

## Seminário duplo

Grupo de Probabilidades e Estatística

06/05/2026

14h00 – 15h20

Sala Sousa Pinto

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### First Seminar (14h00 – 14h45)

## Outliers in dynamic time series models: a robust approach to parameter estimation and Kalman filter

**A. Manuela Gonçalves**

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### Abstract

In time series, the presence of outliers is common, resulting from natural phenomena or measurement errors. These observations compromise the effectiveness of classical estimation methods, such as the Kalman filter, reducing the accuracy of estimates and the reliability of forecasts. The main objective of this work is to study and propose robust methodologies capable of adequately handling these observations, both in the prediction of states and in the estimation of model parameters within dynamic time series modelling. To this end, robust versions of the Kalman filter are proposed based on loss functions, which adjust the weights assigned to residuals, reducing the influence of these values. In parallel, robust likelihood estimation is explored through three distinct approaches: one based on the Huber function, a trimmed version of the classical likelihood that ignores a fraction of the most extreme observations, and a version based on the Cauchy loss function. The performance of these approaches was evaluated through simulation studies, considering different combinations of parameters and sample sizes. Finally, the methods will be applied to real water quality data in a watershed, demonstrating their capabilities in real-world contexts.

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### Second Seminar (14h50 – 15h20)

## Application of PerPCA on distribution routes and air pollution\*

**Diana Vázquez-Limón**  
*CIDMA, University of Aveiro, Portugal*

### Abstract

PCA is a well-known approach for dimension reduction and has been proved to be of impact in unsupervised learning for feature extraction and noise reduction where the data is (naturally) assumed to come from homogeneous sources or from different sources but shaping common trends. Nonetheless, it might be critical to extract shared knowledge and retain unique features when data comes from different heterogeneous sources. A recently introduced approach, Personalised Principal Component Analysis (PerPCA) has been used for the differentiation of such patterns, taking heterogeneous data and using it for topic extraction in language datasets and image recognition in video segmentation. This presentation will explore PerPCA and present the obtained results when applied on (numerical) data from NEXUS and air pollution datasets. We propose a visualization for the results obtained with the datasets which can provide a simple and clear way to interpret them.

(\*): Apresentação para cumprimento da avaliação da UC de Estágio do Curso Avançado em Investigação Científica de Diana Vázquez-Limón.

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