Literature Survey

1. ‘Siami-Namini et al. (2018) – "A Comparison of ARIMA and LSTM in Forecasting Time Series"‘

- ‘Main Idea’: This paper compares the performance of ARIMA and LSTM models for time series forecasting, showing that LSTM models significantly reduce prediction errors for complex, non-linear data.

- ‘Usefulness’: This study supports our decision to use LSTM as a primary model for short-term temperature forecasting, especially due to its proven ability to handle non-linear weather data better than ARIMA.

- ‘Limitations’: The paper mentions that LSTM models require large datasets and significant computational resources, which can be a challenge for smaller datasets. Our project will address this by using a large dataset of temperature records from U.S. cities.

2. ‘Salman et al. (2018) – "Weather Forecasting Using Merged Long Short-Term Memory Model (LSTM) and Autoregressive Integrated Moving Average (ARIMA) Model

- ‘Main Idea’: This study proposes a hybrid ARIMA-LSTM model for weather forecasting and shows that combining the two models can improve forecast accuracy compared to using either model alone.

- ‘Usefulness’: This is directly relevant to our project, as we aim to explore a hybrid ARIMA-LSTM model to enhance short-term temperature forecast accuracy. This combination allows us to capitalize on ARIMA's strengths in modeling linear trends and LSTM's capability in handling non-linear data.

- ‘Limitations’: The study does not explore how well the hybrid model generalizes across different geographical areas. Our project will address this limitation by testing the hybrid model across various U.S. cities with different climate patterns.

3. ‘De Saa & Ranathunga (2021) – "Comparison between ARIMA and Deep Learning Models for Temperature Forecasting"

- ‘Main Idea’: This paper explores the limitations of ARIMA in handling complex weather patterns and highlights the potential of LSTM for improving forecast accuracy.

- ‘Usefulness’: This provides a solid foundation for moving beyond ARIMA and focusing on more advanced models like LSTM in our project, particularly for improving short-term predictions.

- ‘Limitations’: The paper doesn’t provide concrete solutions for overcoming ARIMA’s limitations. We aim to address this by combining ARIMA with LSTM in a hybrid model that will capture both linear and non-linear patterns in the dataset.

4. ‘Murat et al. (2018) – "Forecasting Daily Meteorological Time Series Using ARIMA and Regression Models"‘

- ‘Main Idea’: This study compares ARIMA and regression models for forecasting daily meteorological data, highlighting ARIMA’s strengths in handling linear trends and seasonal patterns.

- ‘Usefulness’: This paper supports our use of ARIMA as a baseline model for comparison with LSTM. It also helps demonstrate that ARIMA is effective for certain types of weather patterns, such as consistent, linear temperature trends.

- ‘Limitations’: ARIMA struggles with non-linear, complex data, which limits its effectiveness for rapidly changing weather conditions. This limitation justifies our exploration of LSTM and hybrid models.

5. ‘Abdallah et al. (2020) – "A Hybrid Methodology for Short Term Temperature Forecasting"‘

- ‘Main Idea’: The paper explores a hybrid methodology combining ARIMA and LSTM models for temperature forecasting, demonstrating improved accuracy compared to standalone models.

- ‘Usefulness’: This supports our hypothesis that combining ARIMA and LSTM in a hybrid model will improve prediction accuracy in short-term temperature forecasting. The methodology outlined is directly applicable to our approach.

- ‘Limitations’: The paper does not extensively cover the scalability of the hybrid model across larger datasets or different regions, which we plan to explore in our project.

6. ‘Li & Qian (2018) – "Weather Prediction Using CNN-LSTM for Time Series Analysis"‘

- ‘Main Idea’: This study applies a CNN-LSTM hybrid model for weather prediction, focusing on the ability of CNN to extract spatial features and LSTM to capture temporal dependencies.

- ‘Usefulness’: While our project focuses on ARIMA-LSTM, the success of the CNN-LSTM model in weather forecasting gives us insights into advanced hybrid approaches, potentially inspiring future improvements beyond ARIMA-LSTM.

- ‘Limitations’: CNN-LSTM is computationally more expensive, and the paper focuses primarily on spatial data. This suggests that while CNN-LSTM may be useful, it may not be practical for our project’s initial scope.

7. ‘Ding (2020) – "Hybrid CNN-LSTM Model for Time Series Predictions"‘

- ‘Main Idea’: This paper discusses hybrid CNN-LSTM models for time series prediction, demonstrating improved performance compared to standalone models.

- ‘Usefulness’: The paper reinforces the potential benefits of hybrid models for time series forecasting, supporting our decision to pursue a hybrid ARIMA-LSTM model for improved temperature prediction.

- ‘Limitations’: Although the focus of the paper is on stock price forecasting, the methodology is applicable to weather data. However, the different application domains may limit its direct relevance.

8. ‘Nghiem et al. (2021) – "Applying Bayesian Inference in a Hybrid CNN-LSTM Model for Time Series Prediction"‘

- ‘Main Idea’: The paper explores the use of Bayesian inference in a hybrid CNN-LSTM model for time series prediction, offering insights into uncertainty estimation and model reliability.

- ‘Usefulness’: While not directly applicable to ARIMA-LSTM, this paper provides useful techniques for improving model reliability, which could be applied to our hybrid approach to manage uncertainty in temperature predictions.

- ‘Limitations’: Bayesian methods are computationally intensive, which may limit their applicability within the timeframe and scope of our project.

9. ‘Ye et al. (2018) – "Prediction of Global Temperature Using ARIMA and GM Models"‘

- ‘Main Idea’: This study discusses global temperature prediction using ARIMA and GM (Gray Model), focusing on short-term forecasting.

- ‘Usefulness’: The findings on ARIMA’s strengths in short-term forecasting provide a useful baseline for comparison with the LSTM model in our project.

- ‘Limitations’: The paper highlights ARIMA’s limitations in handling non-linear data, which further justifies our decision to incorporate LSTM in our hybrid model.

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Conclusion:

These papers collectively support our approach to comparing ARIMA and LSTM models for short-term temperature forecasting, with a focus on leveraging the strengths of both in a hybrid model. By addressing the limitations outlined in the literature, our project aims to develop more accurate forecasting techniques for weather data.