Linear and Nonlinear Methods for Data Science Applications

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Abstract

Numerical linear algebra is at the core of virtually every field of science and engineering, whether in solving linear systems that arise from simulations of physical phenomena, or in obtaining various solutions of optimization problems in data related applications. As the world around us is progressively being analyzed or modeled with the help of available data, the types of computational problems encountered are changing, and as a result the field is currently undergoing a deep transformation. The lecture presents a brief overview of the methodologies used in scientific computing and show how they have been adapted to data science disciplines, with an emphasis on what distinguishes these two worlds. For example, we will illustrate how the idea of graph coarsening has been developed independently by data scientists and by numerical analysts. The second part of the presentation will focus specifically on nonlinear acceleration methods and show how these methods which were developed mainly for problems in physics, are being adapted for accelerating machine learning algorithms.