FUDAN UNIVERSITY

Applied Math Ph.D. Seminar

An efficient method to compute the distance to uncontrollability

Speaker: Siru Gong (Fudan University)

Time: 2022-04-14, 16:10 to 17:00

Location: Tencent Meeting, ID: 474-696-334

Advisor: Yangfeng Su (Fudan University)

Abstract: The distance to uncontrollability is an important measure in classical control theory. For a linear control system (A, B), the distance to uncontrollability is

$$\tau(A, B) = \min_{z \in \mathbb{C}} \sigma_{\min}\big([A - zI, B]\big).$$

Historical methods of this problem take much time and have numerical problems when the system is nearly uncontrollable. We give a new method to compute the distance to uncontrollability. Our method combines Boyd-Balakrishnan method, shift and BFGS method. The key point of our method is to shift the parameter by eigenvalue perturbation theory, which reduces the computation cost and provides reliable result. Numerical experiments show that our method is much faster than the latest method, and in some cases, our computed global minimum is smaller than his computation result, *i.e.*, our algorithm is more reliable.