On Unconstrained Minimization of Nonconvex Functions in Linear Vector Spaces

Prof. John Hauser
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About the speaker

John Hauser received the BS degree from the United States Air Force Academy and the MS and PhD degrees from the University of California at Berkeley, all in Electrical Engineering and Computer Science. Between his periods of education, he flew Air Force jets throughout the United States and Canada participating in active Air Defense exercises. In 1989, he joined the Department of EE-Systems at the University of Southern California as the Fred OGreen Assistant Professor of Engineering. Since 1992, he has been at the University of Colorado at Boulder in the Department of Electrical, Computer, and Energy Engineering. He has held visiting positions at many places including University of Padova, Caltech, Instituto Superior Tecnico in Lisbon, Lund Institute of Technology, and Ecole Superieure dElectricite. He received the Presidential Young Investigator award from the National Science Foundation in 1991.

John Hausers research interests include nonlinear dynamics and control, optimization and optimal control, aggressive maneuvering for high performance motorcycles and aircraft and other vehicles, and dynamic visualization. Recent work has focused on the development of optimization (and optimal control) tools and techniques for trajectory exploration with an eye toward characterizing the trajectory space (with limitations) of highly maneuverable nonlinear systems. This work finds application in the control of highly configurable UAVs (with propulsion vectoring) and in the analysis of racing motorcycles.

Abstract

In this seminar, we investigate descent methods for (possibly) nonconvex optimization of unconstrained functionals in finite and infinite dimensional spaces and their extension to manifolds for which there is a suitable projection operator. The key ideas are the use of a quadratic model function(al) for the determination of a suitable descent direction and a line search that ensures a sufficient decrease. For strongly convex functions, this approach leads naturally to a globalized Newton method, using the second order approximation as quadratic model. When the function is not convex locally, one may explore the use of various positive definite approximations.

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