# CS PhD Seminar Series

November 3rd | 14:30-15:30 | Room 322

## BLOKS: Scaling Kernel Solvers with Sketched Block Preconditioning

Kernel Ridge Regression (KRR) is a theoretically sound algorithm for nonparametric learning, which is also often used to investigate properties of deep learning. However, the exact KRR formulation incurs time and memory costs preventing applicability to large datasets, motivating the development of approximate solvers. These algorithms rely on (i) iterative methods, to avoid the computational burden of direct solutions; (ii) sketching or batching, to reduce the problem size; and (iii) preconditioning, to accelerate convergence. While crucial for fast convergence, preconditioning incurs memory costs that can be managed by lowering the number of free parameters of the model, potentially at the expense of expressivity and hence accuracy. To address this challenge, we propose BLOKS, a Conjugate Gradient-based solver for Nyström-sketched KRR built around a novel preconditioner that combines a block Jacobi approximation with sketching. The BLOKS preconditioner has memory cost independent of both the dataset size and the number of parameters, allowing scaling to large models. We provide a memory-efficient, GPU-accelerated implementation and show that BLOKS achieves excellent accuracy while retaining favorable time/memory complexity. Indeed, on standard large-scale datasets used to benchmark kernel solvers, BLOKS achieves comparable or better performances than state-of-the-art methods.



Speaker: **Giordano Vitale**

Giordano Vitale is a Ph.D. student in Computer Science at the University of Genoa (MaLGa), working on scalable kernel methods for machine learning. He holds a Bachelor's and Master's in Mathematics from the University of Milano-Bicocca, specializing in randomized numerical linear algebra, and is a founding member of the Genoa SIAM Student Chapter and Young SIMAI, as well as a member of GNCS (Gruppo Nazionale per il Calcolo Scientifico).

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## Reasoning with Spreadsheets: Challenges and Strategies

Meaningful AI assistance for spreadsheets requires interpreting data semantics alongside numerical computation. This presentation outlines research aimed at empowering users by automating repetitive tasks while preserving human responsibility for consequential decisions. It explores strategies for spreadsheet time-series analysis, with privacy as a primary requirement. The research examines how AI models can support analytical workflows and reduce mechanical work, allowing users to focus on interpretation, judgement, and decision-making.

Speaker: **Raffaele Rialdi**

Raffaele Rialdi holds a master's degree in Electronic Engineering and is a senior software architect, consultant, speaker, and trainer. A Microsoft MVP since 2003, currently in the Developer category, he is president of DotNetLiguria and co-founder of the Italian C++ User Group. He currently works as an architect and developer on the backend of an enterprise project, focusing on generative AI applications using .NET, Python, and C++.

