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CS6315 AI and ML

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Project Description

Climate drives various major aspects of human life, from agriculture and cuisine to infrastructure and recreation. However, climate change is increasingly disrupting the natural and man-made facilities for these societal mechanisms. In 2021, the United States alone has experienced a winter storm in February that resulted in a power crisis in the state of Texas, a sustained heat dome in the early summer that broke down the infrastructure of the Pacific Northwest and sparked multiple wildfires, a tropical storm later that summer that hit New York City and brought torrential rainfall that flooded the city’s subway system, and an rare December tornado outbreak in the Ohio Valley that leveled homes as it tore through neighborhoods. Although large scale and biome-oriented effects of climate change have extensively been studied, not much attention has been paid to how non-coastal municipalities, like the San Antonio-New Braunfels metropolitan area (known as “Greater San Antonio”), will be affected. Furthermore, local weather is conventionally forecasted a week or two in advance, with the most extensive forecasts spanning around six months. The farther the data, the less likely the forecast for that data is accurate. Can a weather forecaster be trained to predict the weather for each date in a full calendar year? To find the answer to this question, I will obtain publicly available historical weather data from the National Weather Service (<https://www.weather.gov/ewx/>) for the Greater San Antonio area for the past five years. In particular, data will be collected from March 1, 2017, to February 28, 2022. A forecasting model-based machine learning algorithm will be trained on the historical data. This algorithm will then perform predictive analysis and determine what the weather will be for each day from March 1, 2022, to February 28, 2023. Multiple visualizations (e.g., line charts) will summarize the predictions. This project will demonstrate an approach framework for generating climate information that will help local communities like San Antonio prepare for weather events and seriously consider the challenges posed by climate change. The predictive analysis process can be built upon to help weather services flag concerning climate patterns and encourage policymakers to reduce climate alteration caused by humans.