Delhi Climate Time Series Analysis Report (2013–2017)

1. Observations from Analysis

- Strong yearly seasonal temperature pattern observed.
- Higher temperatures during summer and lower during winter.
- Gradual upward long-term warming trend detected.
- Classical and STL decomposition confirmed stable seasonality.
- ADF test indicated non-stationary behavior.
- KPSS test suggested trend-stationarity.
- Differencing required for stable modeling.

2. Model Results

- AR Model captured autocorrelation but did not handle trend fully.
- MA Model showed higher residual variance.
- ARMA Model improved stability compared to AR and MA individually.
- ARIMA Model (2,1,2) performed best by handling non-stationarity.
- ARIMA identified structured time dependence in temperature data.

3. Future Predictions Insight

- Temperature is expected to continue following strong seasonal cycles.
- Short-term forecasting remains reliable using ARIMA.
- Long-term warming trend may continue gradually.
- Forecasting can support climate planning and decision-making.
- Model performance can improve using SARIMA or advanced ML models.

Conclusion

The Delhi climate time series analysis confirms structured seasonal behavior, persistent autocorrelation, and a gradual warming trend. ARIMA modeling provides reliable forecasting capability for short-term predictions.