

Summary

The escalating threat of global warming and climate change, driven by humanity's current trend toward consumerism, deliberate consumption of natural resources, and emission of atmospheric toxins, is a pressing issue. Despite the adoption of renewable energy by many companies, significant change will not be realized until humanity fully acknowledges the impending reality of this problem. Our solution to the Pale Blue Dot challenge focuses on the Sustainable Development Goal: Climate Action. We have extensively studied and analyzed the Earth's land surface temperature using a freely available dataset from Kaggle.com. In addition to analyzing the average monthly temperature behavior, we developed a set of predictive models using Meta's Prophet library to forecast temperatures for all possible cities in the United States. Several Python libraries and frameworks were used in this process, including Numpy, Pandas, Matplotlib, Seaborn, Altair, Scikit-learn, and Streamlit. Our visualization consists of two branches: a statistical data analysis of average monthly temperatures, including geographic maps of the world and U.S. cities, and a forecast for selected U.S. cities showing potential future temperature trends. The prediction models exhibit robust performance as evidenced by the evaluation results on the test set. The reported MAE and MSE are 1.5 and 7.3, respectively, when averaged across all U.S. city models. The comprehensive analysis and visualization described above has been integrated into a Streamlit application called World Temperature Viewer, which facilitates the interactive use of all the data collected, analyzed, and generated, and serves as a dynamic platform for users to interact with the data and gain insights from the visualizations and predictive models that explore climate patterns and future projections, thereby facilitating an understanding of the real-world impacts of global warming and climate change.