DATA VISUALIZATION

PROJECT REPORT

Louisiana Road Home program

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CSCI 627
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BACKGROUND INFORMATION:

Road Home Grants DataSet:

The dataset provides a comprehensive overview of grants awarded to homeowners in Louisiana from the Road Home program. This program was initiated in the aftermath of hurricanes Katrina and Rita which was a devastating Category 5 Atlantic hurricane, aiming to bridge the financial gap homeowners faced after exhausting insurance payouts and Federal Emergency Management Agency(FEMA) aid for repairing or rebuilding their homes.

The dataset in focus has been acquired from public records requests to the Louisiana Division of Administration. It contains individual-level records of homeowners who benefited from it, detailing out various types of grants that were on offer which are:

Compensation Grants(CG): Serving as the main source of funding for homeowners.
Additional Compensation Grants(ACG): Tailored for the benefit of lower-income homeowners.
Elevation Grants: Financial aids targeted at homeowners looking to raise their homes, mitigating the risks of future flooding.
Individual Mitigation Measure Grants(IMM): These are flexible grants, permitting homeowners to undertake diverse preventive actions against potential future flooding.

The data also pinpoints property locations down to a census block level across state of Louisiana.It includes Pre Storm Value of each Structure type and the damage incurred to it after the hurricane.

NewOrleans Neighborhoods Median Income DataSet:

This data set gives the median income of all neighborhoods for the year 2000. This dataset can be used to find financial impact for the New Orleans Neighborhoods

LOUISIANA

TASKS:

1.Whats the trend between Funds distributed and Damage caused by hurricane across each Parish?

2.Are there any regions that experienced severe damage but received comparatively less grants?

3.which structure type has the most damage among Parishes?

VISUALISATION DESCRIPTION:

This visualization employs a Louisiana choropleth map overlaid with bar charts to compare damage versus funds distributed, and bar chart to find Damages across structure types within parishes based on user selection on map.
This visualization uses color encoding and interactive elements such as tool tips and slider to enhance user engagement and understanding

- Red Bar: Damage to Structures(Current Damage Assessment)
- Green Bar: Funds Received(Road home Grant + FEMA/Insurance) =>(TOTAL_CLOSING_AMOUNT + Current Total DOB Amount)
- Damage to Structures - Funds Received = Funds needed ,
  If Funds needed Positive = Blue Hue(More funds needed to cover damages)
  If funds needed Negative= Red Hue(Duplicate funds)
- Slider is used to select no. of parishes to be compared. I have limited it up to 4 Parishes selection due to space constraint and readability.

INTERACTIONS:

- **Use the Slider** to select the number of selections/clicks(parish comparisons);
- **click on the parish** to select parish and view different Structure damage comparisons on bar chart ,**click again** to deselect parish.
- **Hover over Grouped bars on map** to view funds received and Damage values.
- **Hover over parish** to view parish name and funds needed value .
- **Hover over bars on Bar chart** to view Parish Name and Structure Type Damage

MARKS AND CHANNEL:

LOUISIANA CHOROPLETH MAP:

Marks:
Paths in Louisiana State Map
Bars(rectangles) - placed on each parish

Channels:
Color: Different colors of the rectangles represent different categories of data. R**ed bar** represent “Property Damage” and **green bar** represent "Funds received from FEMA/insurance+Grants”,

Red Hue on map shows total duplicate funds received. **Blue hue** on map represents funds need after FEMA/insurance+Grants.
Size:Grouped bar chart on the centroid of map sized based on the value of Funds Received and Damage to properties

GROUPED BAR CHART:

Marks:
The bars(rectangles) are the marks in this chart.

Channels.
Position: The text on each bar's top represents the Structure Damage for different structure types in different parishes.
Size: The length of the bars indicates the magnitude of the data they represent (Structure Damage).
Color: Color on bars here is used to differentiate between the parishes.

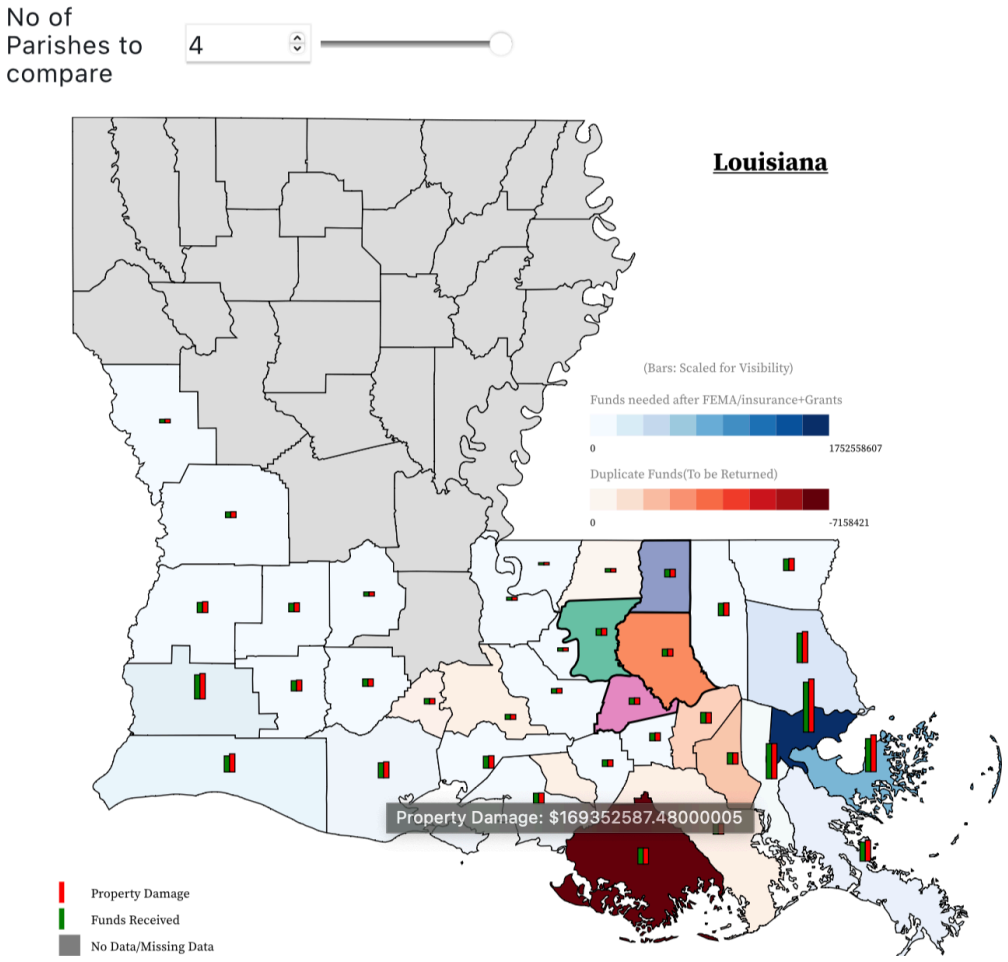
DESIGN EVOLUTION:

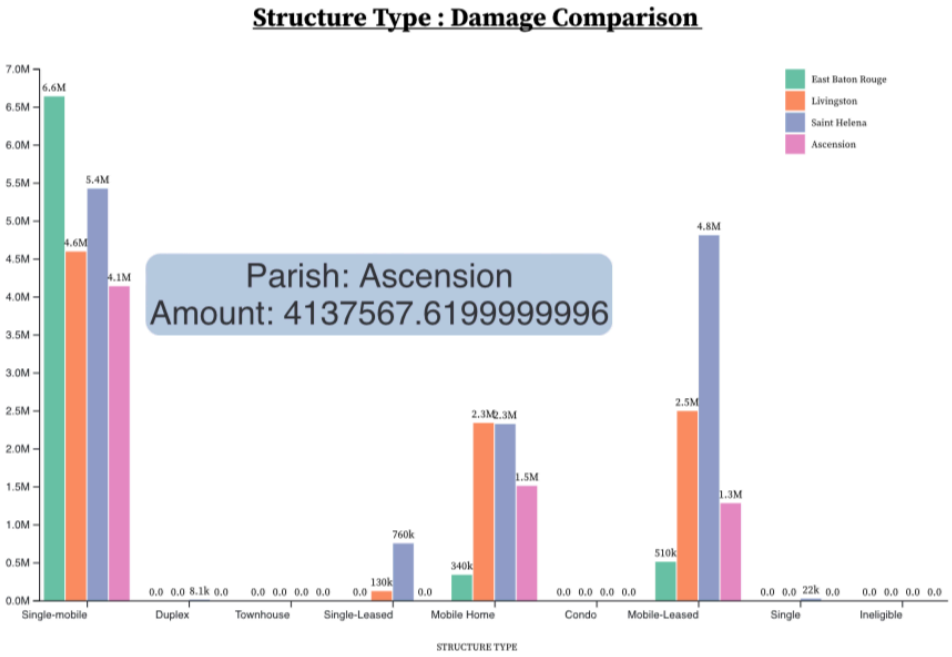
The visualization evolved through a five-sheet design process,The design process started with sketches illustrating the initial concepts for the visualizations. Each sketch focused on a specific task, from displaying the distribution of funds and damages across parishes ,Comparing individual Structure damage of each parish. The final design combines these elements into a cohesive, interactive experience that allows user to select parish/parishes on the map to view individual structure damages and compare it with multiple parishes.

TECHNIQUES:

- This visualization builds upon D3.js for creating interactive map and Bar charts, allowing users to select specific parishes for detailed structure type damages.
- d3.centroid method is used to place grouped bars on the center of each parish on the map.
- d3.transition for bar chart.

VISUALISATION:





RESULTS:

- The observed trends are the damages and damages are more to the costal area and decrease as we move towards inland.(Task1 answer)
- Most of the states(blue hue) didn't receive enough funds even after FEMA/Insurance+Home Grants(Task 2 answer)
- New Orleans has the most structure damage.Single-mobile home structure type has taken highest damage when compared to other structure types(Task3 answer)

More findings:

- Brightest blue color(New Orleans) shows the parish with highest number of funds needs after exhausting financial aid given by FEMA/insurance+Grants.
- 7 parishes(Red hue) has received duplicate funds.
- Brightest Red hue on the parish(Terrebonne) has received highest duplicate funds.
- Grey Color indicated parishes with no damage/no funds spent on them.

HOW DOES THIS VISUALIZATION HELP?

- The visualization serves as a tool for policymakers, researchers, and the public to understand the financial aftermath of hurricanes.
- It allows users to identify areas of need, evaluate the effectiveness of fund distribution, and plan better for future disaster relief efforts.
- Tells which Structure type in a parish has taken most structure damage allowing for insurance policy makers to improve their policies.
- Tells which structure types is prone to most damage when during a disaster.

NEW ORLEANS:

TASKS:

1.Which neighborhood of New Orleans have had the most financial Impact due to Hurricane.?

VISUALISATION DESCRIPTION:

This visualization employs a NewOrleans Neighborhood map overlaid with bar charts to compare Median Income versus Median Funds paid/Duplicate Funds received by Home owners. This visualization uses color encoding and interactive elements such as tool tips for user engagement and understanding.

Funds = Median(Current Damage Assessment)-(Median(TOTAL_CLOSING_AMOUNT) +Median(Current Total DOB Amount))

Here,
Current Damage Assessment is “Structure Damage”
TOTAL_CLOSING_AMOUNT is “Road Home Grant”
Current Total DOB Amount is “FEMA+Insurance”

If “Funds” is Positive = Home owner has to pay remaining amount to Repair/Rebuild his home.
If “Funds” is Negative= Home owner has received Duplicate Funds and has to return them.

- Red Bar: Funds paid by the Home Owners as given aid wasn’t sufficient.
- Orange Bar : Duplicate Funds(in some cases the Funds given are more than the damage so home owners need not pay any money out of their own pockets.However, those funds need to be returned)
- Green Bar:Median Income of Neighborhoods
- Red Hue : **Financial Impact (**Median Income - Funds Paid by the home owner) => Home Owners Annual Income levels are not enough to cover the damages.
- Blue Hue:Damage Covered (Median Income - Funds Paid by the homeOwners) => Home owners were able to Cover the damage with part of their Annual Incomes) . Lightest Blue Hue indicates the HomeOwners have paid more funds and able to save less amount from their annual income. Darkest Blue hue indicates Home owners have paid least amount /No Funds and able to save more of their Annual Income.

INTERACTIONS:

- **Hover over Grouped bars on map** to view Median Income and Median Funds Spent/ Duplication Of funds.
- **Hover over parish** to view parish name and Financial Impact.

MARKS AND CHANNELS:

Marks:
Paths in NewOrleans Neighborhood Map
Bars(rectangles) - placed on each Neighborhood

Channels:
Color: Different colors of the rectangles(bars) represent different categories of data. R**ed bar** represent "Funds Paid by the home owners" ,**green bar** represent "Median Income",**Orange bar** represent "Duplicate Funds", **Red Hue** on map shows Financial Impact. **Blue hue** on map represents Damage Covered.
Size:Grouped bar chart on the centroid of map sized based on the value of Median Income and Funds Paid/Duplicate Funds.

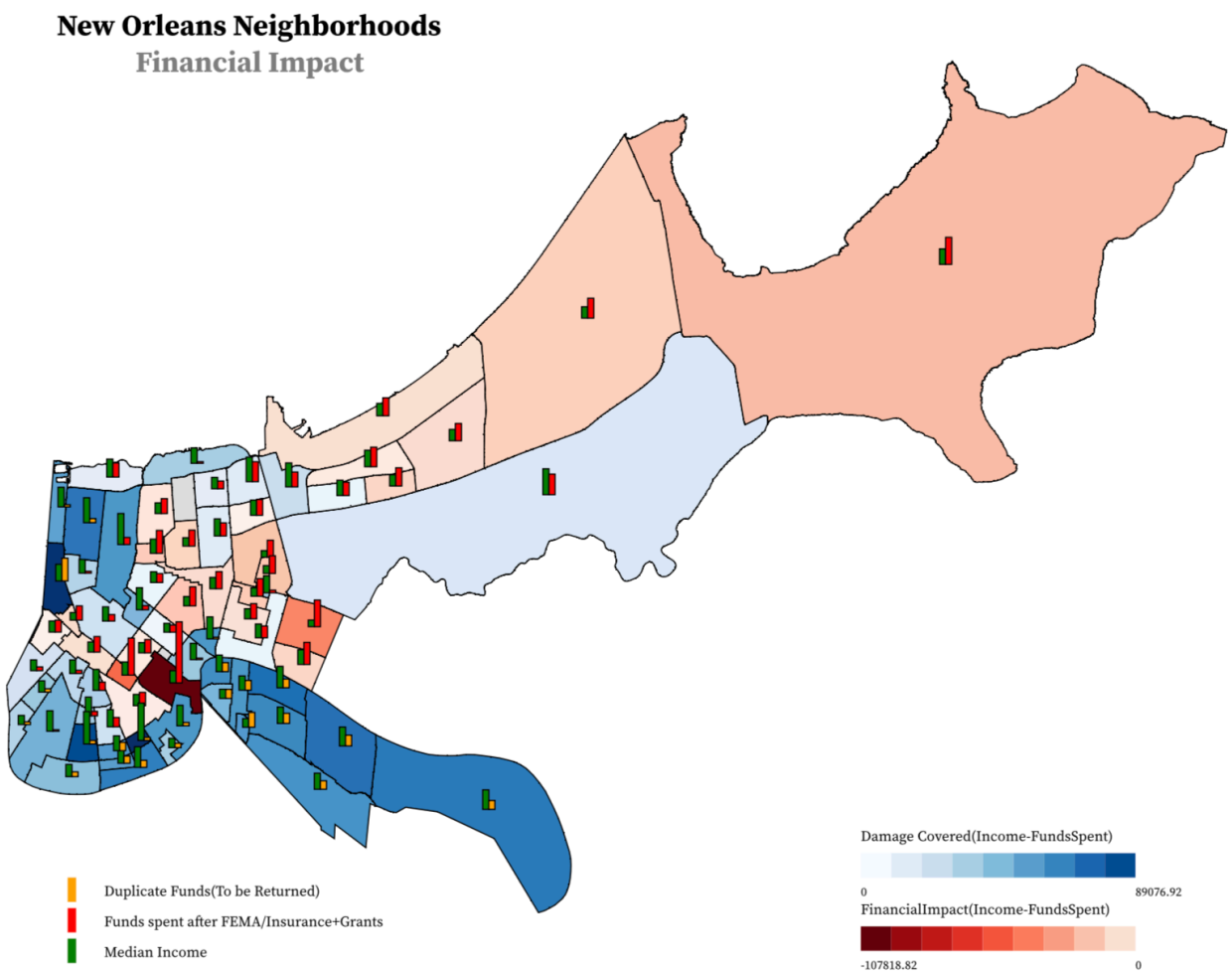
DESIGN EVOLUTION:

The visualization evolved through a five-sheet design process,The design process started with sketches illustrating the initial concepts for the visualizations. Initially idea was to only compare Damage Caused vs Funds received across each neighborhood . Later I have introduced a new dataset that gives Median Income of each neighborhoods which allowed me to find the Financial impact the home owners have had due to hurricane Katrina. The final design shows median incomes , Funds Paid/duplicate funds and Financial Impact colored with red hue. All these elements gives the user a understand of the Financial Impact each neighborhood have had.

TECHNIQUES:

- This visualization builds upon D3.js for creating interactive map and Bar charts, allowing users to select specific parishes for detailed structure type damages.
- Calculation median for Structure Damage,Road Home Grants and FEMA+Insurance.
- d3.centroid method is used to place grouped bars on the center of each parish on the map.

VISUALISATION:



RESULTS:

- Central Business district (Brightest Red color) has the highest Financial Impact. It means their Annual Incomes won't be able to cover the Damages and have the highest debt.(Task1 answer)

More Findings:

- Neighborhoods colored with Red hue has the Financial Impact (about 30% of the neighborhoods have financial impact) based on color.
- Few of the neighborhoods have received Duplicate Funds(Orange Bar)

- Garden District(Green Bar) has the highest Median Income and also has received Duplicate Funds(Orange Bar)
- Most of the Neighborhoods (Blue Hue) were able to Cover the Damages with their income.

HOW DOES THIS VISUALIZATION HELP?

- The visualization serves as a tool for policymakers, researchers, and the public to understand the financial aftermath of hurricanes.
- It allows users to identify areas of need, evaluate the effectiveness of fund distribution, and plan better for future disaster relief efforts.
- Gives the Louisiana govt. which is responsible for Distributing Grants an idea on how to distribute the funds based on income levels and duplicate funds as some of the neighborhoods that have taken more damage and but income is competitively less.

ACKNOWLEDGEMENT:

Special thanks to Prof. David Koop for feedback and guidance throughout the project's development.