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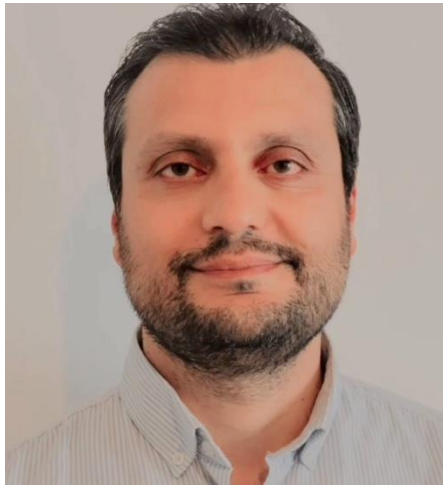
BIOSIG:
Advances in Biomedical Signal Processing

Special track introduction

SIGNAL 2025
March 9-13 Lisbon, Portugal

CHAIRS AND COORDINATORS



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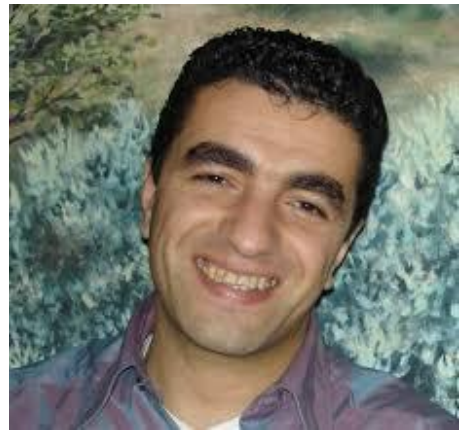

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Short Bio's

- **Ahmad Karfoul** received his Electronics Engineering diploma from Homs University, Syria, followed by both his MSc and PhD degrees in Signal Processing from Université de Rennes, France. He is currently an associate professor in the Department of Biomedical Engineering at ESIR (École Supérieure d'Ingénieurs de Rennes), Université de Rennes. He is also affiliated with LTSI (Laboratoire Traitement du Signal et de l'Image). His research interests include statistical signal processing, tensor decomposition, graph signal processing, machine learning, and deep learning, with applications to electrocardiography and electroencephalography signal processing, encompassing brain connectivity, brain source localization, source separation, heart function monitoring and MRI quantification.

- **Amar Kachenoura** received the diploma in electronic engineering from M.M.T.O. University, Tizi-Ouzou, Algeria, in 1998 and the DEA degree from Ecole Central de Nantes (ECN), Nantes, France, in July 2002. He received the Ph.D. degree in signal processing from the University of Rennes 1, Rennes, France, in July 2006. He is currently Engineer researcher at University of Rennes 1 and is affiliated with the INSERM research group LTSI (Laboratoire Traitement du Signal et de l'Image). His research interests focus mainly on statistical signal processing, blind source separation, graph signal processing, machine and deep learning, non-linear and non-stationary signals analysis, and biosignals (Electrocardiography, Electroencephalography, and NMR Spectroscopy) analysis and interpretation.

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Advances in biomedical signal processing

- Data acquisition and pre-processing
- Temporal pattern analysis and inference for diagnosis of brain and heart diseases
- Methods to understand and analyze complex physiological systems
- Multi-modal data fusion/representation for improved diagnosis and interpretation
- Real-time processing and monitoring in clinical applications
- AI-driven analysis for automated disease detection and personalized medicine
- Integrative approaches for reliable and more robust data processing and results interpretation

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Outline of the BIOSIG Track

Introduction

- Combined EEG/ERG measurements for bipolar disorders diagnosis by Julie Muzzolon, Xiaoxi Ren, Steven Le Cam, Thomas Schwitzer, Valérie Louis Dorr.

- A new 1D-CNN paradigm for onset detection of absence seizures in Children by Maxime Yochum, Amar Kachenoura, Matthieu Aud'hui, Anna Kaminska, Rima Nabbout, Fabrice Wendling, Mathieu Kuchenbuch and Pascal Benquet.

- An integrative strategy for solving the EEG inverse problem and the estimation of brain effective connectivity in epilepsy. A proof-of-concept study by Marc Greige, Ahmad Karfoul, Pascal Benquet, Maxime Yochum and Régine Le Bouquin Jeannès.

Discussion

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Futuristic challenges in biomedical signal processing

- Explainable AI in biomedical signal analysis for enhanced interpretability of the results
- Quantum signal processing especially for large-scale neurophysiological and genomic data
- Personalized predictive models that adapt to a patient's unique physiological patterns for proactive healthcare monitoring
- Handling the increasing volume of biomedical signals efficiently using edge computing and cloud-based solutions
- Synthetic data generation for training AI models to address the scarcity of labeled biomedical signal datasets
- Ultra-low power and wearable devices by creating energy-efficient biomedical signal processing algorithms suitable for continuous monitoring in wearable and implantable devices.