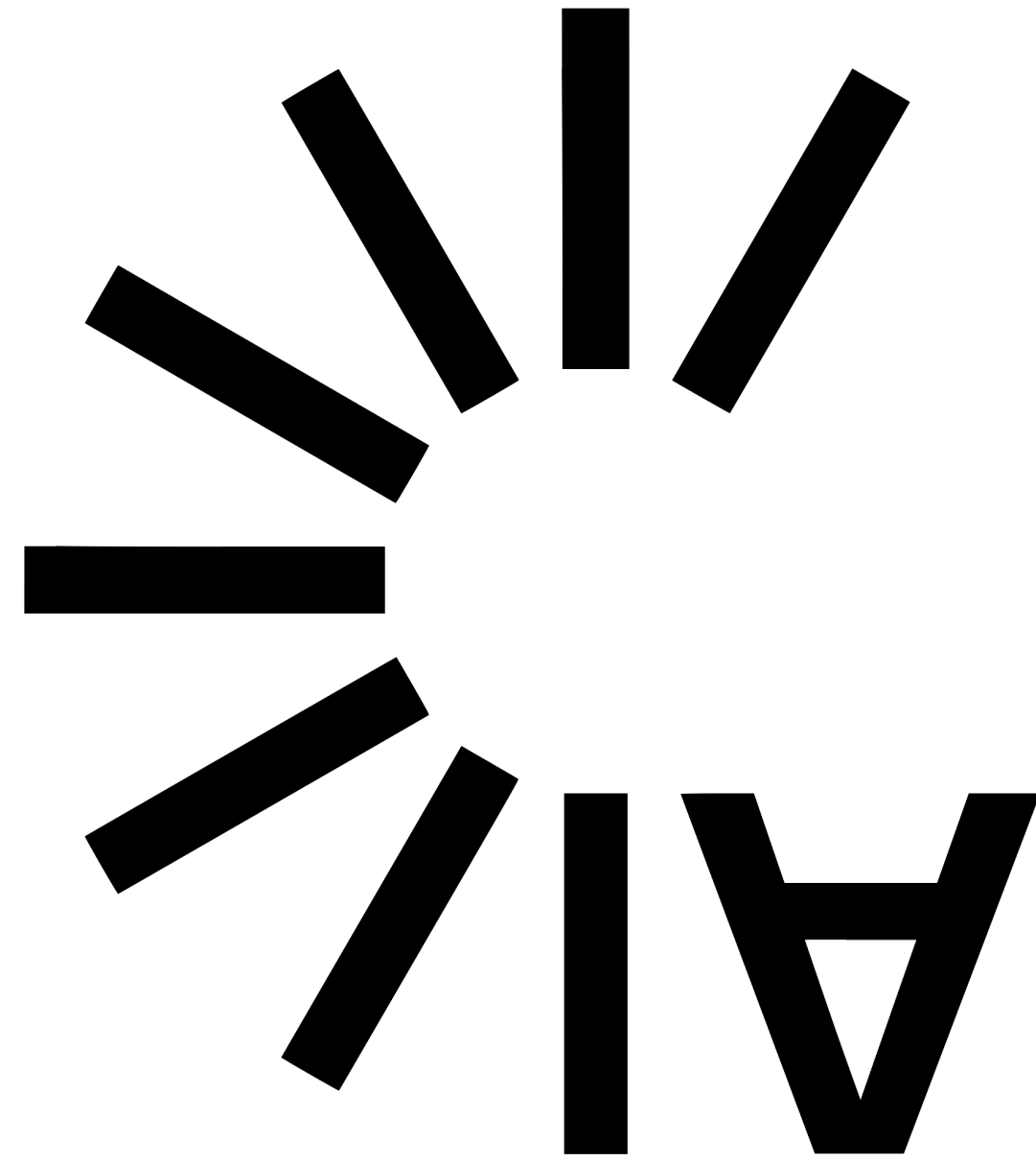
Representation of polyvocality

Data models

Formalisms

Design patterns

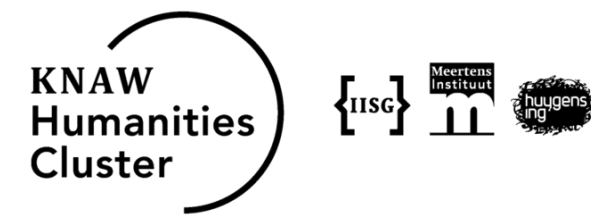
To represent disagreement on categorisation, provenance, etc.



Cultural AI

a lab for
culturally
valued AI

<https://cultural-ai.nl>



RIJKS MUSEUM



TNO





Thank you for your attention!

Project links

- Modelling smell: <https://odeuropa.eu>
 - Modelling Symbolic Knowledge: <https://www.unibo.it/sitoweb/bruno.sartini3/en> & <https://www.w3id.org/simulation/development/>
 - Modelling ship voyages: <https://dutchshipsandsailors.nl/>
 - Towards a polyvocal and contextualised semantic web: <https://cultural-ai.nl>
-
- KNAW Humanities Cluster: <https://huc.knaw.nl>
 - Digital Humanities Research Lab: <https://dhlab.nl>