

# CS416: Narrative Visualization

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## 1 Message

This narrative visualization is aimed at introducing the viewer to the distribution of talented U-21 soccer players among top leagues. With this narrative visualization, we can find that France’s Ligue 1 has the most U-21 players, and the U-21 players from France also show the best performance. We can also observe **that countries whose leagues have more U-21 players usually produce better-performing U-21 players, even if their leagues are not recognized as the most competitive in the world.**

## 2 Narrative Structure

We select the **Martini Glass Structure** for this narrative visualization. The visualization includes four scenes: presenting the total number of U-21 players in each league, the performance of each player, the U-21 player quality of each country, and a filter that allows viewers to freely explore detailed information.

The idea behind the organization of these scenes is to first show the viewer an overview of the number of U-21 players in top leagues. Then, we present a scatterplot to display each player’s performance, so that viewers can understand how we evaluate performance and notice who is the most talented among all U-21 players—and which league he comes from. At this point, the viewer would have a basic understanding of the U-21 talent distribution and performance across leagues.

After that, we move to a scatterplot that illustrates the performance of U-21 players from each country. Viewers can observe that the country producing the most high-quality U-21 players is the same country that has the league with the most U-21 players and the best individual U-21 player. That is the key message we aim to deliver.

Finally, a filter scene is provided, allowing the viewer to explore the detailed information they are interested in and develop their own understanding from the data.

## 3 Visual Structure

Generally, we have four buttons placed at the center of the page. From left to right, they correspond to the first through the last scene. With this design, viewers can easily understand the order of the scenes and switch between them smoothly.

The first scene is a bar chart, as we want to compare the quantity values across different countries. We cannot use a scatter plot here because “country” is a categorical dimension rather than a quantitative measure. Therefore, we choose a bar chart, since humans are most sensitive to length when making visual comparisons—aside from position.

The second scene is a scatter plot. We select this type because when we want to illustrate a player’s performance, we need to present both “Expected Goals” and “Actual Goals” at the same time. Since both are quantitative variables, a scatter plot is the most appropriate choice in this case. The position of each point also helps viewers understand the relationship between “Expected Goals” and “Actual Goals”. A diagonal line is added to the plot to symbolize the case where Expected Goals equals Actual Goals. Points above the line mean a player performs better than expected—seizing more opportunities—while points below the line indicate the player missed more chances than expected.

With this line, viewers can evaluate a player’s performance directly based on the point’s position, which is the visual channel most sensitive to human perception.

The third scene is a bubble chart. We choose this design because in this scene, we want to focus on three quantities: Average Expected Goals, Average Actual Goals, and the ”Youth Output Score” of each country. To show the first two quantities, we need a scatter plot. To represent the last quantity, we extend the scatter plot to a bubble chart, so that viewers can compare the value of ”Youth Output Score” intuitively by observing the area of each bubble. And that is the key message we want to deliver in this scene.

The last scene returns to a scatter plot. This is because that scene is essentially the second scene with an added filter, so the design logic remains the same.

The visual structure keeps consistent axis design and color style across related scenes. For example, Scene 2, 3, and 4 all use ”Expected Goals” vs ”Actual Goals” as the axis. This consistency helps the viewer smoothly switch between scenes and understand how the insights are connected and built on each other.

## 4 Scenes

As we mentioned in Section 2 and Section 3, the four scenes are:

- Scene 1: A bar chart showing the number of U-21 players in top leagues;
- Scene 2: A scatter chart of ”Expected Goals” and ”Actual Goals” for each U-21 player;
- Scene 3: A bubble chart showing the performance of U-21 players from each country;
- Scene 4: A filtered scatter chart of ”Expected Goals” and ”Actual Goals”.

We ordered the scenes this way because we expect viewers to first gain a basic understanding of the U-21 talent distribution and performance across leagues. With this background, they move on to Scene 3 and may notice that the country producing the best U-21 players is also the one whose league has the most U-21 players and the best individual U-21 performer. This is the main message we want to deliver in this narrative visualization.

The last scene is a scatter chart with a filter. It is designed for viewers to freely explore the data.

## 5 Annotations

In the second-to-last scene, a **dynamic** annotation is provided when the user hovers the mouse over the scatter points. In the case of Scene 2 and Scene 4, the annotation displays information about individual players, while in Scene 3, the annotation presents overview data of U-21 players from the specific country.

This is because Scene 2 and Scene 4 focus on the performance of individual players, whereas Scene 3 is aimed at comparing different countries.

## 6 Parameters

### 6.1 Parameters

- General **P1**: Mouse over a scene button (or none);
- Scene 2 and 4 **P2**: Mouse over a player (or none);
- Scene 3 **P3**: Mouse over a country (or none);
- Scene 4 **P4**: Filter configuration

## 6.2 States

- Scene 1:
  - **S1** (default): No button is highlighted;
  - **S2** (mouse over button): The hovered button is highlighted;
- Scene 2:
  - **S3** (default): No annotation appears, and no detailed information is provided;
  - **S4** (mouse over player): An annotation appears showing the player’s team, league, expected goals, and actual goals;
  - **S5** (mouse over button): No annotation appears, the hovered button is highlighted;
- Scene 3:
  - **S6** (default): No annotation appears, and no detailed information is provided;
  - **S7** (mouse over country): An annotation appears showing the country’s number of U-21 players, average actual goals, and youth output score;
  - **S8** (mouse over button): No annotation appears, the hovered button is highlighted;
- Scene 4:
  - **S9** (default): No annotation appears, and no detailed information is provided, all data points are shown;
  - **S10** (mouse over player, no filter is applied): An annotation appears showing the player’s team, league, expected goals, and actual goals, all data points are shown;
  - **S11** (no mouse over player, a filter is applied): No annotation appears, and no detailed information is provided, only filtered data points are shown;
  - **S12** (mouse over player, a filter is applied): An annotation appears showing the player’s team, league, expected goals, and actual goals, only filtered data points are shown;
  - **S13** (mouse over button, no filter is applied): No annotation appears, the hovered button is highlighted, all data points are shown;
  - **S14** (mouse over button, a filter is applied): No annotation appears, the hovered button is highlighted, only filtered data points are shown;

## 7 Triggers

### 7.1 Triggers

- Scene 1:
  - **T1**: Mouseover a bottom → **S2**
- Scene 2:
  - **T2**: Mouseover a bottom → **S5**
  - **T3**: Mouseover a player → **S4**
- Scene 3:
  - **T4**: Mouseover a bottom → **S8**
  - **T5**: Mouseover a country → **S7**
- Scene 4:
  - **T6** Mouseover a bottom → **S13** or **S14**
  - **T7**: Mouseover a player → **S10** or **S12**
  - **T8**: Select a filter → **S11** or **S12** or **S14**

## 7.2 Affordances

- The buttons have frame, indicating the viewer that they can click here;
- An annotation label will appear once you hover the mouse over a data point;
- An dropdown menus is shown over the chart on Scene 4, indicating the viewer that they can select a filter here;