

数学与系统科学研究院

计算数学所学术报告

报告人: **Prof. Wotao Yin**

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报告题目:

**Scaled Relative Graph: A Rigorous  
Geometric Tool for Operators and  
Convergence Analysis**

邀请人: **戴彧虹 研究员**

报告时间: **2019 年 7 月 5 日 (周五)**

**上午 8:30-9:30**

报告地点: **数学院南楼二层**

**204 会议室**

## **Abstract:**

Many iterative algorithms can be thought of as fixed-point iterations of contractive or nonexpansive operators. Traditionally, such algorithms and operators are analyzed analytically, with inequalities. Since Eckstein and Bertsekas (Figure 1, Math Program 55:293-318, 1992), circles and half-spaces have been used to geometrically illustrate operator theoretic notions although the actual analyses, proofs, and the computation of optimal stepsizes were done analytically with inequalities.

In this talk, we formalize a correspondence between common operators (such as proximal mapping and subdifferentials of convex functions) and geometric objects on the complex plane. We use elementary Euclidean geometry to rapidly prove many useful results regarding the convergence of fixed-point iterations and their optimal stepsizes. The formalism maps various classes of operators to sets on the complex plane and also maps algebraic operations such as scaling, inversion, addition, and composition of operators to geometric operations on sets on the complex plane. Equipped with these tools, we use geometric arguments to review classic results and obtain novel convergence results.

This is joint work with Ernest Ryu and Robert Hannah. (Unpublished manuscript arXiv:1902.09788).

**欢迎大家参加！**