

Exploring Avant-Garde: Visualizing Clusters of Exhibited Artists

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Supervisor: Raphael Buchmüller

Chair of Data Analysis & Visualization

Bachelor Project



Explosion of Diverse Movements

Introduction



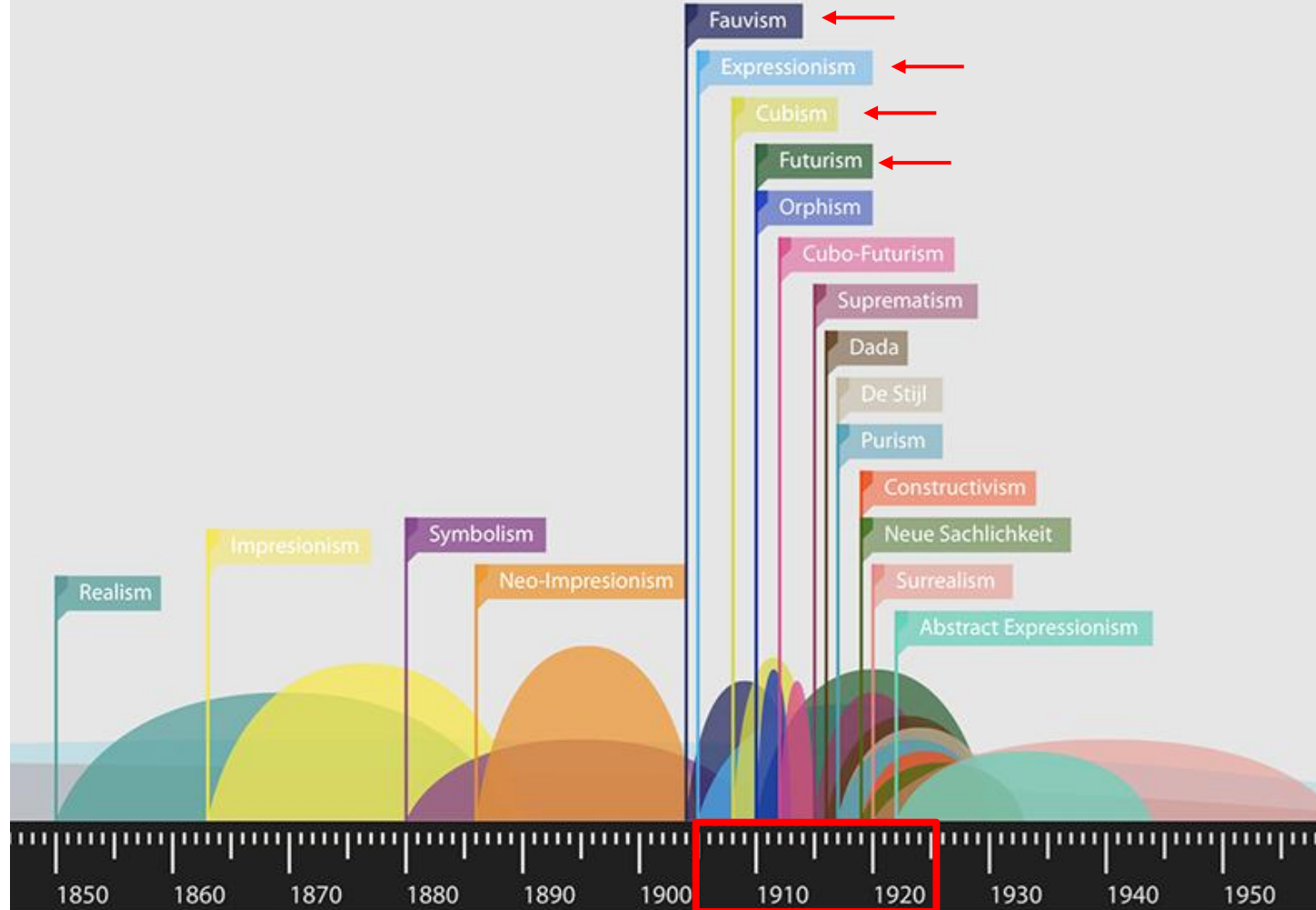
[1] The City Rises, 1910
by Umberto Boccioni
(**Futurism**)



[2] The Scream, 1893
by Edvard Munch
(**Expressionism**)



<https://www.behance.net/gallery/9355791/Timeline-of-Modern-Art>



[3] Joy of Life, 1905
by Henri Matisse
(**Fauvism**)



[4] Girl with Mandolin, 1910
by Pablo Picasso
(**Cubism**)



[1] <https://www.moma.org/collection/works/79865> [2] <https://www.wizardgallery.com/blog/64-edvard-munch-s-influence-on-art-symbolism-expressionism-and/>

[3] <https://www.henrimatisse.org/joy-of-life.jsp> [4] <https://www.pablocicasso.org/cubism.jsp>



How can we Explore Collectives in Artistic Movements?

There is Finally Data

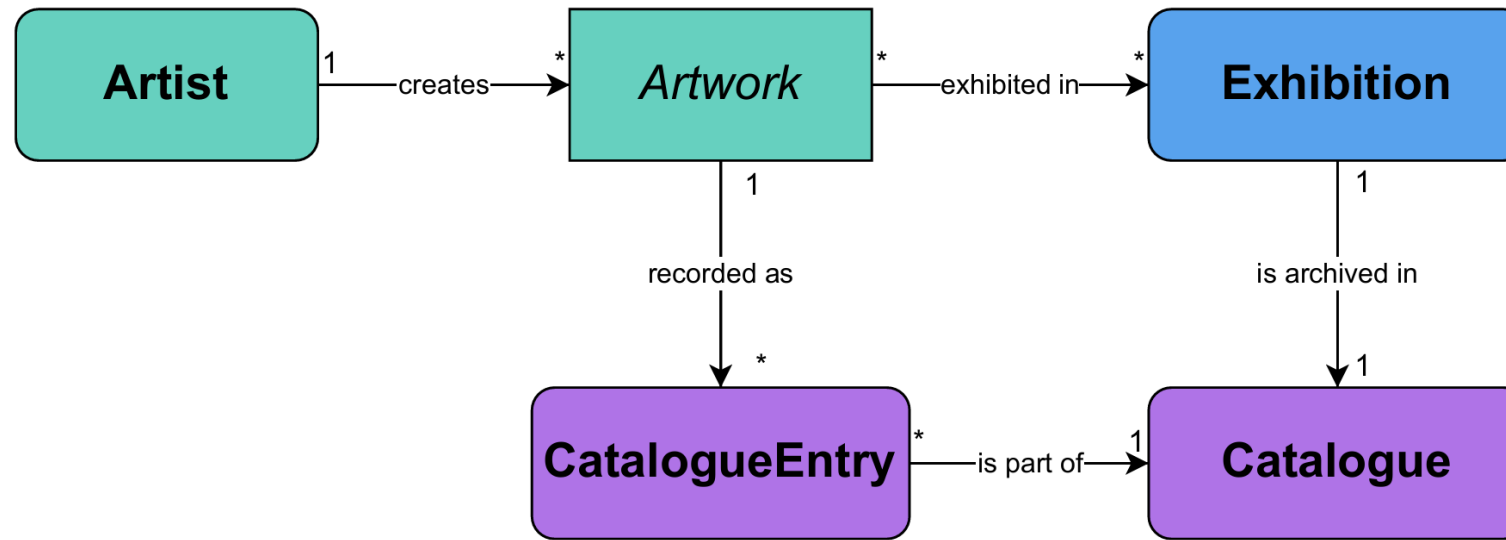
Introduction



- Principal Investigator: **Raphael Rosenberg**
 - professor at the Department of Art History (University of Vienna)
- European Paintings and Drawings **1905-1915**



Overview of Data

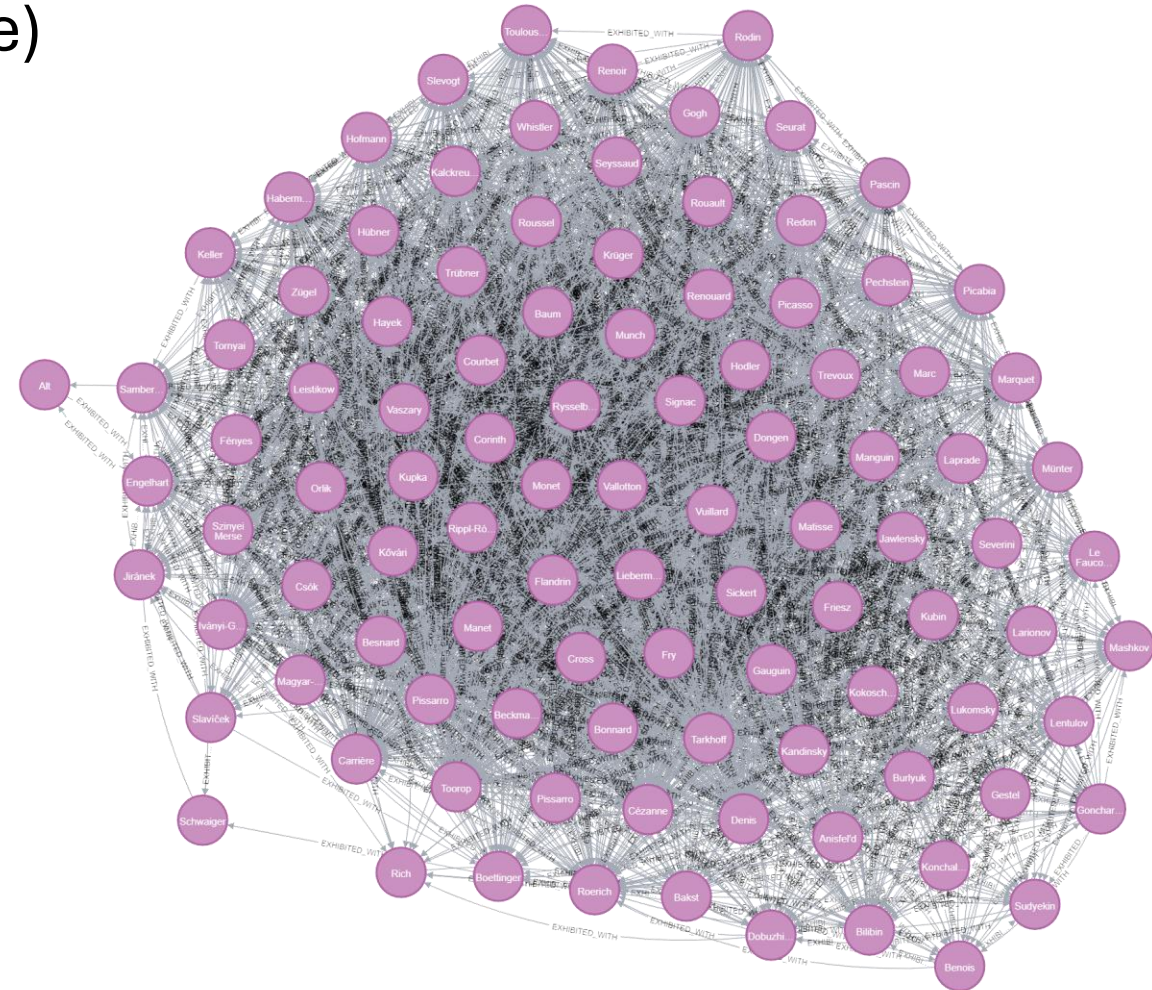


Overcoming Density: We need VA!

Introduction



- Graph generated by Neo4J (Graph Database)
 - 102 Artists, 3931 Edges!
- Hairball graph: dense, complex
- **Solution:** VA that groups artists and makes collectives visible



Related Work: Eurovis 2024

Background

Mapping the Avantgarde: Visualizing Modern Artists' Exhibition Activity.

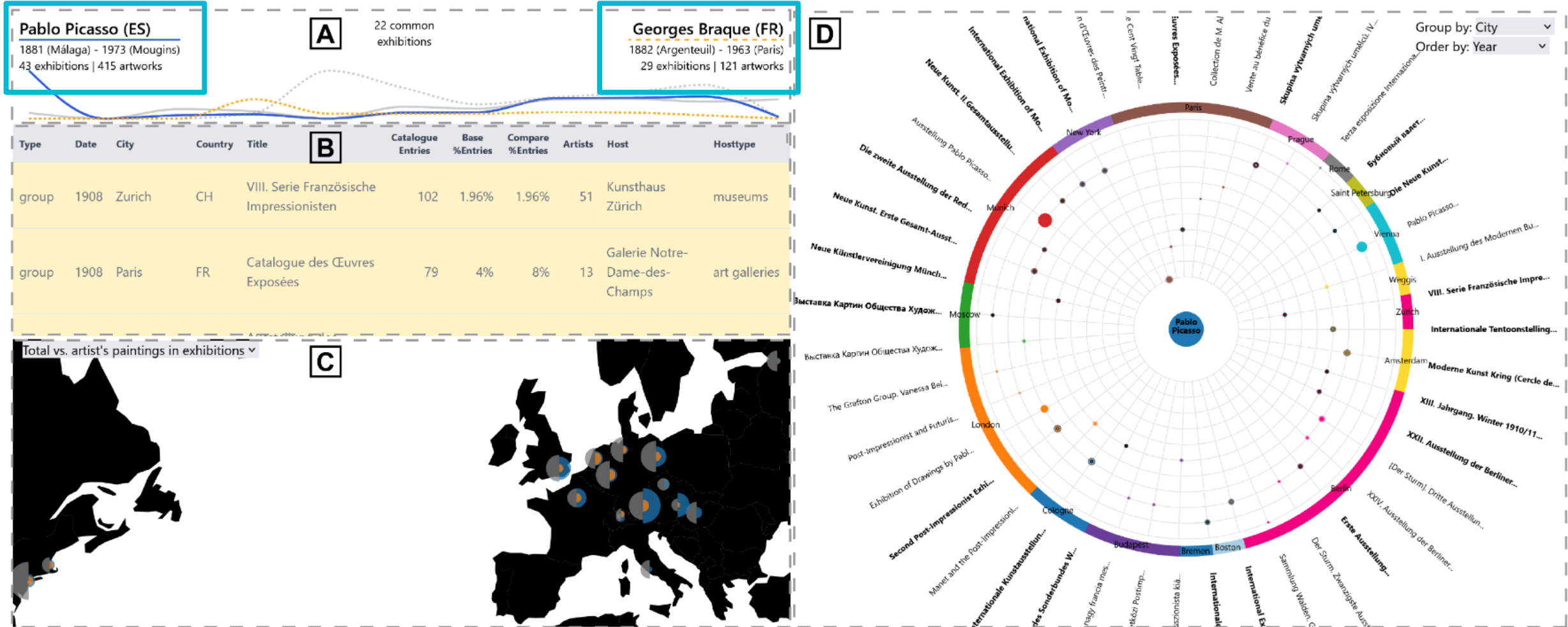


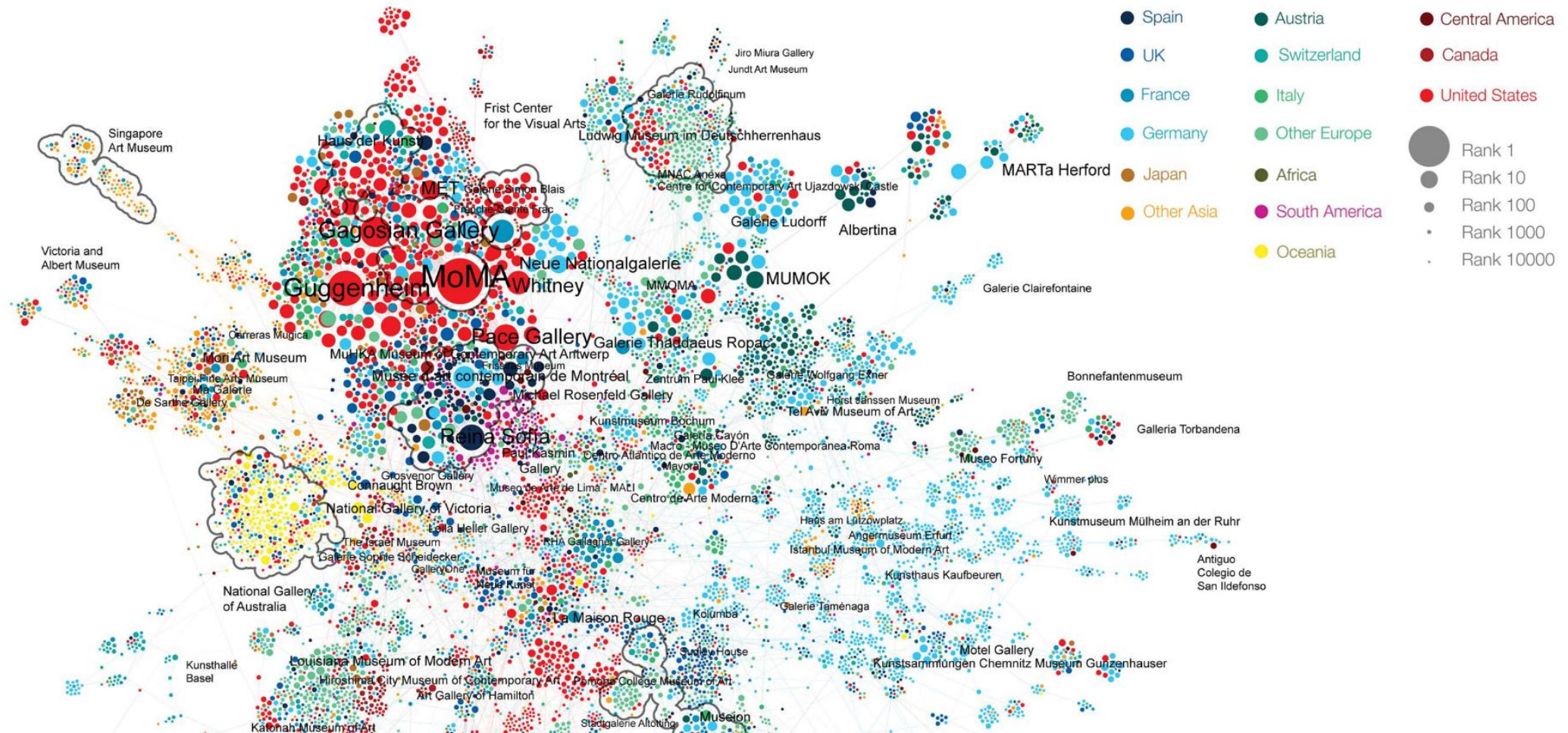
Figure 1 of Michaela Tuscher, **Velitchko Andreev Filipov**, Teresa Kamencek, **Raphael Rosenberg**, and Silvia Miksch. 2024. Mapping the Avantgarde: Visualizing Modern Artists' Exhibition Activity. *EuroVis 2024 - Short Papers* (2024). <https://doi.org/10.2312/EVS.20241063>

Related Work: Network of Exhibitions

Background

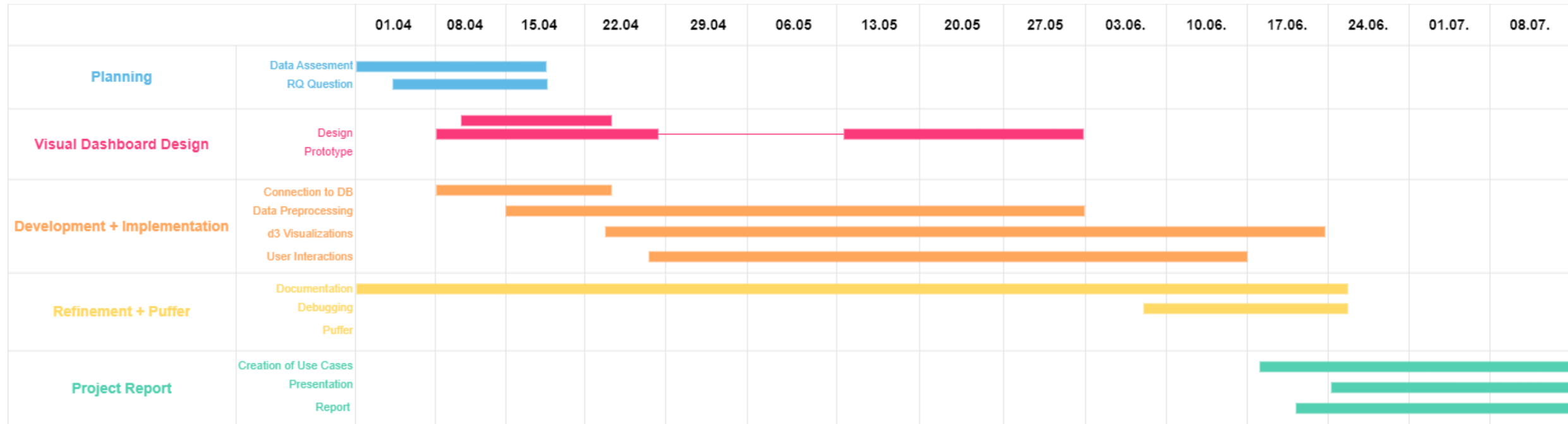


Quantifying reputation and success in art.



Typical Project Workflow

Background



Component Programming

Implementation



Backend

- Neo4j
 - Provided by Velitchko Filipov, Silvia Miksch (CVASt)
- Node.js, Express
- Java, Cypher

Frontend

- Angular
- D3
- Typescript



Custom Clustering Approach

Implementation



- Experimented with Neo4J Algorithms:
 - *Modularity Optimization, SCC, WCC, Louvain*
 - Too many clusters even for a smaller number of artists
 - **No control over the number of clusters**
- Own Implementation of **Spectral Clustering**
 - Suitable for graph structure
 - Utilizes edge weights


Main Steps:

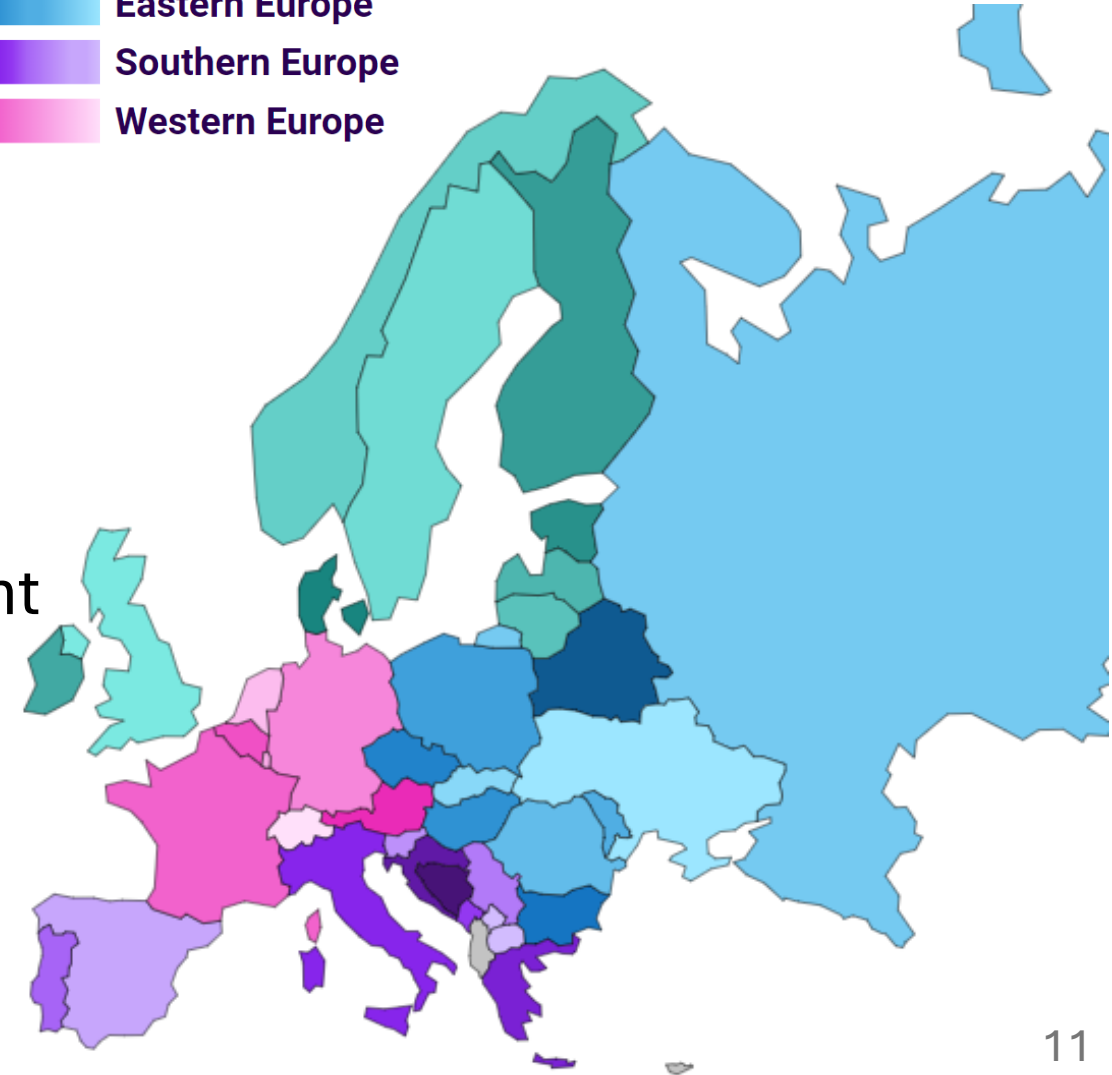
1. Adjacency & Degree Matrix Construction
2. Laplacian Matrix Calculation & Normalization
3. Eigenvalue Decomposition
4. **K-means Clustering**

Geography as a Key Indicator

Design Decisions



- Artists from the same region tend to collaborate.
- Focus of **Data** on Geography
- Geographic emphasis => **Color Encoding**
- Split of Regions: Geoscheme of United Nations Statistics Division (UNSD)
- Goal: Highlight connections between different regions
- For non-european countries: 



Custom Radial Layout

Design Decisions

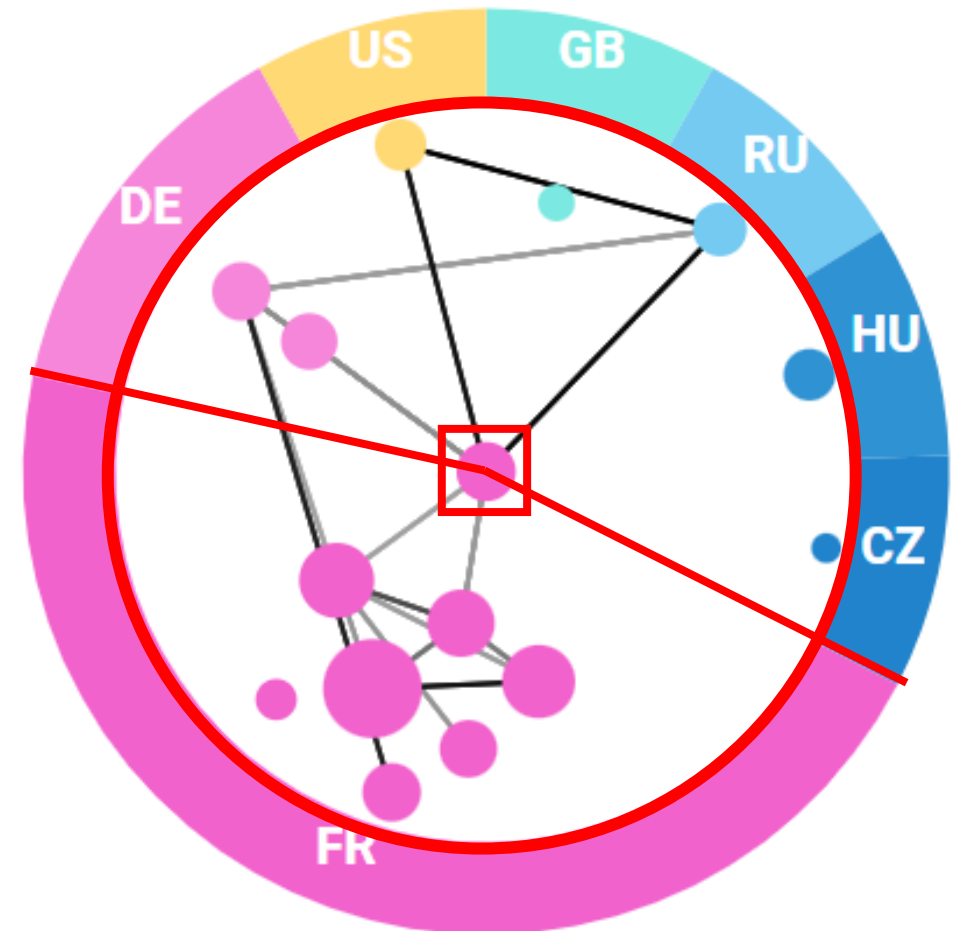


Node - Artist

- Placed from **inner to outer circle** based on degree to visualize **relevance**
- Positioned within **angle** of (here:) their death **country**
- **Size**: Amount of Exhibitions
 - Adjustable in tool

Edges – Co-Exhibition

- Edge **weight**: based on min. number of artworks both artists exhibited
- Avoid Clutter: **threshold** & **color scale**



Custom Radial Layout

Design Decisions

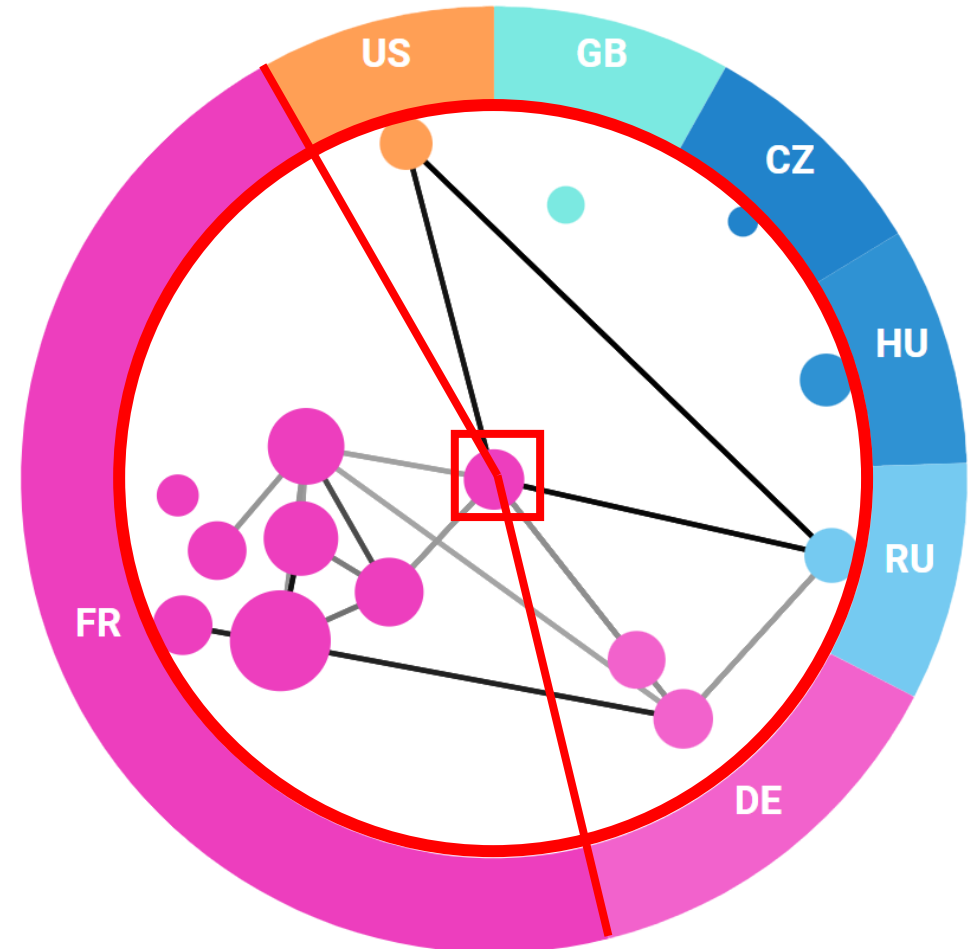


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Custom Radial Layout

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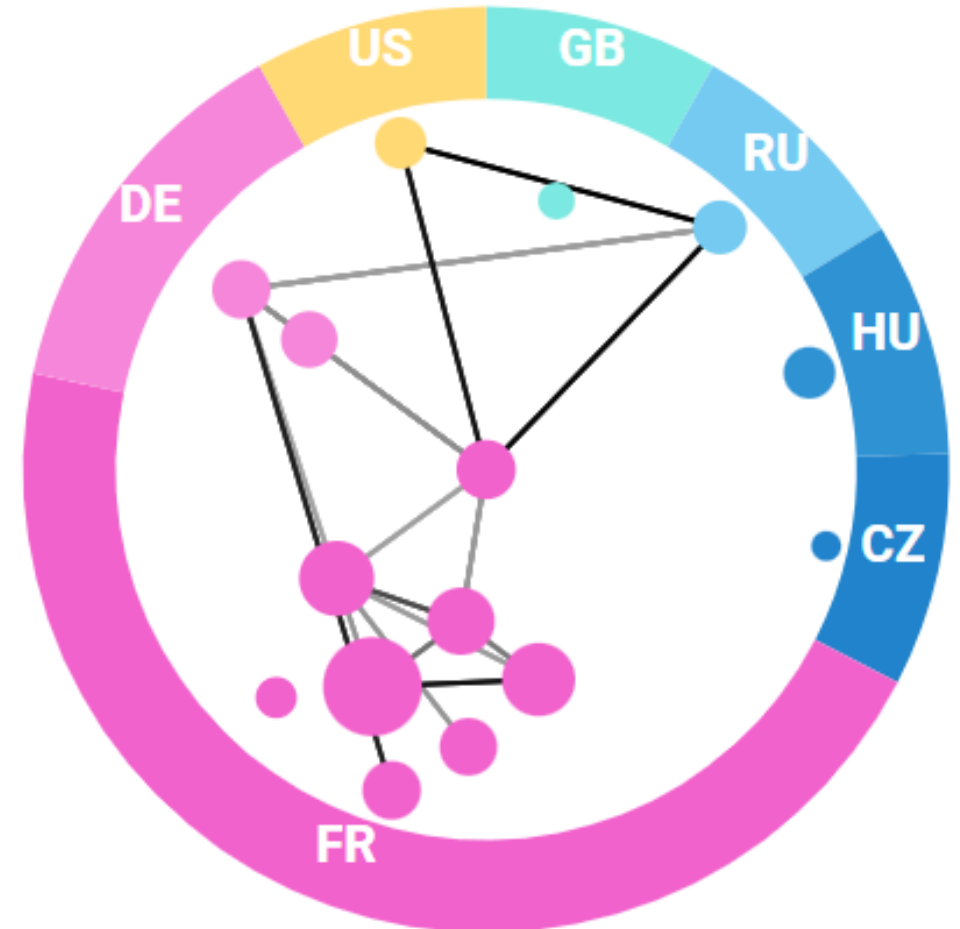


Node - Artist

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- **Size**: Amount of Exhibitions
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Edges – Co-Exhibition

- Edge **weight**: based on min. number of artworks both artists exhibited
- Avoid Clutter: **threshold** & **color scale**
- **Edges visible by interaction**

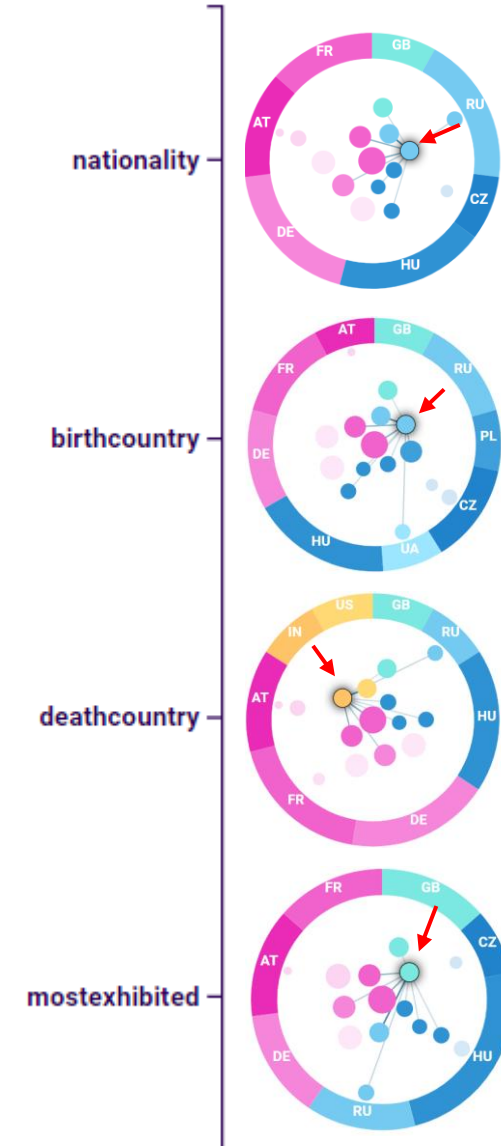


Small Multiples

Design Decisions



- Each **Column** represents one **Cluster**
- **Rows:** Geographic Focus
 - Nationality
 - Birth Country
 - Death Country
 - Most Exhibited Country
- Trace the **geographic journey** of the cluster and artists => artistic movements





Tool Overview

Design Decisions

Possible user changes:

Search for an artist:

Select node size:

Amount of Exhibitions

Select the range of exhibited artworks to filter artists:

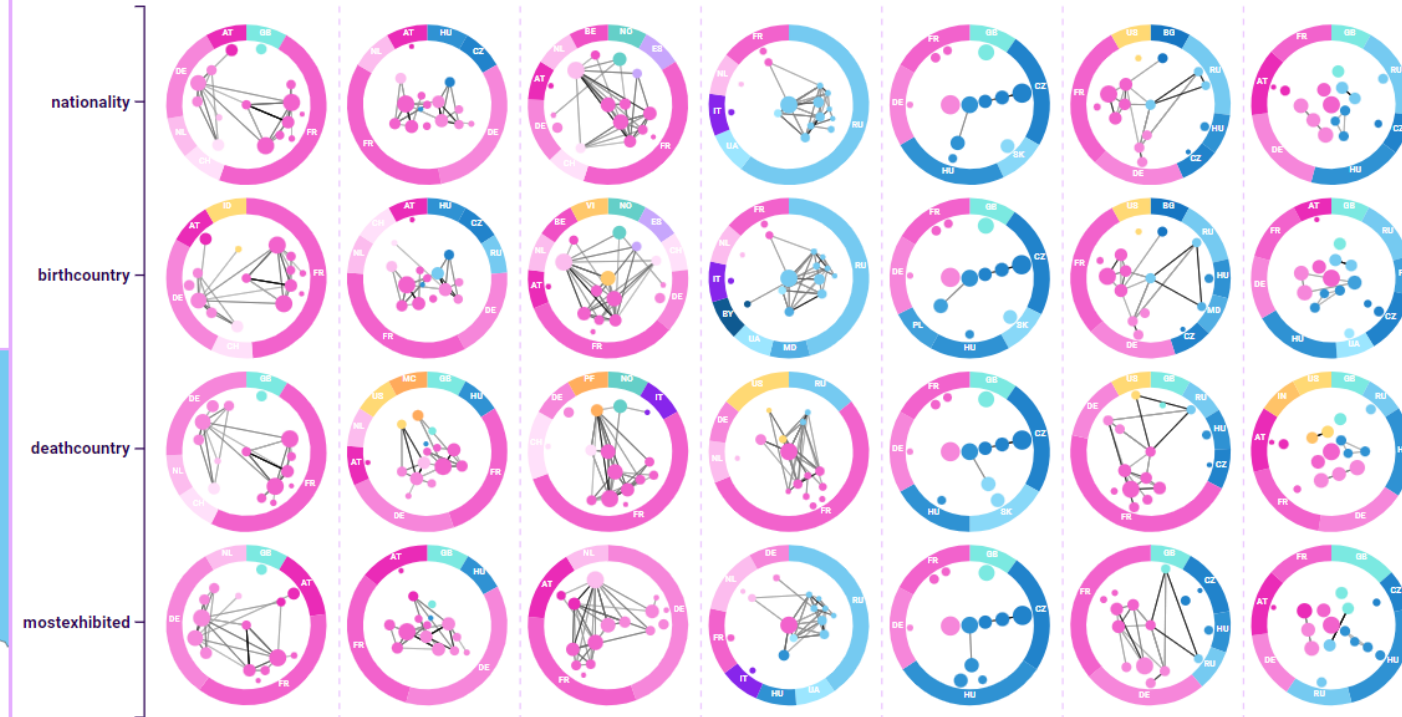
1 200 2217

Select the number of artist clusters:

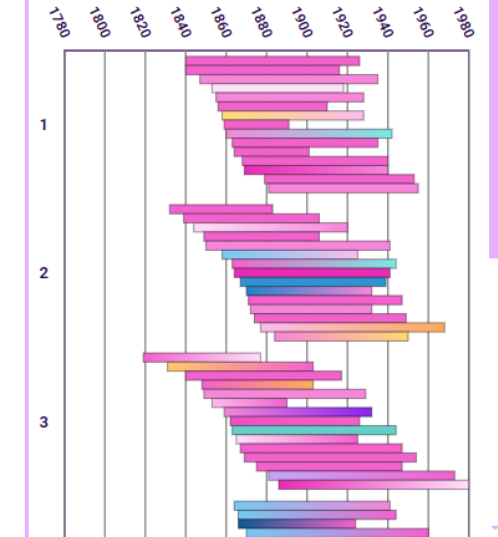
1 7



Displaying 102 artists and 7 clusters

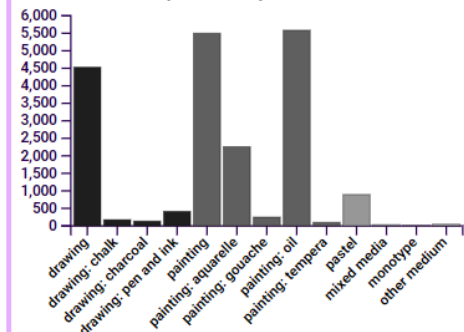


Overview of all artists' lifespans

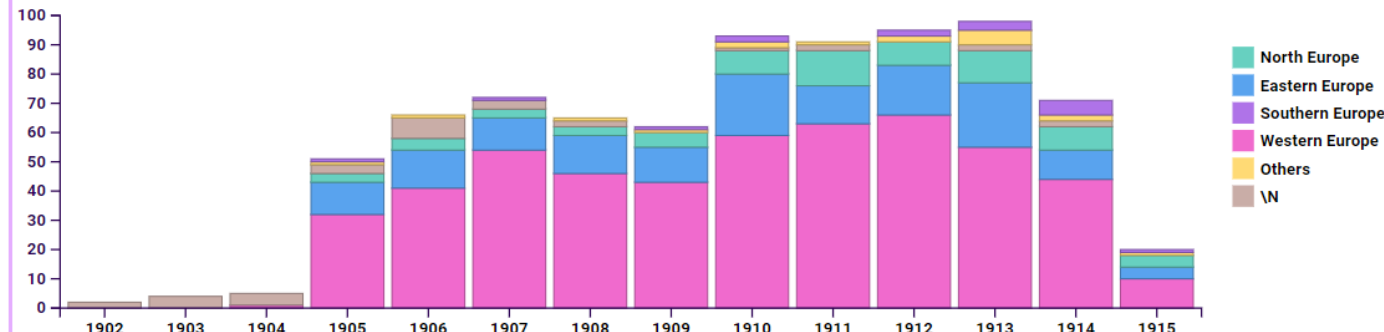


Overview of exhibition timelines

Overview of techniques used by all 102 artists



Overview of all exhibitions of all 102 artists



Click on a bar in the overview of the exhibitions to display the timeline of these exhibitions.



User Decisions

Design Decisions

Possible user changes:

Search for an artist:

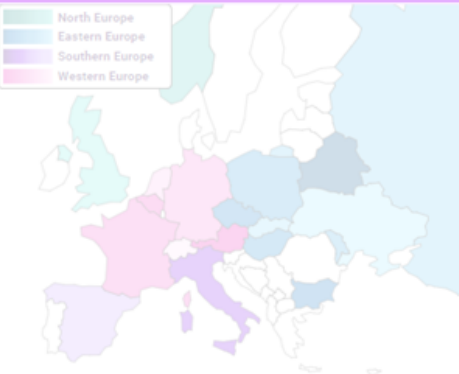
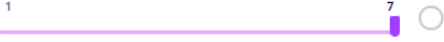
Select node size:

Amount of Exhibitions

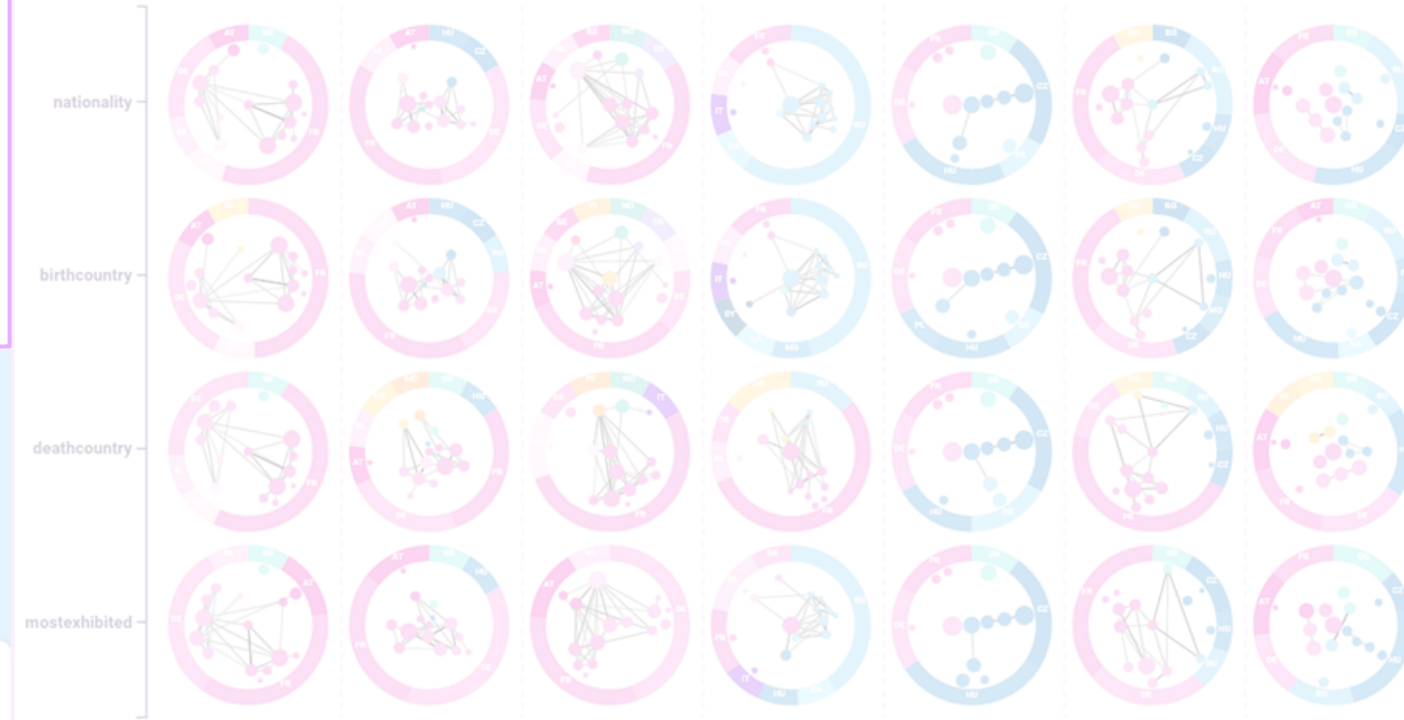
Select the range of exhibited artworks to filter artists:



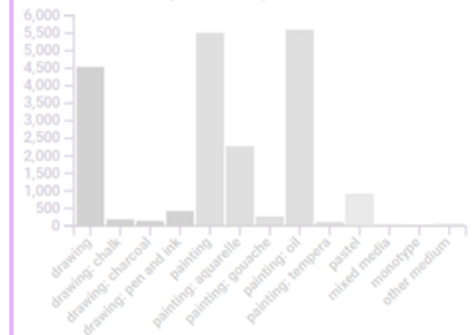
Select the number of artist clusters:



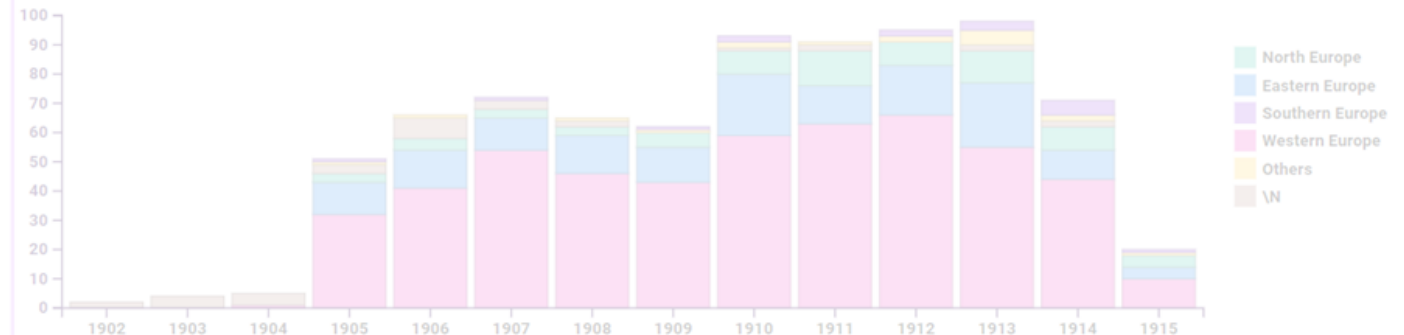
Displaying 102 artists and 7 clusters



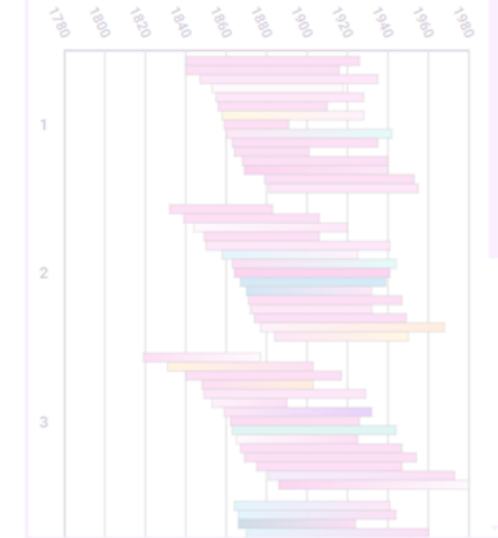
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Overview of all exhibitions of all 102 artists



Overview of all artists' lifespans



Overview of exhibition timelines

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User Decisions

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Possible user changes:

Search for an artist:

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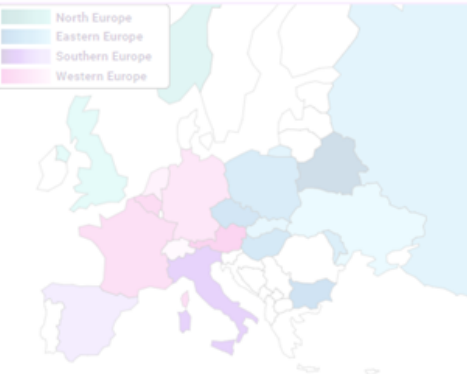
default: Importance (Degree)

Amount of different techniques

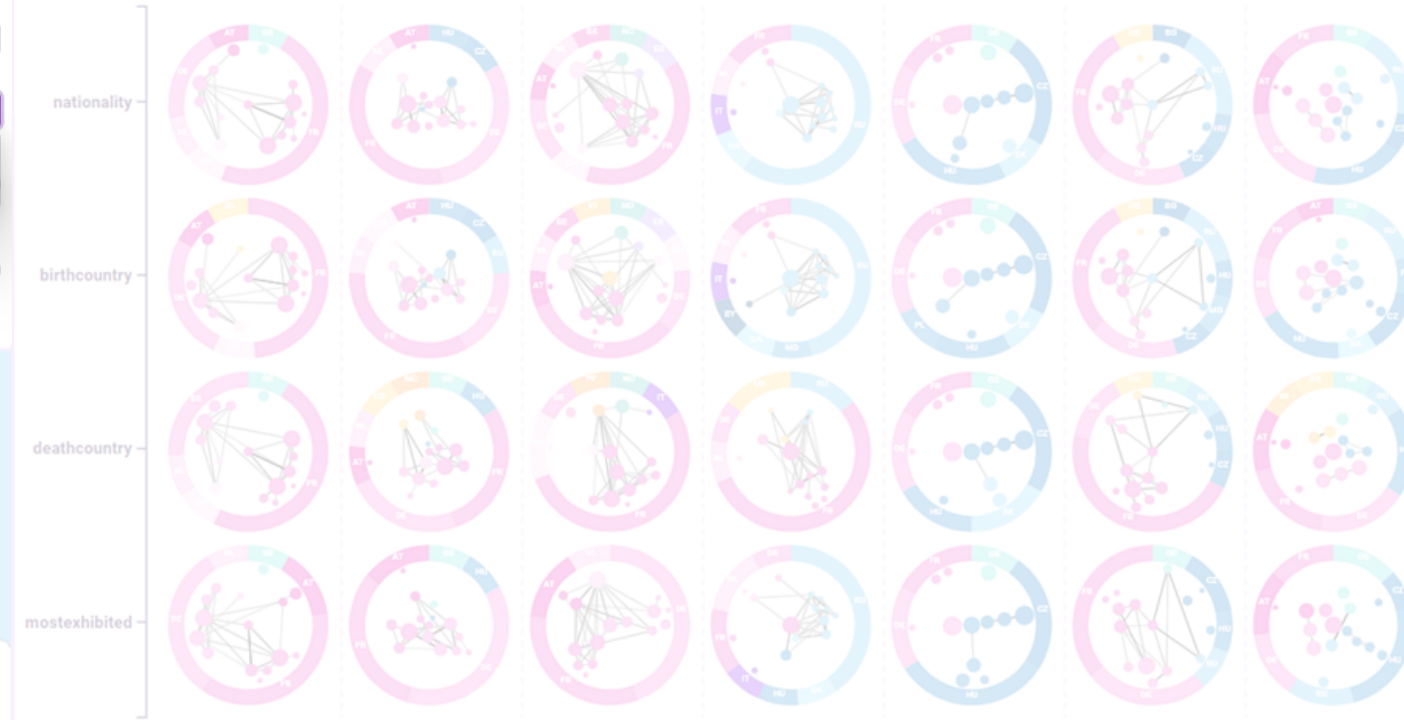
Amount of exhibited Artworks

Select the number of artist clusters:

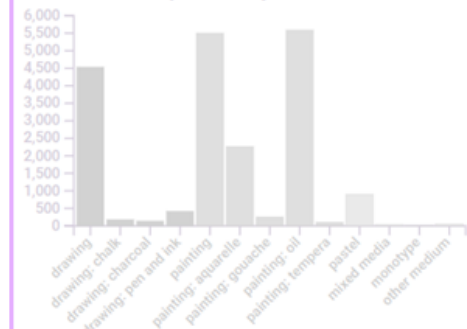
7



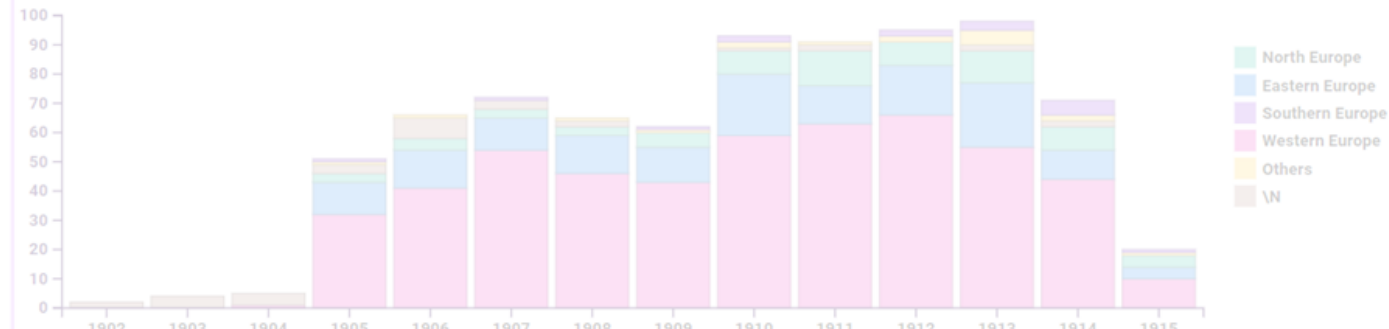
Displaying 102 artists and 7 clusters



Overview of techniques used by all 102 artists



Overview of all exhibitions of all 102 artists



Overview of all artists' lifespans



Overview of exhibition timelines

Click on a bar in the overview of the exhibitions to display the timeline of these exhibitions.

Techniques

Design Decisions



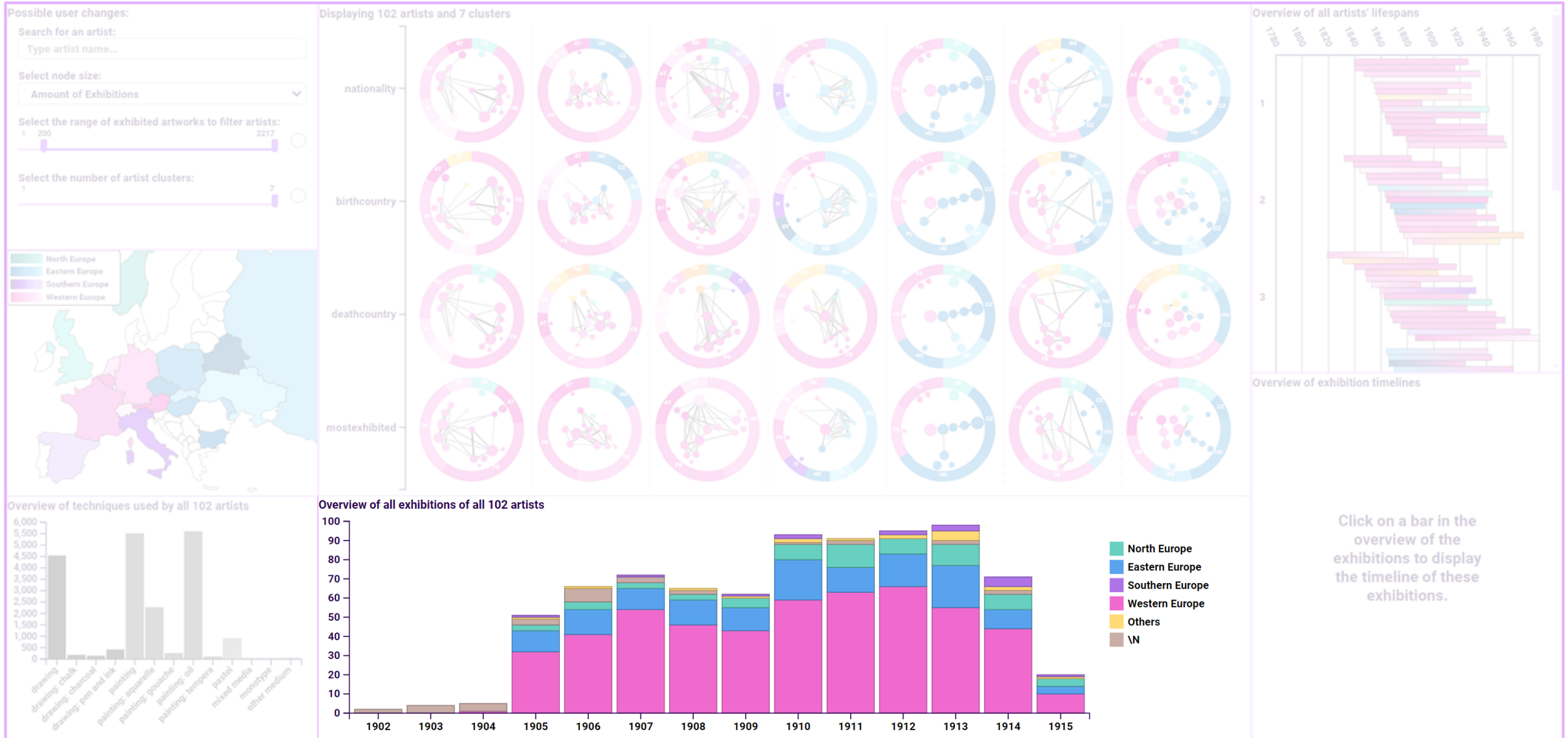
Artist Lifespans

Design Decisions



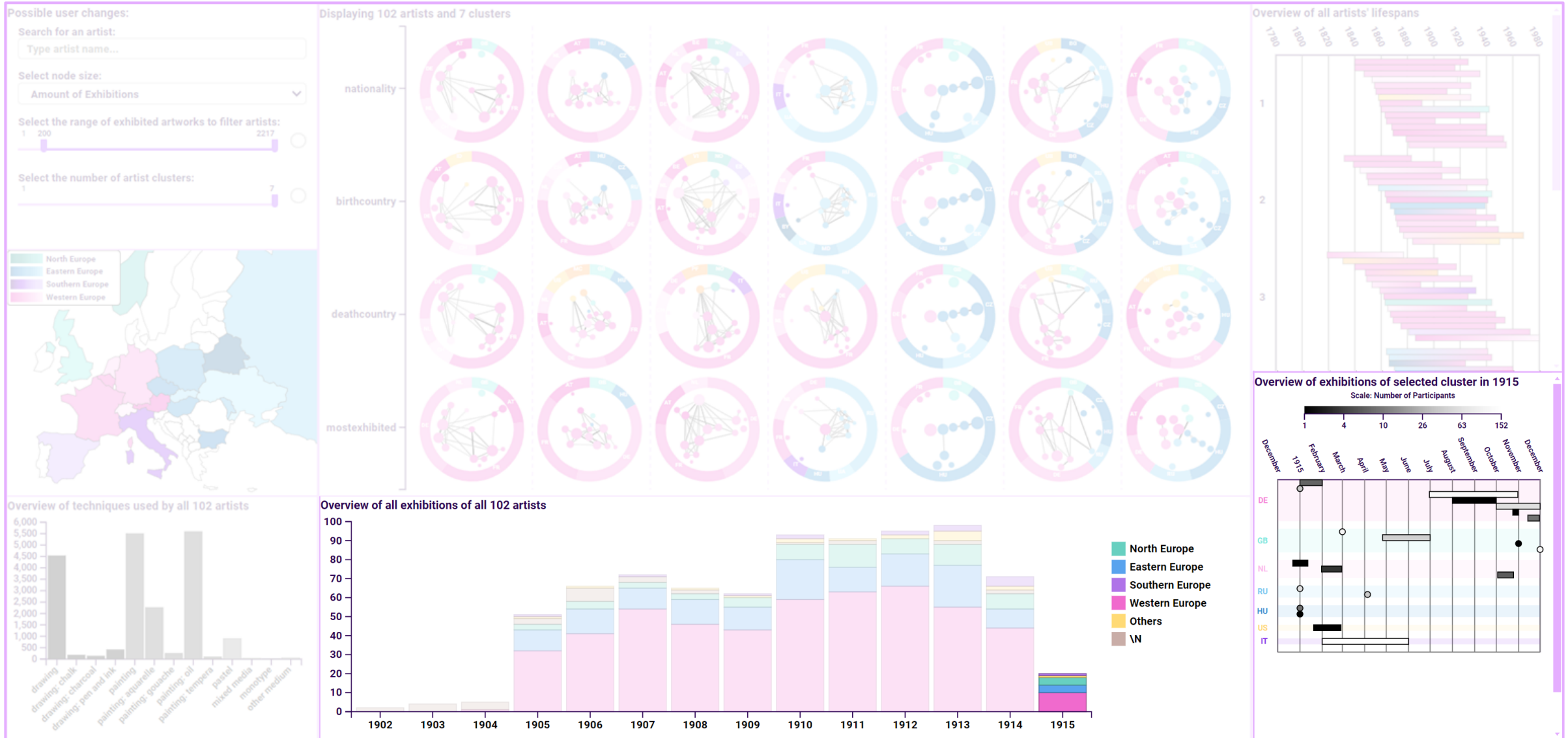
Exhibitions

Design Decisions



Exhibitions over time

Design Decisions



Scenarios of two Use Cases

Art Student

- Research specific Artist
- Example: Vincent Van Gogh (Impressionism)



Sources validating Findings:

- “Through [Pissarro’s] dedication to the Impressionist movement, he earned the nickname “The father of Impressionism”. ”
<https://artincontext.org/camille-pissarro>
- <https://www.vangoghmuseum.nl/en/prints/person/39732/pissarro-camille>
- <https://www.riseart.com/article/2607/gauguin-and-van-gogh-an-explosive-friendship>
- <https://www.tricera.net/artclip/blog912>
- <https://www.kunstimunterricht.de/kunstgeschichte/stilrichtungen/72-impressionismus-allgemeine-grundlagen.html>

Art Historican

- Exploring clusters
- Identify patterns (e.g. triangle, outlier, pairs)



Sources validating Findings:

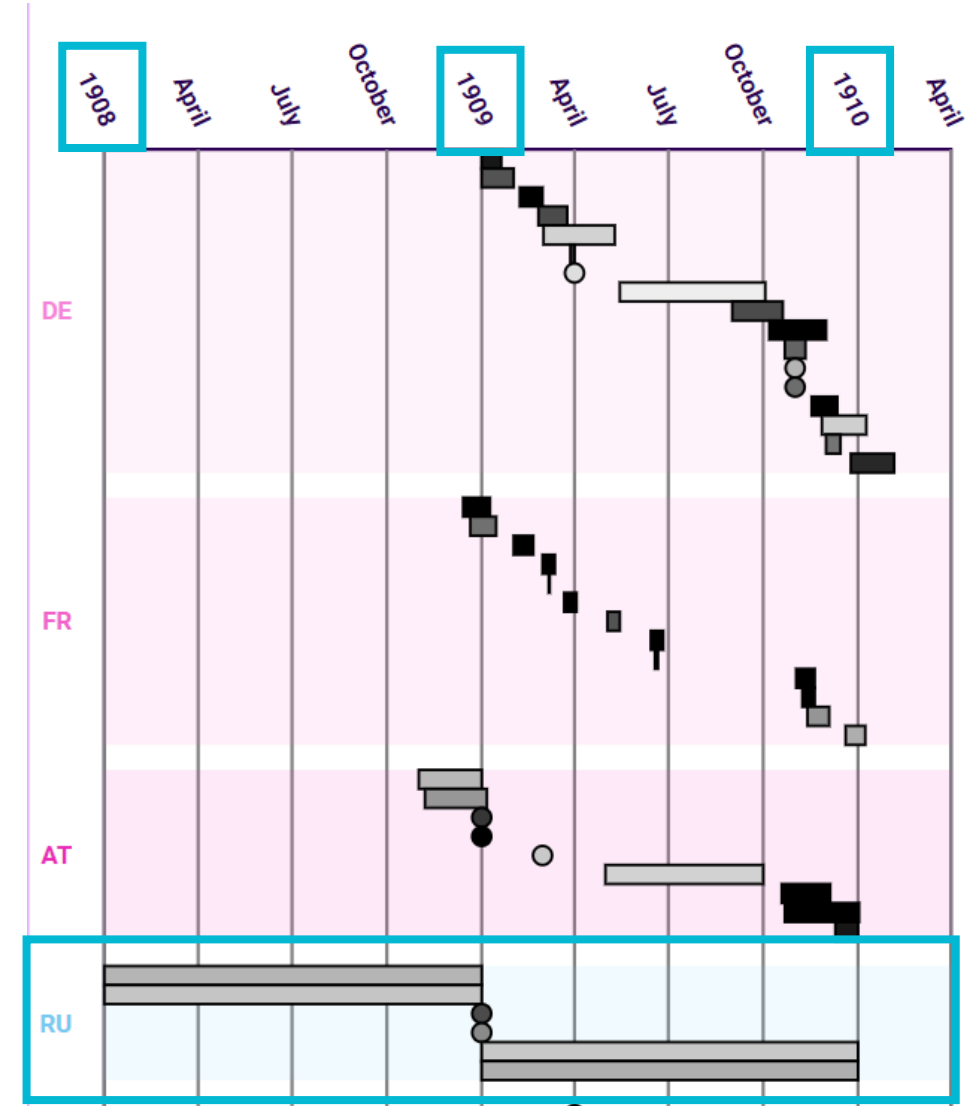
- <https://www.britannica.com/topic/Jack-of-Diamonds>
- <https://www.kettererkunst.com/dict/neue-kunstlervereinigung-munchen.php>
- <http://www.visual-arts-cork.com/history-of-art/donkeys-tail.htm>
- <https://www.idealart.com/magazine/russian-avant-garde>

Further Findings

Findings



1. Four one-year-long exhibitions in Russia (1908-1910): three in Moscow, one in St. Petersburg.



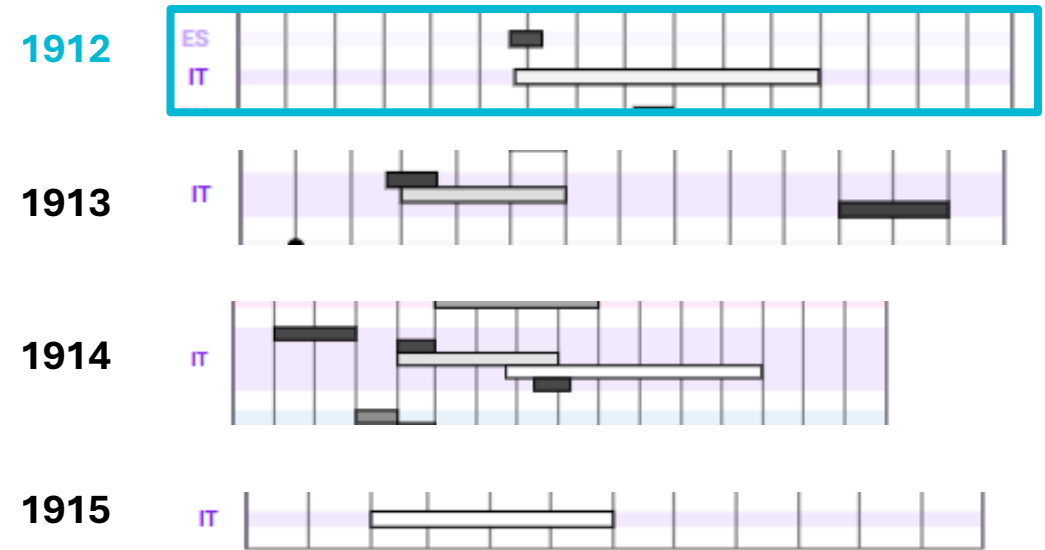
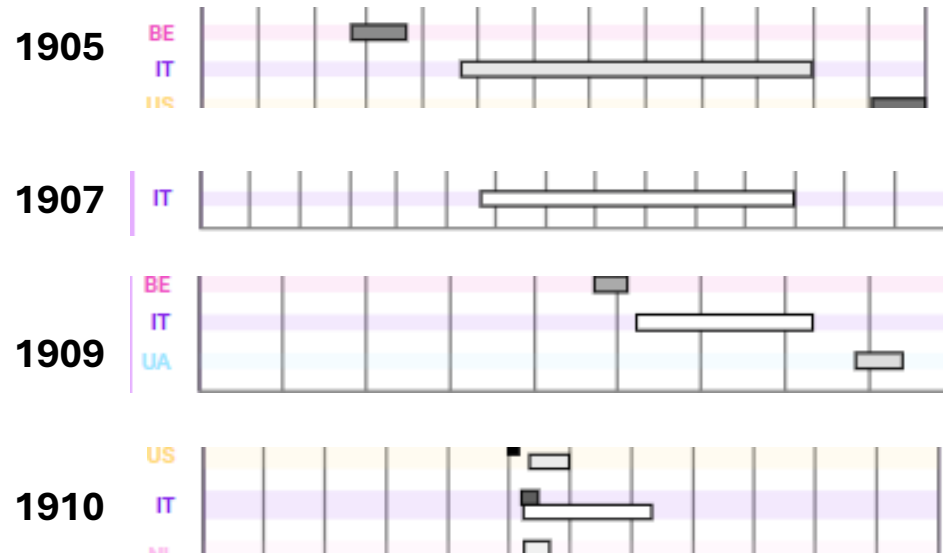
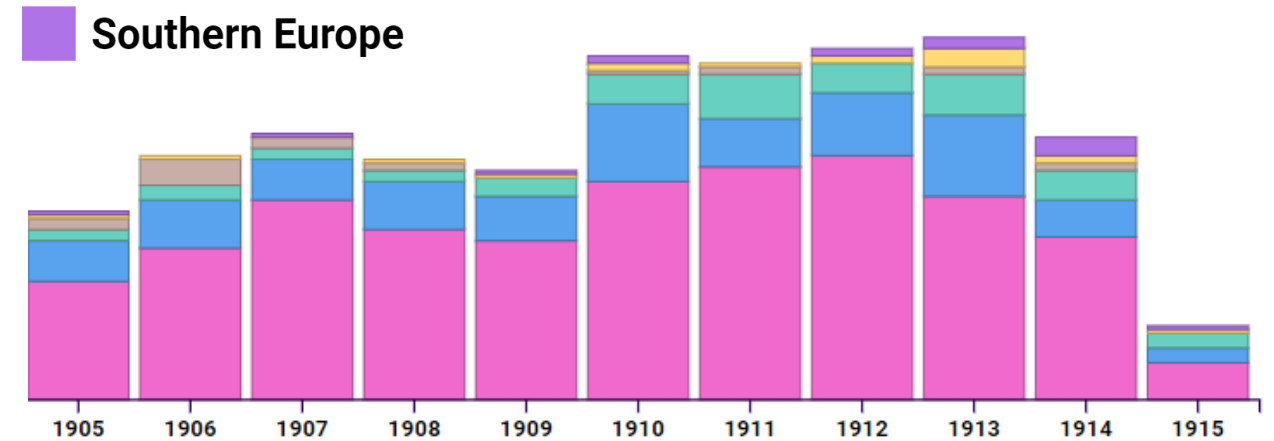
Further Findings

Findings



1. Four one-year-long exhibitions in Russia (1908-1910): three in Moscow, one in St. Petersburg.

2. **All exhibitions in southern Europe were in Italy except one in Spain in 1912.**



Further Findings

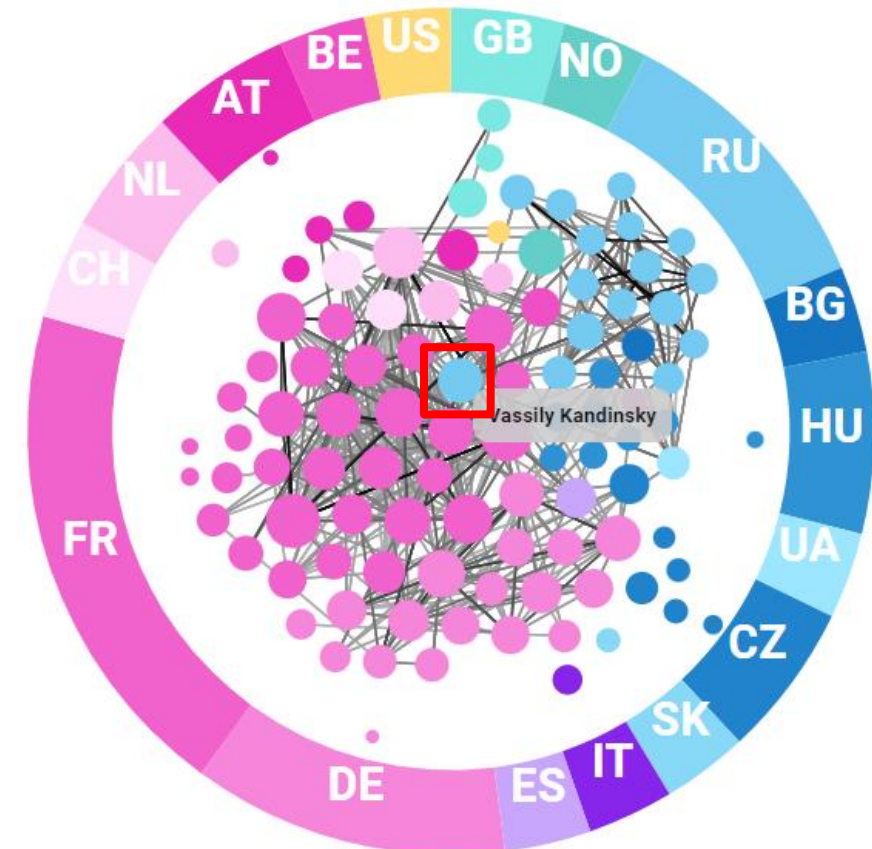
Findings

1. Four one-year-long exhibitions in Russia (1908-1910): three in Moscow, one in St. Petersburg.
2. All exhibitions in southern Europe were in Italy except one in Spain in 1912.
3. **French-dominated center artists with Russian Vassily Kandinsky as a notable exception.** (cluster size changed)

Select the range of exhibited artworks to filter artists:



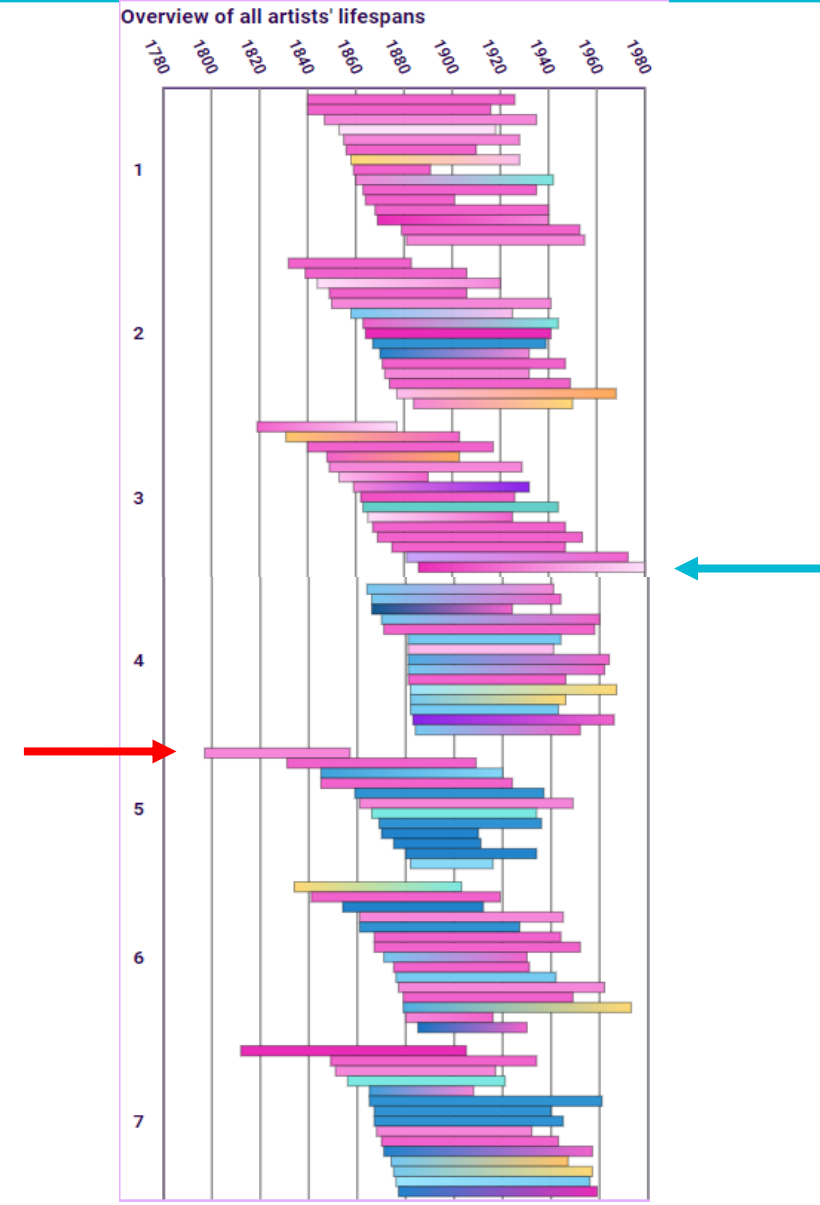
Select the number of artist clusters:



Further Findings

Findings

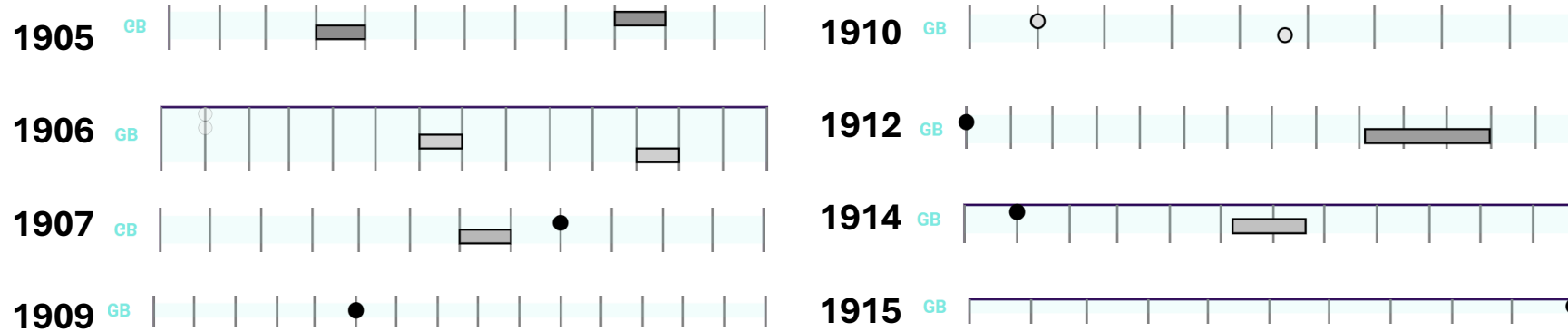
1. Four one-year-long exhibitions in Russia (1908-1910): three in Moscow, one in St. Petersburg
2. All exhibitions in southern Europe were in Italy except one in Spain in 1912.
3. French dominated but Vassily Kandinsky important even though from Russia
4. Oldest artist: **Franz Krüger** (b. 1800); youngest: **Oskar Kokoschka** (d. 1980).



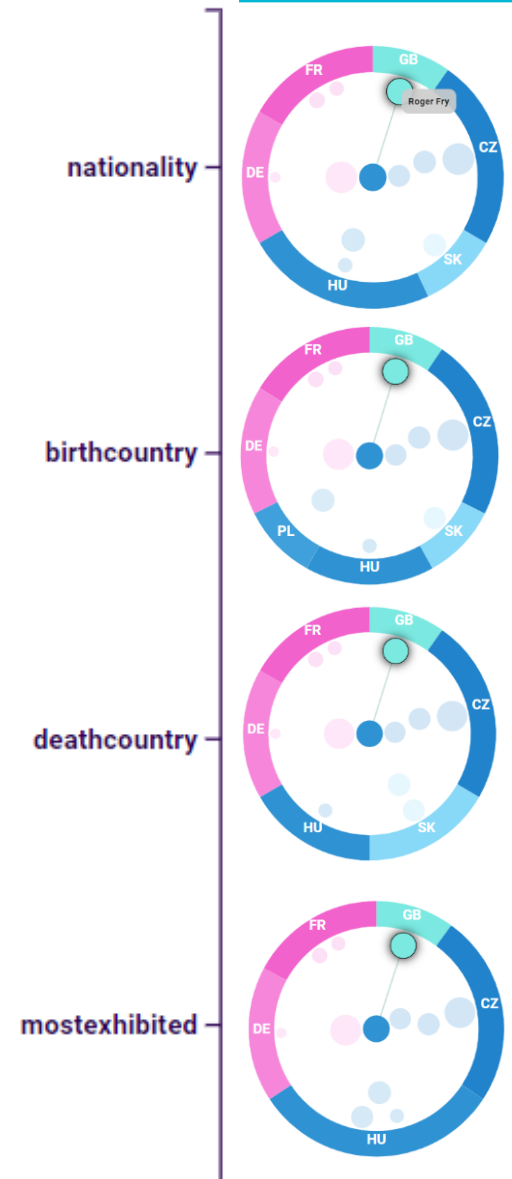
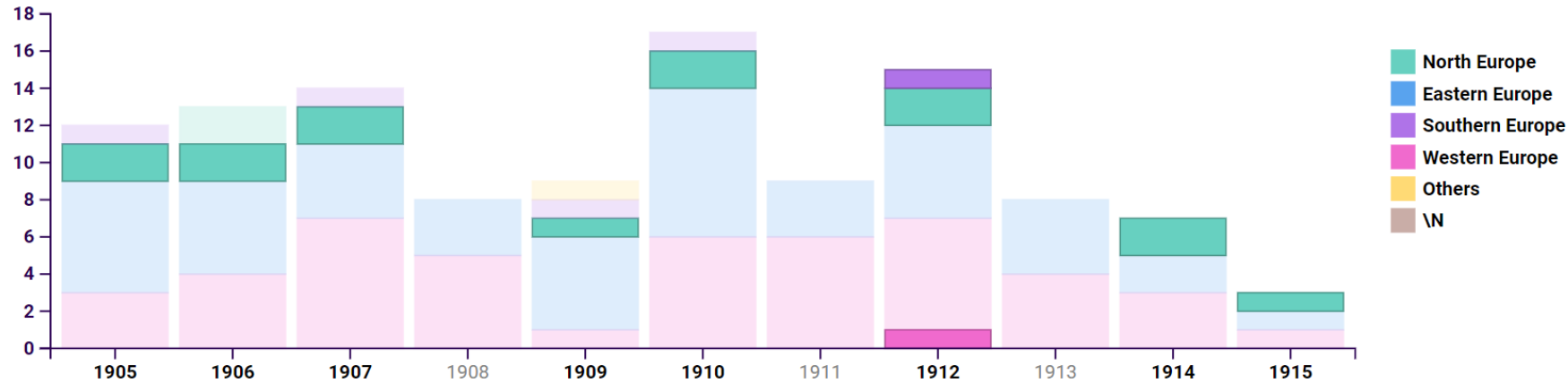
Further Findings

Findings

5. Roger Fry remained in GB and achieved most of his success there.



Exhibitions of Roger Fry



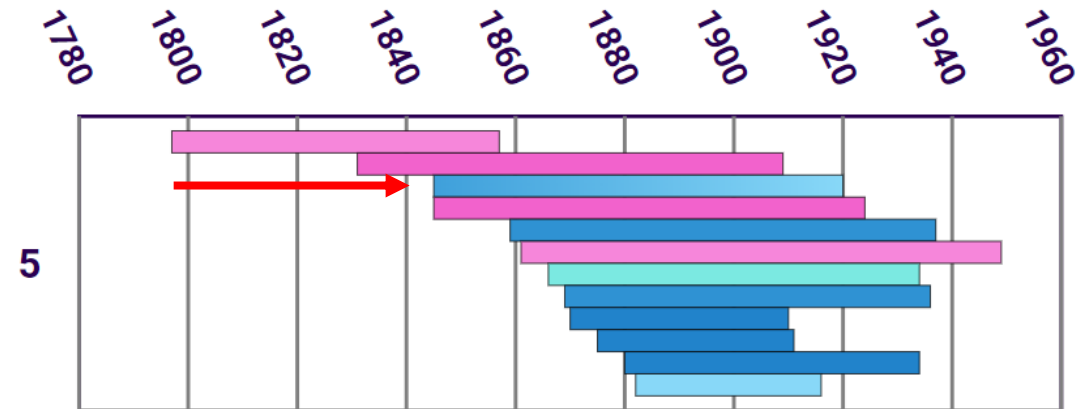
Further Findings

Findings



5. Roger Fry remained in GB and achieved most of his success there.
6. **Cluster of artists that were born and died in same country *except* for Pál Szinyei Merse.**

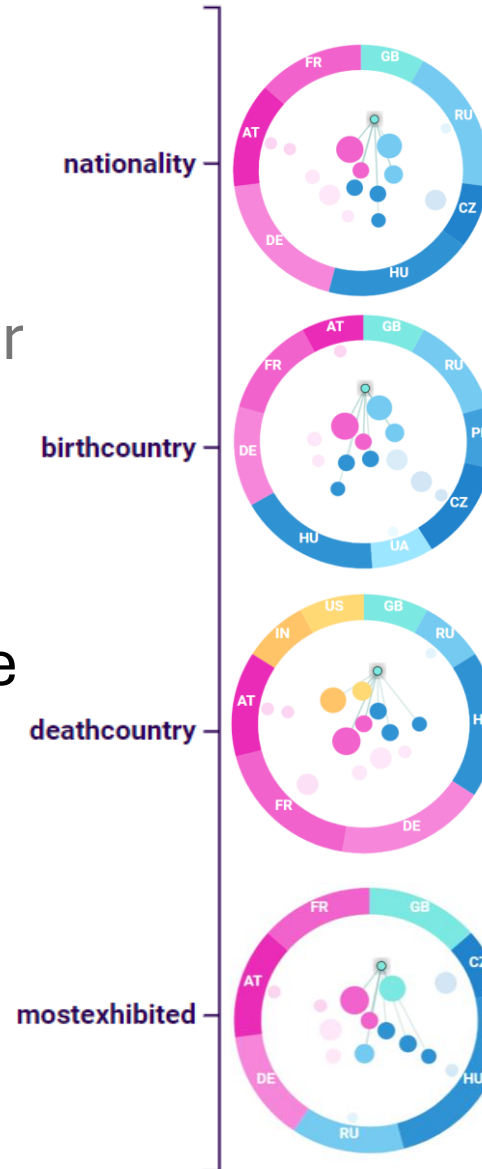
Overview of artists' lifespans in the selected cluster



Further Findings

Findings

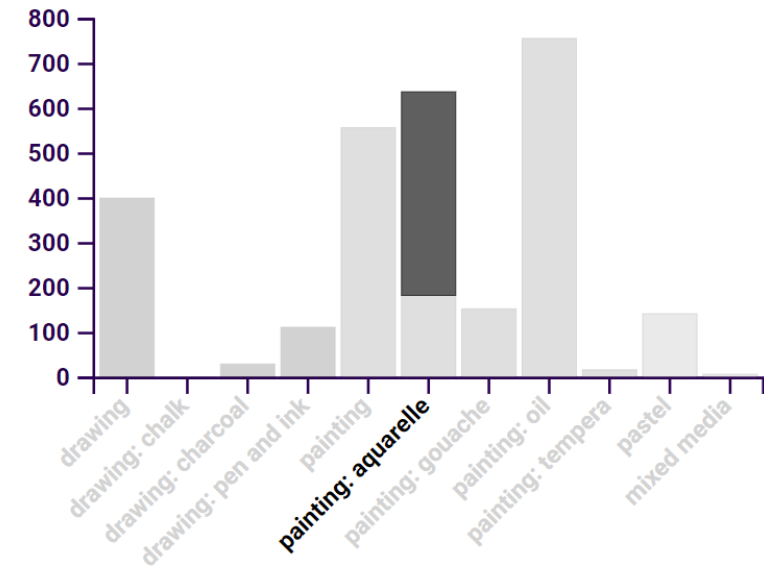
5. Roger Fry remained in GB and achieved most of his success there.
6. Group of artists that stayed in their home countries except for one.
7. **Alfred Rich used only aquarelle, accounting for $\frac{3}{4}$ of his cluster's works in that category.** (node size changed)



Select node size:

Amount of different techniques

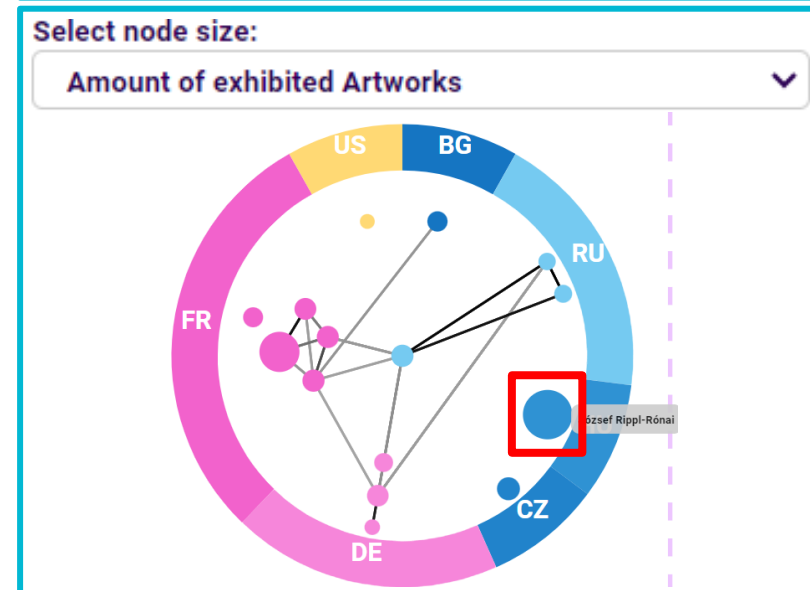
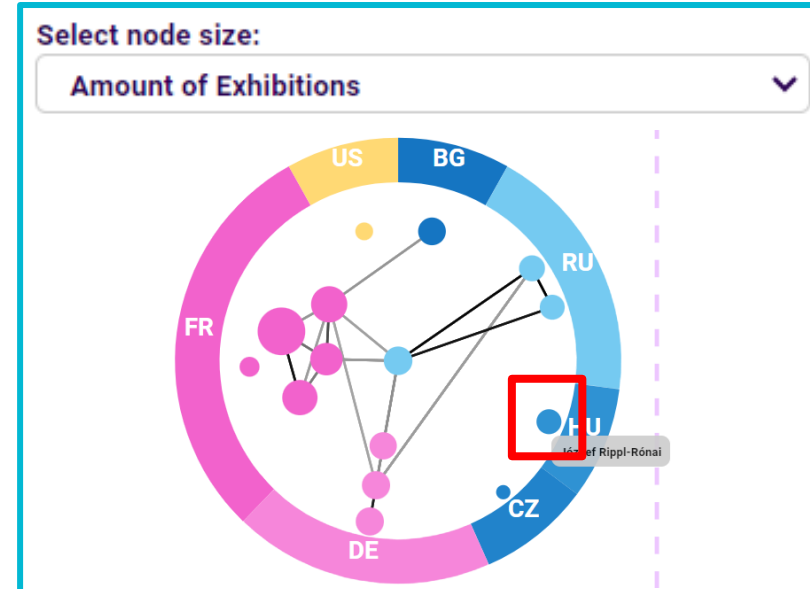
Techniques used by Alfred William Rich



Further Findings

Findings

5. Roger Fry remained in GB and achieved most of his success there.
6. Group of artists that stayed in their home countries except for one.
7. Alfred Rich only used the technique *aquarelle*; accounting for $\frac{3}{4}$ of works in this category of his cluster. (Found with node size change)
8. **József Rippl-Rónai was exhibited in fewer exhibitions but exhibited the most artworks compared to his cluster.**



Limitations

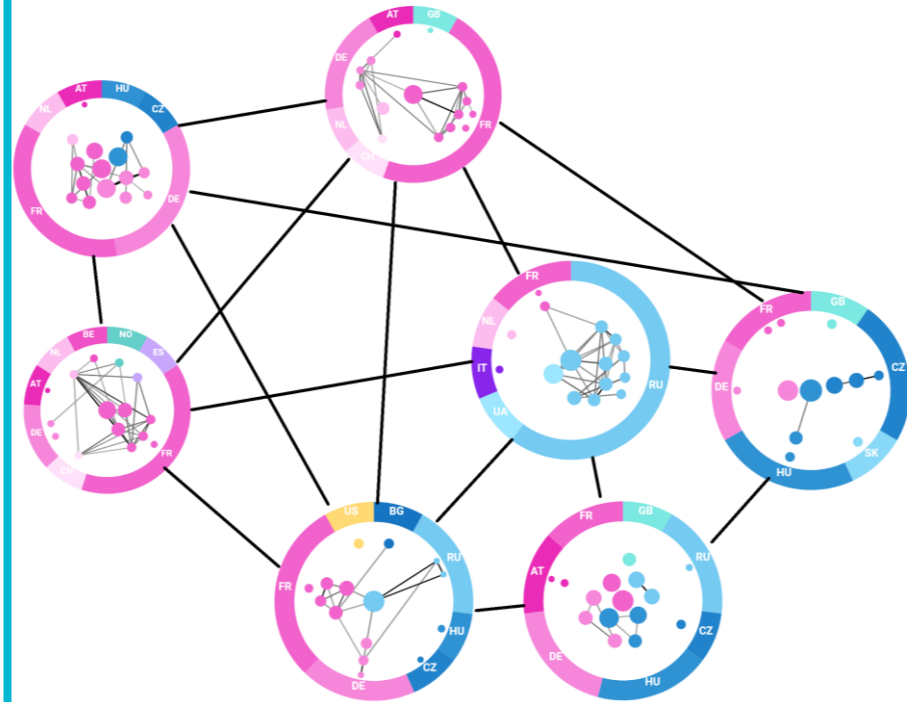


1. **Clustering:** only based on Co-Exhibitions
2. **Data Limitation:**
 - Database focused on Exhibitions, not Artists
 - Bias on western data?
3. **Direct Comparison** between Artists
4. **Connections** between Artists of different Clusters
 - Partial solution through flexibility of #Clusters
 - Considered in Alternative Design

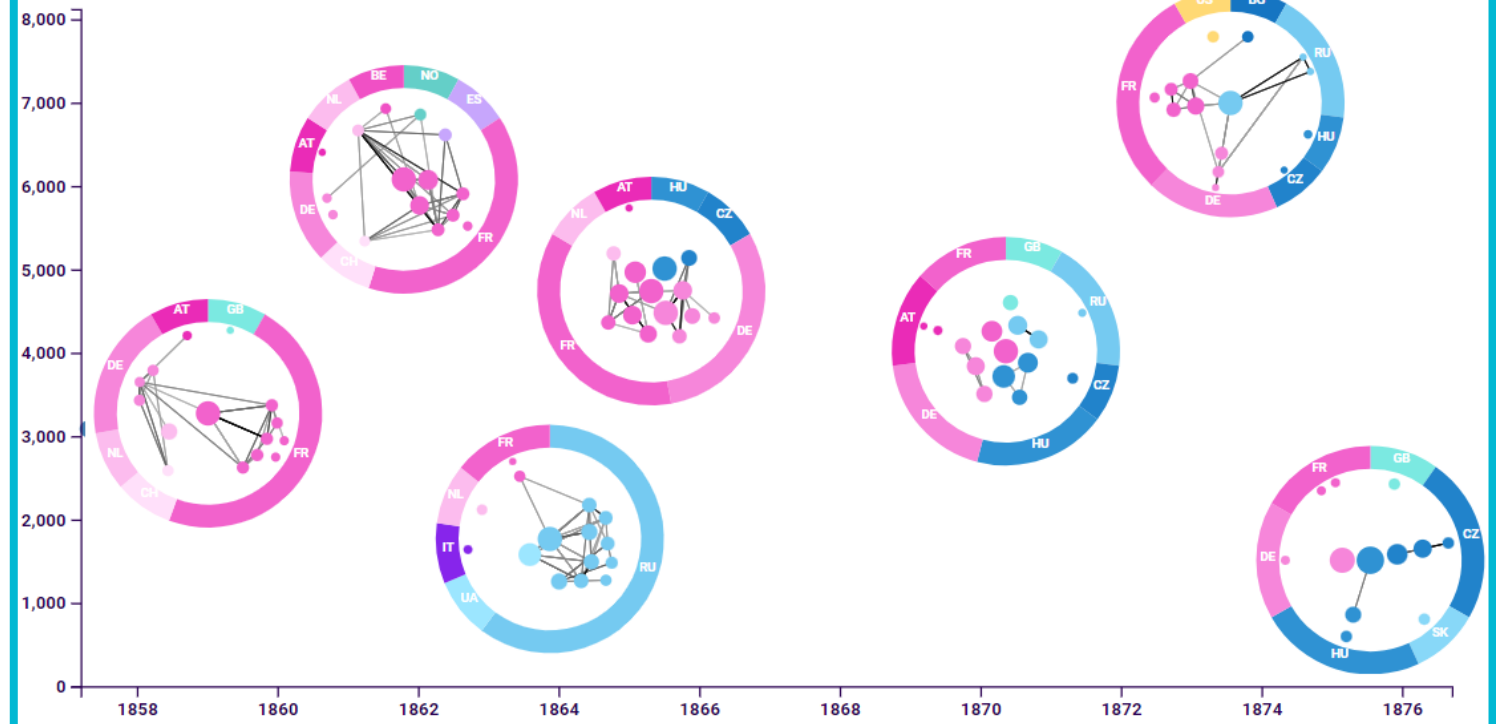
Alternative Designs



Network



Scatterplot over time



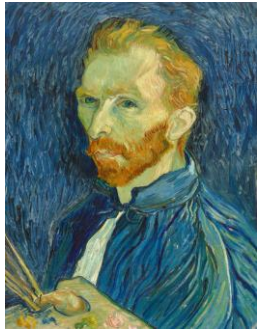
Goal: Adding more Context

Future Work

Contextualizing

by Adding Visual Information

Vincent Van Gogh (**Impressionism**)



Vassily Kandinsky (**Expressionism**)



Verbalization

- Contextualize clusters with language models
- Automate research of cluster

Clustering

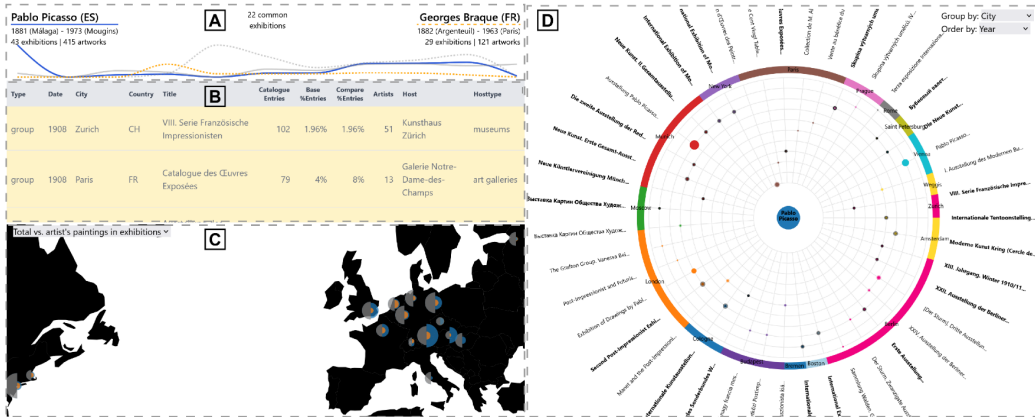
- Enhance Clustering Algorithm
- No more data on Artists **yet**
- Use of LM to add more information to artists, e.g. title of artworks

Evaluation

Future Work



Comparison with Eurovis 2024 Tool



Domain Experts

- Other authors of Eurovis paper
- Raphael Rosenberg (PI)
- Velitchko Filipov

Evaluate Mental Load

- Recruit 5-10 **participants** to perform simple tasks
- Use NASA Task Load Index (TLX) to **measure** experience
- **Interviews** for qualitative Feedback

Name	Task	Date
<p>Mental Demand How mentally demanding was the task?</p> <p>Very Low Very High</p>		
<p>Physical Demand How physically demanding was the task?</p> <p>Very Low Very High</p>		
<p>Temporal Demand How hurried or rushed was the pace of the task?</p> <p>Very Low Very High</p>		
<p>Performance How successful were you in accomplishing what you were asked to do?</p> <p>Perfect Failure</p>		
<p>Effort How hard did you have to work to accomplish your level of performance?</p> <p>Very Low Very High</p>		
<p>Frustration How insecure, discouraged, irritated, stressed, and annoyed were you?</p> <p>Very Low Very High</p>		

<https://humansystems.arc.nasa.gov/groups/TLX/tlxpaperpencil.php>

Conclusion



- Tools Purpose: Enables Exploration of Artistic Movement
- Interactive components
- Makes geographic movement and regional influences visible => artistic movements
- Flexible Clustering
- **Supports art historians in research**

