

DATA SCIENCE TECHNIQUES FOR CONDENSED MATTER PHYSICS

15 hours Course

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COURSE AIMS:

Data science and machine learning/artificial intelligence are revolutionizing many fields, and physics is no exception. This course will introduce machine learning techniques which are usually applied to physics problems, with a particular focus on neural networks, and unsupervised learning. For each algorithm, we will present example applications to condensed-matter-physics problems from the recent literature. Coding tutorials (in Python) will be provided.

Course content

- Examples of data science applications
- Linear regression, regularization (ex: crystal-structure prediction)
- Introduction to deep learning (ex: solving the Schrödinger equation)
- Convolutional neural networks and generative adversarial networks (ex: detecting atomic position in STEM images)
- Recurrent neural networks (ex: ferroelectric switching)
- Structural representation of atomic systems for machine learning (ex: inter-atomic potentials)
- Clustering: k-means, HDBSCAN; dimensionality reduction: PCA, UMAP (ex: Raman spectra, ice structures, STEM images)

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PhD Course

11 April 2022, 14:00-18:00 - Aula 19

12 April 2022, 14:00-18:00 - Aula 19

14 April 2022, 14:00-18:00 - Sala Riunioni S5

15 April 2022, 14:00-17:00 - Sala Riunioni S5

Via Garzetta 48, Brescia

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