HW-Topic-9

Data Acquisition, Modeling and Analysis: Big Data Analytics

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ARMA and ARIMA Models

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CORE IDEA

- ARMA and ARIMA aim to **model time-dependent data**
- **They use past values and past errors** to forecast future values.
- **ARMA:** Works for *stationary* time series.
- **ARIMA:** Adds *differencing* (I) to handle *non-stationary* data.

MATHEMATICAL FORM:

- **ARMA:** $X_t = c + \sum_{i=1}^{p} \phi_i X_{t-i} + \sum_{j=1}^{q} \theta_j \epsilon_{t-j} + \epsilon_t$
- **ARIMA:** $(1 - B)^d X_t = c + \sum_{i=1}^{p} \phi_i X_{t-i} + \sum_{j=1}^{q} \theta_j \epsilon_{t-j} + \epsilon_t$

APPLICATIONS

- Exchange rate prediction
- Stock price forecasting
- Air quality index prediction

Advantages

- Effective for **short-term forecasting**.
- Works well for **univariate time-series** data.

Limitations

- Assumes linear relationships between variables.
- Parameter tuning can be complex.