

Multiscale inverse problem, from Schroedinger to Newton to Boltzmann

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Abstract: Inverse problems are ubiquitous. We probe the media with sources and measure the outputs, to infer the media information. At the scale of quantum, classical, statistical and fluid, we face inverse Schroedinger, inverse Newton's second law, inverse Boltzmann problem, and inverse diffusion respectively. The universe, however, expects a universal mathematical description, as Hilbert proposed in 1900. In this talk, we discuss the connection between these problems. We will give arguments for justifying that these are the same problem merely represented at different scales.

I would like to invite the audience to brainstorm the algorithmic consequences. While mathematically being equivalent, these problems have different conditioning. Are there systematic ways to integrate information across scales?