



PREDICTING VESSEL ARRIVALS IN THE MALACCA STRAIT USING LONG-SHORT TERM MEMORY, SARIMA, AND PROPHET

SMARTER PREDICTIONS, SAFER SEAS, GREENER FUTURE.

AUTHORS

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INTRODUCTION

The Malacca Strait is one of the busiest sea routes. Heavy traffic often causes congestion and accidents. This study uses deep learning and conventional technique to predict ship movements, improve safety, and support better planning.

OBJECTIVE

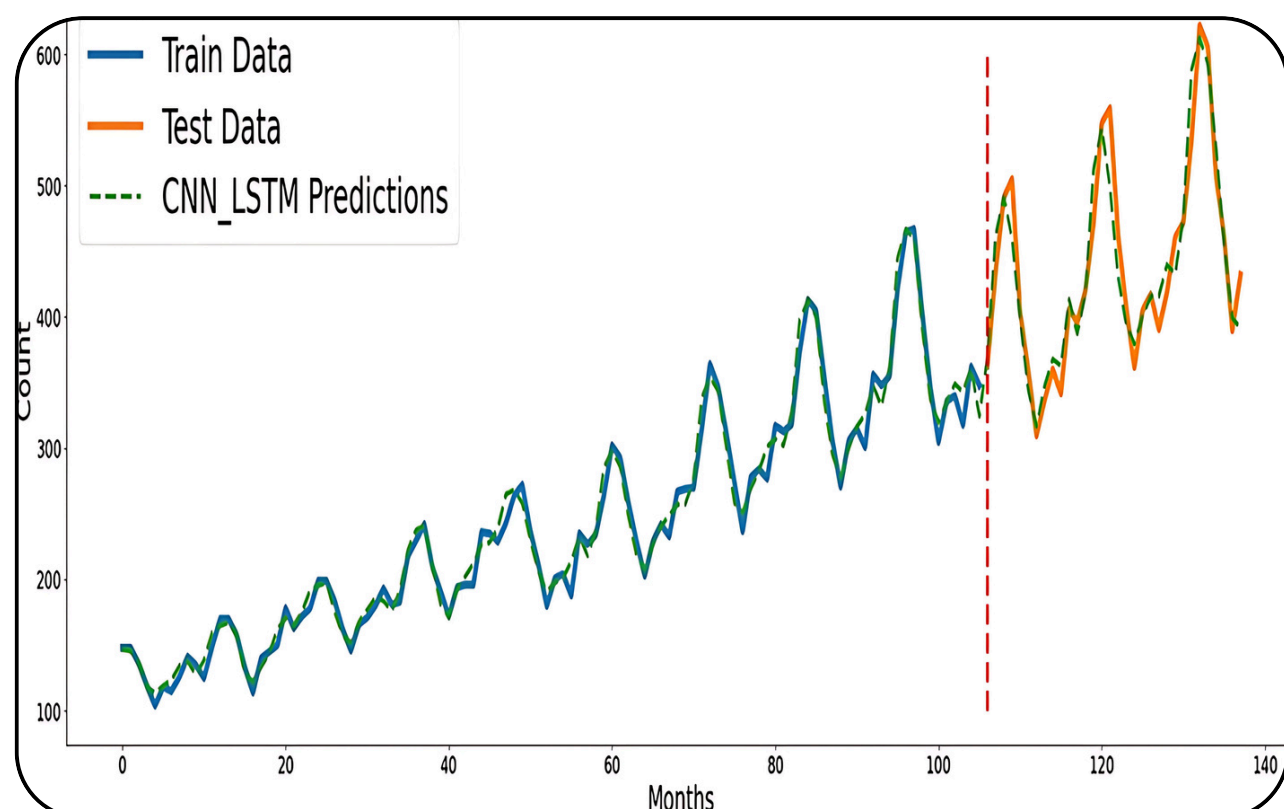
- To predict monthly vessel arrival using LSTM, SARIMA, and Prophet.
- To forecast the next six months of traffic using LSTM.
- To build an interactive dashboard for prediction results.

RESULT/FINDING

OBJECTIVE 1 : PREDICT MONTHLY VESSEL ARRIVAL

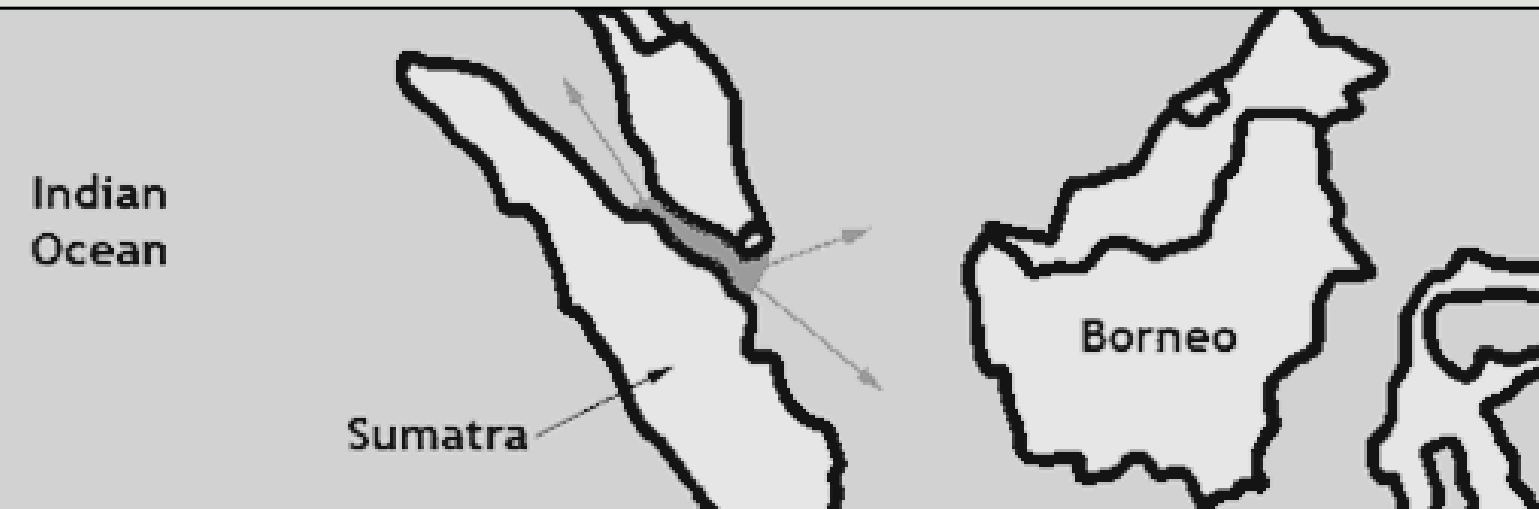
METHOD	RMSE	ACCURACY %
LSTM	508.11	93.14
SARIMA	1408.42	80.9
PROPHET	1508.26	79.63

OBJECTIVE 2 FORECAST NEXT 6 MONTH

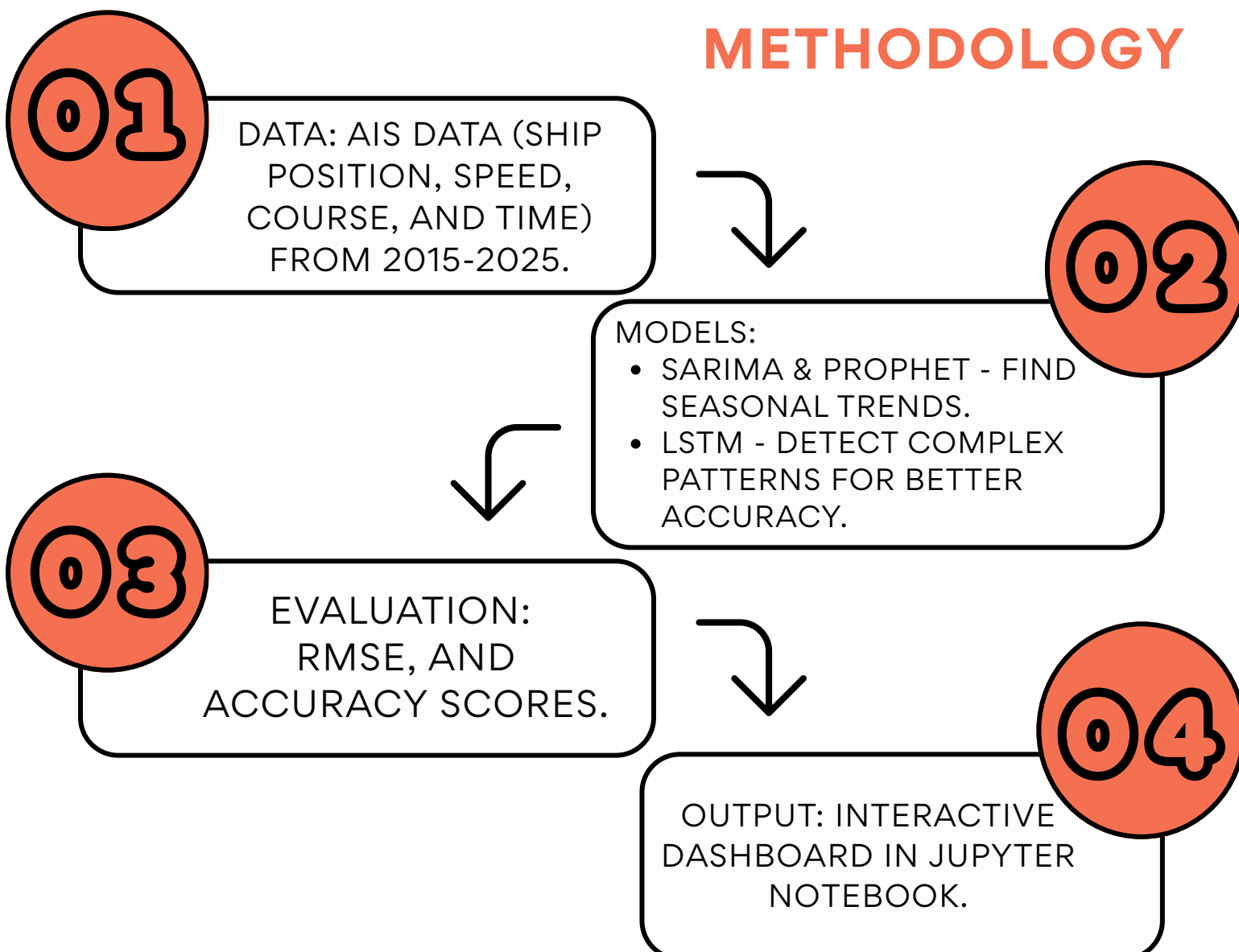


AFFILIATIONS

Universiti Pertahanan Nasional Malaysia (UPNM)



METHODOLOGY



OBJECTIVE 3 BUILD DASHBOARD

```
months_ahed = (target_date.year - df_ts.index[-1].year) * 12 + (target_date.month - df_ts.index[-1].month)

if months_ahed <= 0:
    print("⚠ Please select a future date.")
    return

preds = forecast_lstm_future(n_months=months_ahed)
forecast_value = int(round(preds[-1])) # ROUND TO WHOLE NUMBER

print(f"📅 Forecast for {dropdown_month.value} {dropdown_year.value}: {forecast_value} traffic units")

# Plot forecast
future_dates = pd.date_range(start=df_ts.index[-1] + pd.DateOffset(months=1), periods=months_ahed, freq='MS')
plt.figure(figsize=(10, 4))
plt.plot(df_ts.index, df_ts["Traffic"], label="Historical Traffic", linewidth=2)
plt.plot(future_dates, preds, label="Forecasted Traffic", linestyle='--')
plt.axvline(x=target_date, color='red', linestyle='--', label="Selected Month")
plt.title("🌊 LSTM Forecast for Marine Traffic")
plt.xlabel("Date")
plt.ylabel("Traffic Units")
plt.grid(True)
plt.legend()
plt.tight_layout()
plt.show()

# === BIND DROPDOWN EVENTS ===
dropdown_year.observe(on_select, names="value")
dropdown_month.observe(on_select, names="value")

# === DISPLAY DASHBOARD ===
display(dropdown_year, dropdown_month)
```

In []:

RECOMMENDATIONS

Forecasts should be used in port planning, and future studies should also consider weather, trade, and global events.

CONCLUSION

LSTM has the highest accuracy and lowest RMSE which are 93.14%. And for SARIMA and PROPHET which are personally 80.9% and 79.63%.