

11069 - Project 2 Data Visualisation

Intro

Theme: Creative Industries and
Galleries + Public Art

My dataset is the National Galleries API located here

<https://app.swaggerhub.com/apis/Lateral-Minds/nga-stc-api/1.2#/applications/searchWOA>

I utilised Ben Fry's 7 stages of Data Visualisation (Fry, n.d.) for this project, some of the steps in the process were conducted during the first project. This project aims to create a visualisation of a curated collection of the National Galleries data.

Visible on Github Pages via
<https://jehru.github.io/11069-Assessment-2/main/>
 and main repository
<https://github.com/Jehru/11069-Assessment-2/>



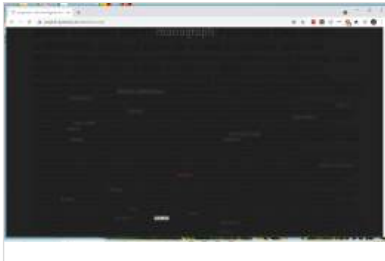
Word map using the written component of this document as data, created using ("Create word clouds – WordItOut", n.d.)

Research and Ideation

I researched various data visualisation ideas and saved some of these ideas on this moodboard.

A higher quality version can be viewed here:

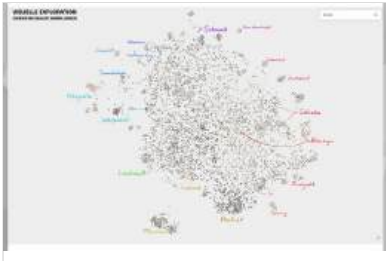
<https://app.milanote.com/1MfcX41aoYpqda/11069-information-visualisation?p=3dKcpP7ZRmJ>



(German Digital Library, n.d.)



(Map of Polish Composers, n.d.)



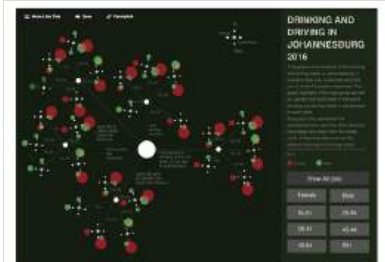
(Visual Exploration Two Museum Collections, n.d.)



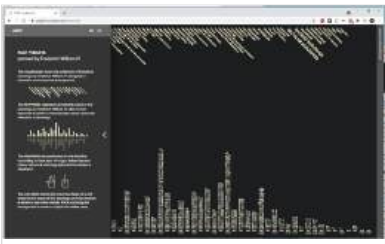
(Capodiferro, 2021)



(100 Years of Rock, n.d.)



(Geddes, 2016)



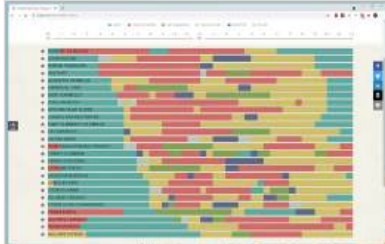
(Past Visions Penned by Fredrick William IV, n.d.)



(Tyne & Wear Archives and Museums, n.d.)



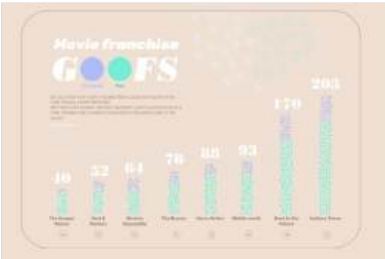
(effe Rao et al., 2014)



(The Daily Routines of Famous People, n.d.)



(LaPorte & Hashemi, n.d.)



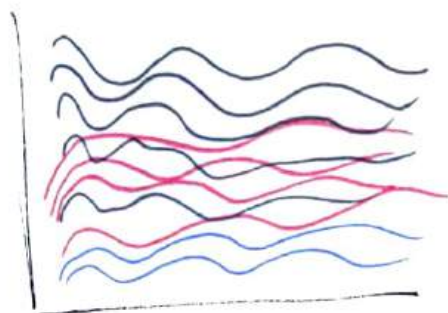
(Amato & Tangerine, 2021)



(Sherratt, n.d.)

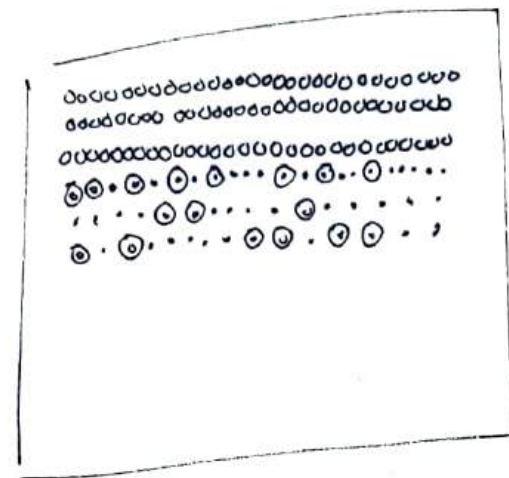


(Urbańska, 2011)



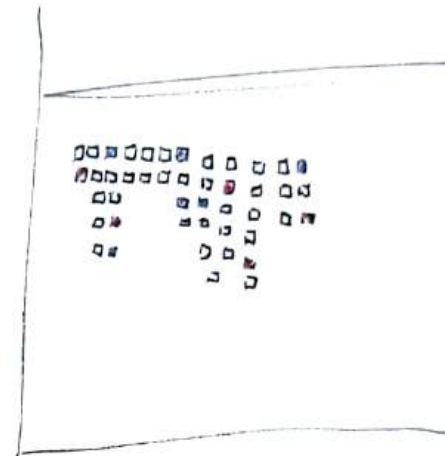
Line chart

Flat prices infographic
If content overlapped
It shows connection.
eg. overlapping 1st class/
2nd class.



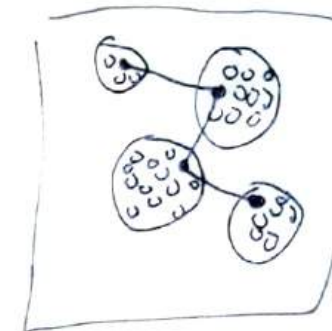
Tiny circles

on how
all data points on
hover makes
connected points
bigger/ other points
smaller and
color.
connected.

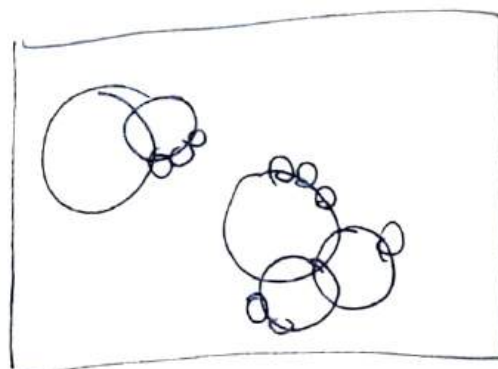


Dots.

Dots are 2
data points.
have over
to dynamically
show
connections.

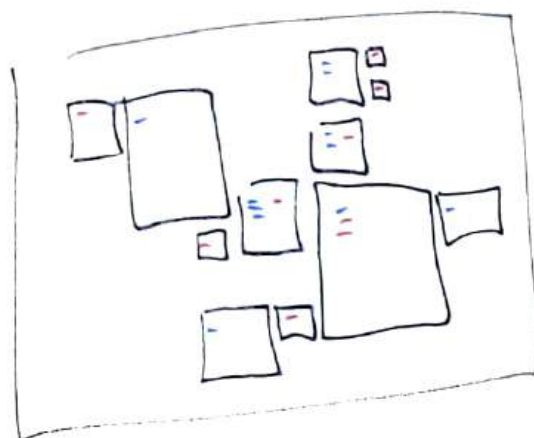
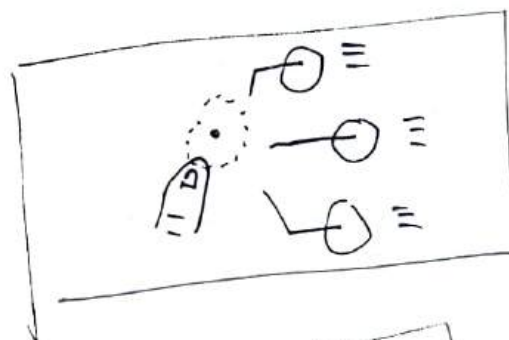


2nd Layer
on hover
shows
any links



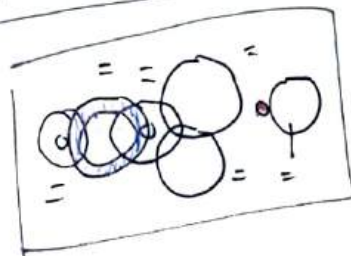
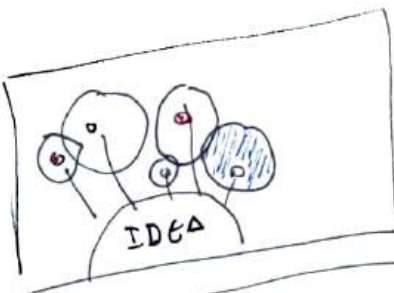
overlapping Bubbles

Shows connected
Items.

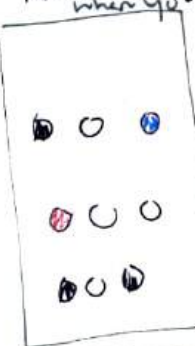


Treemap

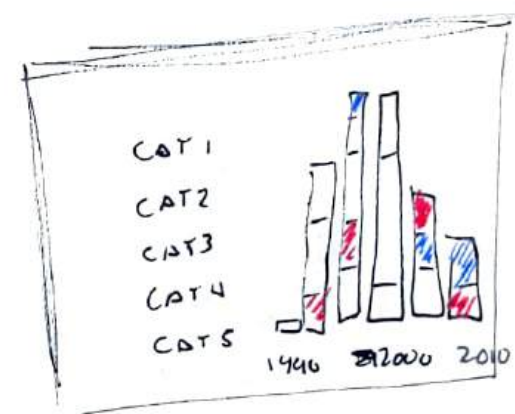
Use colour
to show
connected
Items



How I feel when you

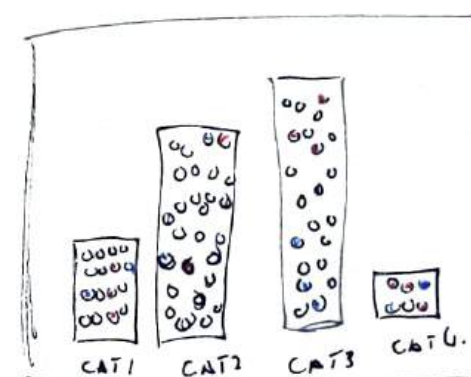


Column.
Categorization.



Broken down Bar.

have over category
to see amount in
each bar chart.
data along timeline.

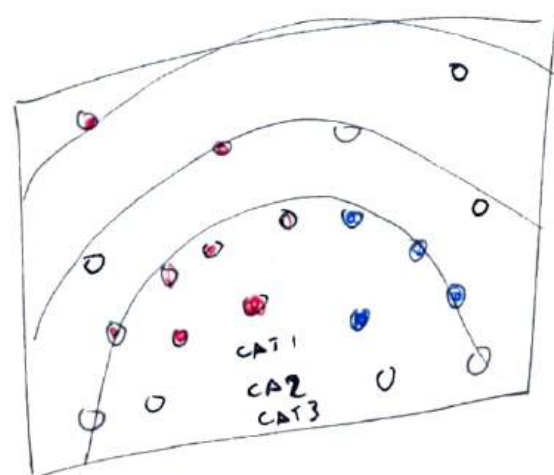


Bar chart made up of dots

each dot one
datapoint.

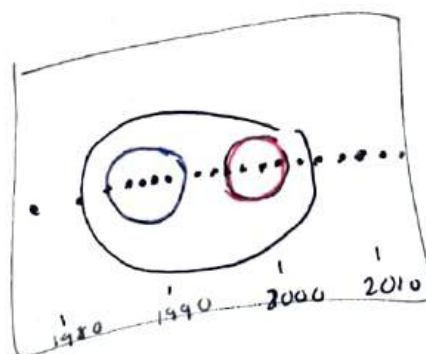
do certain year
group.

Colour Based on object type.

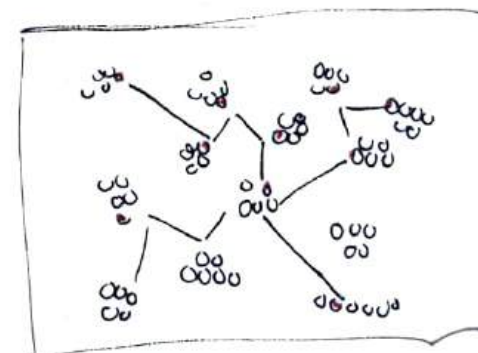


circular diagram

hover on
categories shows
relationship w/ date.
points.

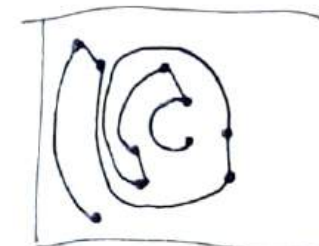


Hovering
over on
Items
overlaps
any
connection
in colour.

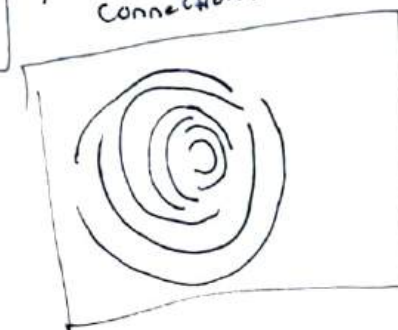


Node network Graph.

allow colour
and line links
to show
connection.



use colour
to
connect and
separate
Layers.



- Line
- Typography
- Colour
- Composition
- Weight

purp. / rupa / Blue / grey
Standard

Red / yellow / orange.
Connection

Discussion of process

For this project I used web based code HTML, CSS and D3.js which stands for Data Driven Documents and is a JavaScript library for visualising data (Bostock, n.d.). D3.js works by showing Scalable Vector Graphics (SVG) on a webpage. D3 requires data in a certain format for it to be able to read the data. In this project I had to re-create my own dataset using two arrays named ‘nodes:’ and ‘links:’, nodes are the individual data items and links combine two nodes together.

This project broken down into two distinct stages 1. Creating the Data and 2. Visualising the data.

‘Saucers’ Data

RawParsed

```
{
  "responseCode": 200,
  "responseMessage": "Successfully retrieved solr search result.",
  "payload": {
    "items": [
      {
        "uniqueId": "116328",
        "department": "International Art - Decorative Arts and Design",
        "departmentFacet": [
          "International Art - Decorative Arts and Design"
        ],
        "wasOnDisplay": false,
        "objectType": [
          "ceramics",
          "saucers",
          "tea sets"
        ],
        "objectTypeFacet": [
          "ceramics",
          "saucers",
          "tea sets"
        ],
        "irn": 116328,
        "creators": [
          "Wassily Kandinsky",
          "State Porcelain Factory"
        ],
        "creatorsFacet": [
          "Wassily Kandinsky",
          "State Porcelain Factory"
        ],
        "creatorsJson": "[[{\\"BioBirthEarliestDate\\":\\"1866\\",\\"BioBirthDate\\":\\"04 December 1866\\",\\"BioDeathDate\\":\\"13 December 1944\\",\\"irn\\":25144,\\"NamFullName\\":\\"Wassily Kandinsky\\",\\"SummaryData\\":\\"Kandinsky, Wassily\\",\\"BioBirthPlace\\":\\"Russia\\",\\"GroNgaSchoolsGroups_tab\\":[],\\"NamPartyType\\":\\"Person\\",\\"BioDeathEarliestDate\\":\\"1944\\",{\\"BioBirthEarliestDate\\":\\"1744\\",\\"BioBirthDate\\":\\"1744\\",\\"irn\\":23764,\\"NamFullName\\":\\"State Porcelain Factory\\",\\"SummaryData\\":\\"State Porcelain Factory\\",\\"BioBirthPlace\\":\\"St Petersburg, Russia\\",\\"GroNgaSchoolsGroups_tab\\":[],\\"NamPartyType\\":\\"Organisation\\",\\"NamOrganisation\\":\\"State Porcelain Factory\\"]]",
        "materials": [
          "porcelain"
        ],
        "aatTerTerm": [
          "curves",
          "lines",
          "Abstract",
          "shape"
        ],
        "aatThes": "[[{\\"aat_irn\\": 335512,\\"terAcronym\\": \\"AAT\\",\\"terValidTerm\\": \\"Yes\\",\\"terTerm\\": \\"curves\\",\\"terScopeNotes\\": \\"Lines having a locus that may be conceived to be traced by a moving point, the direction of motion continuously changing or deviating from a straight line. A closed curve is a path that repeats itself, and thus encloses one or more regions; simple examples include circles, ellipses, and polygons. Open curves such as parabolas, hyperbolas, and spirals have infinite length. src: Encyclopædia Britannica. Britannica Online. Chicago: Encyclopædia Britannica, Inc., 2002-. http://www.eb.com/ (1 July 2002). src: Levi, Howard. Foundations of Geometry and Trigonometry. Englewood Cliffs, N.J.: Prentice-Hall, 1960. src: Oxford English Dictionary Online. Oxford, England: Oxford University, 2002-. http://dictionary.oed.com (10 Jan. 2001). contrib: Getty Vocabulary Program\\",\\"hieThesaurus\\": \\"Art & Architecture Thesaurus\\",\\"hisVersion\\": \\"2015-02-17\\",\\"hisOriginalReference\\": \\"300378887\\",\\"tgnPlaceType\\": \\"\\",\\"secRecordStatus\\": \\"\\",\\"admPublishWebNoPassword\\": \\"Yes\\",\\"admPublishWebPassword\\": \\"\\",\\"admDateModified\\": \\"2018-07-03\\",\\"admTimeModified\\": \\"12:11:41\\\" },{\\"aat_irn\\": 318073,\\"terAcronym\\": \\"AAT\\",\\"terValidTerm\\": \\"Yes\\",\\"terTerm\\": \\"lines\\",\\"terScopeNotes\\": \\"Mathematically, the trace of a moving point; more generally a narrow elongated mark drawn or projected. src: Webster's Third New International Dictionary of the English Language. Unabridged. Springfield, MA: G. & C. Merriam Co., 1961. contrib: Getty Vocabulary Program\\",\\"hieThesaurus\\": \\"Art & Architecture Thesaurus\\",\\"hisVersion\\": \\"2015-02-17\\",\\"hisOriginalReference\\": \\"300056279\\",\\"tgnPlaceType\\": \\"\\",\\"secRecordStatus\\": \\"\\",\\"admPublishWebNoPassword\\": \\"Yes\\",\\"admPublishWebPassword\\": \\"\\",\\"admDateModified\\": \\"2018-07-03\\",\\"admTimeModified\\": \\"13:16:51\\\" },{\\"aat_irn\\": 305863,\\"terAcronym\\": \\"AAT\\",\\"terValidTerm\\": \\"Yes\\",\\"terTerm\\": \\"Abstract\\",\\"terScopeNotes\\": \\"Refers to art styles that were a reaction against the traditional European conception of art as the imitation of nature. In the strictest sense, the term refers to 20th-century Western painting, sculpture, or graphic art having subject matter that does not include forms that represent objects from the visible world. The term is sometimes applied to art in which natural forms are only simplified or changed in their representation, but not eliminated entirely. For the process of formulating general concepts by abstracting common properties of instances, use \\\"abstraction.\\\" src: Grove Dictionary of Art Online. Oxford University Press, 2003-2008. http://www.groveart.com. src: Oxford Companion to Art. 17th impression. Harold Osborne, ed. Oxford: Clarendon Press, 1996. contrib: Getty Vocabulary Program\\",\\"hieThesaurus\\": \\"Art & Architecture Thesaurus\\",\\"hisVersion\\": \\"2015-02-17\\",\\"hisOriginalReference\\": \\"300108127\\",\\"tgnPlaceType\\": \\"\\",\\"secRecordStatus\\": \\"\\",\\"admPublishWebNoPassword\\": \\"Yes\\",\\"admPublishWebPassword\\": \\"\\",\\"admDateModified\\": \\"2018-07-03\\",\\"admTimeModified\\": \\"12:00:25\\\" },{\\"aat_irn\\": 317789,\\"terAcronym\\": \\"AAT\\",\\"terValidTerm\\": \\"Yes\\",\\"terTerm\\": \\"shape\\",\\"terScopeNotes\\": \\"The outline, form, or characteristic configuration of an object, including its contours; the external form or outer boundary of the object. src: Categories for the Description of Works of Art (CDWA) [online]. Edited by Murtha Baca and Patricia Harpring. Los Angeles: J. Paul Getty Trust and the College Art Association, 1995-. http://www.getty.edu/research/publications/electronic_publications/cdwa/index.html (12 July 2013) src: Oxford English Dictionary Online. Oxford, England: Oxford University, 2002-. http://dictionary.oed.com (10 Jan. 2001). contrib: Getty Vocabulary Program\\",\\"hieThesaurus\\": \\"Art & Architecture Thesaurus\\",\\"hisVersion\\": \\"2015-02-17\\",\\"hisOriginalReference\\": \\"300056273\\",\\"tgnPlaceType\\": \\"\\",\\"secRecordStatus\\": \\"\\",\\"admPublishWebNoPassword\\": \\"Yes\\",\\"admPublishWebPassword\\": \\"\\",\\"admDateModified\\": \\"2018-07-03\\",\\"admTimeModified\\": \\"13:16:51\\\"}]",
        "aatTerAlternateTerms": [
          "curve",
          ...
        ]
      }
    ]
  }
}
```

Creating the Data

For this project I found more challenges in creating the nodes/links dataset than visualising the data. When creating this dataset, I began with the ‘saucers’ object category from the NGA, this dataset has substantially less data with only 35 items and one or two links.

I decided that I wanted to showcase the material as the common link items between data, for example if two materials used clay then they would be linked together.

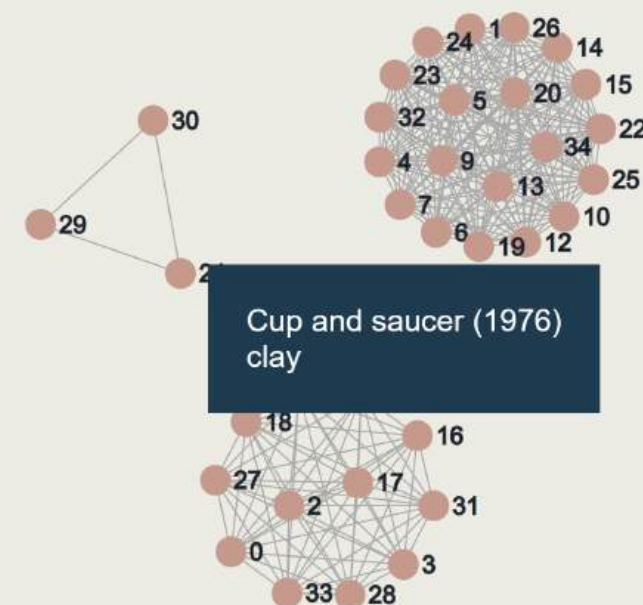
One key issue that I had with this was that there were duplicate and undefined values for some of the various materials. After trial and error, I was able to remove duplicates using a function from

stack overflow (“Get all non-unique values (i.e.: duplicate/more than one occurrence) in an array”, n.d.), however this didn’t remove undefined values from the list and I found a some code from blog to remove undefined values (Love, 2021).

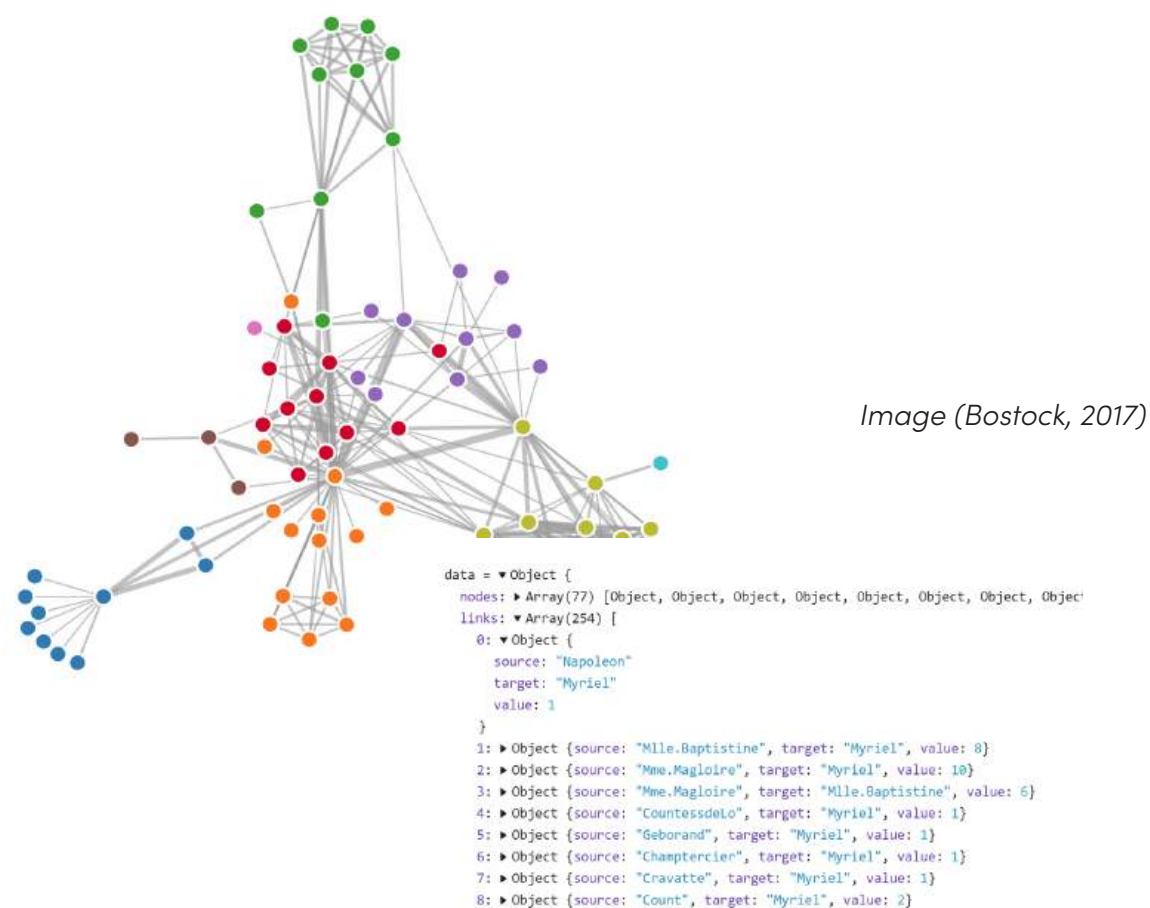
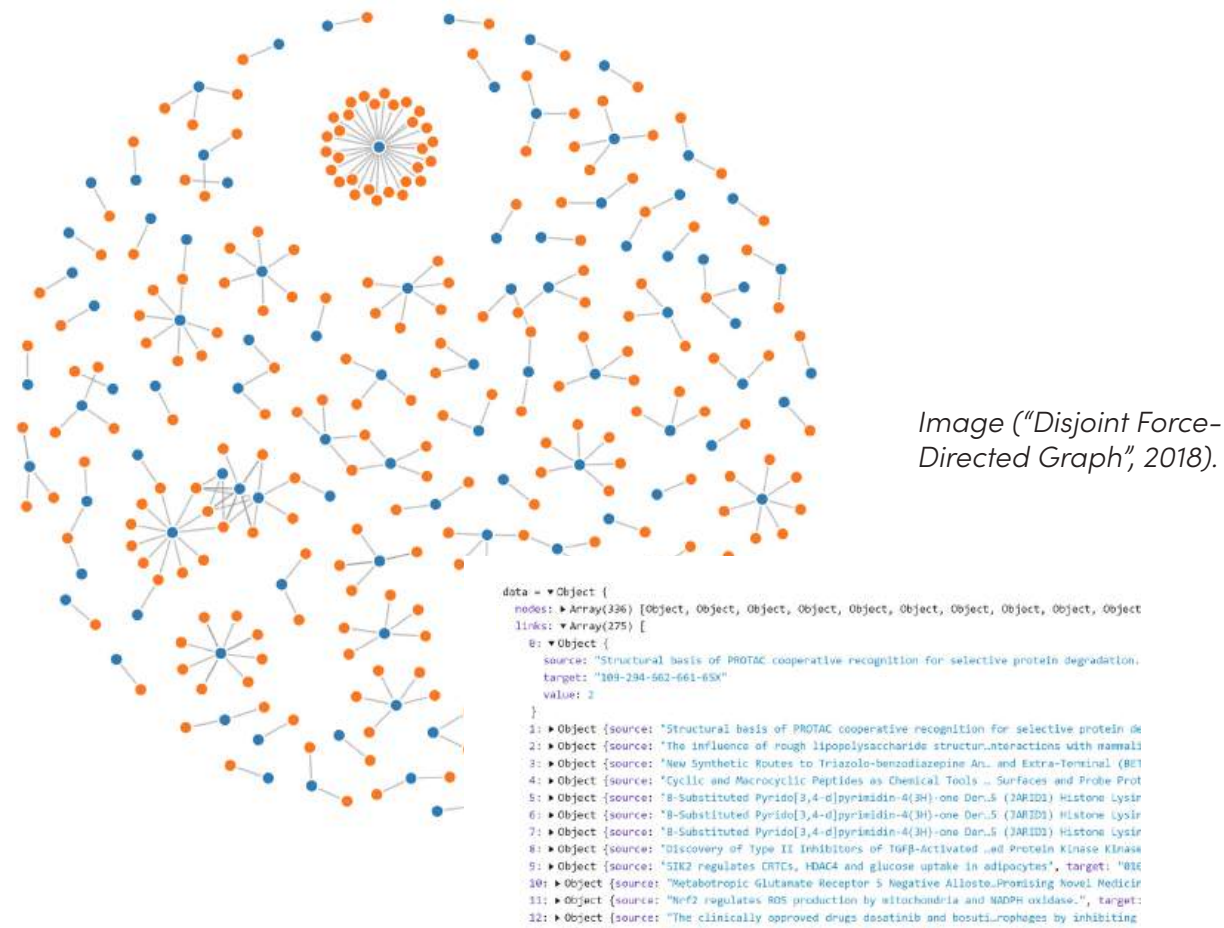
Using array’s, I was able to push the values to create a list of nodes which included a unique id, the NGA identifier number, and the material. This JSON data was copied into a JavaScript file as an array as ‘JSON.stringify’ automatically created quotation marks which turn the array into valid JSON. Valid JSON data was required otherwise it would result in an error when trying to create the links.

```
{
  "nodes": [
    {
      "id": 0,
      "uniqueId": 116328,
      "title": "Cup and saucer (c.1921-23)",
      "material": "porcelain"
    },
    {
      "id": 1,
      "uniqueId": 146664,
      "title": "Cup and saucer (c.1921)",
      "material": "porcelain"
    },
    {
      "id": 2,
      "uniqueId": 116325,
      "title": "Cup and saucer (1925-30)",
      "material": "porcelain"
    },
    {
      "id": 3,
      "uniqueId": 3423,
      "title": "Cup and saucer (1923-25)",
      "material": "porcelain"
    },
    {
      "id": 4,
      "uniqueId": 43413,
      "title": "Cup and saucer (c.1937)",
      "material": "undefined"
    },
    {
      "id": 5,
      "uniqueId": 33060,
      "title": "Coffee cup and saucer (c.1948)",
      "material": "undefined"
    },
    {
      "id": 6,
      "uniqueId": 33042,
      "title": "Coffee cup and saucer (c.1948)",
      "material": "undefined"
    },
    {
      "id": 7,
      "uniqueId": 33042,
      "title": "Coffee cup and saucer (c.1948)",
      "material": "undefined"
    },
    {
      "id": 8,
      "uniqueId": 222825,
      "title": "Cup and saucer (c.1948)",
      "material": "undefined"
    },
    {
      "id": 9,
      "uniqueId": 147909,
      "title": "Cup, saucer and plate set (1936)",
      "material": "undefined"
    },
    {
      "id": 10,
      "uniqueId": 361754,
      "title": "Cup, saucer and plate (1915)",
      "material": "porcelain"
    },
    {
      "id": 11,
      "uniqueId": 15007,
      "title": "Cup and Saucer (c.1825)",
      "material": "undefined"
    },
    {
      "id": 12,
      "uniqueId": 45670,
      "title": "Cup and saucer (c.1910)",
      "material": "undefined"
    },
    {
      "id": 13,
      "uniqueId": 33133,
      "title": "Cup and saucer (1973)",
      "material": "undefined"
    },
    {
      "id": 14,
      "uniqueId": 33135,
      "title": "Cup and saucer (c.1973)",
      "material": "undefined"
    },
    {
      "id": 15,
      "uniqueId": 33043,
      "title": "Coffee cup and saucer (c.1948)",
      "material": "undefined"
    },
    {
      "id": 16,
      "uniqueId": 61754,
      "title": "Cup, saucer and plate (1915)",
      "material": "porcelain"
    },
    {
      "id": 17,
      "uniqueId": 61757,
      "title": "Cup, saucer and plate (c.1925)",
      "material": "porcelain"
    },
    {
      "id": 18,
      "uniqueId": 36406,
      "title": "Cup and saucer (c.1925)",
      "material": "porcelain"
    },
    {
      "id": 19,
      "uniqueId": 36406,
      "title": "Cup and saucer (c.1948)",
      "material": "undefined"
    },
    {
      "id": 20,
      "uniqueId": 36408,
      "title": "Cup and saucer (c.1948)",
      "material": "undefined"
    },
    {
      "id": 21,
      "uniqueId": 98454,
      "title": "Cup and saucer (1976)",
      "material": "clay"
    },
    {
      "id": 22,
      "uniqueId": 98840,
      "title": "Cup and saucer (c.1953)",
      "material": "undefined"
    },
    {
      "id": 23,
      "uniqueId": 33026,
      "title": "Cup and saucer (c.1932)",
      "material": "undefined"
    },
    {
      "id": 24,
      "uniqueId": 92319,
      "title": "Cup and saucer (c.1953)",
      "material": "undefined"
    },
    {
      "id": 25,
      "uniqueId": 36409,
      "title": "Cup and saucer (c.1950)",
      "material": "undefined"
    },
    {
      "id": 26,
      "uniqueId": 88887,
      "title": "Cup and saucer (c.1957)",
      "material": "undefined"
    },
    {
      "id": 27,
      "uniqueId": 77078,
      "title": "Cup and saucer (c.1902)",
      "material": "porcelain"
    },
    {
      "id": 28,
      "uniqueId": 77081,
      "title": "Cup (a), Saucer (b); non-objective decoration based on a circle and segments; cup centre; with decoration in red (c1902)",
      "material": "porcelain"
    },
    {
      "id": 29,
      "uniqueId": 59232,
      "title": "Cup and saucer (1978)",
      "material": "clay"
    },
    {
      "id": 30,
      "uniqueId": 59235,
      "title": "Cup and saucer (1978)",
      "material": "clay"
    },
    {
      "id": 31,
      "uniqueId": 61433,
      "title": "Cup and saucer (c.1923)",
      "material": "porcelain"
    },
    {
      "id": 32,
      "uniqueId": 214105,
      "title": "Egg cup and saucer (c.1846)",
      "material": "undefined"
    },
    {
      "id": 33,
      "uniqueId": 184305,
      "title": "Cup and saucer (1922)",
      "material": "porcelain"
    },
    {
      "id": 34,
      "uniqueId": 60787,
      "title": "Jardiniere with saucer (c1900)",
      "material": "porcelain"
    }
  ],
  "links": [
    {
      "source": 0,
      "target": 2,
      "weight": 2
    }
  ]
}
```

NGA - Watercolours/Sculptures



In this early version all materials were linking to all nodes, i.e. all undefined and all clay/porcelain values were linking together.



The next issue that I encountered was creating the links which connect two or more nodes together. After researching how other examples achieve links between nodes (Bostock, 2017; “Disjoint Force-Directed Graph”, 2018) I noticed that the ‘source:’ and ‘target:’ values for the links don’t have to be numbers but can be strings. A node chart usually has a central node with various items attached, to solve my issue I realised that each material should be a central node and each work of art should be linked to the materials that they contain.

When creating the links, I used an 'if (typeof === undefined)' statement to filter out undefined values as all undefined values would link up to each other. In an example on stack

overflow one forum poster (Furtado, 2016) solved my issue using a loop to push the id values and another loop to push the material values. I was able to achieve this using JavaScripts forEach loop (Salvado, 2010).

One tool that I found important during this process was Curious Concepts JSON formatter (“JSON Formatter & Validator”, n.d.), this tool checks if the JSON is valid and if there are any issues with commas or quotation marks, it allowed me to quickly validate my JSON data.

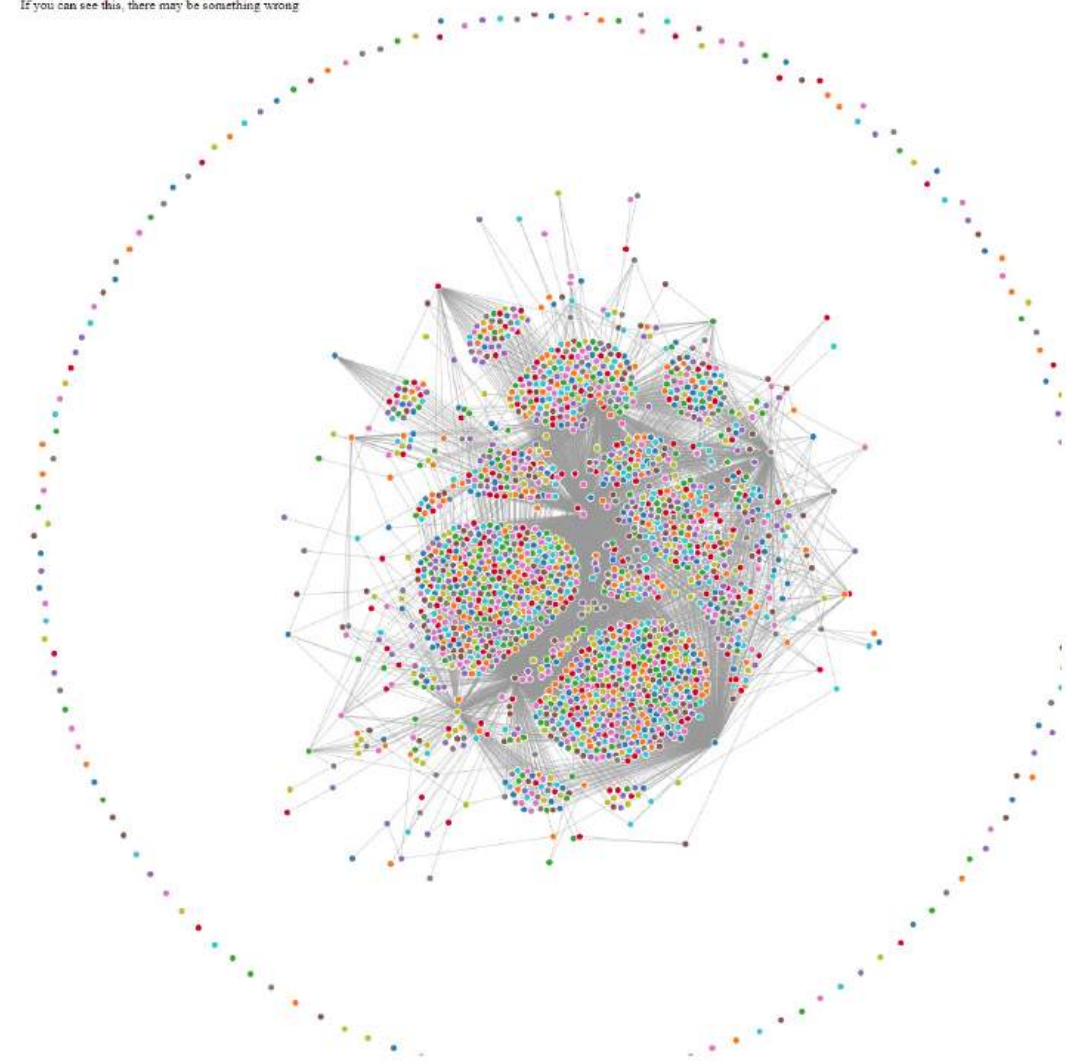
Visualising the Data

After getting a working nodes/links data set the next stage of the process was visualising the data.

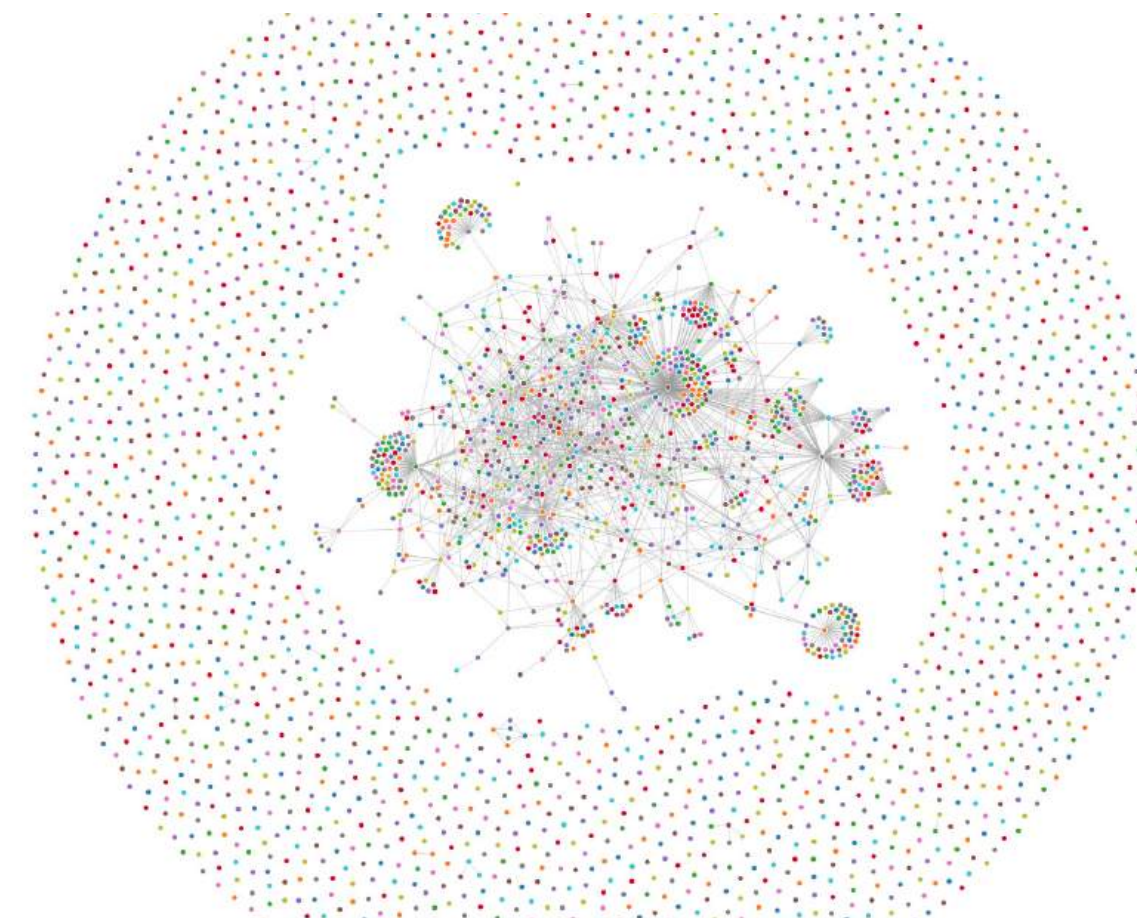
Key challenges that I encountered was that when I got D3's node chart to work it was discovered that the data was unreadable and very difficult to follow. When there is too much data and too many connections it becomes difficult to identify connections and see the patterns this is referred to as 'hairball' from (Healy, n.d.).

I tried various other datasets such as watercolours, sculptures, ceramics, jewellery, paintings, and posters. After trying all these datasets, I decided to switch from materials to authors which have less links and easier to read and comprehend.

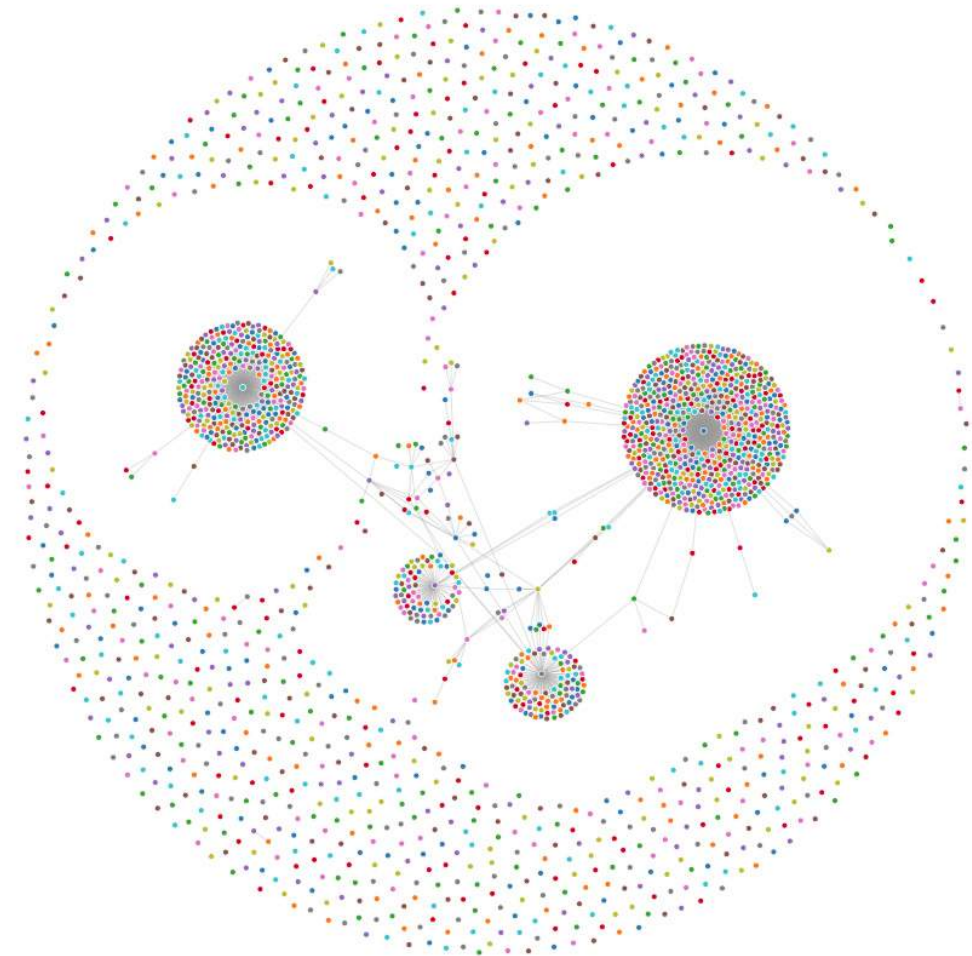
Watercolours
(Materials)



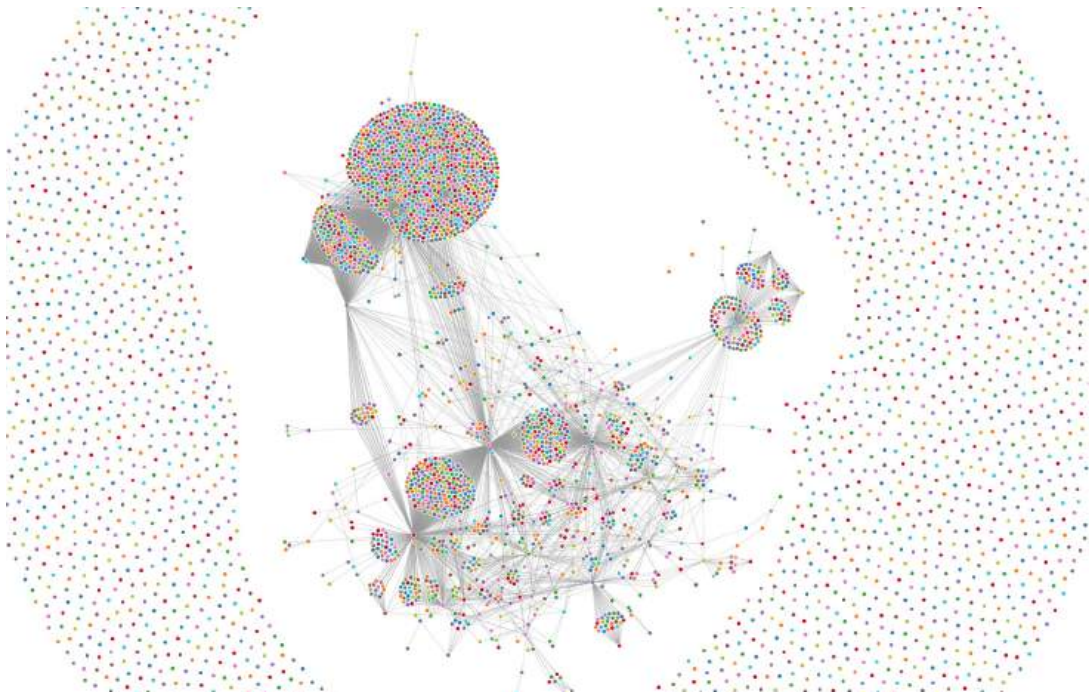
Sculptures
(Materials)



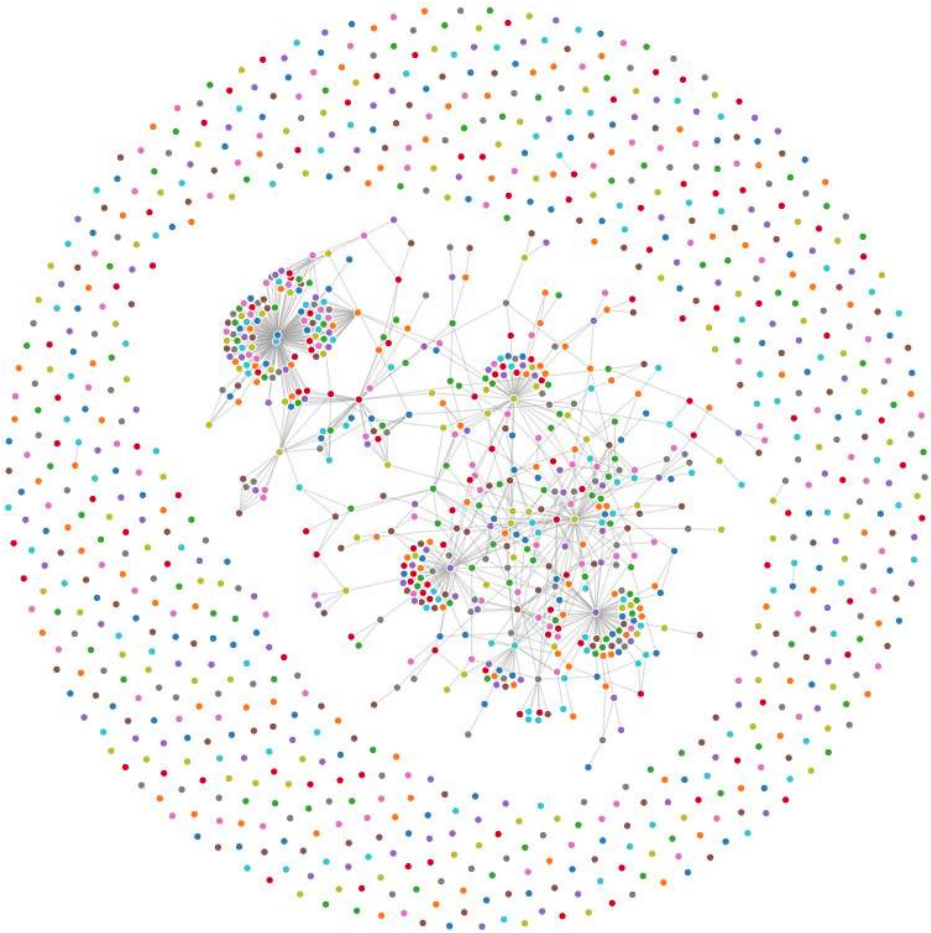
Ceramics
(Materials)



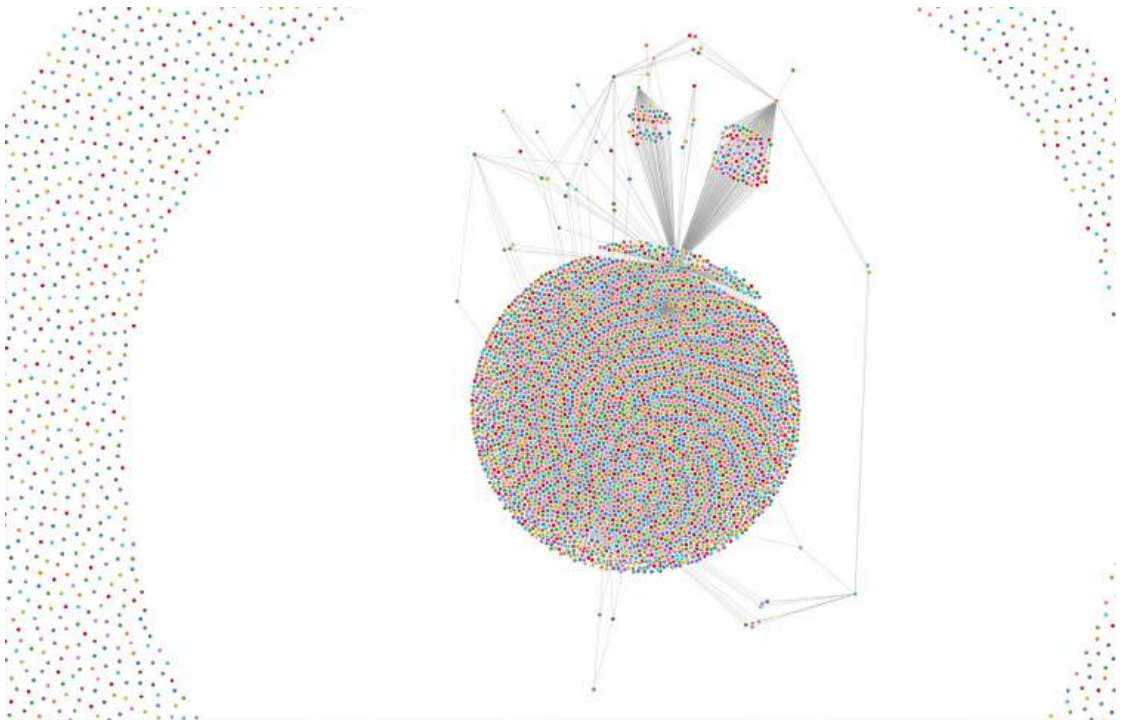
Paintings
(Materials)



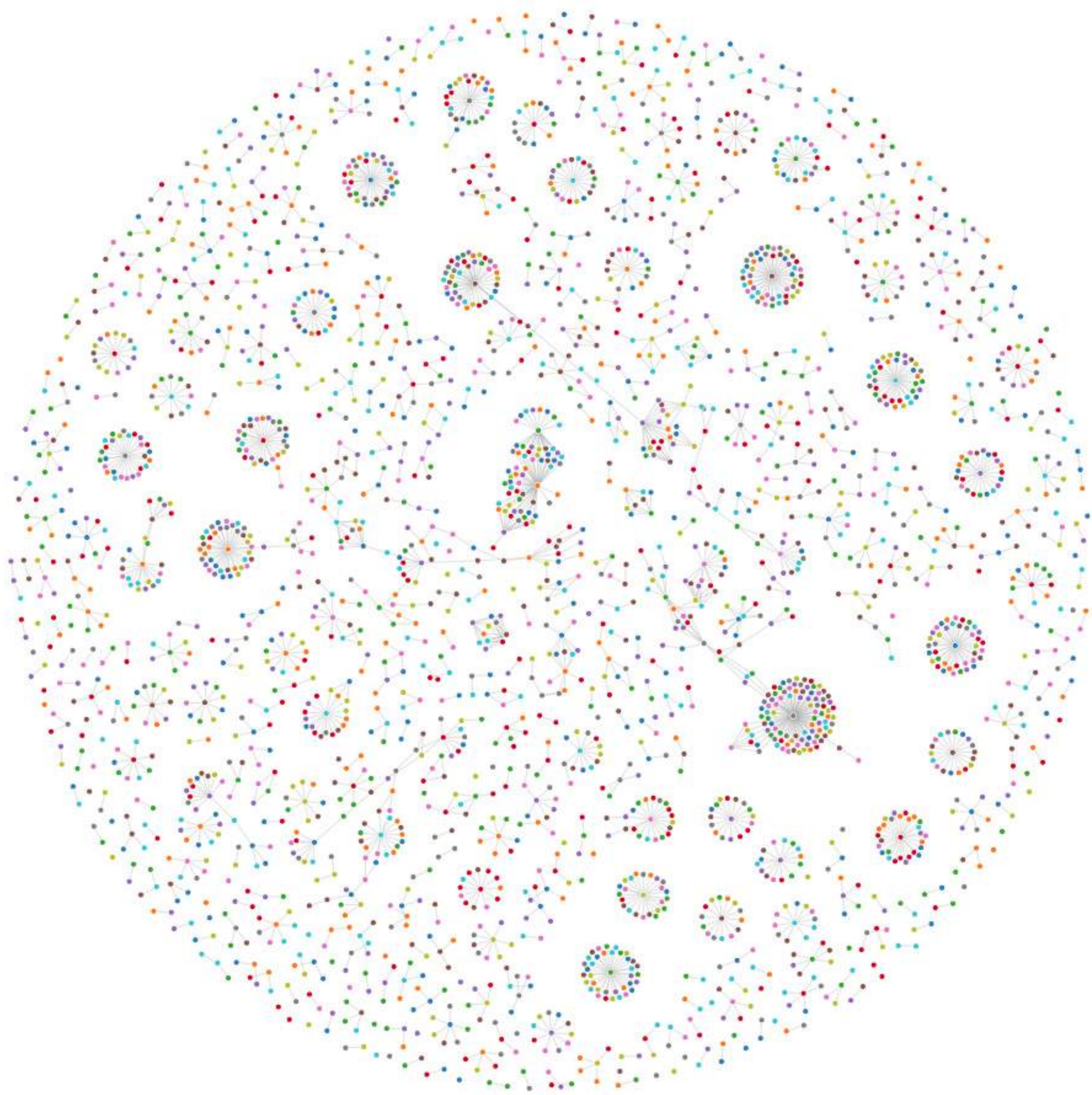
Jewellery
(Materials)

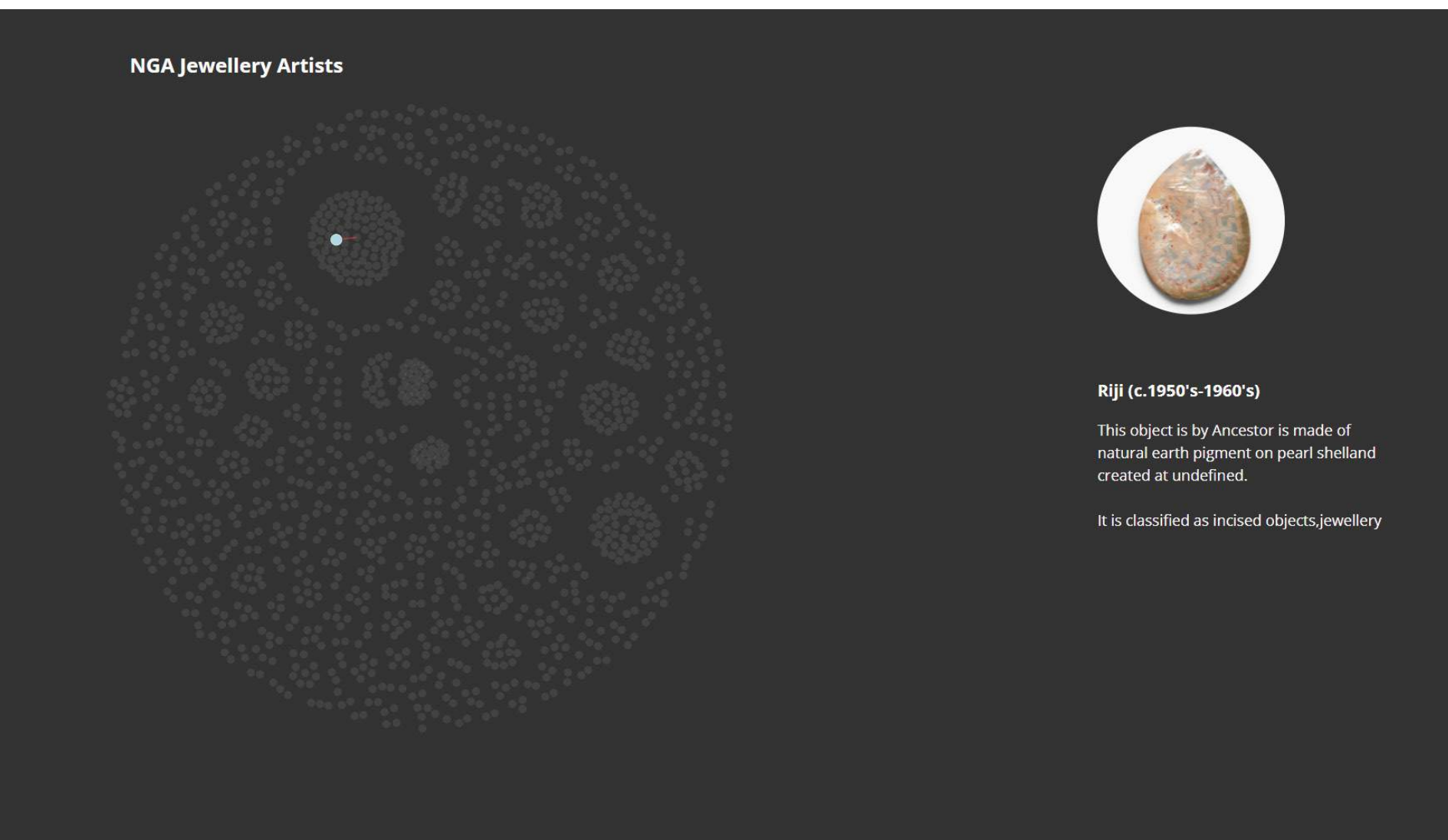


Paintings
(Materials)



Ceramics
(Authors)





The interactivity in this graph, was created using a tooltip to the right side of the chart, when hovering over a node the data would display on the tooltip. Hovering showcases the connected author.

I was not able to more prominently showcase the connections due to time constraints. If I had additional time to work on this project, I would have looked into visualising the lack of images in another format similar Albers boxes using colour or shape to create a visual based on the data. For example, if a ring was made from gold display a gold circle. Another feature that I would have added would be a search mechanic, if the user knows famous maker or piece of jewellery a search function would help them find what an item or an author faster.

If I had the option to do it again

If I had the opportunity to do this project differently, I would have used less data or found another way to visualise it. At the end of this project, I noticed that trying to move my cursor over the individual nodes was challenging due to them being so small, if I scaled their radius size then there would be too much overlap and if I increased the collision radius then part of the data would be cut off from the top and bottom.

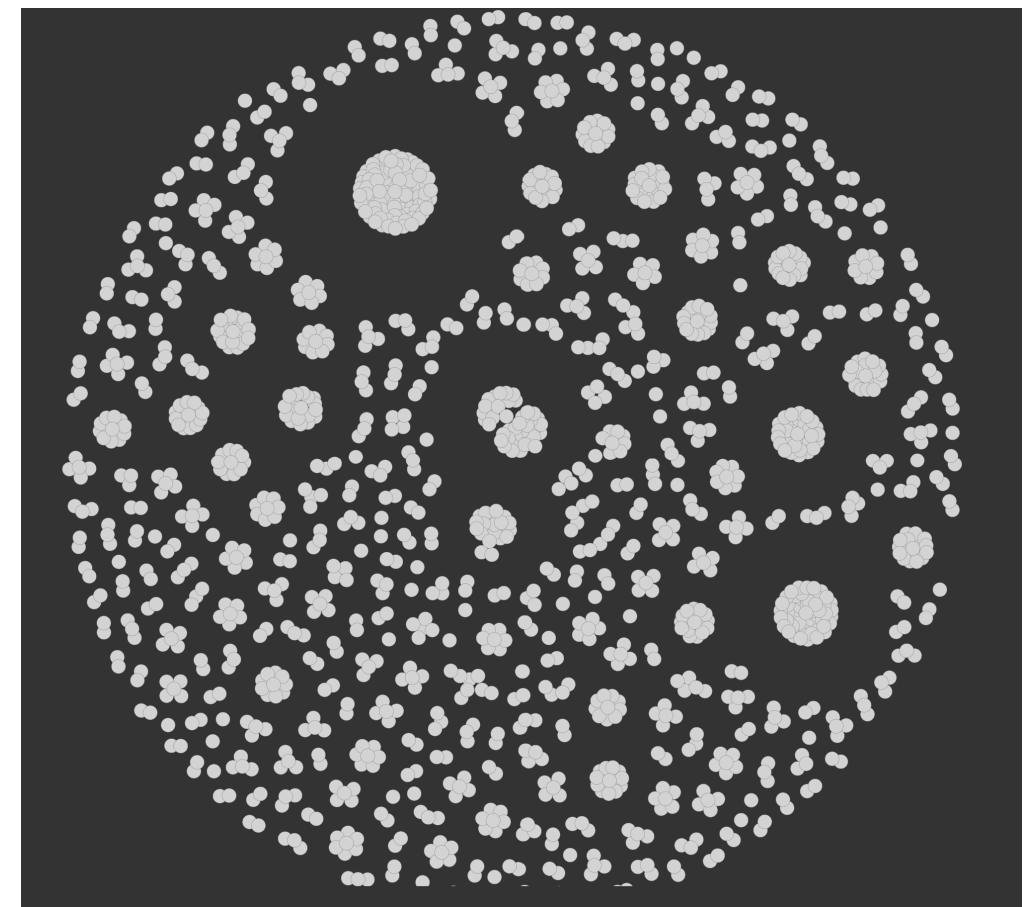
If I had the opportunity to do this project again then I would have more carefully chosen my data set, which would use less data or chosen a different format to visualise it, maybe I could have had a grid of squares that were bigger and more optimised in the 16:9 screen size. The

size of the squares could relate to how many works were available and when clicked would display a list of smaller squares underneath showcasing links.

Another component that looking back I should have implemented was a way to filter the data, for example filtering by year of creation or material type such as gold or silver. Filtering the data aligns with Ben Shneiderman's Visual Information Seeking mantra 'Overview first, zoom and filter, then details on demand' (Shneiderman, 1996). Including some method to filter the data would have helped to solve my large dataset issue and provide a more interesting subsection of the data for the viewer.

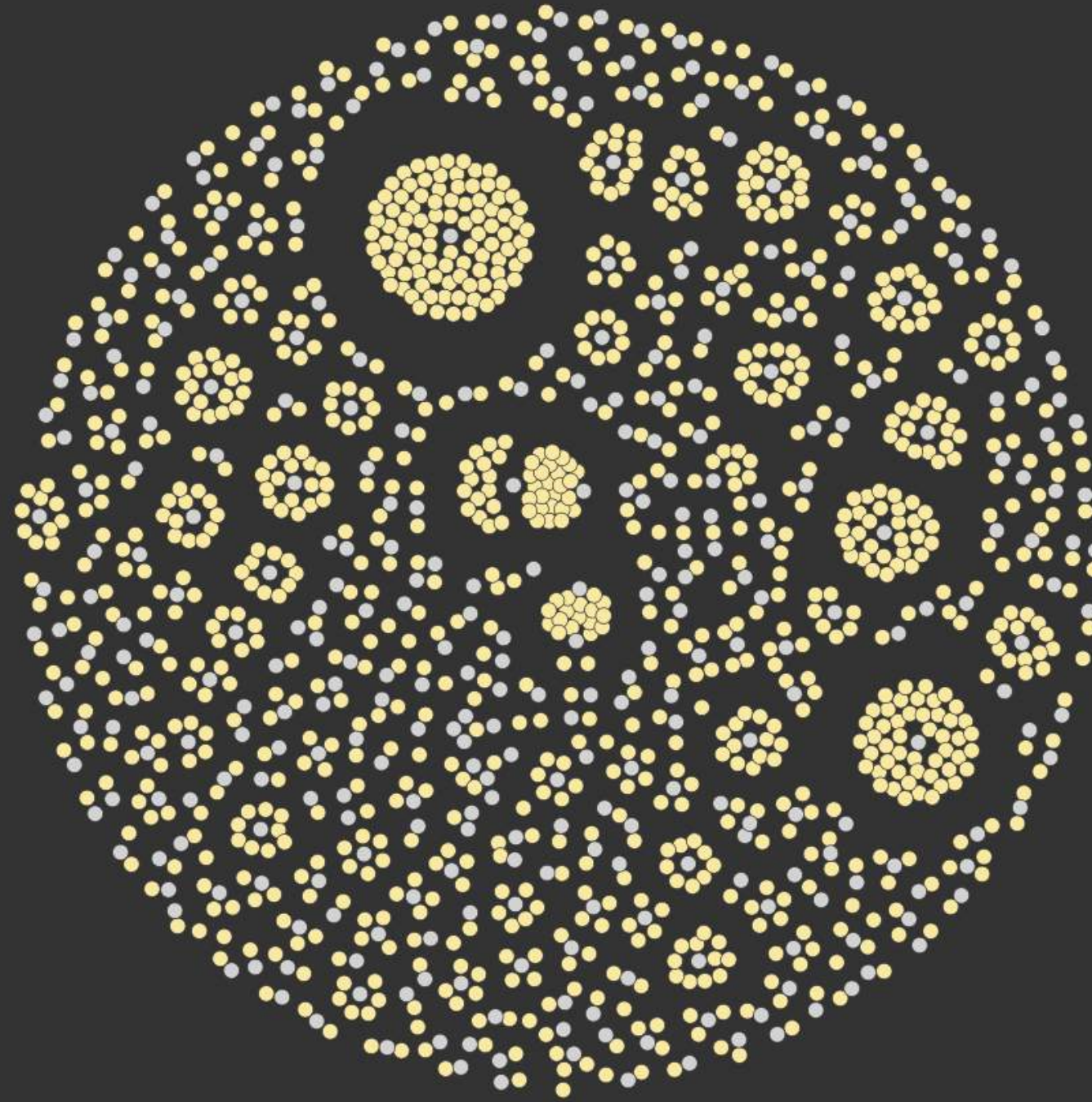


Some method to filter the data may have helped to reduce the amount of nodes.
(Screenshot of German Digital Library filter by year function, n.d.)



JEWELLERY COLLECTION

A data Visualisation using National Gallery of Australia's collection



Brooch (2011)

This object is by Helen Britton is made of 925 silver
paint and the location of creation is unknown.
It is classified as brooches,jewellery

Final Work

Due to API Query limits the images
may stop loading.

Work can be viewed [here](#)

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