PMRF-ISSS Teaching Programme

Prime Minister Research Fellowship students' teaching requirement facilitated by the Institute of Smart Structures and Systems

Module PMRF-ISSS151/2024

Mathematical foundations for scientific machine learning

Name of the PMRF student

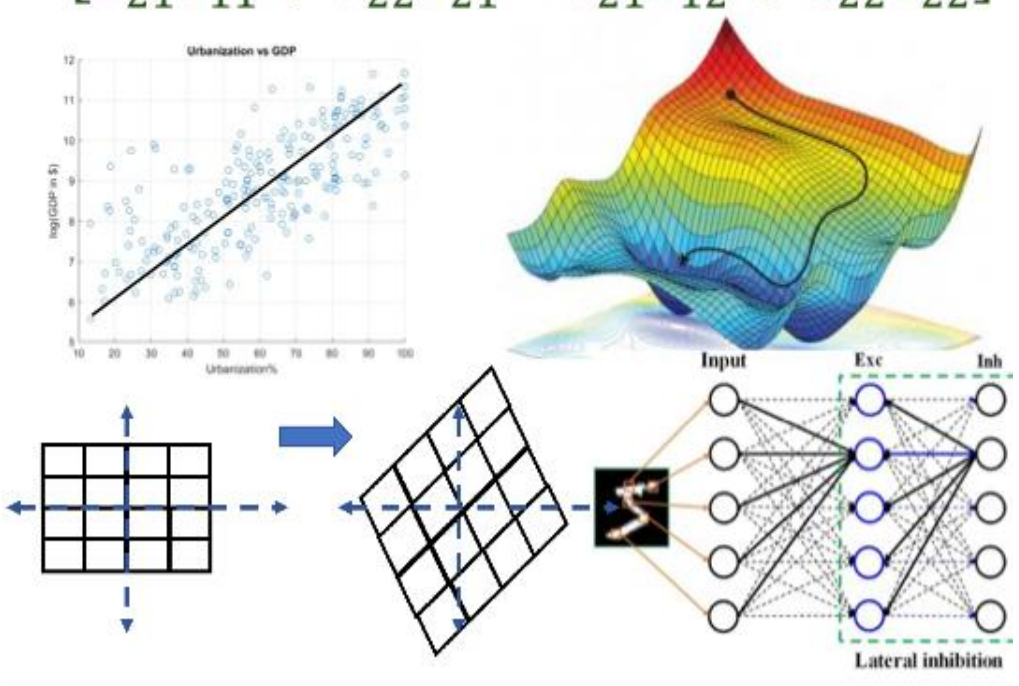
Kartick Ramakrishnan

Required background of the students taught

Basic linear algebra and high-school calculus

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix}$$

$$= \begin{bmatrix} a_{11}b_{11} + a_{12}b_{21} & a_{11}b_{12} + a_{12}b_{12} \\ a_{21}b_{11} + a_{22}b_{21} & a_{21}b_{12} + a_{22}b_{22} \end{bmatrix}$$



Details of the content of the module

This course covers the essential foundations required for machine learning. Through the lectures we will understand the core concepts behind various machine learning models with problem solving sessions on the various mathematical topics covered in the course.

The following topics will be covered:

→ Introduction to Linear Algebra

→ Matrix decompositions (eigenvalue decomposition, QR decomposition, SVD and polar decomposition)

→ Least squares problem, linear and logistic regression

→ Introduction to multivariable calculus

→ Introduction to optimization

→ Gradient based optimizations(conjugate gradient, steepest gradient, batched and stochastic gradient descent algorithms)

→ Introduction to Neural networks (Leveraging the concepts learned so far…)

Schedule of the module

Start Date: 7th October 2024
End Date: 25th October 2024
Lecture Timings: Monday-Thursday 6PM-8PM
Discussion/Problem Solving Timings: Friday 6PM-8PM

Meeting link : Will be shared later

Link

Contact email ID: isss.forum@gmail.com

Registration link: https://forms.gle/zih2EruwuC1uPyXGA