Learning models and constraints with limited data

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Abstract:

System identification has a long history with several well-established methods, in particular for learning linear dynamical systems from input/output data. While the asymptotic properties of these methods are well understood as the number of data points goes to infinity or the noise level tends to zero, how well their estimates in finite data regime evolve is relatively less studied. This talk will mainly focus on our analysis of the robustness of the classical Ho-Kalman algorithm and how it translates to non-asymptotic estimation error bounds as a function of the number of data samples. In the second part of the talk, I will describe a practical problem where a robot needs to learn safe behaviours from a limited number of demonstrations. We recast this problem as an inverse constraint learning problem, similar to inverse optimal control. Our experiments with several robotics problems show (local) optimality can be a very strong prior in learning from demonstrations. I will conclude the talk with some open problems and directions for future research