Weather Prediction Developed by Yen-Chen Shih

(a) Definition of the Problem

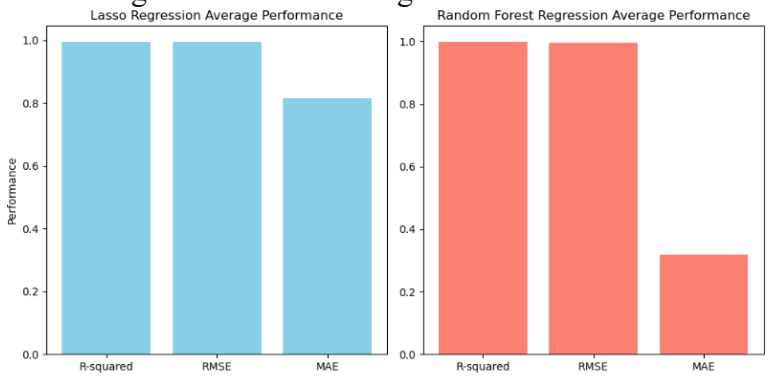
This task involves predicting temperature (Temp_C) using weather data. I used regression models to forecast temperature based on various weather features, treating it as a supervised learning problem. Accurate temperature predictions are vital for sectors like agriculture, entertainment, and construction, relying on historical weather data to anticipate future conditions.

(b) Rational of target variable selection

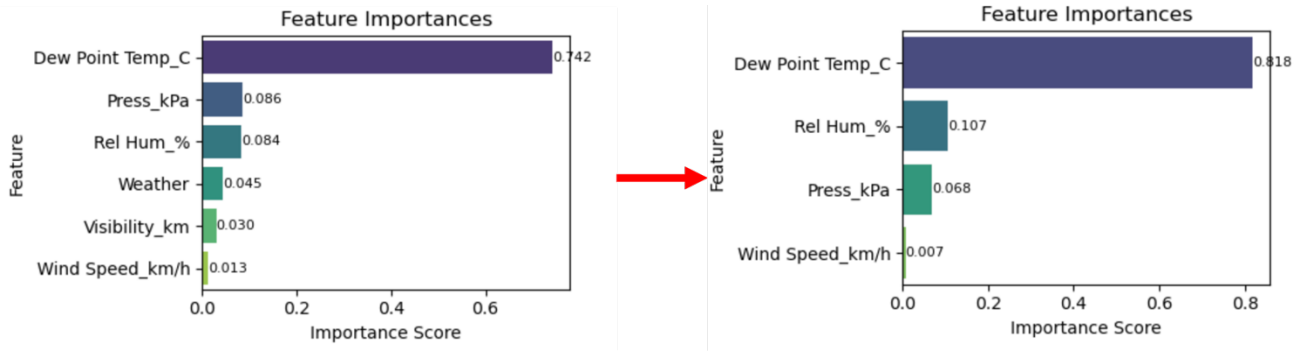
I chose temperature (Temp_C) as the target variable because temperature is a key meteorological variable. Understanding and predicting temperature fluctuations play a crucial role in various applications such as weather-forecasting apps to help agriculture, outdoor enthusiasts, construction

(c) A short note on which kind of machine learning is suitable for this problem

This task aims to predict temperature using meteorological variables, a regression problem. Hence, supervised learning algorithms like random forest regression and lasso regression are suitable. Despite similar R-squared and RMSE scores, the lower MAE score of Random Forest Regression makes it the preferred choice.



(d) Conclusion with at least one visual



Through feature importance analysis, the results show that the model's performance improves after removing the features "Weather" and "Visibility_km" due to their non-normal distributions and low feature importance. The most important feature is "Dew Point Temperature (Dew Point Temp_C)", with an importance score of 0.818. Other important features include "Relative Humidity (Rel Hum_%)" (0.107),

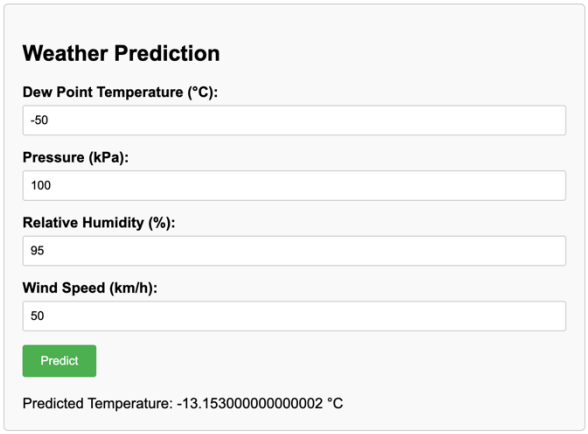
"Pressure (Press_kPa)" (0.068), and "Wind Speed (Wind Speed_km/h)" (0.007). This model can predict specified temperature values based on existing weather data.

(e) Scope for future work

Model Ensembles: Experimenting with ensemble methods, such as combining predictions from multiple models, could potentially enhance predictive accuracy. **Time-Series Analysis**: Considering the temporal aspect of meteorological data and incorporating time-series analysis techniques may lead to better predictions. **Hyperparameter Tuning**: Continued exploration of hyperparameter tuning methods to optimize model performance. **Integration with Other Data Sources**: Incorporating additional data sources, such as satellite imagery or geographical information, could provide supplementary insights for temperature prediction.

(f) Did you go beyond the expectation and deserve the extra 5 points?

The provided solution not only meets the expectations but also goes beyond by integrating a machine learning model for weather prediction into a web application using Flask for the backend and HTML/CSS/JavaScript(fetch API) for the front-end.



Use Cases:

- **Agriculture**: Helping Agricultural companies make informed decisions regarding planting, harvesting, and irrigation.
- **Outdoor enthusiasts**: People who enjoy outdoor activities can plan their activities accordingly.
- **Construction**: Construction companies can plan schedules, avoiding extreme weather conditions.

Test Cases：

Normal scenario test:	**Extreme scenario test:**
Dew Point Temperature (°C): 20	Dew Point Temperature (°C): -50
Pressure (kPa): 90	Pressure (kPa): 100
Relative Humidity (%): 70	Relative Humidity (%): 95
Wind Speed (km/h): 10	Wind Speed (km/h): 50
Predicted Temperature: 21.05 °C	Predicted Temperature: -13.153000000000002 °C