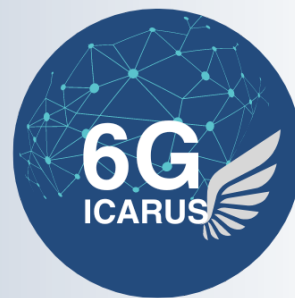


6G Intelligent Connectivity And inteRaction for Users and infraStructures



Newsletter #2

August, 2025

Highlighting Dissemination Activities

IEEE International Conference on Communications

Active Participation in Panels & Workshops



Panel: "6G Empowered Robotics"



Workshop: "Security, Trust & Privacy in 6G"



Workshop: "6G & Global Digital Health Transformation"



**IEEE ICC 2024
Denver, USA**

IEEE Wireless Communications and Networking Conference

Advanced Research Presentation

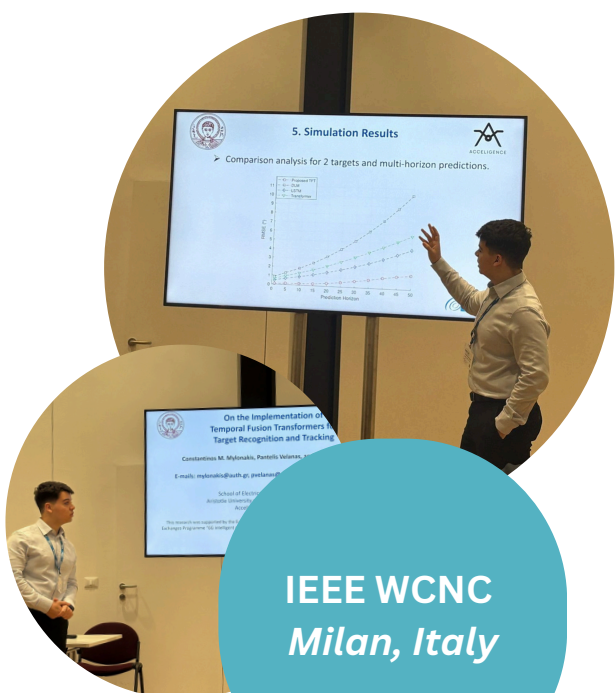


Paper Title: "On the Implementation of Temporal Fusion Transformers for Target Recognition and Tracking"

Constantinos M. Mylonakis, Pantelis Velanas, and Zaharias D. Zaharis



Collaboration between Aristotle University of Thessaloniki and ACCELIGENCE



**IEEE WCNC
Milan, Italy**



Funded by
the European Union

Secondments: Bridging Expertise Across Borders

Aristotle University of Thessaloniki



Zaharias D. Zaharis
AUTH to Sofia Tech Park
Sofia, Bulgaria

Work Focus:

Developing Intelligent ML/DL Algorithms for Real-Time RIS Control

Develop and enhance ML/DL algorithms by integrating evolutionary optimisation techniques. This resulted in a suite of improved models showing faster convergence, increased robustness, and adaptability for reconfigurable intelligent surfaces (RIS) in dynamic 6G environments.



Christos Antonopoulos
AUTH to Sofia Tech Park
Sofia, Bulgaria

Work Focus:

Advanced Modelling and Optimisation of RISs on UAV Platforms

The objective of this secondment was to design and optimise RIS models for aerial deployment on UAVs, a key innovation area in flexible 6G infrastructures.



Alkiviadis Chatzopoulos
AUTH to Sofia Tech Park
Sofia, Bulgaria

Work Focus:

Evaluating Electronic Switching Components for ML-Driven RIS Systems

The focus of this secondment was an extensive study of electronic switching components for use in reconfigurable intelligent surfaces (RISs)—a key enabler for dynamic, real-time 6G systems.

Secondments: Bridging Expertise Across Borders

Aristotle University of Thessaloniki



Zaharias D. Zaharis
AUTH to ACCELI
Nicosia, Cyprus

Work Focus:

*Applying ML/DL for Dynamic
RIS Pattern Control*

This secondment focused on applying and evaluating ML/DL algorithms for the dynamic control of RIS radiation patterns. Several neural network architectures were implemented and tested to improve adaptability, accuracy, and efficiency in real-world scenarios, including smart cities and IoT environments.

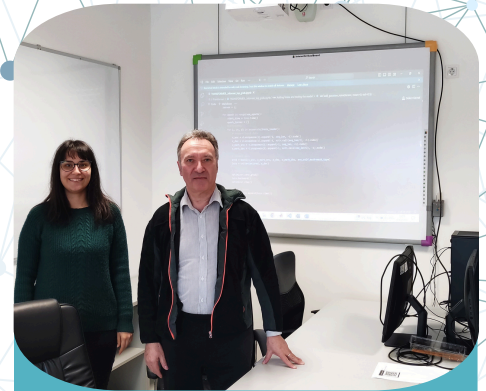


Christos Antonopoulos
AUTH to ACCELI
Nicosia, Cyprus

Work Focus:

*Optimising RISs for UAV-
Based Deployments*

This secondment focused on optimising RIS models for UAV-based deployments. It involved designing compact RIS geometries and developing advanced optimisation algorithms to improve electromagnetic performance under dynamic flight conditions, supporting reliable mmWave and sub-THz communication.



Zaharias D. Zaharis
AUTH to Sofia Tech Park
Sofia, Bulgaria

Work Focus:

*Enhancing ML/DL Algorithms
for RIS Control with
Evolutionary Optimisation*

This secondment improved ML/DL algorithms with evolutionary optimisation, boosting their speed, adaptability, and accuracy for real-time RIS control in dynamic environments, supporting future 6G applications.

Secondments: Bridging Expertise Across Borders

ACCELIGENCE



Rea Levantinou
ACCELI to AUTH
Thessaloniki, Greece

Work Focus:

*Administrative Research
Support for Channel
Modelling for UAV
Communications*

Contribution by conducting literature and policy reviews, preparing and organizing internal documentation, facilitating communication among project partners, and supporting progress tracking and task alignment.



Christos Malliarakis
ACCELI to AUTH
Thessaloniki, Greece

Work Focus:

*Channel Modelling for UAV
Communications*

Contribution to the development and refinement of channel models for UAV-based communication scenarios. Improvement of model accuracy and adaptability in mmWave/subTHz environments. Active engagement in technical discussions.

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Newsletter #2

August, 2025

Scientific Publications



Mylonakis, C., Velanas, P., Lazaridis, P., Sarigiannidis, P., Goudos, S., & Zaharis, Z. (2025). Deep learning framework using spatial attention mechanisms for adaptable angle estimation across diverse array configurations. <https://doi.org/10.3390/technologies13020046>



Mylonakis, C., Velanas, P., & Zaharis, Z. (2025, April 4). On the Implementation of Temporal Fusion Transformers for Target Recognition and Tracking. <https://doi.org/10.5281/zenodo.15147925>



Al Kassir, H., Antonopoulos, C., & Zaharis, Z. (2025). TBF-CM: A Transformer-Based Beamforming Framework Leveraging Correlation Matrix Information. Zenodo. <https://doi.org/10.1109/TAP.2025.3585686>



Mahmoud, M., Rizou, S., Panayides, A. S., Lazaridis, P. I., Karagiannidis, G. K., Kantartzis, N. V., & Zaharis, Z. D. (2025, May). STAV360: A Dataset for Subjective Tile-based Assessment of 360° Videos. In 2025 12th International Conference on Information Technology (ICIT) (pp. 67-72). IEEE.



Published January 24, 2025 | Version v1

Journal article Open

Deep learning framework using spatial attention mechanisms for adaptable angle estimation across diverse array configurations

Mylonakis, Constantinos¹; Velanas, Pantele²; Lazaridis, Pavlos³; Sarigiannidis, Panagiotis⁴; Goudos, Sotirios⁵; Zaharis, Zaharias⁶

Rapid advancement of wireless communication systems and the increasing need for accurate, real-time signal processing have driven research in estimation techniques. This paper introduces a novel convolutional neural network (CNN) architecture that combines spatial attention mechanism to enhance both accuracy and versatility in DoA estimation. The model integrates spatial attention layers to dynamically prioritize information value, allowing it to isolate relevant signals and suppress interference in noisy or crowded signal environments. In addition, the proposed model generalizes across various antenna array configurations (i.e., planar, linear, and circular arrays) with minimal additional training. Results benchmark the proposed model against existing state-of-the-art methods for DoA estimation, achieving improved absolute error and robust, scalable tool for next-generation wireless communication systems.

Published July 10, 2025 | Version v1

Journal Open

TBF-CM: A Transformer-Based Beamforming Framework Leveraging Correlation Matrix Information

Al Kassir, Haya¹; Antonopoulos, Christos²; Zaharis, Zaharias³

Show affiliations

This paper introduces TBF-CM, a transformer-based beamforming framework that leverages correlation matrix data. The core contribution is a transformer-based neural network (TNN) designed to map correlation matrices to beamforming weights for a 16-element uniform linear array (ULA) in scenarios accommodating up to seven incoming signals. The capability of TBF-CM to generate complex feeding weights for precise main lobe steering is benchmarked against two advanced NN architectures, a residual NN (ResNet) and a convolutional NN (CNN). Extensive evaluations consider prediction accuracy, inference time, and radiation pattern precision. Results indicate that TBF-CM achieves the lowest prediction errors, especially as the number of incoming signals grows, underscoring its robust generalization in challenging beamforming contexts. Although ResNet accurately identifies null positions, it exhibits marginally higher error rates, while CNN maintains close alignment with the ground truth but incurs greater deviations in side lobes. Inference time analysis reveals that TBF-CM achieves a balanced trade-off between accuracy and efficiency, making it well-suited for real-time applications. While ResNet offers the fastest inference at the expense of accuracy, CNN, despite its high precision, imposes the greatest computational overhead, limiting its suitability for latency-sensitive systems. Finally, radiation pattern comparisons further attest to the superiority of TBF-CM, showing stable main lobe steering and effective side-lobe suppression. Altogether, these findings position TBF-CM as a highly efficient approach for next-generation wireless communication systems.



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August, 2025

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Singular Logic



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