Seminarium Wydziałowe

27 stycznia 2025, godz. 10:15 (poniedziałek), w Małej Auli

Referat na temat:

Bringing Knowledge to Design and Analysis in Machine Learning

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Over the recent years, we have been witnessing an unpreceded progress in Machine Learning (ML) that has resulted in highly visible and impactful accomplishments reported in numerous areas of applications.

Data are central and of paramount relevance to the design methodologies and algorithms of ML. While they are behind successes of ML, there are also far-reaching challenges that must be prudently addressed in light of the growing importance of quests for interpretability, transparency, credibility, stability, and explainability and a scope of applications and deployment requirements. Recently, knowledge associated with the problem for which ML models are constructed, has started to play a visible role and impacted the landscape of the ML methodologies by offering an original paradigm referred to as a knowledge-data ML. As a new discipline, knowledge-data ML focuses on a prudent and orchestrated engagement of data and knowledge in the design practices of the ML architectures.

Data and knowledge arise at very different levels of abstraction with knowledge being formalized and represented at symbolic level. We advocate that to develop a cohesive and unified framework of coping with data and knowledge in learning processes, one has to reconcile highly distinct levels of abstraction and with this regard information granules play a pivotal role.

We offer a taxonomy of knowledge by distinguishing between scientific and common-sense knowledge and elaborate on a spectrum of ensuing knowledge representation scheme. In the sequel, the main categories of knowledge-oriented ML design are discussed including physics-informed ML (with the reliance of scientific knowledge), an augmentation of data driven models through knowledge-oriented constraints, a development of granular expansion of the data-driven model and ways of building ML models in the presence of knowledge conveyed by rules. When analyzing the proposed categories, it is also clearly explained how the new ML environment helps avoid a growing effect of data blinding.

Zapraszamy wszystkich zainteresowanych