Session 2: Hands-on – LSTM Drought Monitoring Lab

Mindanao Case Study with NDVI, Rainfall, Temperature, and ONI

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Lab Plan & Pacing

- **Duration:** 2.5 hours (150 minutes)
- **Plan:**
  - 0–10: Setup & objectives
  - 10–35: Data generation + EDA
  - 35–65: Sequence creation (sliding window)
  - 65–95: Model design (LSTM)
  - 95–125: Training + evaluation
  - 125–145: Operationalization discussion
  - 145–150: Wrap-up & Q&A

Objectives

- Build a multi-variate LSTM for drought forecasting
- Use NDVI, rainfall, temperature, and ONI
- Apply temporal validation (no leakage)
- Evaluate with RMSE/MAE and visualize predictions

Notebooks

- Student: `course_site/day4/notebooks/day4_session2_lstm_drought_lab_STUDENT.ipynb`
- Instructor: `course_site/day4/notebooks/day4_session2_lstm_drought_lab_INSTRUCTOR.ipynb`

Step 0: Setup

Environment

- Colab GPU optional (CPU sufficient)
- Install packages if needed

Step 1: Data Generation & EDA

Synthetic Data Strategy

- Self-contained for training speed
- Emulates seasonal signals + drought anomalies

EDA Checklist

- Plot NDVI, rainfall, temp, ONI
- Check missing values & scaling

Step 2: Sequence Creation

Sliding Window

- Choose lookback (e.g., 6–12 months)
- Build X (sequences) and y (targets)

Temporal Split

- Train on past, test on future (no shuffle)

Step 3: LSTM Model Design

Architecture (Example)

- 1–2 LSTM layers (32–64 units)
- Dropout for regularization
- Dense output (regression)

Compilation

- Loss: MSE
- Optimizer: Adam
- Metrics: MAE, RMSE

Step 4: Training & Evaluation

Training Tips

- Early stopping
- Batch size tuning
- Learning rate

Evaluation

- RMSE/MAE
- Actual vs predicted plots
- Error analysis

Step 5: Operationalization

Deployment Considerations

- Retraining cadence (quarterly)
- Monitoring drift
- Model explainability (Session 3)

Outputs

- Forecast charts
- Exportable tables for decision-makers

Wrap-up & Q&A

- Summarize results and lessons learned
- Prepare questions for Session 3 (emerging AI)