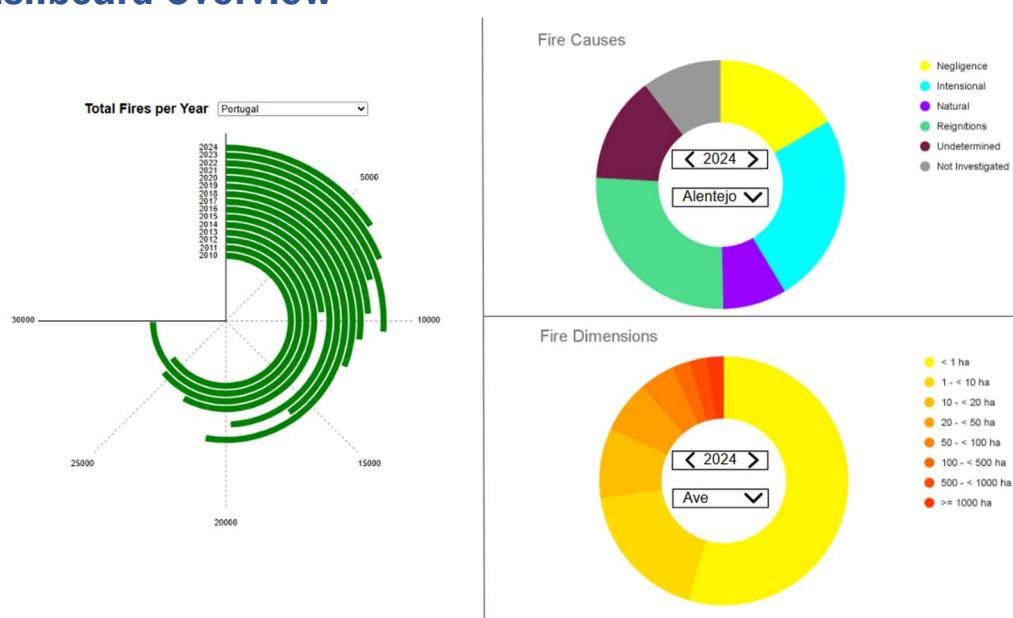




Checkpoint II: Visualization Sketch

Group: 43
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Dashboard Overview



The dashboard combines temporal and categorical perspectives to explore fire activity and prevention in Portugal (2010–2024). On the left, a radial bar chart with a dropdown menu shows the annual number of fires, either for Portugal as a whole or by NUTS-III regions (NUTS-2024), giving users a quick view of long-term trends.

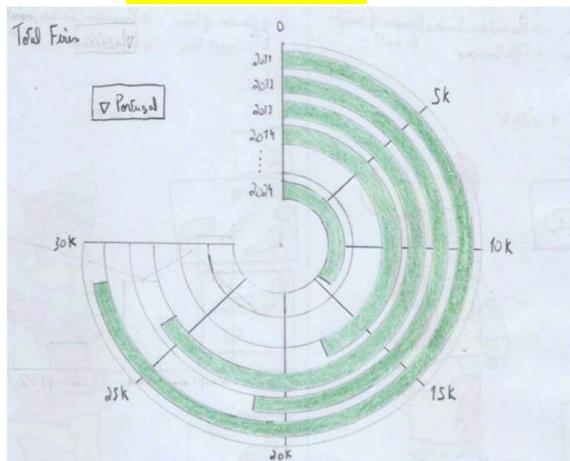
To the right, two donut charts are stacked vertically: the top chart displays the distribution of fire causes, while the bottom chart shows the distribution of fire sizes. Each donut chart includes its own region and year selectors, allowing users to explore causes and fire sizes independently across different spatial and temporal contexts.

The charts are visually separated by dividing lines — a vertical line between the radial bar chart and the donut charts, and a horizontal line between the two donuts — ensuring clarity and a well-structured layout.

Charts

The project will use **four visualization idioms**: a **radial bar chart** showing the number of fires per year for Portugal or by NUTS-III regions (NUTS-2024); a **choropleth map** of NUTS-III regions displaying fires, burned area percentage, efficiency index, or prevention index depending on the selected filter; and a set of **donut charts** that show fire causes and fire size distributions. The donut charts are presented in two forms: regional views displaying the distribution for a chosen region and year, and trend views that show yearly changes across Portugal or NUTS-III regions.

Chart #1: Radial Bar Chart



Marks and Channels

The radial bar chart uses circular bars, one for each year in the dataset. The main visual channel is bar length, represented by the radial distance from the center, which encodes the number of fires (a quantitative variable). Years are arranged chronologically around the circle, with angular position encoding time, while a uniform green fill ensures consistency and avoids distracting from length comparisons. Reference values such as 5k or 10k are provided through axis ticks and labels, helping users interpret bar lengths precisely.

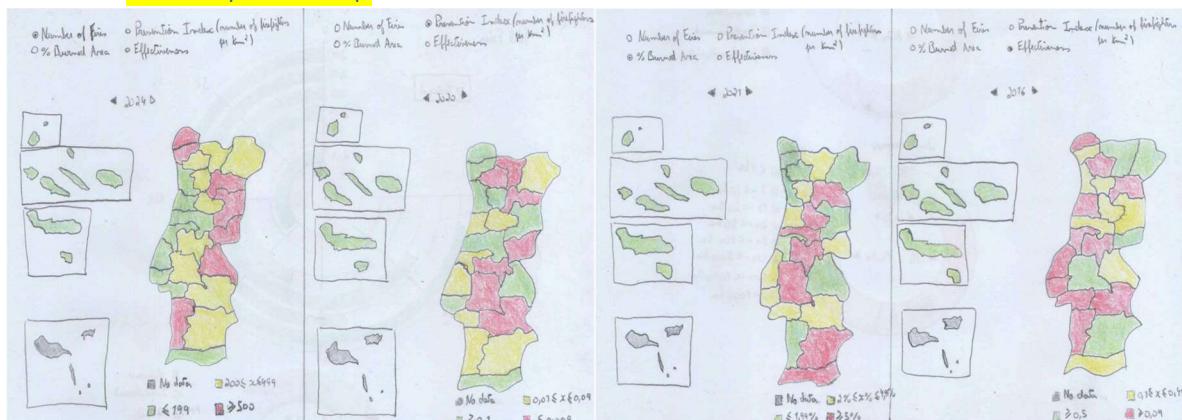
Rationale

The radial bar chart was chosen instead of a standard bar chart to emphasize the cyclical nature of yearly data and to provide a compact visualization that integrates smoothly into the dashboard layout. Length is an effective channel for quantitative comparison, and arranging years radially helps highlight variations over time while maintaining visual appeal.

Interaction

A drop-down menu allows users to switch between Portugal as a whole or a specific NUTS-III region (NUTS-2024), updating the chart accordingly. Hovering over a bar highlights it for better visibility, and clicking a bar reveals a pop-up with the exact number of fires for that year, supporting more precise analysis beyond visual estimation.

Chart #2: Choropleth Map



Marks and Channels

The choropleth map represents Portugal's NUTS-III regions (NUTS-2024) as polygons, with fill color encoding the selected indicator: number of fires, percentage of burned area, efficiency index, or prevention index. The chosen color scale follows a hue progression from teal to yellow to red, which communicates performance in an intuitive way—teal reflects good outcomes, yellow indicates

moderate, and red highlights poor results. Neutral-colored borders preserve the visibility of geographic boundaries, while the position of each polygon matches its real geographic location to ensure accurate spatial comparisons.

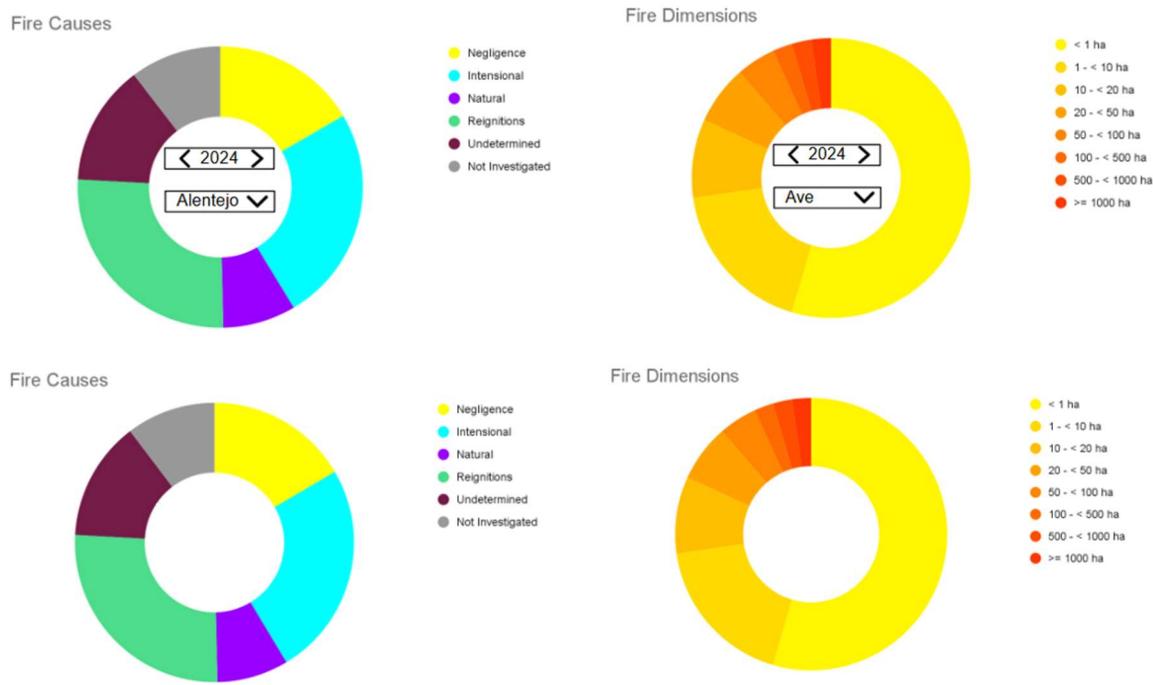
Rationale

The choropleth map provides an intuitive way to compare regions spatially, as geographic boundaries are directly tied to the data of interest. Color is an effective channel for representing ratio and magnitude variables across areas, enabling quick identification of high- and low-performing regions. The chosen color scale leverages intuitive associations with “good” (teal) and “bad” (red), which supports interpretation at a glance. The inclusion of multiple filters increases flexibility, allowing users to analyze not only fire occurrence but also efficiency and prevention efforts.

Interaction

Users can interact with the map through several mechanisms. A year selector with arrows allows them to move through time between 2010 and 2024, updating the visualization. Filters let them switch between indicators by clicking on the desired option. Hovering over a region highlights it for clarity, and clicking on it reveals detailed information for that year, including two donut charts of fire causes and fire dimensions as well as accompanying text on the number of firefighters and the percentage of burned area.

Chart #3: Donut Chart



Marks and Channels

All donut charts use arcs arranged in a circular ring, with each arc representing a categorical value. For *fire causes*, categories include negligence, intentional origin, and others; for *fire sizes*, classes include <1 ha, 1–10 ha, and so on. Arc length and angle encode the proportion of fires in each category, while distinct colors differentiate them for easy comparison. In the *fire size* donut chart, a sequential color scale from yellow (< 1 ha) to red (≥ 1000 ha) encodes increasing fire magnitude. The central hole provides space for totals or labels, improving readability and conserving dashboard space.

Rationale

Donut charts were chosen for their intuitive representation of categorical proportions. Arc length/angle is a perceptually effective channel for relative comparison, and distinct colors ensure

categories remain visually distinguishable. The donut format also allows integration of contextual labels (e.g., total fires) and maintains visual consistency across the dashboard.

Interaction

Hovering over an arc highlights the corresponding segment to improve focus. Clicking reveals a pop-up with the exact number of fires in that category or size class, providing precise values beyond visual estimation. Additionally, **only the donut charts embedded in the main dashboard** allow users to change the region and year independently, enabling deeper exploration of spatial and temporal patterns.

Chart Integration

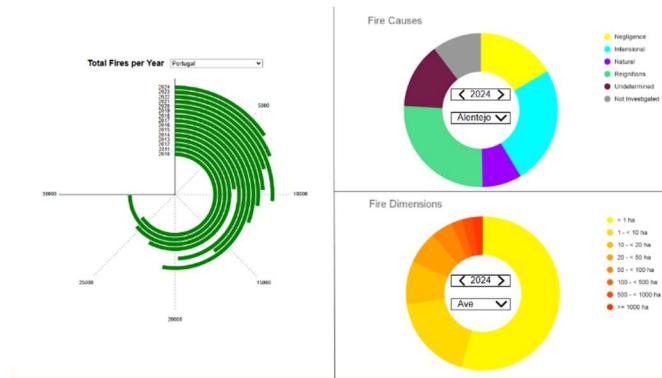
The main interaction occurs between the radial bar chart, the choropleth map, and the donut charts. The user begins by selecting a year in the radial bar chart, which loads the corresponding choropleth map of NUTS-III regions. From there, clicking on a specific region updates the dashboard with detailed information for that region and year: two donut charts display the distribution of fire causes and fire dimensions, while accompanying text provides the number of firefighters and the percentage of burned area. In this way, the radial bar chart guides temporal navigation, the choropleth provides a comparative spatial overview, and the linked donut charts and textual indicators enable users to drill down into regional details.

Answering the Questions

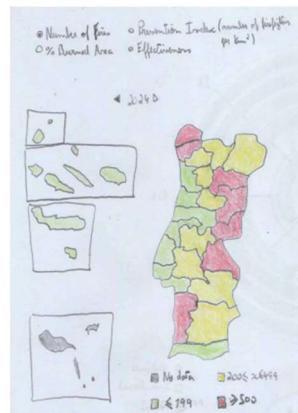
- **Question 1: How has the total number of fires in Alentejo Central evolved over the past fourteen years?**
 - Select “Alentejo Central” in the bar chart dropdown and track fire counts from 2010-2024.
- **Question 2: Which regions have the highest number of fires in 2024, and how does this compare with the number of firefighters in each region?**
 - Select 2024 in the radial bar chart to load the choropleth map, apply the Prevention Index filter, and compare color-coded ratios of fires to firefighters.
- **Question 3: What is the distribution of fire causes within Algarve in 2024, and does it relate with the number of firefighters available?**
 - Select 2024 in the radial bar chart, click “Algarve” on the choropleth map, and view the donut chart of causes alongside firefighter numbers.
- **Question 4: How do fire causes and dimensions relate with the number of firefighters in Alto Minho in 2023?**
 - Select 2023 in the radial bar chart, click “Alto Minho” on the map, and see donut charts of causes and sizes next to firefighter counts.
- **Question 5: Which regions have the most or fewest firefighters relative to the number of fires, and does this reveal patterns of high fire risk?**
 - Select the year in the radial bar chart, activate the Efficiency Index filter on the map, and compare teal (higher coverage) vs yellow/red (higher risk) regions.
- **Question 6: Is there a relationship between the number of fires and the number of firefighters in each region in 2020?**
 - Select 2020 in the radial bar chart and enable the Efficiency Index filter on the map to compare balance across regions.
- **Question 7: How does the amount of burned area per firefighter vary across regions, and what does this suggest about prevention and response capacity?**
 - Select the year in the radial bar chart, apply the Prevention Index filter on the map, and view coverage per km², with teal showing stronger and yellow/red weaker capacity.

Storyboards

Frame 1: The radial bar chart shows the total number of fires for Portugal over the years. The user selects a year by clicking a bar, which loads the choropleth map for that year.



Frame 2: On the choropleth map, the user clicks on *Algarve*, zooming into the region's details.



Frame 3: The donut charts display Algarve's information: the top donut shows the breakdown of fire causes, and the bottom donut shows the distribution of fire sizes.



Frame 4: Alongside the donuts, the dashboard also presents the number of available firefighters and the percentage of burned area for Algarve, allowing the user to compare whether fire origins and dimensions align with allocated resources.