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Invited Speaker

Dr. Jaewook J. Suh, Rice University

"Adaptive and Tuning-free First-Order Methods via Lyapunov Analysis"

Tuesday, May 26, 2026 • 2:00PM • SPRK 229 (Formerly Global) • Zoom

Abstract:

Choosing effective step sizes is a central challenge in first-order optimization methods, particularly for large-scale problems. In this talk, we present a Lyapunov-analysis-based framework for designing adaptive, parameter-free, and line-search-free gradient methods, in which update rules for the step sizes are derived from the convergence proof. In particular, we introduce an adaptive Nesterov's accelerated gradient method, which retains the structure and optimal accelerated rates of Nesterov's method while being parameter-free and line-search-free. The method achieves an O(1/k^2) convergence rate in function values together with an O(1/k^3) convergence rate for the best-iterate squared gradient norm. Beyond acceleration, we also show that the same design principle yields other novel adaptive methods, including an adaptive gradient descent method and its extension to Riemannian optimization. Numerical experiments illustrate the practical competitiveness of these methods. Additionally, we briefly discuss an AI-assisted approach that may further enhance the design framework.

Bio:

Jaewook J. Suh is a Postdoctoral Associate in the Department of Computational Applied Mathematics and Operations Research at Rice University, working with Professor Shiqian Ma. He received his Ph.D. in Mathematical Sciences from Seoul National University under the supervision of Professor Ernest K. Ryu. His research focuses on mathematical optimization and its applications to machine learning and data science, with an emphasis on adaptive algorithms and computer-assisted convergence analysis for first-order methods.