



INTERNATIONAL JOINT CONFERENCE ON NEURAL NETWORKS

IJCNN2025

30 JUNE - 5 JULY 2025 ROME, ITALY



INTERNATIONAL NEURAL NETWORK SOCIETY

SPECIAL SESSION on HYPERDIMENSIONAL COMPUTING AND VECTOR SYMBOLIC ARCHITECTURES FOR NEURAL NETWORKS AND ARTIFICIAL INTELLIGENCE

DESCRIPTION

The primary objective of this session is to delve into the forefront of research at the intersection of Hyperdimensional Computing (HDC), Vector Symbolic Architectures (VSA), neural networks, and artificial intelligence. HDC and VSA, celebrated for their ability to model human perception through high-dimensional spaces, provide a distinctive lens for enhancing the design, implementation, and interpretability of machine learning systems. This session will spotlight novel algorithms, innovative applications, and transformative insights that harness the strengths of HDC and VSA. These paradigms have demonstrated remarkable versatility across diverse fields, including computer vision, wireless communication, natural language processing, time-series forecasting, energy-efficient computation, and bio-inspired AI systems. By fostering a deeper understanding of the interplay between hyperdimensional vectors and neural architectures, this session aims to pave the way for more transparent, efficient, and adaptable AI models.

While HDC and VSA are not new concepts, the recent surge in brain-inspired technologies and a growing emphasis on interpretable AI present a unique and timely opportunity for focused exploration and application. This platform will facilitate the exchange of groundbreaking research, encourage collaboration on pressing challenges, and inspire the next generation of AI innovations.

Building on the success of previous editions, including outstanding turnouts at WCCI, this session is expected to attract a diverse audience, including members of the established HDC/VSA research community and scientists engaged in traditional IJCNN topics. It offers a valuable opportunity for participants to extend their expertise into the realms of interpretability and neural network optimization through the HDC/VSA framework.

LIST OF TOPICS

A range of possible topics to be covered in this special session includes, but is not limited to, the following:

- Incorporation of HD vectors in neural networks (input/output)
- Application of HDC/VSA primitives in neural network design
- Explanatory power of HDC/VSA in understanding neural networks and Explainable AI using HDC/VSA paradigms
- Temporal and sequential data processing with HDC/VSA
- HDC/VSA-based architectures for low-resource environments and energy-efficient implementations
- Synergies between HDC/VSA and Transformer architectures
- Cross-domain applications of HDC/VSA-enhanced neural models
- Benchmarking and evaluation frameworks for HDC/VSA neural systems
- Bio-inspired neural network designs with HDC/VSA and neuromorphic hardware
- Integration of HDC/VSA with reinforcement learning frameworks
- Ethical considerations and fairness in HDC/VSA-enhanced AI models
- Future trends and challenges in HDC/VSA for neural networks
- Hardware acceleration and scalability for HDC/VSA-based neural networks
- Quantum-inspired implementations of HDC/VSA

IMPORTANT DATES

15 January, 2025	Paper Submission Deadline (possibly extended)
31 March, 2025	Paper Acceptance Notification
1 May, 2025	Camera-Ready Submission & Early Registration Deadline
30 June - 5 July, 2025	IJCNN 2025 ROME Conference Dates

SUBMISSION GUIDELINES

Papers submitted to this Special Session are reviewed according to the same rules (i.e. double-blind) as all the submissions for IJCNN 2025. General author guidelines can be found [here](#), please read them carefully before submitting.

Papers must be submitted through Microsoft CMT; once you are in the submission system, select the Special Session (Hyperdimensional Computing and Vector Symbolic Architectures for Neural Networks and Artificial Intelligence) as the main topic of your paper. The accepted papers will be included in the proceedings of the IJCNN 2025 and indexed in IEEEExplore.

ORGANIZER

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