



Federated Learning: Charting the Course from Potential to Real-World Impact



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Abstract

Federated Learning (FL) is emerging as a transformative paradigm in artificial intelligence, designed to reconcile the need for powerful data-driven models with increasing demands for privacy and regulatory compliance. Instead of centralizing sensitive information, FL enables decentralized training across distributed devices and institutions, allowing collaboration without compromising data sovereignty. This seminar will provide a comprehensive overview of FL, from its conceptual foundations to its real-world applications in healthcare, mobility, and smart industries. We will explore how FL is evolving beyond classical approaches, incorporating efficiency improvements, personalization, and synergies with large language models and generative AI. Key technical and ethical challenges—such as security, fairness, and heterogeneity—will also be addressed, along with innovative solutions developed within the MODAL Lab. Finally, we will discuss how FL can move from academic potential to tangible societal impact, paving the way for trustworthy, decentralized AI ecosystems.

About the Speaker

Prof. Francesco Piccialli is an Associate Professor of Computer Science at the Department of Mathematics and Applications "R. Caccioppoli" of the University of Naples Federico II, where he also serves as Head and Scientific Director of the M.O.D.A.L. (Mathematical mOdelling and Data AnaLysis) research group. His research spans Artificial Intelligence, Deep and Machine Learning, and the Internet of Things, with a particular emphasis on modeling advanced neural architectures, federated and privacy-preserving AI, and the development of intelligent, data-driven solutions for healthcare, mobility, and smart environments. He has authored a large body of scientific publications, with an h-index of 50 and over 10.000 citations according to Google Scholar. His research is supported by significant national and European funding: he is Principal Investigator of multiple projects under Horizon Europe, PRIN, Erasmus+, and the Italian PNRR, and has coordinated large-scale initiatives such as TUAi (Marie Skłodowska-Curie Doctoral Network).

Prof. Piccialli has been listed among the Top 2% World Scientists by Stanford University since 2021. He is also Associate Editor and Editorial Board Member of multiple international journals in Artificial Intelligence and Computer Science. He regularly contributes to the AI community as Workshop Chair (AAAI, MobiCom, ICDCS, CCGrid), Program Committee Member of top-tier international conferences, and invited keynote and plenary speaker across Europe and Asia. In addition, he serves as an evaluator for European projects and ERC Starting Grants, and as examiner for international Ph.D. theses. Beyond academia, he is actively engaged in technology transfer, collaborating with industry and institutions to bridge theoretical advances with real-world applications.