University of Rijeka, Faculty of Maritime studies

PROJECT ACRONYM AND TITLE: Analysis and Classification of Non-Stationary Signals Using Advanced Deep Learning Methods

FUNDING PROGRAMME: University of Rijeka (UNIRI Young Scientists' Projects 2022)

PERSON RESPONSIBLE: Assist. Prof. Nikola Lopac, PhD

FINANCIAL DATA

Project total cost	Overall funding assigned to PFRI
2.478,91 EUR	2.478,91 EUR

SUMMARY

Non-stationary signals are characterized by a time-varying frequency spectrum, often multi-component and, in practical applications, corrupted by noise. Therefore, their analysis requires advanced methods for the simultaneous signal representation in time and frequency. Quadratic time-frequency distributions provide insight into signal energy distribution in the joint time-frequency domain, with a trade-off between time-frequency resolution and interference suppression. The project will develop an improved procedure for classifying non-stationary signals in noise, aiming for the universal application on signals from different fields. The developed procedure will be based on the application of quadratic time-frequency distributions from Cohen's class on non-stationary input signals and their use in classifiers based on advanced deep learning algorithms, focusing on deep convolutional neural networks. The influence of noise on the detection process will also be analyzed, as well as the possibility of reducing this influence by applying data-driven, locally adaptive denoising methods or improving time-frequency distributions with better robustness to noise and interferences. The developed procedure will be validated by application on various non-stationary signals, enabling the extraction of useful features and the detection of various phenomena, thus opening the possibility of use in a number of classification tasks. The aim is the universality of this procedure and its application to various non-stationary signals from unrelated fields, such as biomedical, radar, and seismic signals or gravitational-wave signals, emphasizing the interdisciplinary research approach. The project will strengthen research capacities and contribute to the University's development policies by strengthening collaboration and internationalization, following the strategy of smart specialization in the field of bio-nano-info technologies.

Start date	End date
01/02/2023	31/01/2024

WEBSITE: -

ADDITIONAL INFO:

Project team members:

- Assist. Prof. Nikola Lopac, PhD