7. Linear process

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Exercises due Nov 10, 2021 17:29 IST Completed

Linear process

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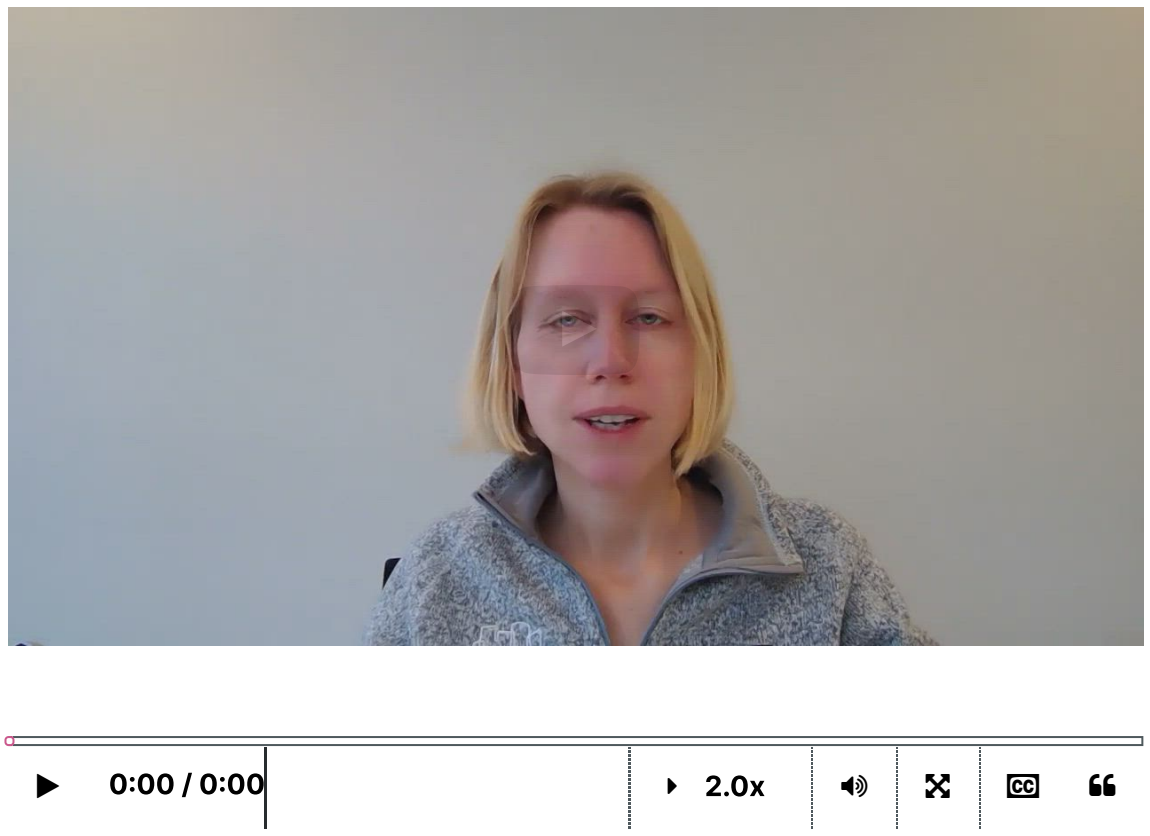

Prof Jegelka: Next, we will look at some relations

between autoregressive models and moving average models.

And this actually will also close some gaps

that we left in the previous lectures.

So to start with, let's remind ourselves

of autoregressive and moving

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The moving average model and the autoregressive model can be related to each other with the concept **Linear Process** . Linear process models can be written as the following:

$$X_t = \sum_{j=-\infty}^{\infty} \psi_j W_{t-j}$$

for the process to be well-defined, $\sum_j \|\psi_j\| < \infty$

A linear process is called causal, if ψ_j =0 whenever j<0. This is to say that the value of X_t only depends on the information from the past, not the future.

A linear process model is weakly stationary. We can check this by calculating the expectation and the auto covariance:

$$\mathbf{E}[X_t] = 0$$

and

$$\gamma_X(t, t+h) = \sum_{i=-\infty}^{\infty} \psi_i \psi_{i+h} \sigma_w^2$$

which only depends on the length of the gap h

Moving average model as a linear process model

2/2 points (graded)
Think about a moving average model of order q $X_t = MA(q)$ as a special form of linear process model.

Is X_t weakly stationary?

Is X_t weakly stationary?

- (●) True
- ( ) False
- ( ) Depends on q

✔

Is X_t causal?

- (●) True
- ( ) False
- ( ) Depends on q

✔

Solution:

Moving average model is a special form of linear process model. Since all linear process models are weakly stationary, therefore MA(q) is weakly stationary regardless of q.

Since $MA(q) = \sum_{h=0}^{q} \theta_h W_{t-h}$, only the coefficients of the past terms are non-zero. Therefore MA(q) is causal regardless of q.

Submit You have used 1 of 1 attempt

Answers are displayed within the problem

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I don't understand why the sum of the absolute value of psi has to be finite

question posted about a month ago by **sa_abbasi**

The professor glossed over this a bit. Can someone please explain the math.

This post is visible to everyone.

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