






Mapping the Avantgarde: Visualizing Modern Artists' Exhibition Activity

Supplementary Material

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1. Introduction

Included within this supplementary material are additional resources describing the utilization and understanding of our approach presented in the paper. We provide additional figures supplemented by the insights and patterns that could be identified by the domain expert in our case study evaluation. This supplementary material offers a comprehensive case study for researchers and practitioners seeking to delve deeper into the intersection of Visual Analytics and Art History and how the methodologies presented in the paper and the proposed approach can be leveraged.

2. Pablo Picasso

URL: <https://artvis.cvast.tuwien.ac.at/exhibitions/301>

In the evaluation with our domain expert, we first had a look at Pablo Picasso. A close-up view of his details can be seen in Figure 1. It shows that the average number of artworks he exhibited mostly stayed constant and went up a little in later years (blue line).

The table view (see Figure 2) lists the exhibition details. Initially, it is ordered by the year in which the exhibitions took place, so it shows that Picasso only had one exhibition in 1905 and none in 1906. This can also be seen in the radial view in Figure 3.

Further, by grouping the radial view by city and ordering inside the groups by year, it can be seen that Picasso exhibited only in Paris at the beginning of the time frame covered. The domain expert commented that Picasso had moved to Paris to advance his career, so it makes sense that this was also the city where he exhibited first. In 1911, Picasso started exhibiting in many different countries; in 1913, he even participated in exhibitions in the USA, indicating that he became an internationally established artist.

The various countries where Picasso exhibited, as well as the “hotspots”, can be seen in the map view in Figure 4. The radial chart and map view show that Picasso exhibited a lot in Berlin, Paris as well as London. Changing the map markers to half-circles makes it possible to see a summarized view (see Figure 5). It shows that Picasso exhibited most artworks in Vienna, Berlin, and London. Putting this information together with the radial chart, it can be seen that he had bigger solo exhibitions in Vienna and London and many smaller group exhibitions in Berlin. The map view with half-circles also shows that the

exhibitions in New York were the biggest ones (i.e., they featured the highest numbers of artworks), but only a few of them were by Picasso.

Figures 6 - 8 show close-up views of the markers in the radial chart and on the map. The radial chart markers consist of two circles (see Figure 6). The larger transparent circle in the background shows the number of artworks exhibited in this exhibition and the smaller opaque circle shows the percentages of artworks the artist exhibited in that exhibition. If there is only one completely opaque circle it means that the exhibition was a solo exhibition, where all of the exhibited artworks were by one artist. Hovering over a circle will highlight it (bottom right of Figure 6) and also highlight the circle denoting the year of the exhibition in a grey dashed line, so it is easier to see exhibitions that took place in the same year around the circle.

Figure 7 shows the circle markers with different transparencies on the map. The circle sizes denote the number of artworks exhibited by the artist in the corresponding exhibitions. The more opaque a circle, the more exhibitions took place in that city. Bigger opaque circles show that the artist exhibited many artworks in many exhibitions in the same city (e.g., the circle in the top left), while bigger transparent circles show that the artist might have only had one very big exhibition in this city (e.g., the big circle in the bottom right).

Figure 8 shows a close-up of the half-circles on the map. Here, the transparencies ensure the visibility of overlapping circles (e.g., in the bottom center) and support identifying geographical “hotspots” of exhibition activity.

By grouping the radial chart by host types and ordering by year, it can be seen in which type of venues Picasso exhibited most over the years (see Figure 9). It shows that most of the venues, especially in the early years, were art galleries, followed in later years by artist associations. There were also a few exhibitions in museums and one auction that featured Picasso's artworks.

Grouping by exhibition types and ordering by year shows that Picasso had a lot of group exhibitions, three solo exhibitions, and two auctions (see Figure 10). It can also be seen that the solo exhibitions were his biggest exhibitions and that he had them later in his career.

3. Georges Braque

URL: <https://artvis.cvast.tuwien.ac.at/exhibitions/41>

After the extensive exploration of Picasso's exhibitions, the domain ex-

Pablo Picasso (ES)

1881 (Málaga) - 1973 (Mougins)

43 exhibitions | 415 artworks



Figure 1: Picasso: Close-up of artist detail view with a line chart. The blue line corresponds to the yearly averages of the artists exhibited artworks, whereas the grey line represents the yearly total of artworks featured in those exhibitions.

| Type | Date | City | Country | Title | Catalogue Entries | Base %Entries | Artists | Host | Hosttype |
|-------|------|-------|---------|---|-------------------|---------------|---------|---------------------|---------------|
| group | 1905 | Paris | FR | Exposition d'Œuvres des Peintres Trachsel, Gérardin, Picasso | 75 | 42.03% | 3 | Galleries Serrurier | art galleries |
| group | 1907 | Paris | FR | Exposition de Cent Vingt Tableautins, Peintures, Aquarelles, Pastels et Dessins | 120 | 1.71% | 49 | Galerie Eug. Blot | art galleries |

Figure 2: Picasso: Close-up of the table view showing details of exhibitions. The table can be scrolled to explore all of the exhibitions.

pert chose Georges Braque to compare his exhibition activity to the one by Pablo Picasso by typing his name into the search bar. It can be seen in the line chart (see Figure 11) that Braque's exhibition activity (dashed orange line) went up a bit in the first third, but went down again later and then stayed below Picasso's activity (blue line). The detailed view further shows that in more than half of Picasso's exhibitions, Braque was featured as well and Braque only had seven exhibitions without Picasso. The domain expert explained to us that Picasso and Braque worked closely together at this time and co-invented Cubism. It is no surprise that they were often participating in the same exhibitions. The fact that Braque had fewer exhibitions and fewer exhibitions without Picasso than Picasso without Braque, indicates that Picasso marketed himself more decidedly, that he probably already in this time became better known to the public. The map also shows the extent of their co-exhibition activity (see Figure 12), where many of the circles changed their color to yellow for common exhibitions. It can also be seen that Braque did not participate in some of Picasso's bigger exhibitions (e.g., the big blue circle in the bottom right, which was a solo exhibition).

Looking at the map view with half-circles (see Figure 13), it is possible to see which of the two artists exhibited more artworks in different cities by comparing the sizes of the blue half-circles (Picasso) and the orange ones (Braque). This makes it clear that Braque only exhibited more artworks in one of the cities—Prague (the circle in the center-right, where the blue half-circle is surrounded by a slightly bigger orange one). If only a blue half-circle is seen, Braque did not exhibit in that city. The exhibition in the bottom center, where only the orange half-circle is visible means that both artists exhibited an equal number of artworks there. This can also be seen in the table view (see Figure 14), where the common exhibitions are highlighted in yellow and the percentages

of exhibition entries of the artists are displayed. For the exhibition in Zurich, the percentages for base and compared artists are equal.

The radial chart (see Figure 15) also shows that Picasso and Braque had a lot of common exhibitions, which are highlighted in bold. It can be seen that Braque even participated in the same exhibition as Picasso in New York.

Figure 16 shows a close-up view of the markers in the radial comparison view.

4. Missing Data

During our evaluation, we also came across cases where some data was missing. These cases can be seen in our visualization and make it possible to find and correct such database entries. Figure 17 shows missing host data in the radial chart tooltip. In this case, the city is unknown, so the exhibition is grouped in the category "NA". Further, when hovering over the exhibition title, the tooltip shows that all of the host data (i.e., hostname, country, city, and host type) is missing.

The missing host data can also be seen in the table view entries in the corresponding columns displaying the host data (see Figure 18).

It is also possible that some data concerning the artist is missing. This can be seen in the artist detail view in Figure 19, where the country, place of birth, place of death, date of birth, and date of death are missing for the compared artist.

5. Carl Moll and Gustav Klimt

At one point, the domain expert compared the artists Carl Moll and Gustav Klimt, who were both from Austria (see Figure 20). Both had more

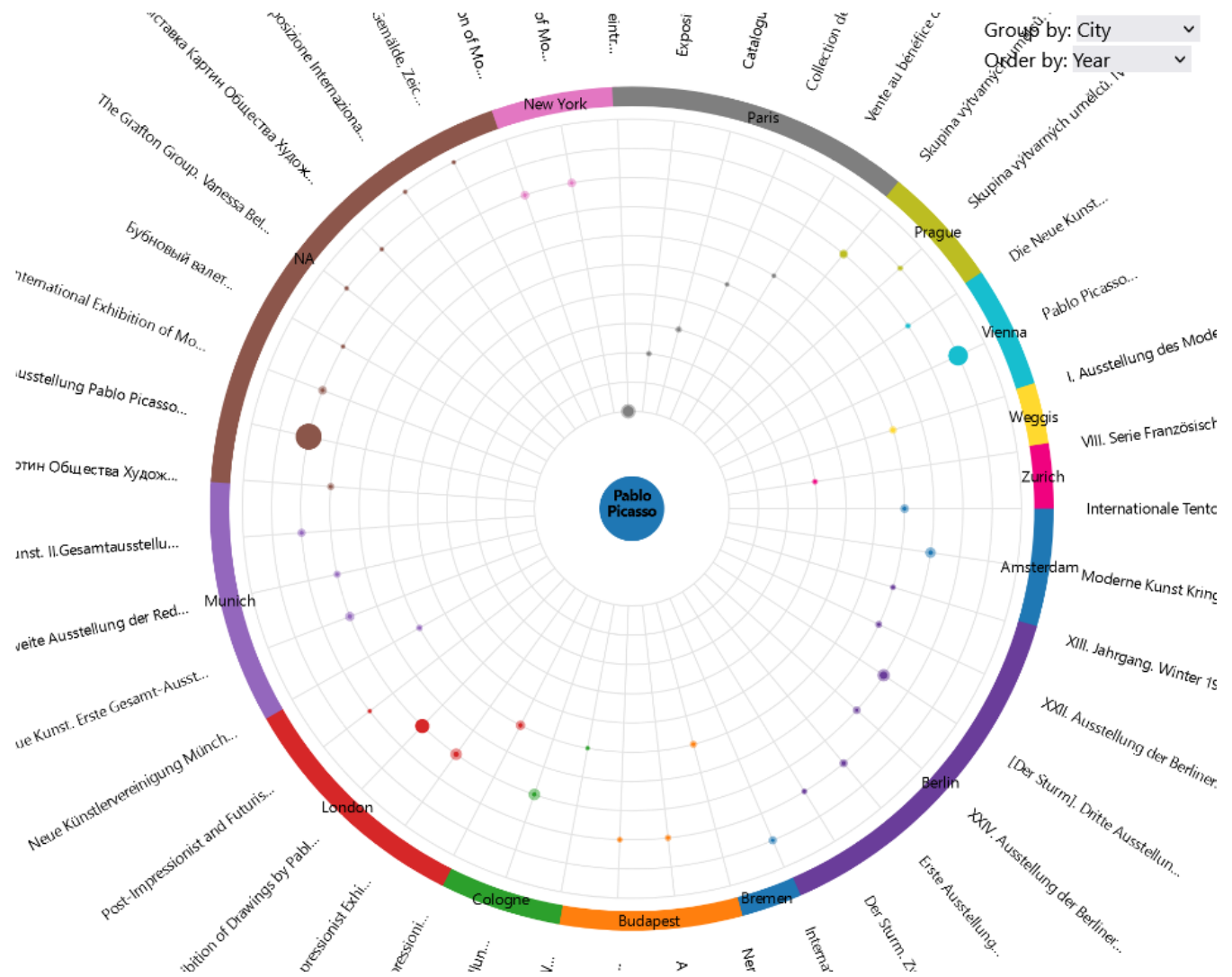


Figure 3: Picasso: Radial view showing that Picasso first exhibited in Paris for some years, then all around the world. In later years, he had some solo exhibitions in different cities. In 1905 he had only one exhibition and none in 1906. By 1913 Picasso was already famous and invited to the USA. In the same year, he also exhibited in Vienna and had a solo exhibition there the following year.

than half of their exhibitions in common and their geographical focus was in Austria, where both were co-founders of the Vienna Secession.

The map view with the half-circles shows that Klimt exhibited more than or equal to Moll everywhere (see Figure 21).

6. Gustav Klimt and Egon Schiele

Klimt URL: <https://artvis.cvast.tuwien.ac.at/exhibitions/187>
Schiele URL: <https://artvis.cvast.tuwien.ac.at/exhibitions/343>

A comparison of Gustav Klimt and Egon Schiele shows that Klimt had a higher exhibition activity than Schiele and that they did not have many exhibitions together even though Klimt was a mentor of Schiele (see Figure 22). Their common exhibitions started in 1909, but there were some more in later years, as seen in the radial chart.

7. Karoly Kernstok

URL: <https://artvis.cvast.tuwien.ac.at/exhibitions/181>

Karoly Kernstok is an artist very famous in Hungary but lesser known abroad. The visualization shows that he exhibited by far the most in Hungary both in terms of the absolute number of exhibitions and in terms of the percentage of his works within exhibitions (see Figure 23). This makes it clear that he was probably much more popular in Hungary than outside of Hungary already during his lifetime.

7.1. Vassily Kandinsky and Gabriele Münter

Kandinsky URL: <https://artvis.cvast.tuwien.ac.at/exhibitions/5>
Münter URL: <https://artvis.cvast.tuwien.ac.at/exhibitions/277>

Comparing Vassily Kandinsky and Gabriele Münter, one of the best-known female representatives of Expressionism in Germany and

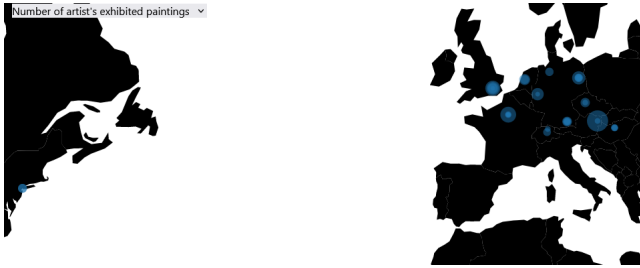


Figure 4: Picasso: Close-up of the map view with circles showing “hotspots” of exhibition locations. Picasso exhibited not only in Europe but also in the USA (New York).

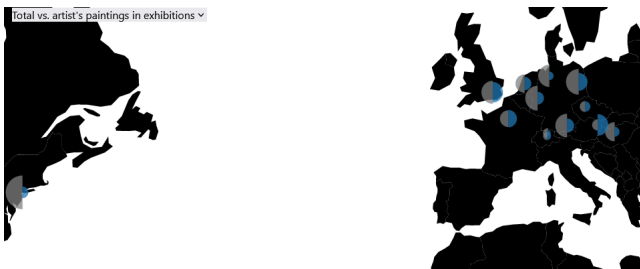


Figure 5: Picasso: Close-up of the map view with half-circles showing summaries of exhibition locations. Picasso exhibited in many exhibitions in Berlin and Paris. In Vienna and London, he had solo exhibitions. The biggest exhibitions he participated in were in New York, but he only exhibited a few artworks there.

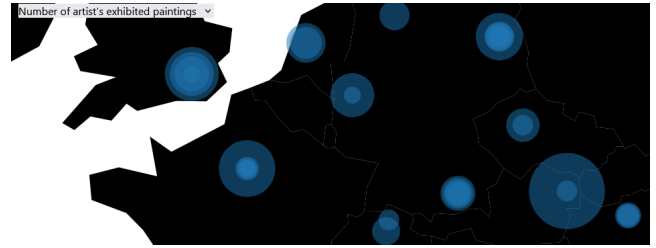


Figure 7: Picasso: A close-up of the map view showing the circle markers in different sizes and opacities.

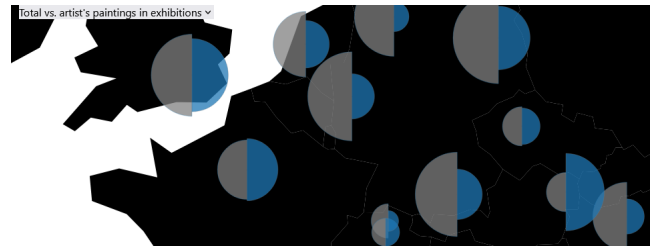


Figure 8: Picasso: Super close-up of the map view showing the half-circle markers in different sizes.

that they started exhibiting together in 1909 and continued doing so until 1915. Especially between 1909 and 1911 Münter was part of nearly all of Kandinsky’s exhibitions. However, the map view shows that Kandinsky exhibited more than Münter, except for one city.

8. Pierre-Auguste Renoir and Claude Monet

Renoir URL: <https://artvis.cvast.tuwien.ac.at/exhibitions/317>

Monet URL: <https://artvis.cvast.tuwien.ac.at/exhibitions/268>

Pierre-Auguste Renoir was the artist with most exhibitions between 1905 and 1915. Figure 25 shows the radial chart grouped by year and ordered by the number of artworks. It can be seen that Renoir had some of his biggest exhibitions in 1912 and most exhibitions per year one year later, in 1913.

Comparing Renoir to Claude Monet shows that they exhibited together a lot throughout the years, even in the USA (see Figure 26). They had more than half of their exhibitions in common, which is also very visible by the yellow circles on the map. As was the case with comparisons between other artists, Monet did not participate in some of Renoir’s bigger exhibitions. An interesting observation is that their exhibition activity over the years is very similar, as can be seen in the line charts.

Grouping the radial chart by city and looking at the half-circles on the map shows that they exhibited in most cities together. Exceptions are, for example, Leipzig and Marseille (see radial chart). The half-circles on the map show that Renoir exhibited more artworks than Monet in most of the bigger exhibitions, but there were also some exhibitions where Monet exhibited more or equal as much, for example, in New York.

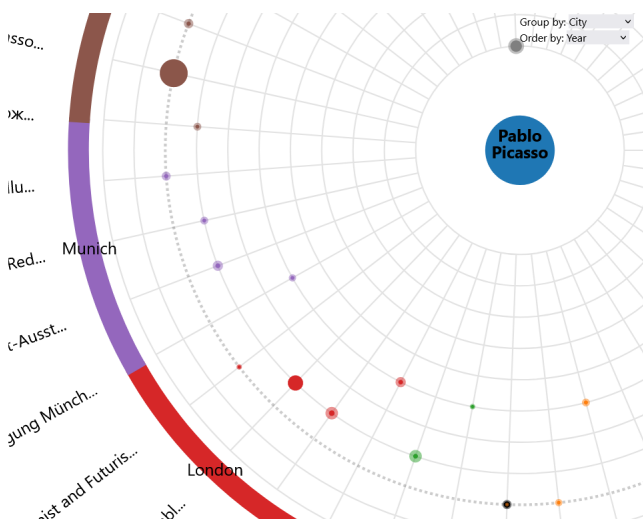


Figure 6: Picasso: Close-up of the radial chart showing the markers with different opacities, two solo exhibitions where the circles are completely opaque, a highlighted exhibition (bottom right), and the highlights of the same year circle (dashed line).

Kandinsky’s partner for more than 10 years, it can be seen that they had a lot of common exhibitions and Münter only had five exhibitions without Kandinsky (see Figure 24). The radial chart and table show

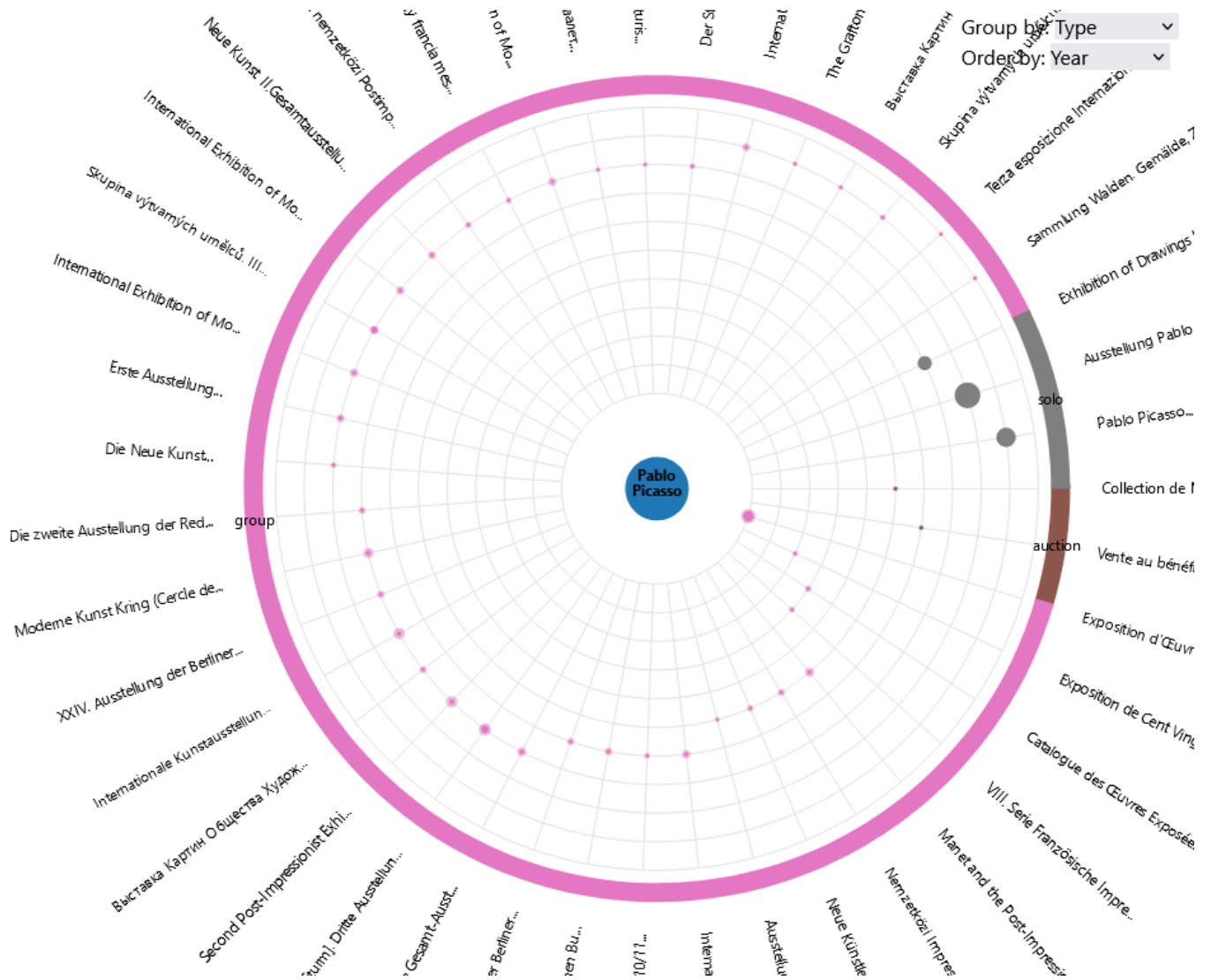


Figure 10: Picasso: Radial chart showing different exhibition types. Picasso exhibited in many group exhibitions, but his bigger exhibitions were solo exhibitions. His artworks were also presented in two auctions.

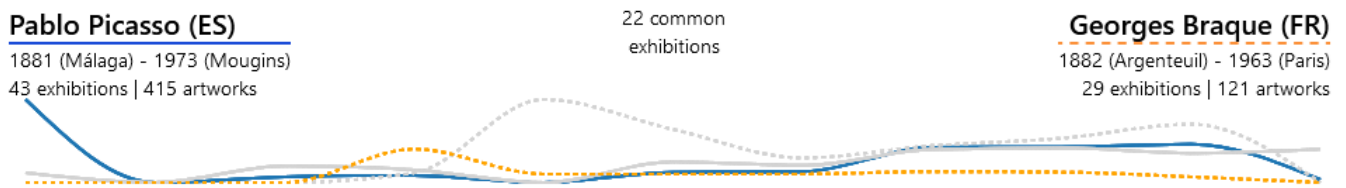


Figure 11: Picasso & Braque: Artist details for comparison view. Picasso's averages over time (blue lines) were mostly higher than Braque's (orange lines).

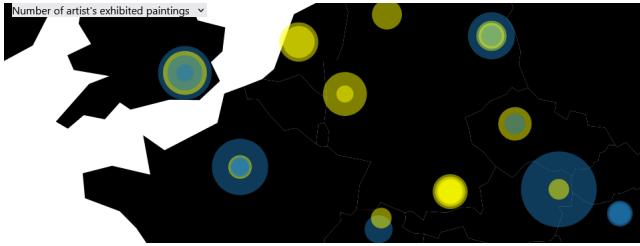


Figure 12: Picasso & Braque: Map with circles showing that Braque exhibited in many exhibitions where Picasso exhibited too. However, Braque did not participate in some of Picasso's bigger exhibitions (i.e., where Picasso exhibited many artworks), where often a blue circle can be seen surrounding the smaller yellow ones (e.g., the big blue circle at the bottom right).

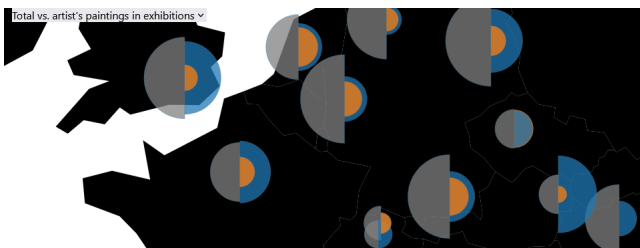


Figure 13: Picasso & Braque: Map with half-circles showing that Picasso only exhibited fewer artworks than Braque in one city where the orange half-circle is bigger than the blue one (center right). In two of the cities, Braque did not exhibit at all, where no orange half-circle can be seen (bottom center and bottom right).

| Type | Date | City | Country | Title | Catalogue Entries | Base %Entries | Compare %Entries | Artists | Host | Hosttype |
|-------|------|--------|---------|--|-------------------|---------------|------------------|---------|-------------------------------|---------------|
| group | 1908 | Zurich | CH | VIII. Serie Französische Impressionisten | 102 | 1.96% | 1.96% | 51 | Kunsthaus Zürich | museums |
| group | 1908 | Paris | FR | Catalogue des Œuvres Exposées | 79 | 4% | 8% | 13 | Galerie Notre-Dame-des-Champs | art galleries |

Figure 14: Picasso & Braque: Table showing common exhibitions of Picasso and Braque. In the first exhibition both artists exhibited the same number of artworks (seen as the same percentages in the respective columns), in the second exhibition Braque exhibited more artworks.

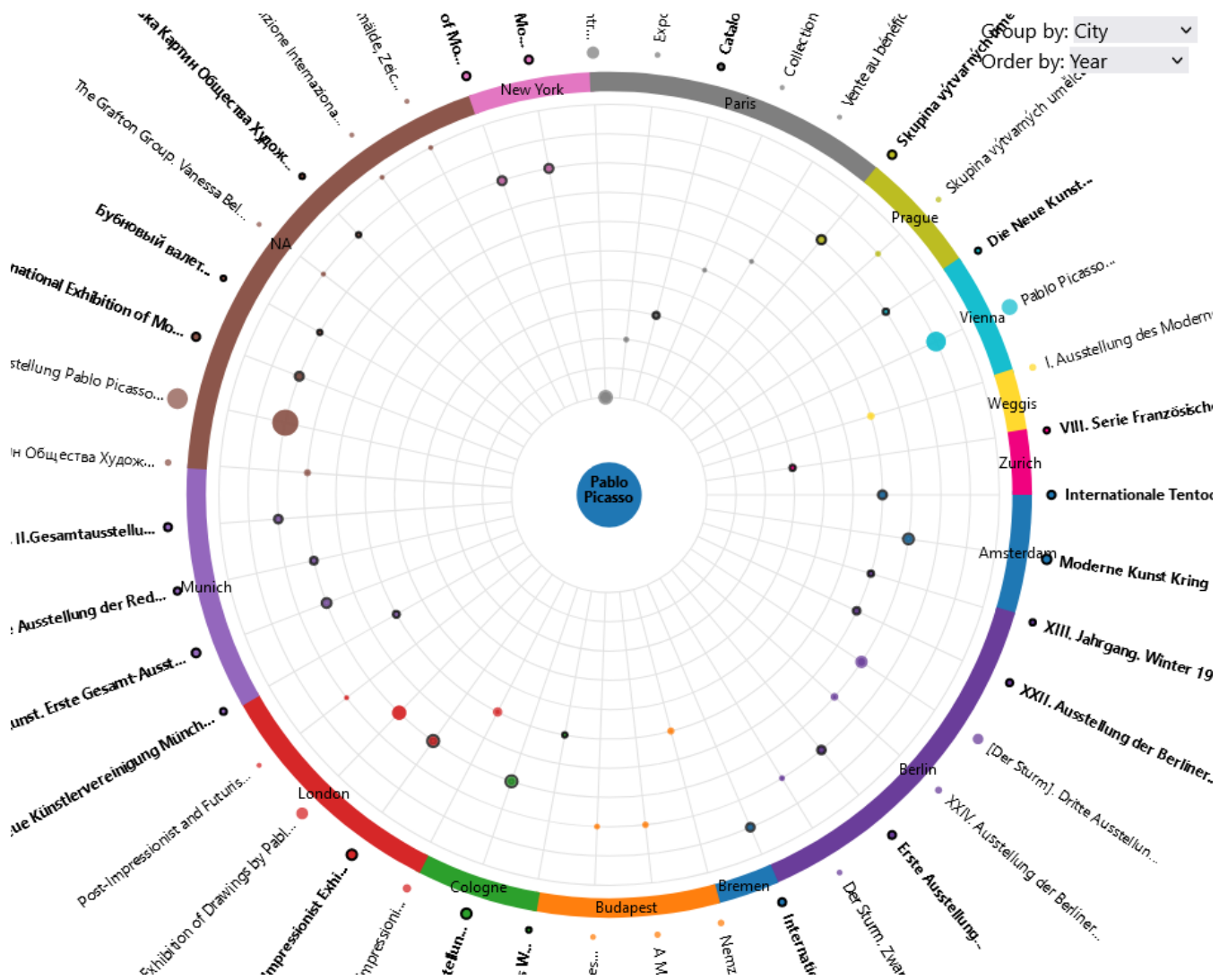


Figure 15: Picasso & Braque: Radial chart showing the common exhibitions (highlighted in bold). Braque participated in many of Picasso's exhibitions, even in both of the exhibitions in New York.

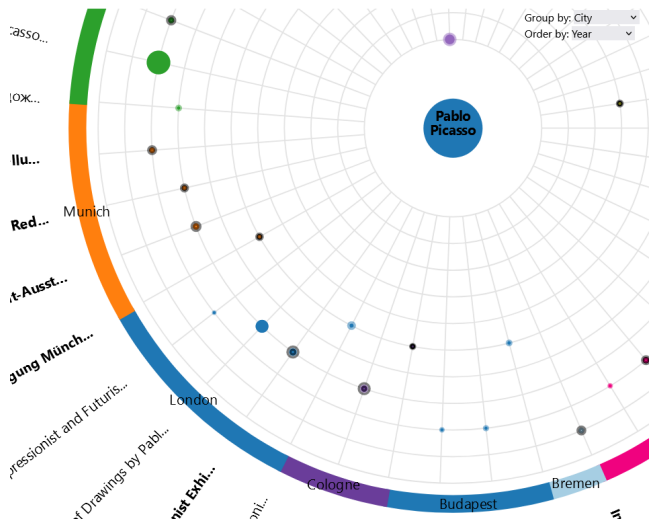


Figure 16: Picasso & Braque: Close-up of comparisons in the radial chart showing common (highlighted) exhibitions.

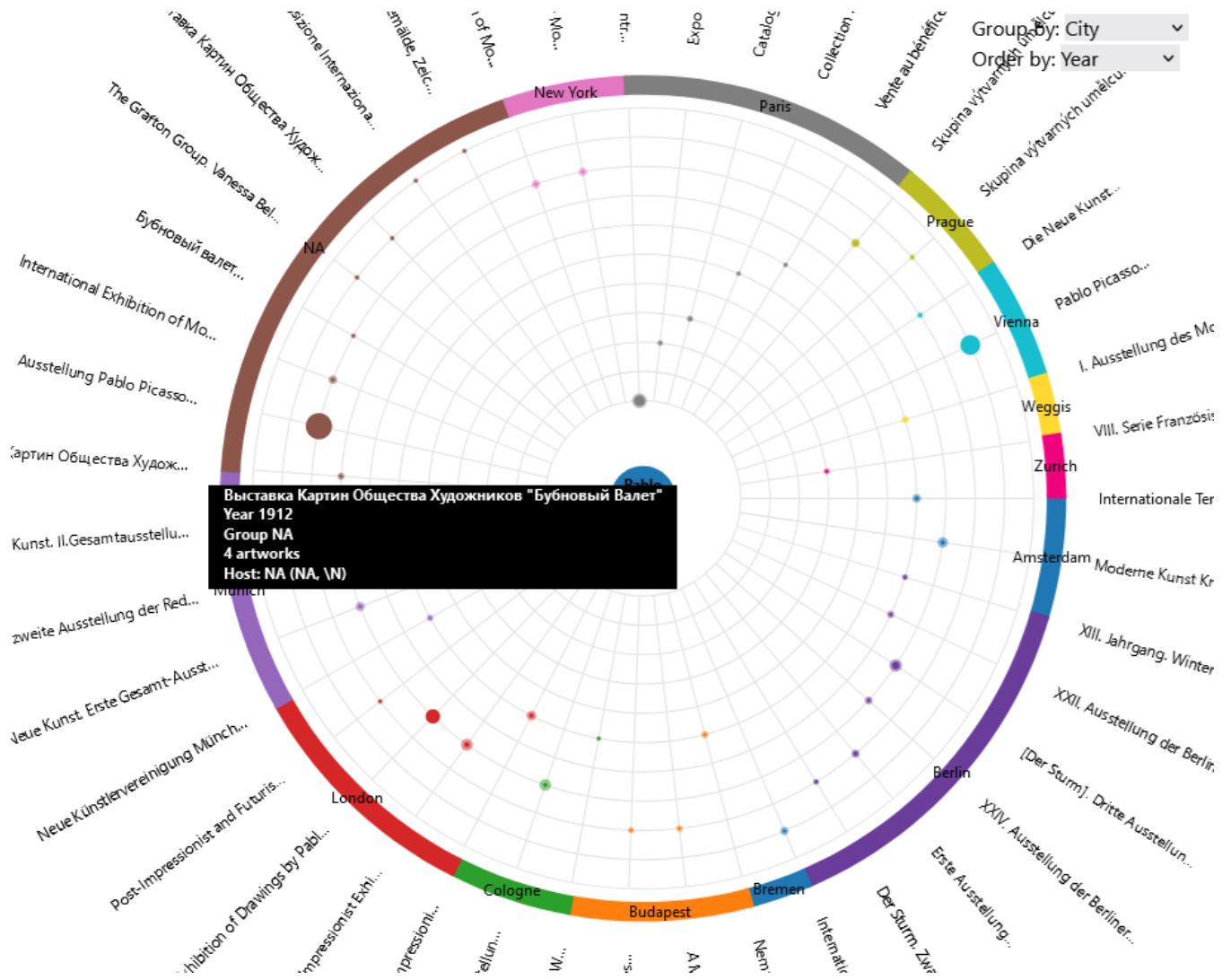


Figure 17: Missing Data: Exhibition with missing host data, as can be seen in the tooltip of the radial view and the grouping into the category "NA".

| Type | Date | City | Country | Title | Catalogue Entries | Base %Entries | Artists | Host | Hosttype |
|-------|------|------|---------|--|-------------------|---------------|---------|------|----------|
| group | 1915 | NA | \N | Sammlung Walden. Gemälde, Zeichnungen, Plastiken | 154 | 0.68% | 36 | NA | NA |
| group | 1915 | NA | \N | Terza esposizione Internazionale d'Arte della "Secessione" | 388 | 0.31% | 152 | NA | NA |

Figure 18: Missing Data: Exhibition with missing host data in the table view.

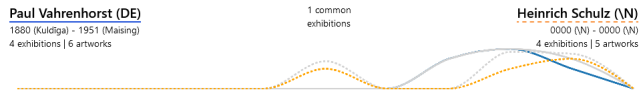


Figure 19: Artist detail view showing missing data (birth- and death place, birth- and death year) of the compared artist.

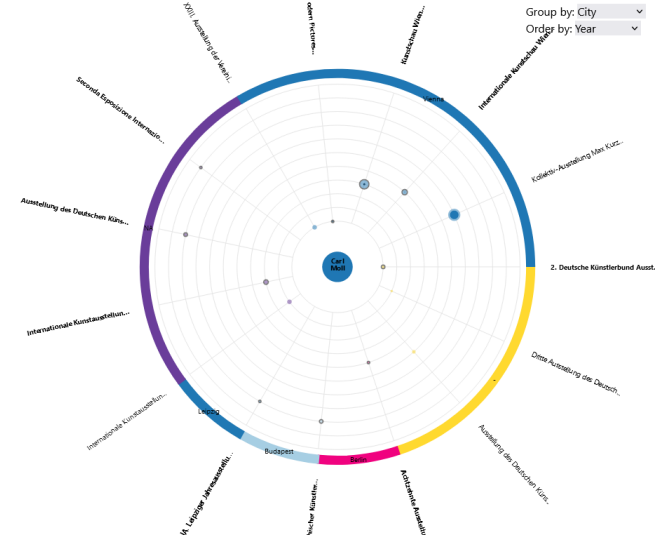
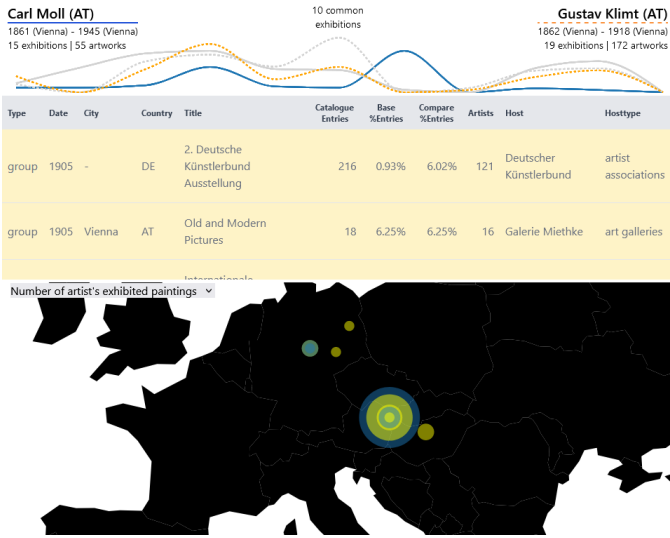


Figure 20: Moll & Klimt: They exhibited in more than half of their exhibitions together. The focus was in Austria (Vienna) and Germany, both were Viennese.

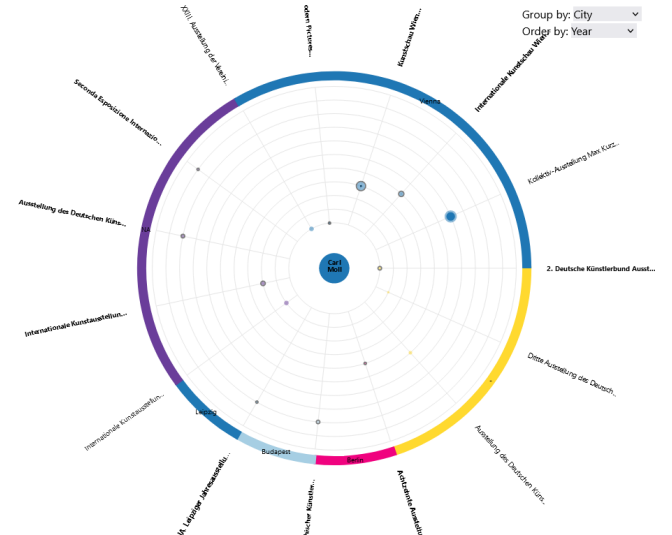
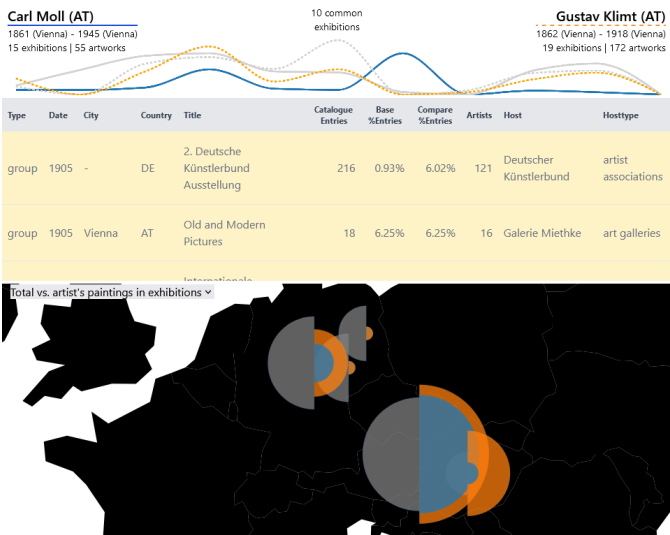


Figure 21: Moll & Klimt: The half-circles on the map show that Klimt exhibited more than Moll or an equal number of artworks (if there is only an orange half-circle but no blue one) everywhere.

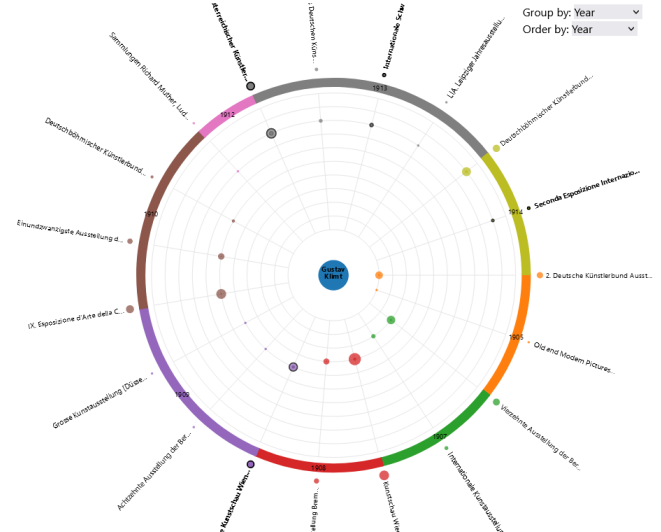
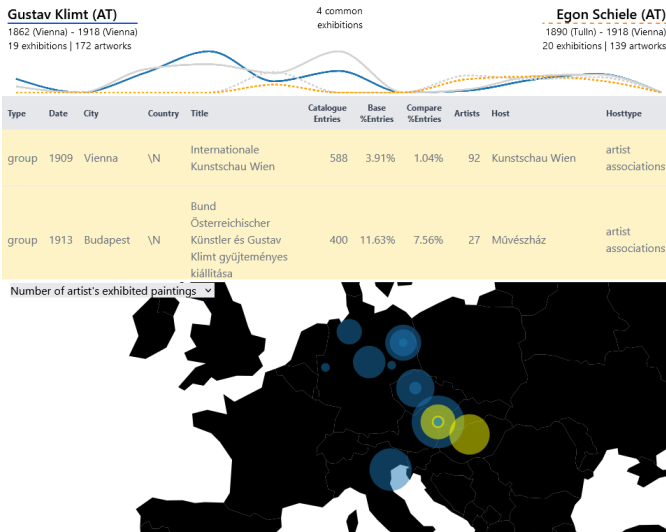


Figure 22: Klimt & Schiele: Klimt was a mentor of Schiele, but they did not have many common exhibitions.

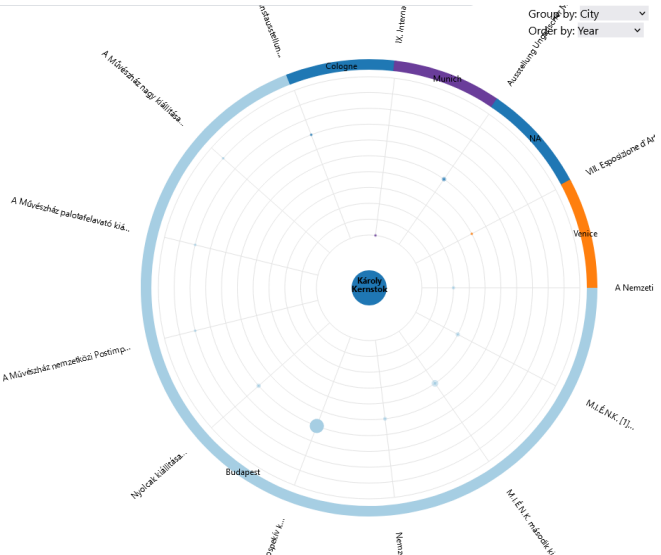
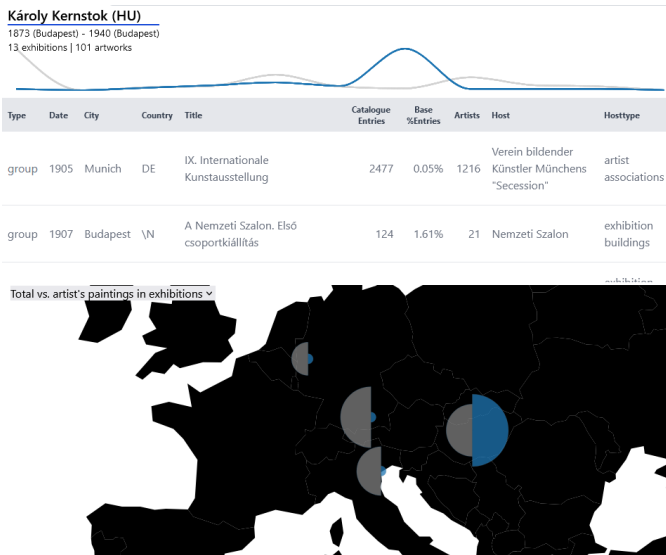


Figure 23: Kernstok was a famous Hungarian artist. It can be seen in the map view that he mostly exhibited in Hungary. He had many small exhibitions and a big solo exhibition (the retrospective) as can be seen in the radial chart.

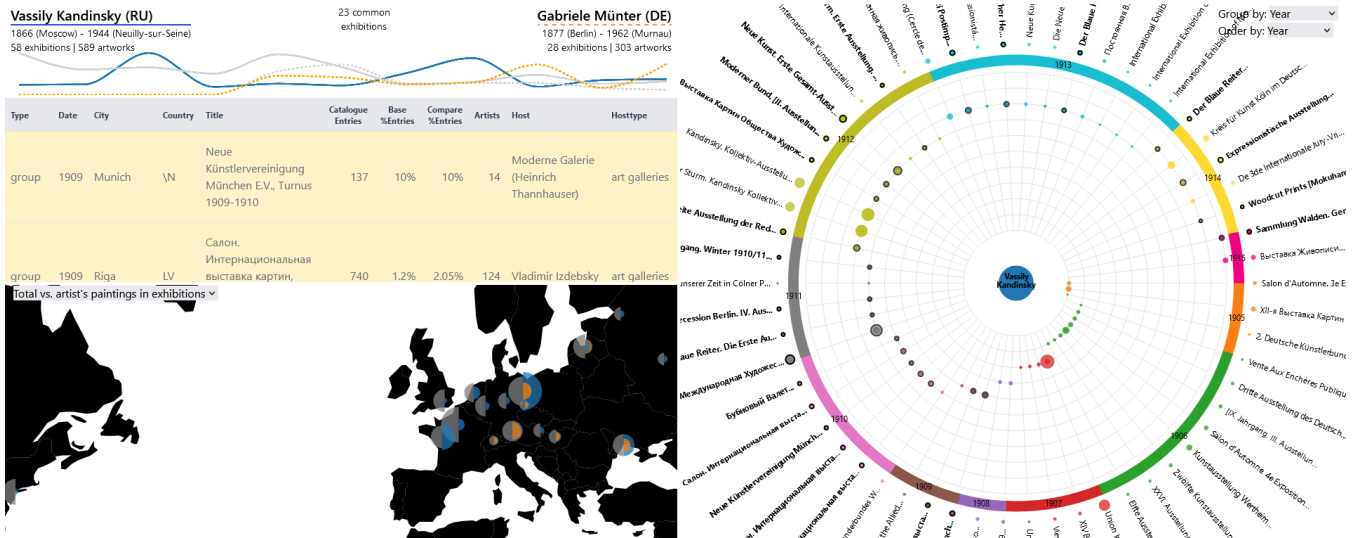


Figure 24: Kandinsky & Münter: Most of Münter's exhibitions were with Kandinsky (as can be seen by the number in the detail view). Kandinsky exhibited more than her in every city except one. They started exhibiting together in 1909 (which can be seen in the radial chart and the table).

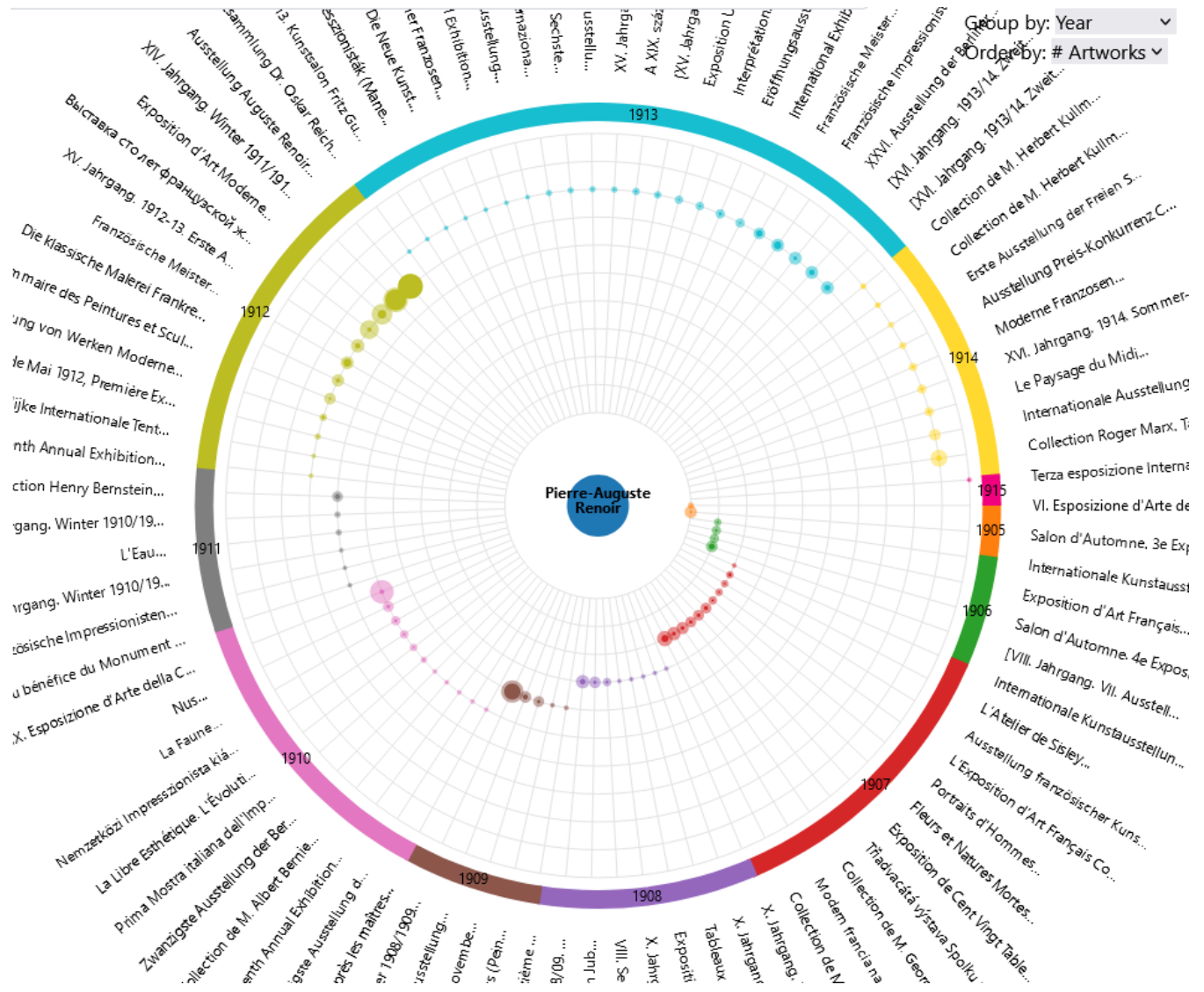


Figure 25: Renoir: Radial chart showing that Renoir had his biggest exhibitions in 1912 and most exhibitions per year in 1913.

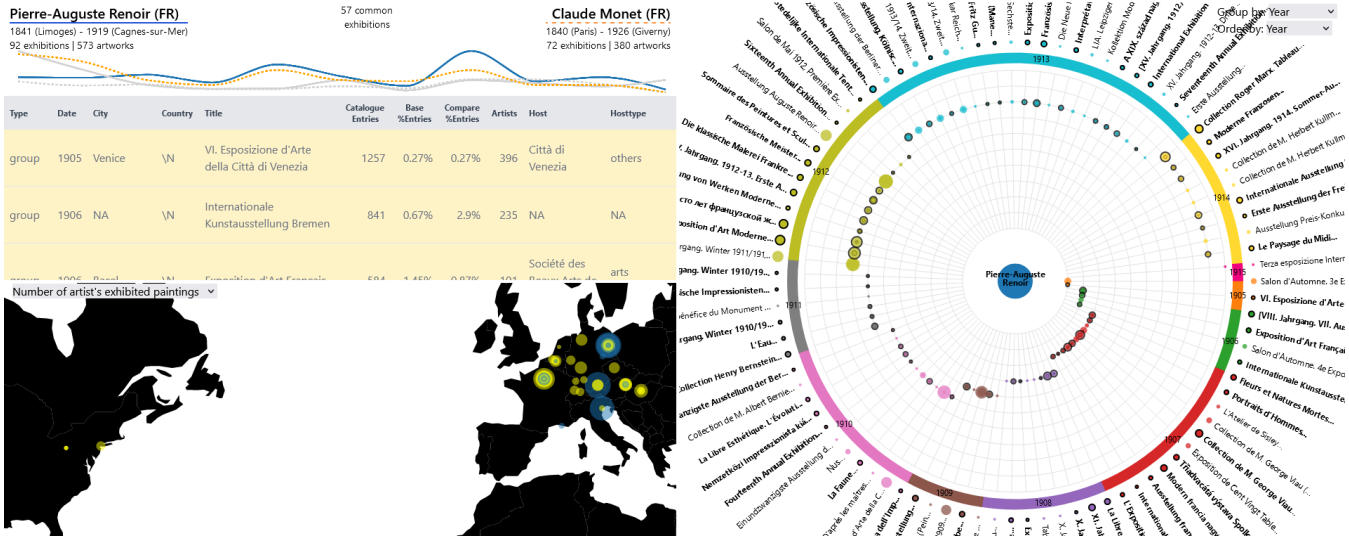


Figure 26: Renoir & Monet: They exhibited a lot together, also in all of Renoir's exhibitions in the USA. Renoir had some bigger exhibitions in which Monet did not participate. Their averages in the line charts are pretty similar:

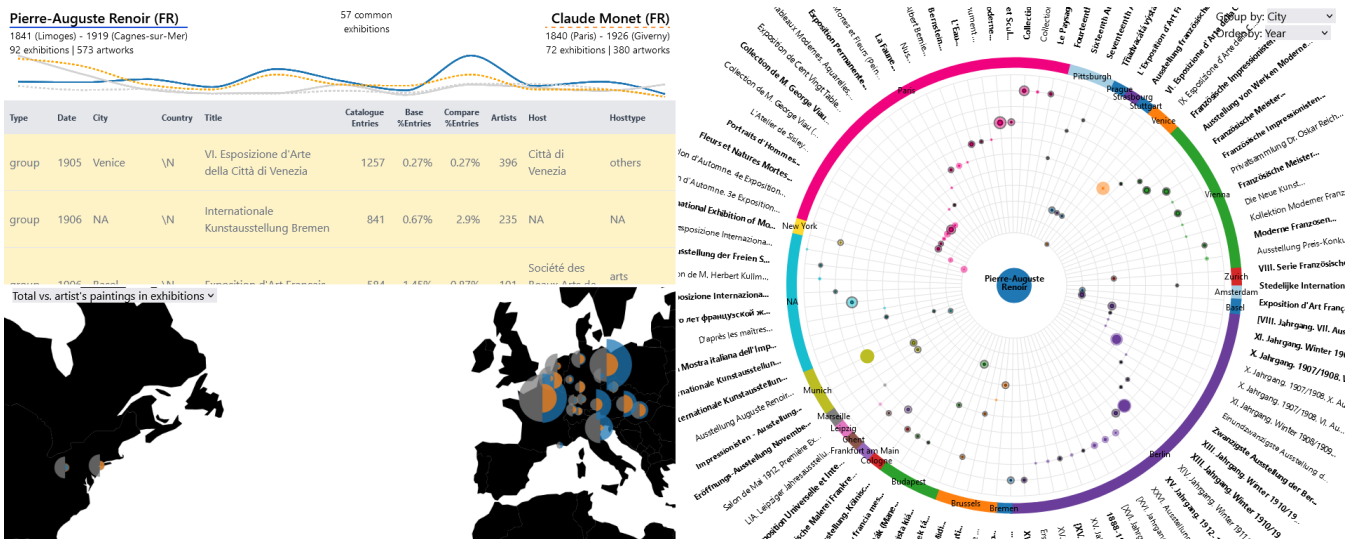


Figure 27: Renoir & Monet: The map view with the half-circles shows that in some cities Renoir exhibited more and in others Monet. They exhibited in many different cities together (see also radial chart).