

Probabilistic Time Series Analysis: Lab 6

Midterm Review

Tim Kunisky

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Problem 1: ACF Calculations

1. Write down the general form of an AR(1) process.
2. Calculate the ACF.
3. Plot how it looks, in general. What kind of plot would you draw to test visually for this pattern?

Problem 2: ARMA Models

Consider the model

$$X_t = 0.4X_{t-1} + 0.45X_{t-2} + Z_t + Z_{t-1} + 0.25Z_{t-2}.$$

1. Rewrite it in terms of the backwards operator B .
2. Is there parameter redundancy? What are p and q for this ARMA(p, q)?
3. Is it causal? Is it invertible?

Problem 3: Learning and Inference

1. What is the difference between the Kalman filter and smoother?
2. What is the analog for the Kalman smoother in the (discrete) HMM? What do they let you compute?
3. Which step of EM algorithms do these get used in, and why?
4. How much memory does it take to run the Viterbi algorithm? (What's the largest amount of variables you need to hold at a time, whether they're numbers or states?)
5. What have we talked about for ARMA models that performs a similar task to an EM algorithm?