Project Problem: Hurricane Path Prediction

For this project, we will examine Hurricane IDALIA, which impacted the U.S. in August 2023. The National Hurricane Center's website provided regular updates on the hurricane's path, including forecasts from several days before landfall until it crossed the mainland. The dataset includes GIS information, temperature, wind gusts, and more, available here:

https://www.nhc.noaa.gov/gis/archive_forecast_results.php?id=al10&year=2023&name=Hurricane%20IDALIA

The project is divided into two phases, with tasks outlined for each:

Phase 1: Exploratory Data Analysis (EDA) and Data Preprocessing

In this phase, your task is to collect daily data for geographical locations (county subdivision/ZCTA/block group/block/census tract) projected to be affected by the hurricane. Additionally, gather demographic and population data (age distribution, male, female, children, rich/poor, car availability, etc.) for these census tracts using the following sources:

a. https://data.census.gov/

b. GIS data: https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-line-file.html

Both hurricane and population data are GIS in nature. Files are available as shapefiles. You may use QGIS or kmlviewer.nsspot.net/ or google earth, whatever works best, to visualize and superimpose hurricane and population data. Perform EDA on the demographics (age groups, gender) of the affected districts day wise. You may refer to examples of hurricane EDA for guidance at the following links:

https://www.kaggle.com/datasets/utkarshx27/noaa-atlantic-hurricane-database

https://www.kaggle.com/code/stpeteishii/atlantic-hurricane-trace-route

Phase 2: Data Mining Algorithm Application

In this phase, you are required to apply data mining algorithms to predict the hurricane's path. You may consider applying Generative AI models for this task. Search relevant studies through Google Scholar to guide you. For model training, consider utilizing data from past hurricanes (https://www.nhc.noaa.gov/data/hurdat/hurdat2-1851-2024-040425.txt) with similar characteristics during their early stages. You may refer to following research papers.

https://aaai.org/ojs/index.php/AAAI/article/view/3819/3697

https://link.springer.com/content/pdf/10.1007/s10596-021-10037-2.pdf