

Data Vizualisation - Proposal

Overview, motivation, target audience. Related work and inspiration. What am I trying to show in the data viz?

For this project, we choose to look at a movie dataset. The aim is to have an overview of some movies (from a The movie Database dataset) by looking at how they are linked together. To link them, we would like to look at usual features like actors, directors, year, type or score, but also to consider the work of crew members that are neither actors nor directors but are present in a lot of movies, like hairdressers, CGI technicians, sound effects directors and so on. We hope that it will highlight new relations and propose a new perspective on movie dataset. We want to integrate those different dimension in a unique interactive visualisation, addressed to anyone who want to have a better understanding of the relation that exist between well known movies.

This idea came to us by looking at some visualization that show how some entities were linked in a particular universe or space. For instance, we saw network visualisation about Star Wars [1], Star Trek [2] or even Subreddits [3]. We found this pretty cool and interesting and looked at which universe/space we could focus on. We decided to look at movies in general and not to focus in a particular universe. We found our dataset and realized that we may have more informations than expected (not just actors and directors), which can be even more interesting and original. A lot of visualization and analysis of movie dataset already exist. For instance [4] propose cool interactive visualization and there are a lot like this. However, we didn't find any visualization that show link made with the crew members. We would like to let the user explore the data by letting him go through different point of view, highlighting different feature that he could choose.

[1] <http://www.kirellbenzi.com/blog/exploring-the-star-wars-expanded-universe/>

[2] <https://datascopeanalytics.com/startrekviz/>

[3] <http://rhiever.github.io/redditviz/>

[4] <https://ngchwanlil.github.io/datavis/imdb-genres.html>

Dataset : <https://www.kaggle.com/tmdb/tmdb-movie-metadata/data>

A dataset of 5000 extracted from The movie Database (<https://www.themoviedb.org/?language=fr>). It contains generic informations about the movies (title, language, production country/companies, genres, budget and revenue, and grades). For each movie, we also have complete cast and the crew. We may want to get more data from other dataset/website (IMDB).

GitHub: <https://github.com/qkuenlin/DataViz>

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CODE BOOK

With this project, we propose an overview on the movie industry, more specifically by looking at the relations between well known movies. Usually, this is done by looking at the actors or directors they have in common, or by looking at features like budget, revenue or ranking. Here, the idea is also to point out the work of crew members that are neither actors nor directors but are present in a lot of movies, like hairdressers, CGI technicians, sound effects directors and so on.

We will use an unique interactive visualization to integrate those different dimensions. It is addressed to anyone who want to explore the various relations and have a better understanding of the movie industry.

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We looked at various movie dataset and found one that have more informations than expected (not just actors and directors), which can be even more interesting and original. A lot of visualization and analysis of movie dataset already exist. For instance [4] propose cool interactive visualization and there are a lot like this. However, we didn't find any visualization that show link made with the crew members. We would like to let the user explore the data by letting him go through different point of view, highlighting different feature that he could choose.

The dataset we chose contains 5000 movies extracted from The movie Database (<https://www.themoviedb.org/?language=fr>). It contains generic informations about the movies (title, language, production country/companies, genres, budget and revenue, and grades). For each movie, we also have complete cast and the crew.

The dataset is available here : <https://www.kaggle.com/tmdb/tmdb-movie-metadata/data>

To increase the interactivity and the information available in the visualization, we may want to combine data from other sources, like wikipedia or IMDb.

The data was explored using a Jupyter Notebook and Python. We started to clean the data and to integrate it into a sqlite database. The advantages of this format is that it facilitates information retrieval with simple sql queries, and that the database is a simple file that do not need to run on a particular server.

We examined the possibility to make requests directly from javascript, in a similar way we would have opened a file, but it seems complicated to do in this particular language. In fact, there exist a script to make SQL request to a sqlite file in javascript ([sql.js](#)). The first main issue was to get the sqlite file from into the browser. As it is a web page, there is no possibility to load files that are not JSON, CSV or other separated data file, for security

reasons. The first work around we explored was to embed the sqlite database into a JSON file to be able to load it, but there was a problem because it is a binary file, and JSON is read as a string, so some reserved characters broke the JSON. Even using a base64 encoding (binary to string) didn't work, the database was broken when decoding the string. Then we managed to create a DB inside the browser, not by directly importing the sqlite file, but by recreating it with SQL commands "CREATE TABLE" and "INSERT INTO". But after that, the second main issue arises. It was super slow. It took nearly 10 seconds to load the page, whereas with simply JSONs it took 1. And the third and last issue that made us give up this idea was the way the data was returned by queries. With JSONs we are able to do filter operations that return us another JSON array. With SQL, the result is an array of arrays, not an array of JSON, so the selection of attributes becomes way harder and we have to use indices instead of names, that complicates the code.

Once the data was put in the database, we had 104842 person, cast and crew mixed, 4803 movies and 235665 links between movies and people. The crew was splitted into different departments and jobs. All the person from the cast were assigned in the same department and job: Cast > Actor. The problem here is that the main actors and extras/stunt doubles are in the same category, which results in a huge category that may be hard to handle later in the visualization. An idea to separate some of the person, could be to extract a list of well known actors.

As a first try, and to develop the visualization, we chose to take only movies with a popularity greater to 50 (we don't know exactly here what it represents but it ranges from 875 to 0). [BOXPLOT] We also removed the links and the associated person where a person was linked to only one movie. For now, we also removed the person that were under the department CREW, because it wasn't really clear what it meant and because we want to initially focus our visualisation on the department level (and not the job level).

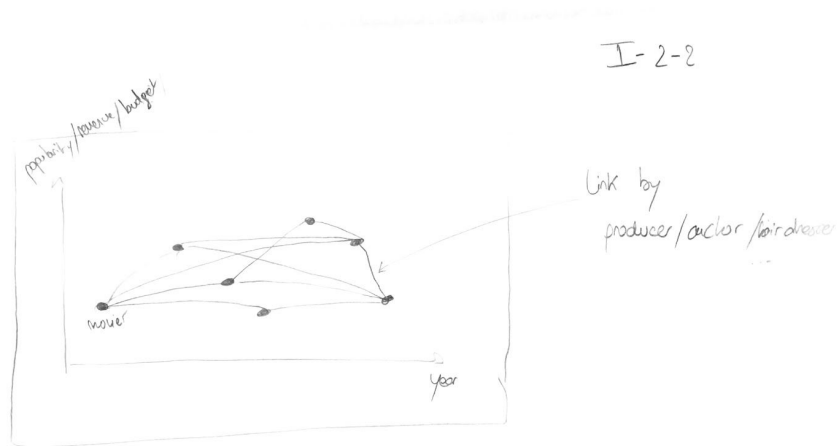
The next step of the project is to establish a first visualization design and experiment it. To do this, we tried to follow the steps proposed by McKenna et al. [<https://design-worksheets.github.io/>], the first step (Understand) had been already done.

To resume, we want to:

- Show relations between well known movies and present general information/statistics
 - relations at the crew level => highlight less known jobs
 - relations at the cast level (maybe limited to famous person)
- Present informations about particular movies

The user should be able to explore the data, find interesting links and think about new aspects of movies. It could also be useful to find movies similar to one movie the user liked.

Because we want to display relations, we first thought about a classic node-link diagram.



Sketch 1: First visualization idea

The idea was to display the different nodes on a two dimensional diagram where the x-axis could have been the year, and the y-axis the popularity, the revenue or the budget of the movie. Then, edges would have been drawn between nodes linked by same crew members or cast members.

However this kind of visualization would have been instinctive and quite easy to order, we fear that the potentially high number of links make the visualization hard to read and to navigate. Here a force-directed layout seems not adapted.

The second idea was to use circle layout with edge bundling.



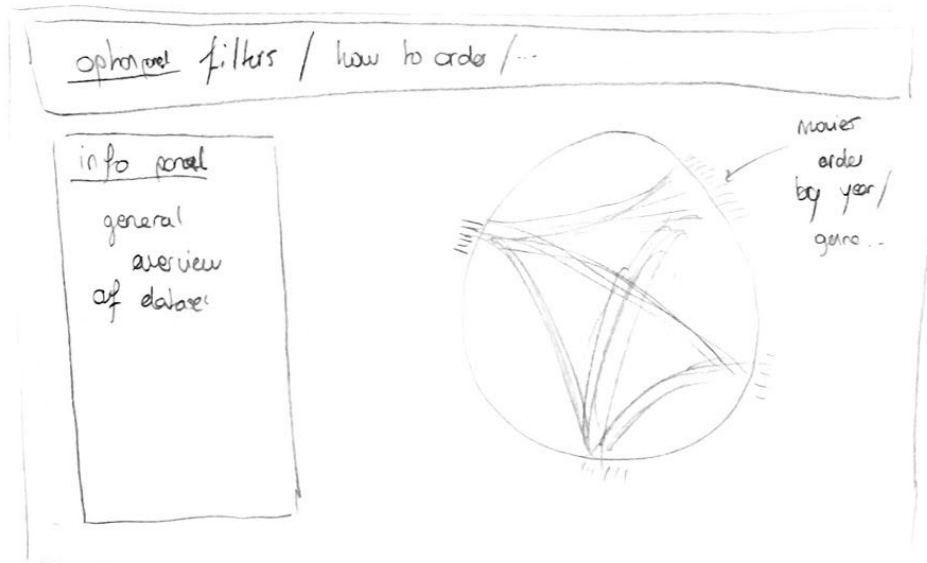
Sketch 2: second visualization idea

Here, it could be possible to order the movies by year or genre (or even maybe by revenue, budget or popularity). Then, as for the first layout, the links would have been made if two

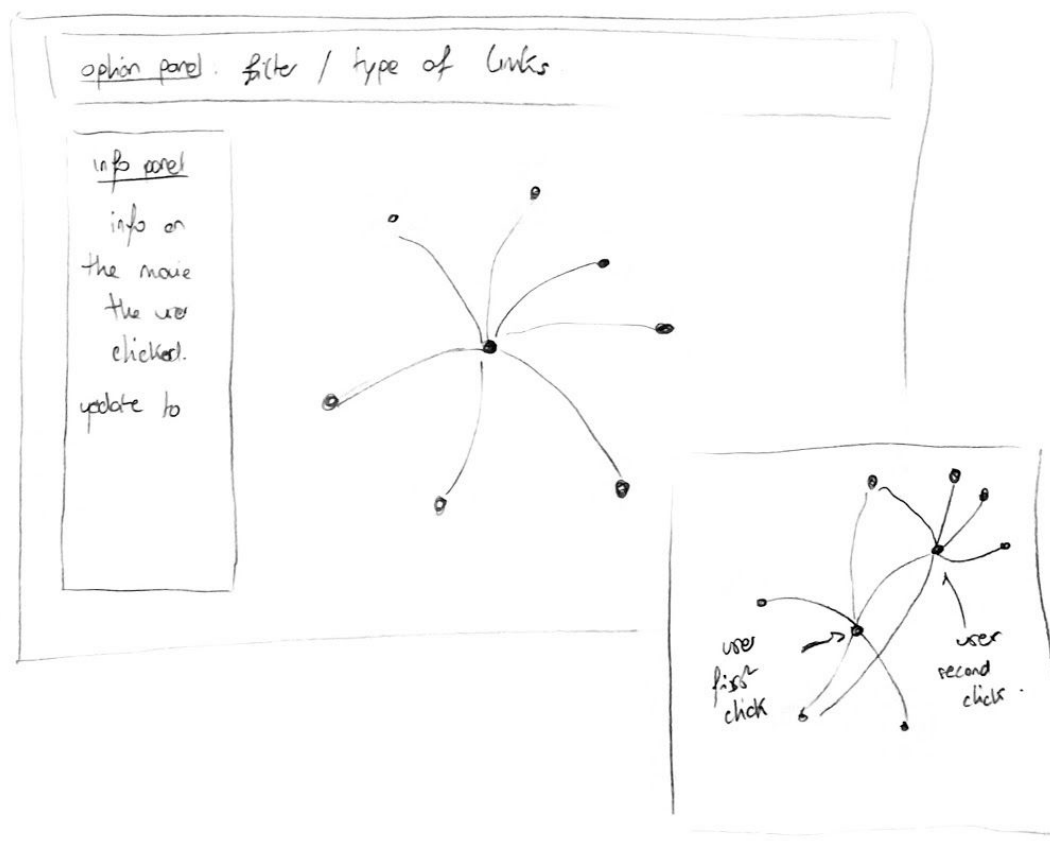
movies share a crew or cast member. With this layout, the general overview is cleaner but we find this type of layout less instinctive and maybe harder to interact with.

Finally, we decided to try to integrate both layout, depending of the level of detail the user want, in order to keep the benefits of both layouts.

start view:



click on a movie



Sketch 3: Final visualization idea

To have an overview of the data, we display a circular layout with edge bundling. When a user clicks on a particular movie, we switch to traditional node-link diagram and display only the movies connected to it. If the user clicks on a second node, the movies linked to this one would be displayed. Here the layout could be a collapsible force layout or an organized layout in a two dimensional diagram, with x-axis as the year and y-axis as the popularity or revenue. We will try those different possibilities and see which one is more adapted.

This way, we keep the advantages of the circular layout to have an overview of the data, and the advantages of a more traditional layout, which is to be instinctive and easy to manipulate. In both views (general and detailed), we will have an option panel at the top that will allow to filter the data and select which type of link the user want to display, and an information panel where general or particular information and statistics will be displayed.

Design justification:

In the general view (circle layout):

We will use points to represent movies. Movies can be splitted between different categories, like production companies, genre or year. If only one type of category is displayed, we will use the position around the circle to represent the grouping. If a second type is displayed, we will use the color of the points [citation]. Concerning the links between movies, we will use lines. We may want to display the category of the link (by crew or cast, of by department or even by job) by changing the color of the link, because the position is not something we can change. Here, we will have to be careful that we do not use too many colors to show different categories. Practically, even a grouping by department will result in too many categories and thus, too many colors. To mitigate this problem, we will use a filter function in the option panel. This will not allow the user to see every categories at one time but it will be easier to read.

In the detail view (Collapse Force layout):

Here the marks and channels will be similar as before, except that we may not be able to set the position for the movies. We will then use color to display categories.

Implementation:

As stated earlier, we started by taking movies with a popularity above 50. This allowed us to have 452 movies to build the visualization.

To facilitate the general manipulation of the web page and the styles, we used Bootstrap (v4.0.0). We created the side panel and the main panel, which was composed of the filter panel and the main visualisation area. This disposition in three panels will be the present to present the different views on the data.

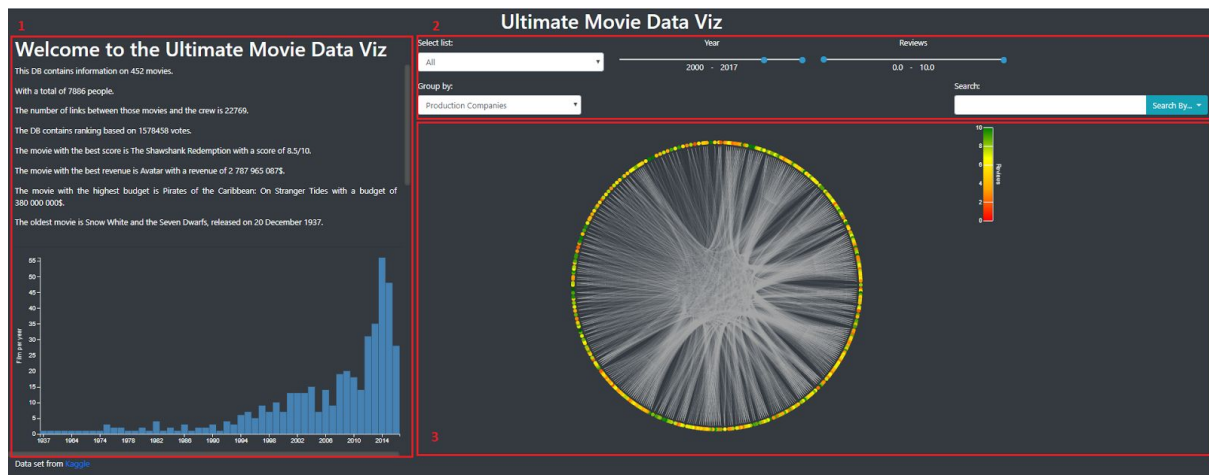


Image 1: General view of the visualization. We find the side panel (number 1) that contains informations, the filter panel (number 2) that allow to filter the movies that are shown and the main panel (number 3) with the main visualization.

General view:

As stated earlier, in the general view, we present the different movies in a circular layout, because it allows to present more elements in a cleaner way. As shown in Image 2, each movie is represented by a point, its color representing the review of the movie, and each links between movies is represented by a white line. If two movies are linked in different manners (same director and same actor for instance), we only draw one link. Here, it could have been interesting to represent the degree of linkage, by changing the saturation of the link or its width. For example, if two movie have a lot of links between them, we draw a whiter line. However, because we have a lot of links, this would have slowed down the visualization and complicated the understanding.

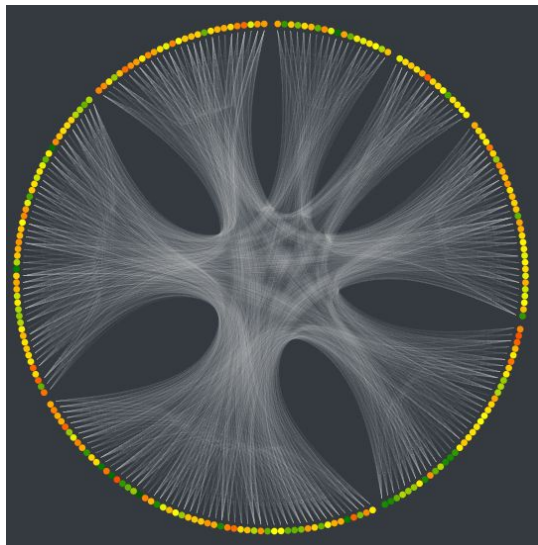


Image 2: circular layout. Here, the movies are grouped by year

The grouping of the movies around the circle can be changed in the filter panel. By default, we group the movies according to their production companies (the first one if multiples). Here we didn't succeed to display the name of the categories which is quite problematic to fully understand the visualization. Other filters allow you to select the type of link you want to

display, the year and the review range you want to display. If too many movies are displayed, the visualization is very laggy but we didn't find a way to make it more efficient.

We realized that this visualization does not present a lot of informations because there is no clear patterns: everything is linked with everything. However, it's beautiful and allow to present all the movies in one view. Here, maybe a word cloud could have been a nice visualization (with the color proportional to the review and the size proportional to the number of link for instance). Because we had the idea very late, we didn't try it.

As you can see in image 3, when the mouse is placed over a node, it highlights the movies linked to it and display its title in a tooltip.

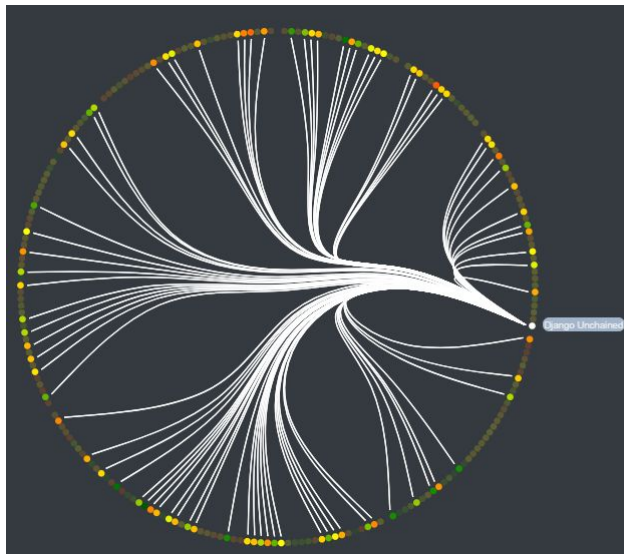


Image 3: Circular layout when the mouse is over a node.

By clicking on the movie, you arrive in the detail view for this movie.

Detailed view:

The general layout of this view is presented on image 4.

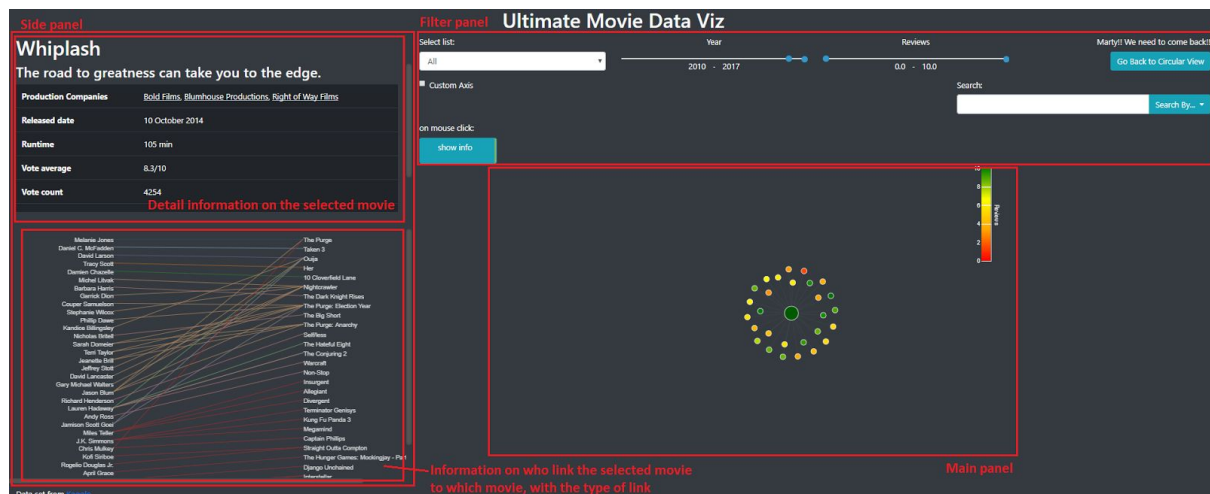


Image 4: Detailed view of a movie

Selected movies are big nodes and the movies linked to it are the little ones. To select a new movie, you can just click on a node. Passing the mouse over a node highlights the movies linked to it and display its name on a tooltip. Those features can be seen in image 5.

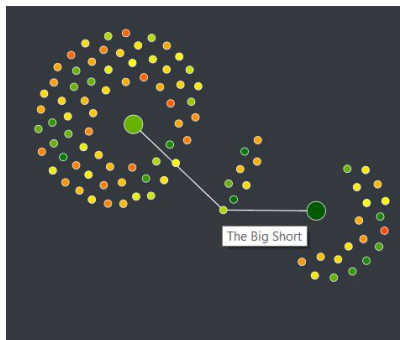


Image 5: Multiple movie selected and mouse over a node.

In the side panel, you see the informations on the last movie you selected. By clicking on another movie, you will display its information. To unselect a movie, you can switch the button “on mouse click: show info” to “on mouse click: close node” and then click on a selected node (Image 6). The information on the first movie you selected will appear.



Image 6: Button Show Info/ Close node

In the side panel, you can now see information on the selected movie and a visualization of each person that link the selected movie to another movie.

In the information part, you can see the various production companies of the selected movie and by passing the mouse over one them, you can see the movies that have the same production company (Image 7) and clicking on it will select the highlighted movies.

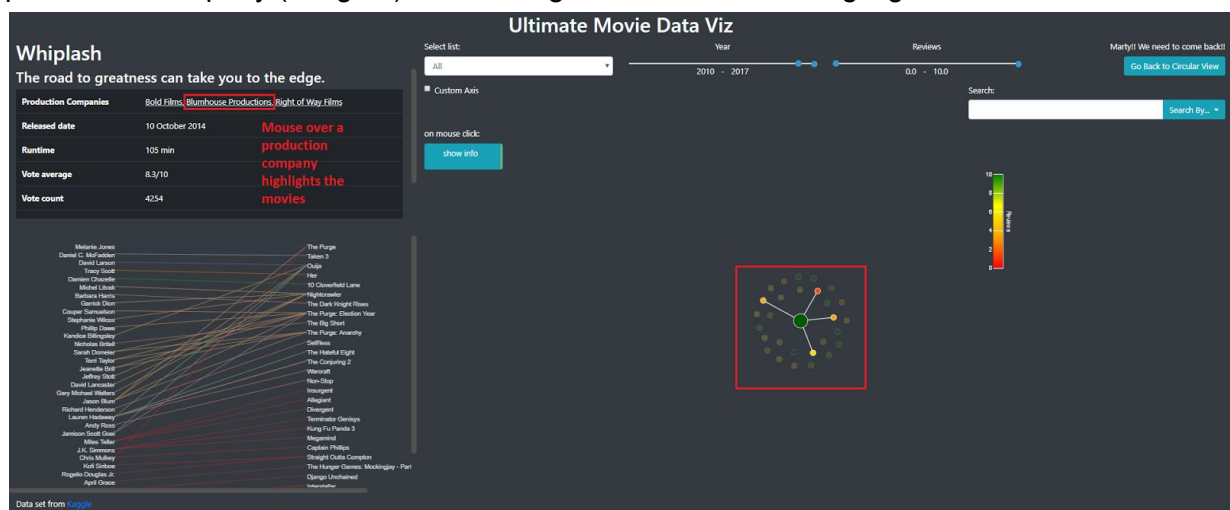


Image 7: Mouse over a production company highlights the movies having the same one

The second part of the side panel allow the same type of interaction. As you can see in images 8, 9 and 10, when the mouse is placed over a crew member, a link or a movie, the different nodes corresponding to the element selected are also highlighted.

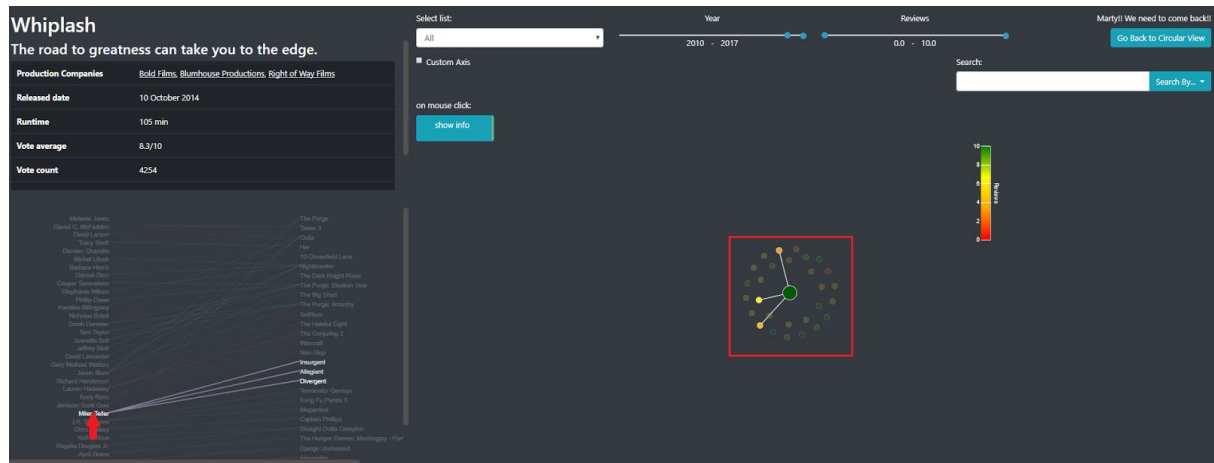


Image 8: The mouse over a crew member highlights the movies in which he appears.

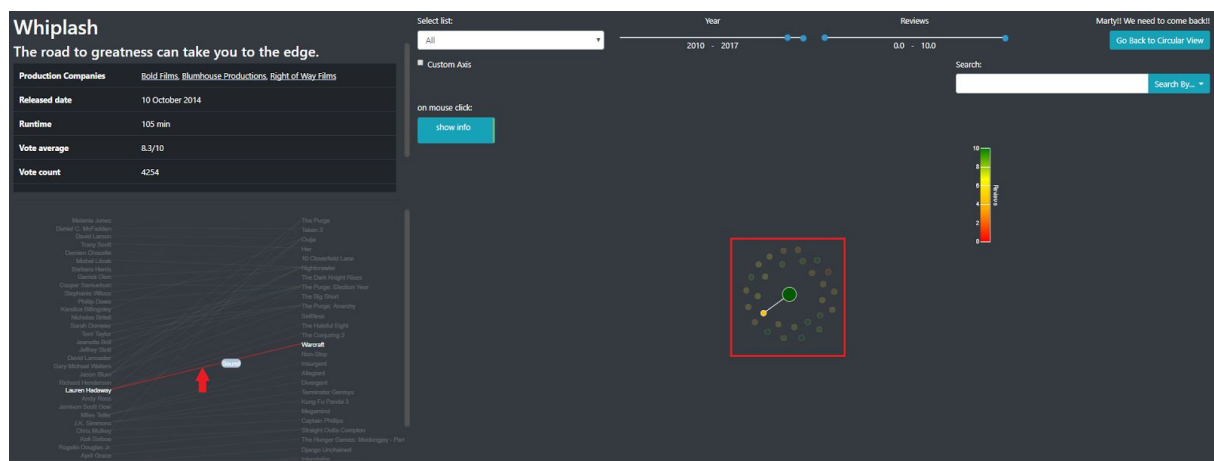


Image 9: The mouse over a link highlights the link on the main visualization along with the movies it links.

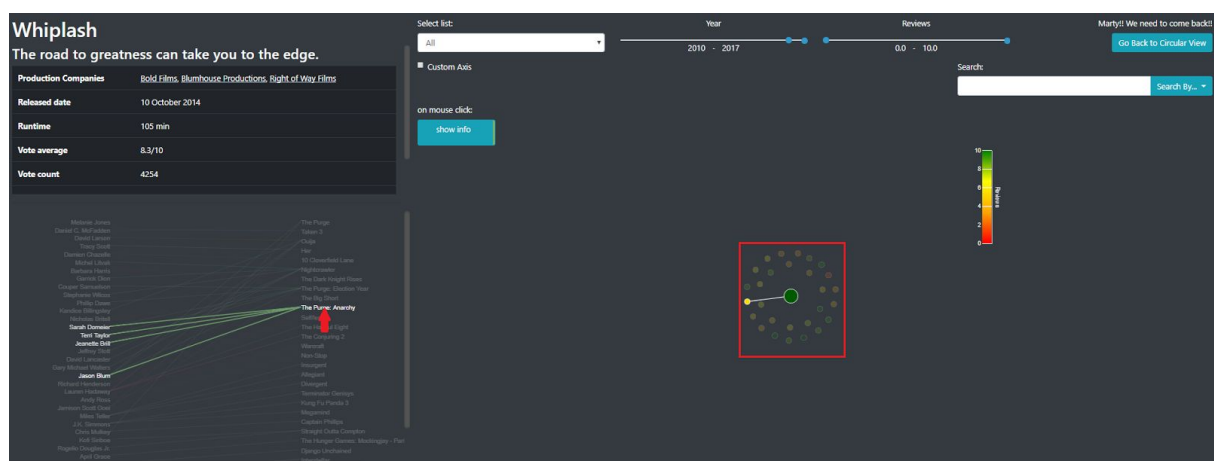


Image 10: The mouse over a movie highlights the movie in the main visualization.

If you click on the movie, it will select it. If you click on a crew member, it will select the different movie where he appears (only for the filtered movies).

When on the detailed view, you can see a checkbox that allow you to switch on the scatter plot mode, with custom axis. In this mode, instead of having the nodes ordered by a force layout, the nodes are placed in a scatter plot along 2 axis that the user can choose (image 11).

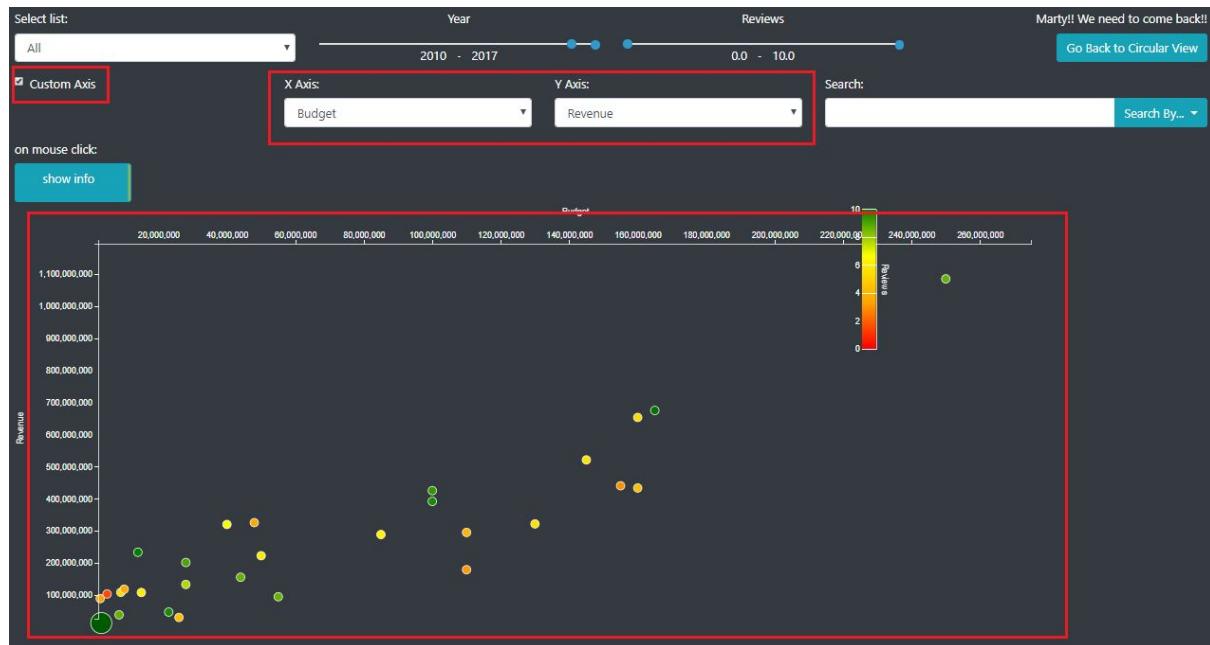


Image 11: Nodes are ordered along 2 axis that the user can choose (Scatter plot).

In this mode, all the other features (filtering, node (un)selection...) are still available.

We decided to include this feature because we realized that when a lot of movies were displayed, it was hard to navigate through the movies and to understand something. Furthermore, this visualization allow to have an insight into the correlation between multiple features.

Search View:

We implemented a search view that is displayed when the user use the search bar in the filter panel. As shown in the image 12, it is possible to look for a movie, a keyword, a crew/cast member, or all of them.

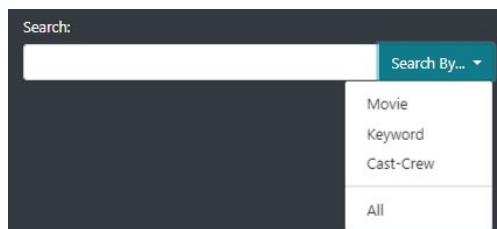


Image 12: Search bar functionality

The results of a search are displayed in the side panel and in the main panel, using the node link diagram used in the detailed view (image 13)



Image 13: Result of a search.

Evaluation: