Digital Heraldry
Exploring the Middle Ages with Machine Learning and Semantic Web Technologies
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

The city of Augsburg

Augsburg guildsmen

Peasant seal (Normandie)
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**
- **Identity** ... expanded e.g. by stories of origin
- **Political concepts**
- **Historiographical concepts**
- **Origin,** dominion, kinship, status, claims ...
- **Abstract concepts (sins, death, Trinity)**
- **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 coats of arms (esp. from manuscripts).
- Bildindex Kunst und Architektur: 38,000 works
- Object catalogue of the GNM: 5650 objects with coats of arms
- Bibliothèque nationale de France (BnF): 800 Mss.
- Siebmacher: 130,000 listed coats of arms

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

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.
1. Collecting instances of heraldic representations (Detection)

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)

Future steps

1. Collecting instances of heraldic representations (Detection)
2. Extracting the different heraldic components (Segmentation)
3. Supervised / Unsupervised Classification, Analysis of similarities

In close collaboration with:
Prof. Benjamin Risse (Münster)
Computer Vision and Machine Learning Systems-Group
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 guelles (Gules - Red)
- a le croix d’or pommelee et fleuronnée aux bouz (cross pommy and flory Or)
- billetee de mesmes (Billey Or)

Gules, a cross pommy and flory Or, billey of the same.
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)
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?
Philipp Schneider

„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.