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NITheCS COLLOQUIUM:
A trainable and explainable filter-based approach to visual pattern recognition

Prof George Azzopardi (University of Groningen, Netherlands)

Tuesday, 7 May 2024 | 16h00 – 17h00 SAST

Venues: Neelsie Cinema, Stellenbosch University, and online

ABSTRACT

In this presentation, I will introduce the COSFIRE method, an acronym for Combination of Shifted Filter Responses, which mimics the functionality of shape-selective neurons found in the V1 and V4 regions of the visual cortex. This approach utilizes trainable filters that are configured automatically using (user) specific prototypes. The main focus will be on how these filters facilitate robust object localization and image classification. Key advantages of COSFIRE include its efficiency, stemming from its lightweight operational framework; its high degree of explainability, with transparent filter response maps; and its inherent invariance to rotation, reflection, and scale—attributes that enhance its reliability and applicability across varied domains. Unlike typical learning-based systems, COSFIRE avoids the pitfalls of overfitting and instabilities since it operates without a conventional learning algorithm. Throughout the talk, I will showcase several practical applications of this technique, including retinal image analysis, gender recognition from facial images, and the classification of radio galaxies, highlighting its versatility and effectiveness in different settings.

BIOGRAPHY

George Azzopardi is an associate professor in pattern recognition at the University of Groningen in the Netherlands. He is the coordinator of the Applied AI theme of the Jantina Tammes School of Digital Society, Technology and AI.

Prof Azzopardi earned a BSc degree (Hons) from Goldsmiths College, an MSc degree from Queen Mary University of London, and a PhD degree (cum laude) in computer science from the University of Groningen in 2013. Prof Azzopardi has (co-) authored over 90 peer-reviewed publications and has successfully (co-) promoted 7 PhD candidates.

His research spans brain-inspired pattern recognition, image processing, machine/deep learning, and information retrieval, with application to medical, forensic and radioastronomy image analysis. His work led to him being a co-recipient of the Ben Feringa Impact Award from the University of Groningen in 2023.

Currently, Prof Azzopardi serves as associate editor for the Q1 journal, *Pattern Recognition*.

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