

The Africa-Europe Cluster of Research Excellence: Addressing Global and African Challenges Through Methods of Artificial Intelligence, Data Science, and Theoretical and Computational Thinking

presents a

MASTERCLASS:

An Introduction to Graph Learning and Signal Processing

Tuesday, 27 May 2025

South Africa: 11h00-13h00 SAST | UK: 10h00-12h00 (BST)

VENUES:

- Physics Seminar Room, Stellenbosch University, South Africa
- Swan Room, Elm Bank, Coventry University, United Kingdom
- Online

DESCRIPTOR

This lecture offers an accessible introduction to Graph Signal Processing (GSP) and Graph Neural Networks (GNNs), two complementary frameworks that enable the modeling and analysis of data with complex relational structures. These methods are particularly useful for biomedical and neuroscience applications, where data often naturally reside on irregular, non-Euclidean domains such as brain networks or physiological connectivity graphs.


In the first hour, we will explore the fundamentals of Graph Signal Processing. How classical signal processing concepts extend to graph domains, including graph Fourier transforms, filtering, and spectral analysis. Practical coding examples will demonstrate how GSP can be used to analyse biomedical or neural signals.

In the second hour, we will shift focus to Graph Neural Networks, covering the intuition and core architectures, how to construct the graph, and how they learn from graph-structured data. A hands-on coding session will guide students through implementing a simple GNN using Python and PyTorch.


PREREQUISITES

- A basic background or understanding of signal processing and machine learning.
- Some practical experience of using Python, or Matlab.

TIME (SAST)	TITLE
11h00-11h40	Signal processing and graph signal processing
11h40-12h00	Practical coding examples (or exercises) on applying GSP to real biomedical data analysis
12h00-12h30	Introduction to Graph Neural Networks
12h30-13h00	Practical coding examples (or exercises) on implementing GNNs



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