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Die *Performanz* der Wappen
(Dilthey-Fellowship)

VolkswagenStiftung

Digital Heraldry

Exploring the Middle Ages with Machine Learning and Semantic Web Technologies

Torsten Hiltmann
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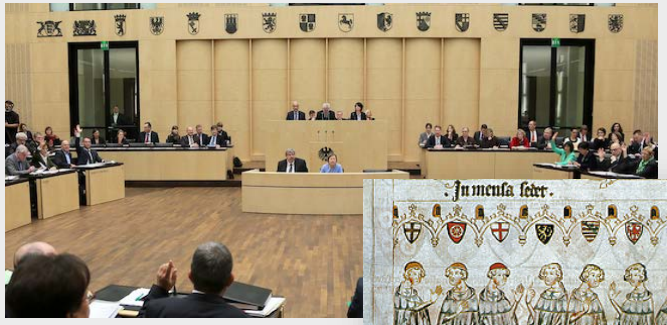
Coats of arms and Heraldry …



Federal Council

The seven Electors

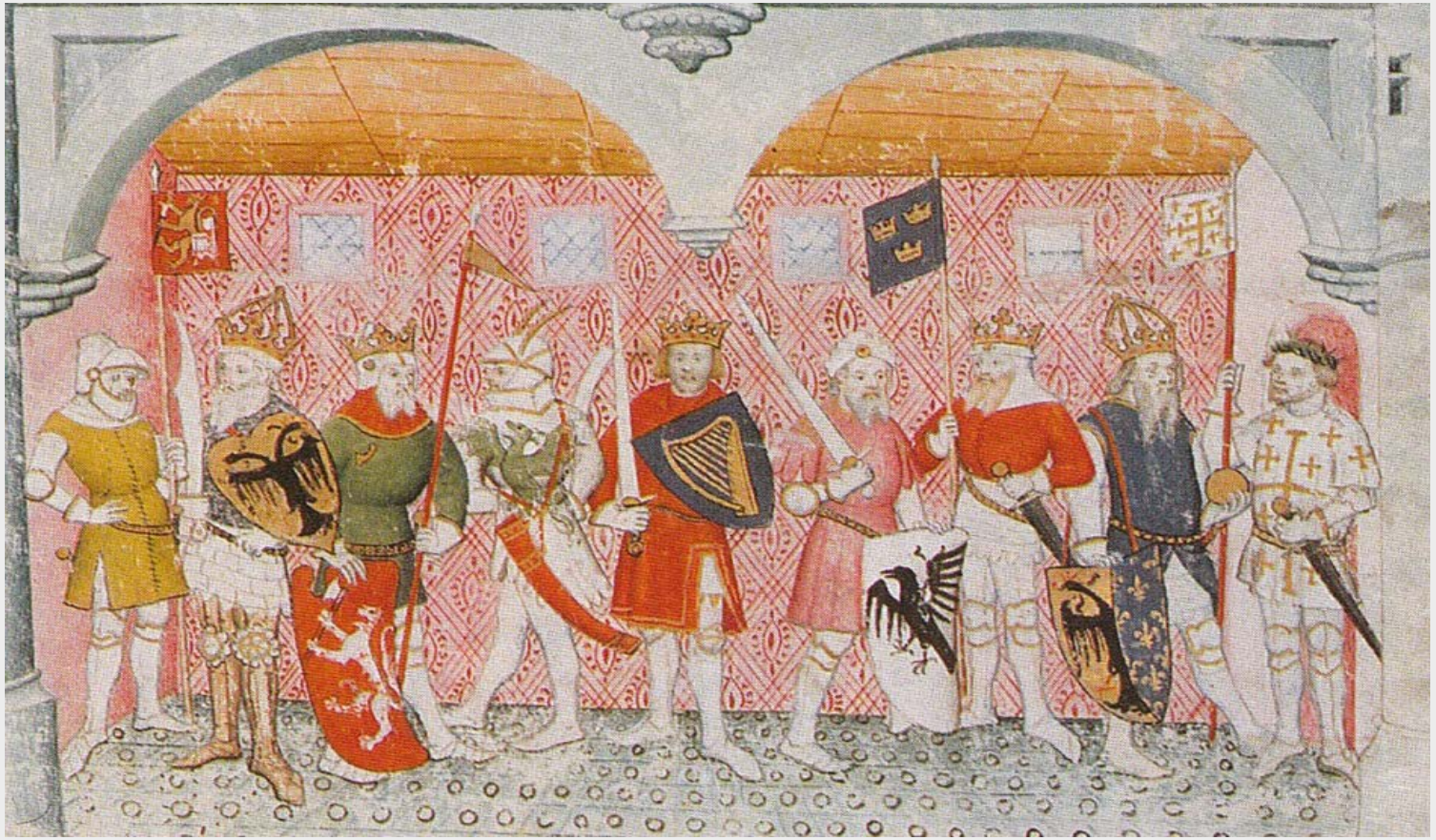
Ellinger Tor, Weissenburg

President of Germany Steinmeier (2017)

Emergence in the 12th century

Early tournament depiction from the „Queste del saint graal“,
Paris, BnF, fr. 342, fol. 102v (Artois, 13th c.)

Coat of arms in the Middle Ages



Depiction of the Nine Heroes (Hector of Troy, Julius Caesar, Alexander the Great; Judas Maccabee, King David, Joshua ; King Arthur, Charlemagne, Godfrey of Bouillon), France, 1404

Carpenters' Guild in Ghent

Augsburg guildsmen

The city of Augsburg

Peasant seal (Normandie)

Medial dissemination

In the Middle Ages and the early modern period, coats of arms could be depicted in almost all existing techniques on all conceivable supports, in the most private as well as in the most public space.

Coats of arms as a historical source

Posession

Memoria

Origin,
dominion, kinship, status,
claims ...

Abstract concepts (sins, death, Trinity)

Identity

... expanded e.g. by
stories of origin

Political concepts

Historiographical concepts

Pragmatic communication

State of research and current challenges

Coats of arms are a central means of communication in the Middle Ages and early modern period, the analysis of which provides comprehensive insights into pre-modern culture and society

Current state of research:

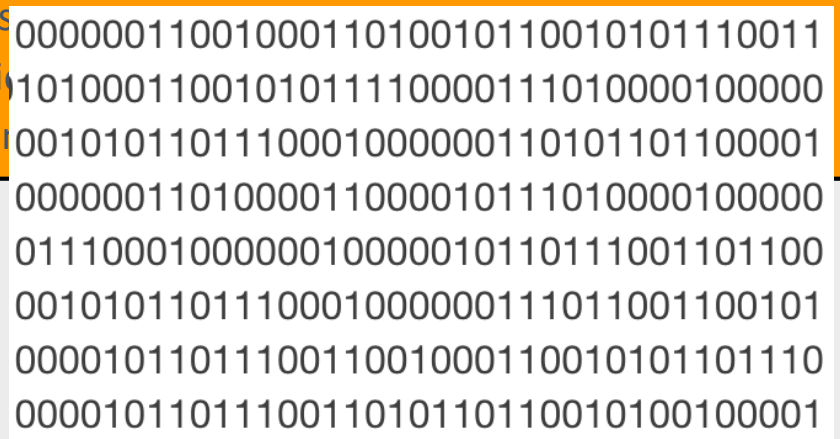
- Hardly researched so far
- No comprehensive historical accounts or analyses

Three (technical) challenges

1. Sheer quantity of surviving sources
2. Heterogeneity of contexts of use and tradition
3. Complexity of the topic itself

Evidence (mentions in the metadata):

- Clemensen, Ordinary of Medieval Armorial: 80,000 coat of arms (esp. from manuscripts).
- Bildindex Kunst und Architektur: 38,000 works
- Object catalogue of the GNM: 5650 objects with coats of arms
- Bibli
- Sieb

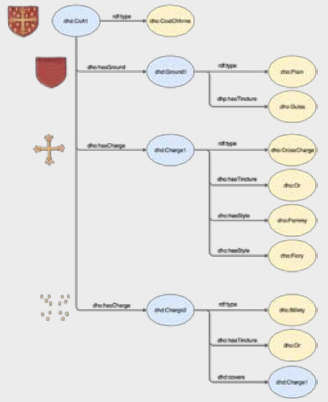


↳ Use of digital methods

Digital methods

1. Sheer quantity of surviving sources

2. Heterogeneity of contexts of use and tradition
3. Complexity of the topic itself



Machine Learning
(in Computer Vision)

Ontology Engineering & Linked Data
(Semantic Web Technologies)

Digital methods

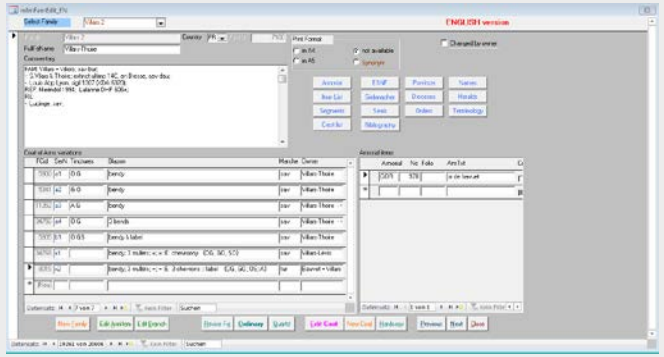
1. Sheer quantity of surviving sources

Machine Learning
(in Computer Vision)

2. Heterogeneity of contexts of use and tradition
3. Complexity of the topic itself

Linked Data & Ontology Engineering
(Semantic Web)

A point of departure:

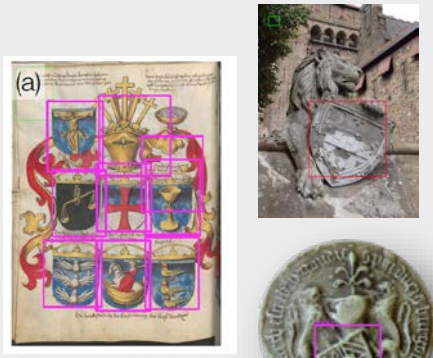


Steen Clemmensen, Ordinary of Medieval arms

- Medieval armorials (codices) up to c. 1500
- 111 armorials completed, a further 117 in parts
- 87,638 descriptions of coats of arms
- 17,763 families, towns, abbeys, etc.

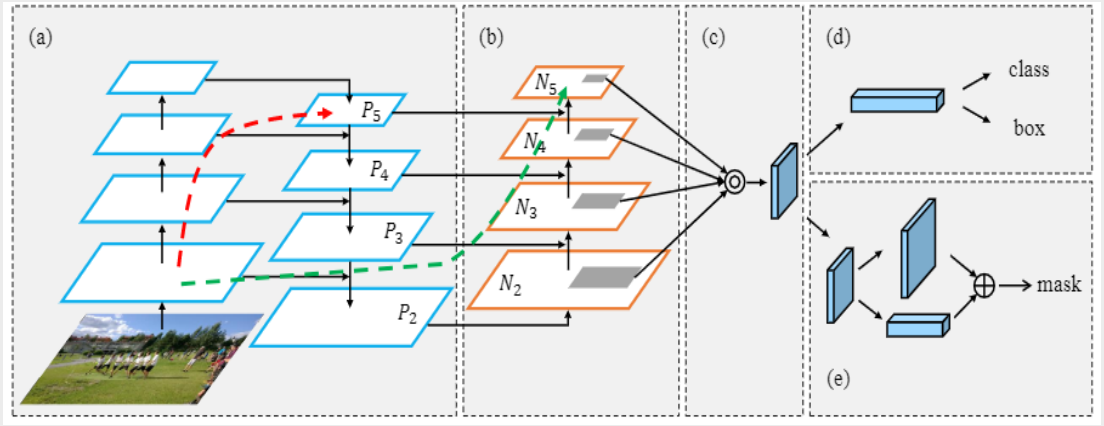
Machine Learning (in Computer Vision)

1. Collecting instances of heraldic representations (Detection)



In close collaboration with:
Prof. Benjamin Risse (Münster)
Computer Vision and Machine Learning Systems-Group

Current state



Detector: *Yolo 4*
Approx. 10.000 labeled coats of arms as training data
Several Classes (coats of arms, banner, clothing, …)
Precision: 0.89
Recall: 0.80

Machine Learning (in Computer Vision)

1. Collecting instances of heraldic representations (Detection)

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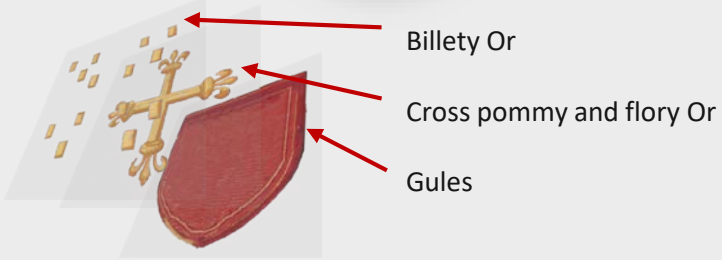
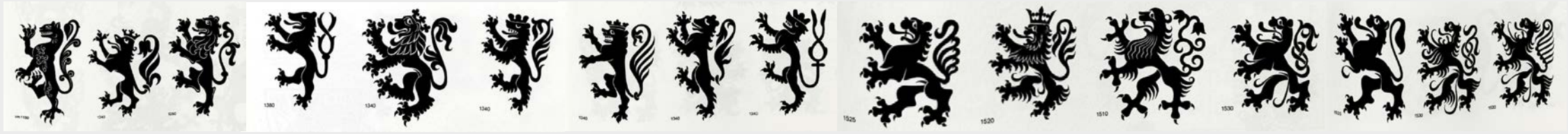
Future steps

2. Extracting the different heraldic components (Segmentation)



3. Supervised / Unsupervised Classification, Analysis of similarities



2. Semantic Web Technologies (encoding coats of arms)

Important: Shapes and colours are abstract

Representations of shapes and colours refer to the idea of these shapes and colours. The concrete representation does not matter.

- Red (light, dark, Bordeaux, etc.) = red
- Lion (thick, thin, ...) = lion

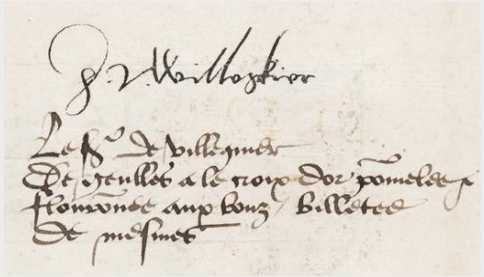




Michel Pastoureau: *Les armoiries sont une image conceptuelle qui peut exister sans être peint*.

2. Semantic Web Technologies (encoding coats of arms)

Important: Shapes and colours are abstract

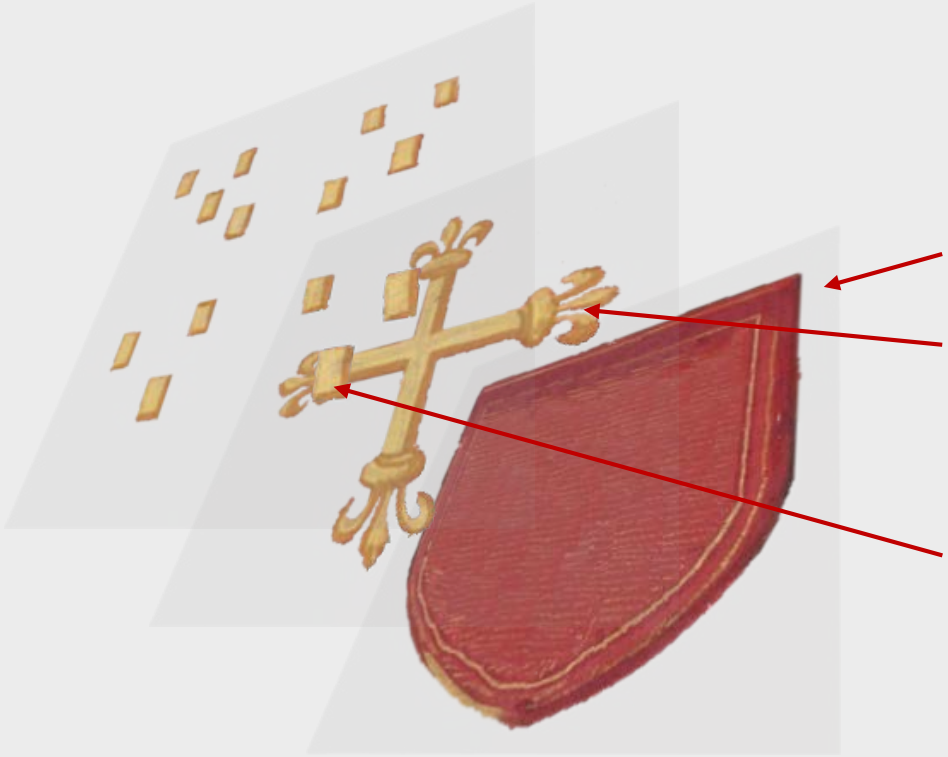


Le seigneur de Villequier
De guelles a le croix d'or pommelees et fleuronnée aux bouz, billetee de mesmes

Coats of arms are (usually) transferable without loss between pictorial and textual representation

2. Semantic Web Technologies (encoding coats of arms)

Medieval coats of arms as layered images



- *De geulles* (Gules - Red)
- *a le croix d'or pommelee et fleuronnée aux bouz* (cross pommy and flory Or)
- *billetee de mesmes* (Billety Or)

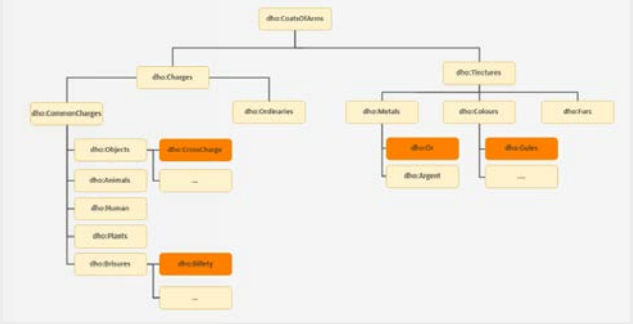
Gules, a cross pommy and flory Or, billety of the same.

2. Semantic Web Technologies (encoding coats of arms)

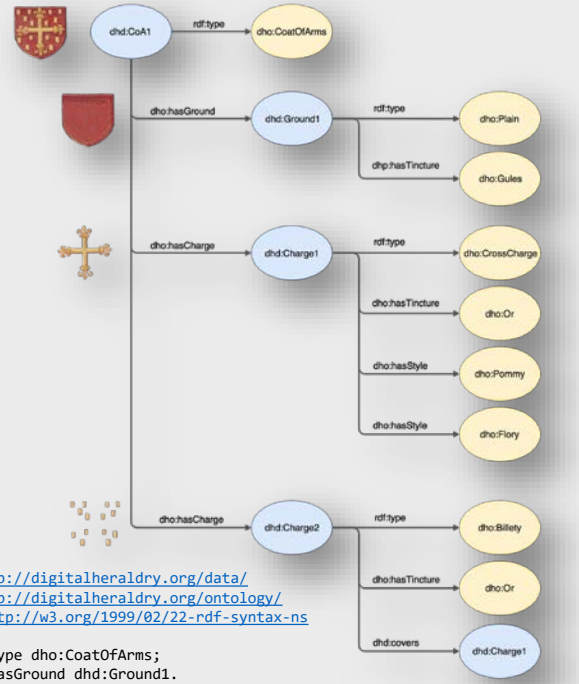
Ontology for the description of coats of arms

Instead of a mostly individually phrased string, a language-independent conceptual representation as a combination of abstract concepts

Heraldic description in plain text:
Gules, a cross pommy and flory
Or, billety of the same.



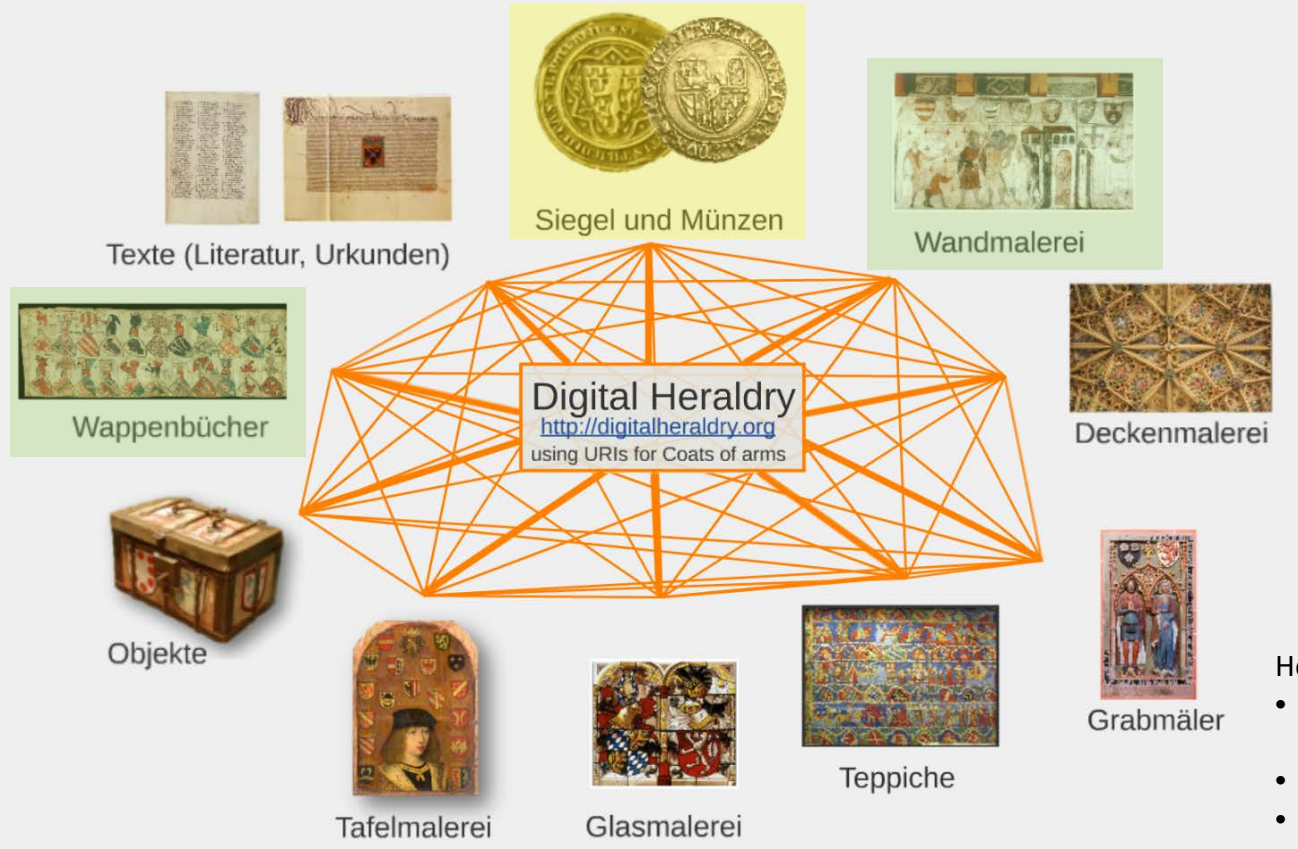
Ontology for the description of coats of arms (conceptualisation of coats of arms)

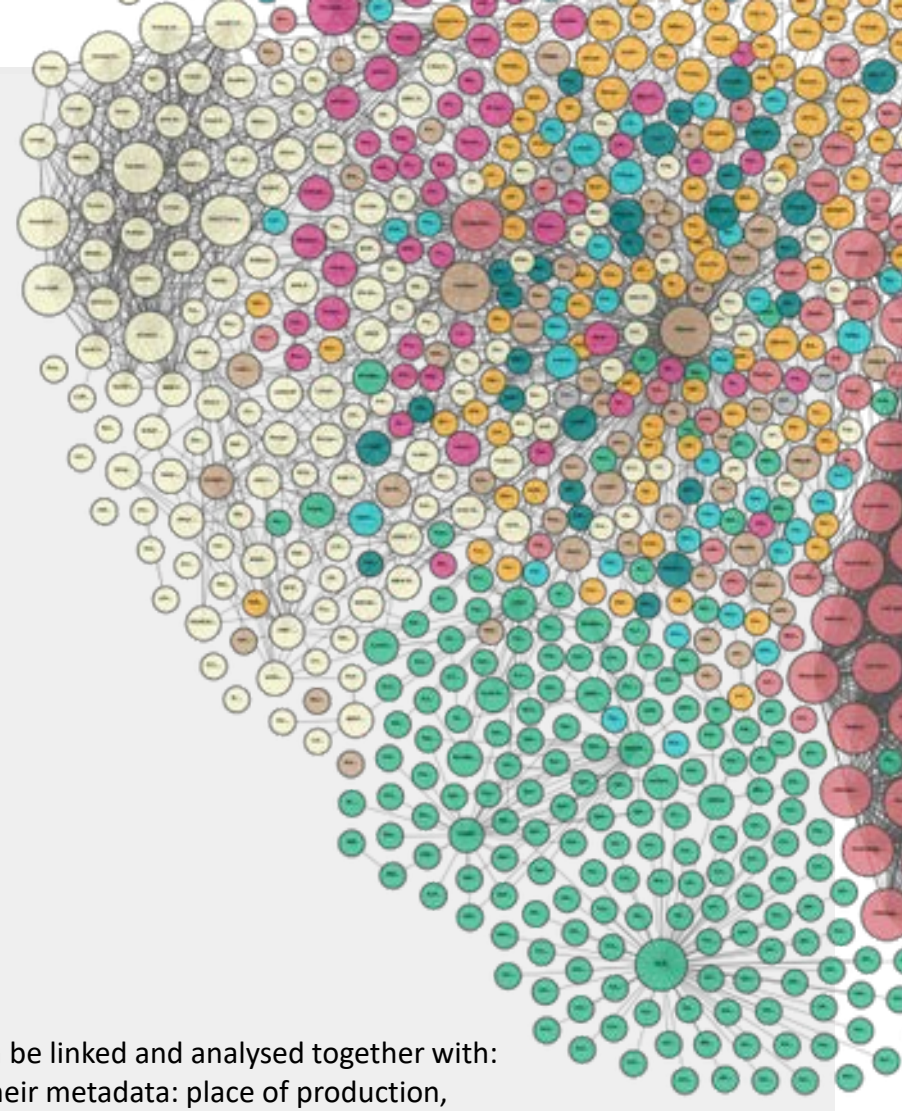



```
@prefix  dhd:   http://digitalheraldry.org/data/
@prefix  dho:   http://digitalheraldry.org/ontology/
@prefix rdf:     http://w3.org/1999/02/22-rdf-syntax-ns

dhd:CoA1      rdf:type dho:CoatOfArms;
              dho:hasGround dhd:Ground1.
dhd:Ground1   rdf:type dho:Plain;
               dho:hasTincture dhr:Gules.
dhd:CoA1      dho:hasCharge dhd:Charge1.
dhd:Charge1   rdf:type dho:CrossCharge;
              dho:hasTincture dho:Or;
              dho:hasStyle dho:Pommy,
                           dho:Flory.
dhd:CoA1      dho:hasCharge dhd:Charge2.
dhd:Charge2   rdf:type dho:Billety;
              dho:hasTincture dho:Or;
              dho:covers dhd:Charge1.
```

Perspectives: Connecting the repositories and include contexts in the analysis





Heraldic data can be linked and analysed together with:

- Objects and their metadata: place of production, place of discovery, provenance, etc.
- biographical, genealogical and social data
- geographical data, property, fiefs, etc.
- concepts

Question: How to analyse the data in the Knowledge Graph?

2. Semantic Web Technologies (encoding coats of arms)

Philipp Schneider

VolkswagenStiftung

Die *Performanz* der Wappen (Dilthey-Fellowship)

„Coats of arms in practice“-Project

Inclusion of context in data analysis using the example of heraldic wall paintings
Semantic Web, Machine Learning

Event information:

Zeit: Mittwochs, 16-18 Uhr c.t.
Ort: Videokonferenz via Zoom

Wenn Sie an der Veranstaltung gern teilnehmen möchten, melden Sie sich bitte einfach per Email bei uns: digitalhistory@hu-berlin.de.

***Digital History* – Offenes Forschungskolloquium (via Zoom)**

9. Februar
Data for History Lectures*
Philipp Schneider (HU Berlin)
Putting visual sources into context: Towards an ontology to analyze medieval heraldic murals and ceiling paintings