



Αθήνα, 20/3/2024

Δ Ι Α Λ Ε Ξ Η**Ομιλητής: Νίκος Παλληκαράκης, Μεταδιδάκτορας Τομέα Μαθηματικών ΣΕΜΦΕ****Τίτλος: Solving Inverse Problems with Supervised Machine Learning Models**

Περίληψη: The latest years, machine learning has been one of the main directions in the numerical solution of inverse problems, aiming to face the ill-posed nature of these problems. In this talk, we delve into the numerical solution of inverse problems and specifically inverse eigenvalue and inverse source problems, from a machine learning perspective.

In the first part, we focus on the inverse Sturm-Liouville eigenvalue problem for symmetric potentials and the inverse transmission eigenvalue problem for spherically symmetric refractive indices. We present the main ideas behind supervised machine learning regression and briefly discuss the basic properties of the algorithms we implement, which are k-Nearest Neighbours (kNN), Random Forests (RF) and Neural Networks (MLP). Afterwards, we numerically solve the direct problems using well known methods, in order to produce the spectral data which in turn are used for training the machine learning models. We consider examples of inverse problems and compare the performance of each model to predict the unknown potentials and refractive indices respectively, from a given small set of the lowest eigenvalues.

In the second part, we pose the inverse problem, to predict the number of sources inside a dielectric cylinder. Using classification Neural Networks, we show that this problem is solved with high accuracy. Our experiments validate the efficiency of these machine learning models for numerically tackling such inverse problems, providing a proof-of-concept for their applicability in this field.

Η ομιλία θα δοθεί την **Παρασκευή 22 Μαρτίου 2024** και ώρα **13:00**, στην Αίθουσα Σεμιναρίων του Τομέα Μαθηματικών, κτ. Ε', 2ος όροφος.