

Course outline

How does an NPTEL online course work?

Week-0

Week-1

Week-2

Week-3

Week-4

Week-5

Week-6

Week-7

Week-8

Week-9

Week-10

Lec 49- Machine Learning application: Support Vector Machines (SVM)

Lec 50- Support Vector Machines (SVM): Problem formulation via maximum hyperplane separation

Lec 51- Sparse regression: problem formulation and relation to Compressive Sensing (CS)

Lec 52- Sparse regression: solution via the Orthogonal Matching Pursuit (OMP) algorithm

Lec 53- OMP Example for Sparse Regression

Lec 54- Machine Learning Application: Clustering

Lec 55- K-Means Clustering algorithm

Quiz : Assignment-10

Feedback for Week 10

Solution-10

Week-11

Week-12

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Live session

Text transcripts

Assignment-10

The due date for submitting this assignment has passed.

Due on 2021-03-31, 23:59 IST.

As per our records you have not submitted this assignment.

 1) Consider the matrix \mathbf{H} given as

$$\mathbf{H} = \begin{bmatrix} 0 & -1 \\ 0 & 0 \end{bmatrix}$$

 The matrix exponential $e^{t\mathbf{H}}$ is given as

$\begin{bmatrix} 1 & -t \\ 0 & 1 \end{bmatrix}$

$\begin{bmatrix} 0 & e^{-t} \\ 0 & 0 \end{bmatrix}$

$e^{-t} \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$e^{-t} \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\begin{bmatrix} 1 & -t \\ 0 & 1 \end{bmatrix}$$

 2) Consider the matrix \mathbf{H} given as

$$\mathbf{H} = \omega \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$$

 The matrix exponential $e^{t\mathbf{H}}$ is given as

$\begin{bmatrix} \cos(\omega t) & \sin(\omega t) \\ \sin(\omega t) & \cos(\omega t) \end{bmatrix}$

$\begin{bmatrix} \cos(\omega t) & \sin(\omega t) \\ -\sin(\omega t) & \cos(\omega t) \end{bmatrix}$

$e^{\omega t} \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$

$e^t \begin{bmatrix} 0 & \omega \\ -\omega & 0 \end{bmatrix}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\begin{bmatrix} \cos(\omega t) & \sin(\omega t) \\ -\sin(\omega t) & \cos(\omega t) \end{bmatrix}$$

3) In 4G cellular systems,

 SC-FDMA is used in the DL and OFDM in the UL

 SC-FDMA is used in the UL and OFDM in the DL

 OFDM is used both in UL and DL

 SC-FDMA is used both in the UL and DL

No, the answer is incorrect.

Score: 0

Accepted Answers:

SC-FDMA is used in the UL and OFDM in the DL

4) The PAPR (Peak-to-Average Power Ratio) of SC-FDMA, in comparison to OFDM, is

 Identical

 Cannot be determined

 Higher

 Lower

No, the answer is incorrect.

Score: 0

Accepted Answers:

Lower

5) At the receiver in an SC-FDMA system, the order of operations is

 IFFT, followed by Equalization, followed by FFT

 Equalization, followed by FFT, followed by IFFT

 IFFT, followed by FFT, followed by Equalization

 FFT, followed by Equalization, followed by IFFT

No, the answer is incorrect.

Score: 0

Accepted Answers:

FFT, followed by Equalization, followed by IFFT

6) The general model for an autonomous Linear Dynamical System is

$\frac{d}{dt} \tilde{\mathbf{v}}(t) = 0$

$\frac{d}{dt} \tilde{\mathbf{v}}(t) = \mathbf{H}\tilde{\mathbf{v}}(t)$

$\mathbf{H}\tilde{\mathbf{v}}(t) = 0$

$\frac{d}{dt} \tilde{\mathbf{v}}(t) = \mathbf{H}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\frac{d}{dt} \tilde{\mathbf{v}}(t) = \mathbf{H}\tilde{\mathbf{v}}(t)$$

7) The solution of the autonomous Linear Dynamical System described in lectures is

$\tilde{\mathbf{v}}(t) = e^t \mathbf{H}$

$\tilde{\mathbf{v}}(t) = e^{\mathbf{H}} \tilde{\mathbf{v}}(0) t$

$\tilde{\mathbf{v}}(t) = e^{t\mathbf{H}} \tilde{\mathbf{v}}(0)$

$\tilde{\mathbf{v}}(t) = \mathbf{H}\tilde{\mathbf{v}}(0) t$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\tilde{\mathbf{v}}(t) = e^{t\mathbf{H}} \tilde{\mathbf{v}}(0)$$

8) Consider an autonomous LDS with

$$\frac{d}{dt} \tilde{\mathbf{v}}(t) = \mathbf{H}_i \tilde{\mathbf{v}}(t), (i-1)T \leq t < iT$$

 for $i = 1, 2, \dots, N$. The solution $\tilde{\mathbf{v}}(NT)$

$e^{-T\mathbf{H}_N} e^{-T\mathbf{H}_{N-1}} \dots e^{-T\mathbf{H}_1} \tilde{\mathbf{v}}(0)$

$T^N \mathbf{H}_N \mathbf{H}_{N-1} \dots \mathbf{H}_1 \tilde{\mathbf{v}}(0)$

$e^{T\mathbf{H}_N} e^{T\mathbf{H}_{N-1}} \dots e^{T\mathbf{H}_1} \tilde{\mathbf{v}}(0)$

$(e^{T\mathbf{H}_N} + e^{T\mathbf{H}_{N-1}} + \dots + e^{T\mathbf{H}_1}) \tilde{\mathbf{v}}(0)$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$e^{T\mathbf{H}_N} e^{T\mathbf{H}_{N-1}} \dots e^{T\mathbf{H}_1} \tilde{\mathbf{v}}(0)$$

9) Support Vector Machines (SVMs) can be used for

 Classification

 Regression

 Beamforming

 Optimal power allocation

No, the answer is incorrect.

Score: 0

Accepted Answers:

Classification

 10) The SVM problem corresponding to points $\tilde{\mathbf{x}}(k)$, binary outputs $y(k) \in \pm 1, k = 1, 2, \dots, m$ is

$\max \|\tilde{\mathbf{a}}\|$

 subject to $y(k)(\tilde{\mathbf{a}}^T \tilde{\mathbf{x}}(k) + b) \geq 1$

$\max \|\tilde{\mathbf{a}}\|$

 subject to $y(k)(\tilde{\mathbf{a}}^T \tilde{\mathbf{x}}(k) + b) \geq 0$

$\min \|\tilde{\mathbf{a}}\|$

 subject to $y(k)(\tilde{\mathbf{a}}^T \tilde{\mathbf{x}}(k) + b) \geq 0$

$\min \|\tilde{\mathbf{a}}\|$

 subject to $y(k)(\tilde{\mathbf{a}}^T \tilde{\mathbf{x}}(k) + b) \geq 1$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\min \|\tilde{\mathbf{a}}\|$$

$$\text{subject to } y(k)(\tilde{\mathbf{a}}^T \tilde{\mathbf{x}}(k) + b) \geq 1$$