From Metric Learning to Future Representation Learning: Challenges, Advances, and Opportunities

Dr. Gábor Kertész
Óbuda University, Budapest, Hungary
kertesz.gabor@nik.uni-obuda.hu

Abstract: In recent years, deep metric learning and contrastive learning have become essential approaches to represent similarity and difference using neural networks. By comparing pairs or triplets of examples, these methods construct embedding spaces that are the foundation of modern computer vision, natural language processing, and multimodal systems. Yet, while they have enabled breakthroughs in object re-identification and face verification, fundamental challenges remain: efficient negative sampling, robust training stability, and generalization across domains.
In this talk, I will provide a brief overview of the evolution of metric and contrastive learning, from early Siamese and triplet architectures to recent developments in loss functions and sampling strategies. Building on these foundations, I will highlight the current research frontier, beyond pairwise comparisons toward self-supervised representation learning.

Short CV: Gábor Kertész is an associate professor at the John von Neumann Faculty of Informatics of Obuda University (Hungary), where he also serves as vice-dean for research. He received his bachelor's degree in computer science and engineering from Obuda University (2011), his master's degree in computer science from Eötvös Loránd University in 2014, and his PhD in Information Science from Obuda University in 2019 (summa cum laude). In 2025, he completed his habilitation with a focus on deep metric learning. He is also a part-time Research Fellow at the Institute for Computer Science and Control (SZTAKI) of the Hungarian Research Network (HUN-REN), Laboratory of Parallel and Distributed Systems (LPDS). He serves as the vice-president of the John von Neumann Computer Society (2024-), president of the IEEE Computational Intelligence Chapter in Hungary (2023-).
With more than a decade of research and teaching experience, his work focuses on deep learning, metric and contrastive learning, computer vision, and representation learning. His current research emphasizes optimizing sampling strategies for representation learning and exploring future applications of embedding models.