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## HPC + Neural networks + Linear programs: Towards Hybrid AI

Thursday 10 July 2025 09:00 (30 minutes)

The presentation is dedicated to a promising new scientific research direction called hybrid artificial intelligence. Hybrid AI means developing methods to combine the advantages of machine learning, strong mathematical models, and high-performance computing. This issue is considered in the context of solving large linear programming problems in real time. The following subjects are discussed.

- The specifics of using different types of parallelism: coarse-grained, fine-grained and micro-grained.
- The structure of AI technology.
- Deep neural networks as an universal tool for approximating complex functions: advantages of inference and difficulties with training.
- Linear programming as the most popular mathematical optimization model.
- The splendor and poverty of simplex method.
- Is there an alternative to the simplex method?
- New projection methods in linear programming.
- The poverty and splendor of projection methods.
- Is the combinatorial explosion so terrible?
- How to create an image of an affine subspace and feed it to a neural network.
- Will the projection method armed with a neural network be able to outperform the simplex method on a supercomputer?

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