



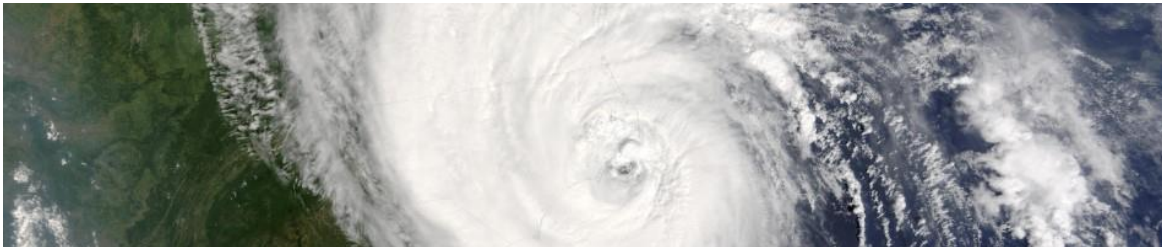
*Juracán*: God of Chaos, Hurricanes,... (according to Taino Mythology)  
*Juracán* Video: [The Wrath of Juracan: Taino Legends and Modern Impacts - YouTube](#)

## COSC 3337 “Data Science I” Fall 2024

### Task 3

### Group Project

## *Juracán*: Analyzing Hurricane Trajectories and Assessing Hurricane Risks for Gulf of Mexico Locations



Last Updated: October 16, 2024, 6:40 (Version 4)

½-3/4 page status report is due: Monday, October 28, 2024

All other group project deliverables are due: Friday, November 8 end of the day.

Responsible TA: Raunak Sarbajna

### Learning Objectives:

1. Processing, visualizing and analyzing complex spatio-temporal data.
2. Analyzing trajectory data
3. Hurricane risk assessment
4. Spatial Trajectory Prediction (BONUS)

The goal of the project is to design and implement a system called *Juracán*, which is capable of summary generation, tracking and highlighting cities under the most threat of hurricanes.

### I. DATA COLLECTION AND PREPARATION

A. Use HURDAT (<https://www.nhc.noaa.gov/data/>) from the National Hurricane Center for a list of all hurricanes and tropical storms that have affected the Gulf of Mexico region. OR. Use [the TroPyCal Python library](#) to obtain the information through the inbuilt API.

B. Survey the list of 25 cities provided. Mark their latitude/longitude.

### II. ANALYSIS OF HURRICANE AND TROPICAL STORM TRACKS

- A. Visualize storm tracks over the last 25-year period for the Gulf Coast region.
- B. Identify common patterns and trends.
- C. Make a report after performing statistical analysis of track frequency, intensity, motion vectors and duration.

### III. RISK-PROFILE ANALYSIS

A. Research and Identify potential natural factors influencing hurricane activity. Rank factors in order of perceived severity.

1. Sea surface temperatures
2. El Niño/La Niña patterns
3. Atlantic Multidecadal Oscillation
4. Saharan dust levels
5. Upper-level wind patterns

B. Perform spatial correlation analysis between identified factors and hurricane activity.

C. Use *Non-parametric density estimation* to analyse historical hurricane data to assess location risks based on past hurricane trajectories and severities.

Remark; *Other approaches which assess the risk of a location hit by a hurricane (instead B or C) are also welcome. But we expect that you come up with 2 approaches for risk assessment for a particular location.*

D. Use risk assessment model you have created using B and C to assess the hurricane risk for the list of 25 Golf of Mexico cities. Summarize the obtained results.

### IV. CASE BASED PREDICTION (OPTIONAL BONUS TASK – SUBMIT BY NOV 14)

- A. Develop a predictive model for hurricane season *intensity* and validate it using historical data.
- B. Perform sensitivity analysis to identify the most impactful factors for hurricane intensity.

### V. PROJECT DELIVERABLES

- A. Comprehensive report detailing methodology, findings, and conclusions.
- B. Interactive visualization tools for hurricane tracks and temperature maps.
- C. Statistical models for predicting hurricane season intensity.

### VI. TEAM RESPONSIBILITIES AND COLLABORATION

- A. Divide tasks properly among team members.
- B. Host regular team meetings and progress reports.
- C. In the end, do peer review of individual contributions.
- D. Collaboratively write and edit the final report.

You must present your findings in a report of 8 ~ 10 pages, excluding references and appendices. Any animations created for the report must be attached alongside (preferably in .mp4 or .gif

formats). The report must also contain clearly labelled imagery of the intensity, hotspots and the change-over-time.

In your report, you must clearly state which members contributed to the project, and what were their contributions. Each group must submit only one report. Zip up your report/code/animations. Name your zip as <TEAM\_NAME\_Group\_Project\_3337.zip>. Your report should be submitted in PDF format and formatted using the ACM camera-ready templates available at <http://www.acm.org/publications/proceedings-template>. You may use MS Word/Google Docs/LaTeX/etc. for your report. Additionally, you must also submit your entire, *working* code as a zipped folder