12.4.1 Predicting the Weather, One Last Time

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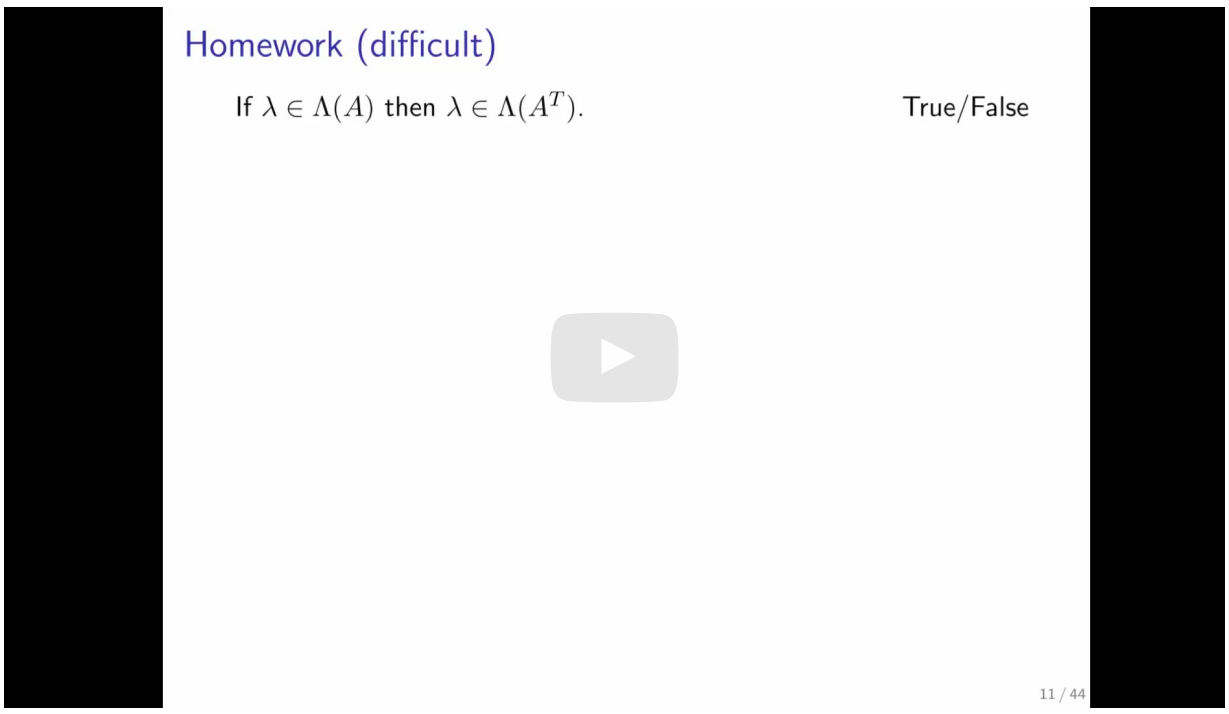
Week 12 due Dec 29, 2023 10:42 IST

12.4.1 Predicting the Weather, One Last Time

Video 12.4.1 Part 1



1:17 / 1:17 2.0x

important in a minute.

It sure seemed like there was a vector such that P times x was equal to x.

And therefore 1 would have to be an eigenvalue of the transition matrix P.

Why is this?

So here is a homework that actually is quite challenging.

So don't fret about this one too long.

If you get frustrated, just go to the next video.

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Reading Assignment

0 points possible (ungraded)

Read Unit 12.4.1 of the notes. [LINK]

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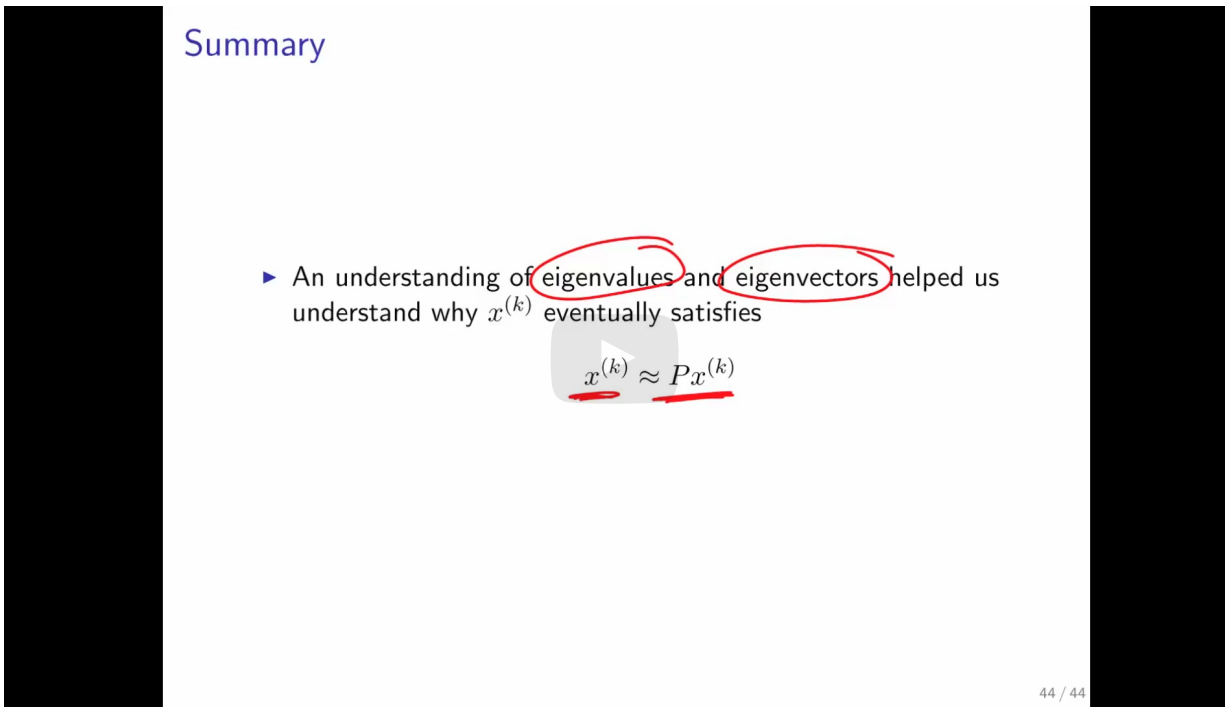
HW 12.4.1.1: Explanation of the leap in logic 1

Type in PDF notes? 5

Calculator

Typo in PDF notes?

Video 12.4.1.1 Part 2



and you end up with a vector that points in the direction of the eigenvector v0.

And bingo!

That explains the magic of predicting the weather many days from now.

So in summary, it's understanding eigenvalues and eigenvectors

that allowed us to explain that when we keep hitting this vector

x with P, eventually we end up with a vector that doesn't change anymore,

at least not noticeably.

▶ 8:22 / 8:22 2.0x

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Homework 12.4.1.1

1/1 point (graded)

If $\lambda \in \Lambda(A)$ then $\lambda \in \Lambda(A^T)$.

True ✔ Answer: True

ANSWER: True

$$
\begin{array}{ll}
\lambda \in \Lambda(A) & \Rightarrow \quad (A - \lambda I) \text{ is singular} \\
& \Rightarrow \quad < \text{equivalent conditions} > \\
\dim(\mathcal{N}(A - \lambda I)) = k > 0 & \\
& \Rightarrow \quad < A \text{ is square, fundamental space picture} > \\
\dim(\mathcal{N}((A - \lambda I)^T)) = k > 0 & \\
& \Rightarrow \quad < (A - \lambda I)^T = A^T - \lambda I > \\
\dim(\mathcal{N}(A^T - \lambda I)) = k > 0 & \\
& \Rightarrow \quad < \text{equivalent conditions} > \\
(A^T - \lambda I) \text{ is singular} & \\
& \Rightarrow \quad < \text{property of eigenvalue} > \\
\lambda \in \Lambda(A^T) &
\end{array}
$$

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Calculator

Answers are displayed within the problem

Homework 12.4.1.2

1/1 point (graded)

$\lambda \in \Lambda(A)$ if and only if $\lambda \in \Lambda(A^T)$.

TRUE ✔ Answer: TRUE

This follows immediately from the last homework and the fact that $(A^T)^T = A$.

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