Bioinformatics Summer School Report

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Project title: Making Climate Hazard Risk Data Useful for North Carolina Communities

1. Introduction

The National Risk Index (NRI) identifies areas in which are affected by natural hazards and climate change the most. These specified areas will act as the public, private, and philanthropic organizations' geographic focus to provide financial and technical assistance for the planning and implementation of resilience projects. Creswell town in North Carolina is a $1 km^2$ with a population of 205 people, predominately black, rural, and underserved community. Situated at a low elevation, just above sea level, near the coast and with a river running underneath the town, it was identified by the federal government as a region in need of reliance and climate disaster planning. This exceptional risk is recognized by insurance companies which is driving the cost of insurance up and ultimately driving insurance companies out of markets in climate-vulnerable communities like Creswell, NC. We aim in this project to create a pilot model to evaluate risk of flooding and subsequent damage to target areas for infrastructure development and risk reduction in Creswell.

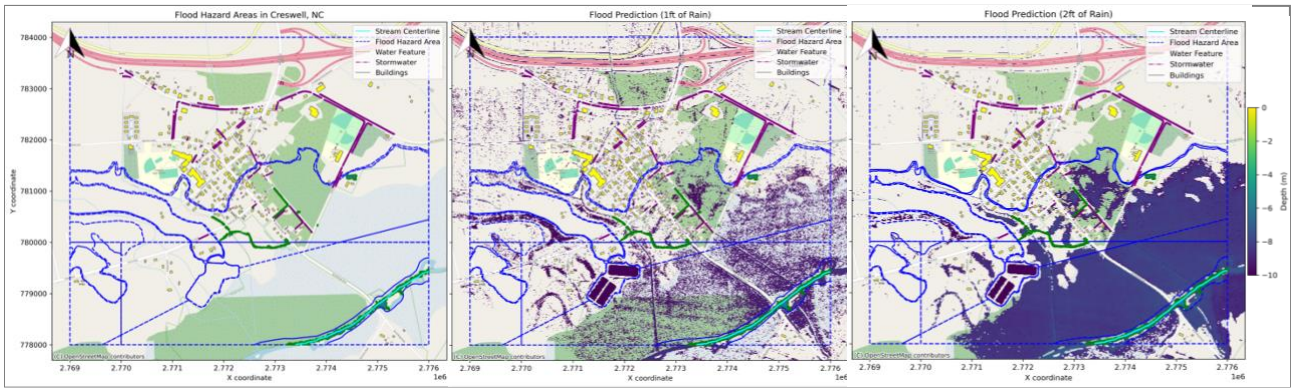
2. Materials and Methodology

- **Data Collection**
    - Online available data was collected from Google maps and Federal Emergency Management Agency (FEMA) for Washington County and Town of Creswell. The collected data include, digital elevation model, stormwater system, waterbodies, buildings distribution and cost, and flood hazard areas.
    - Data collected in field using tape measures and measure phone application. This include measuring the pipes and ditches.
    - Stormwater system mapping using Bad-Elf GPS tracker by pinpointing the start and end of each pipe/ditch.
- **Damages and Modeling**
    - Evaluate the expected flooding and creating a model to highlight risk areas and the expected outcome using different scenarios by the use of HEC-RAS water simulation model.
    - Building damage costs analysis was done using a model developed by the US Army Corp of Engineers to translate that output into damage cost for each household.

3. Results and Discussion

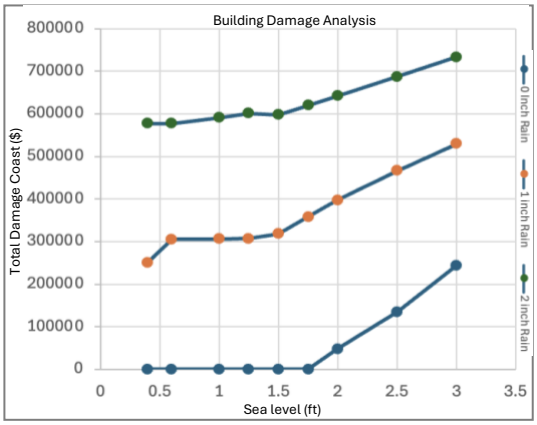
- **Risk Visualization**

Flood simulated via HEC-RAS model in different scenarios. The raster files generated by the model were overlayed a map of creswell using python.



- **Damage analysis**

We generated output data on the depth of water present in each building, then used a model developed by the US Army Corp of Engineers to translate that output into damage cost for each household. Costs range from 12%, in cases of no rain, raising up to 33% of Creswell's median household income when it rains.

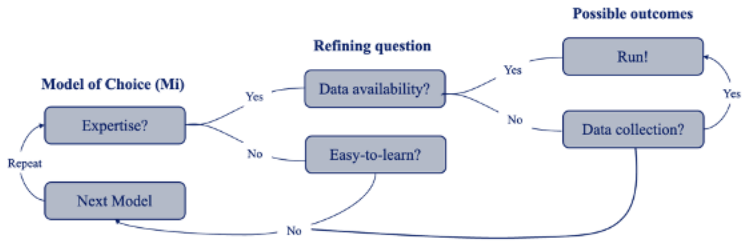


4. Skills and Knowledge Gained

Working on this project provided the team with extensive knowledge in data collection from different sources. In addition to data analysis, and visualization using Python. To identify the most suitable model, we developed a decision tree, which honed our problem-solving skills. Furthermore, the collaborative nature of the project enhanced our teamwork abilities, as each member actively contributed to the process. Engaging with community members during fieldwork also significantly improved our communication skills.

5. Challenges and Solutions

- The first challenge we faced working on this project was chosing the best model that would provide the best results in the time period we had. In order to overcome this challenge we created a decision tree to help us choose the model.



- The second challenge that we faced with this project was data availability. Online available data were informative but not suffecient to run the model of choice. To overcome this challenge we went in a field trip to the town of interest and collected the necessary data by hand to be able to run the HEC-RAS model.

6. Conclusion

- One of the Saudi Vision 2030 aims is improving the quality of life and aiming towards sustainable living. By implying such project to Saudi towns and cities that are at risk of flooding, it will help in guiding target areas for infrastructural development and damage reduction.
- The overall experience significantly broadened my knowledge across multiple fields, enhanced my practical skills, and deepened my understanding of real-world applications. It also provided invaluable networking opportunities and developed both personal and professional growth.

7. Acknowledgments

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8. References

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