# 数学与系统科学研究院

# 计算数学所学术报告

**报告人：Dr. Zaikun Zhang**

***（ IRIT-ENSEEIHT, Toulouse, France ）***

**报告题目：**

**The Worst Case Complexity of Direct Search and the (Unexpected) Mathematics in It**

**邀请人：** 刘亚锋 博士

**报告时间：2015 年 8 月 18 日（周二）**

**上午 8:50~9:50**

**报告地点：** 科技综合楼三层

**311 报告厅**

# Abstract:

**Direct-search methods are a class of derivative-free algorithms characterized by evaluating the objective function using a step size and a number of (polling) directions, which are typically taken from positive spanning sets consisting of at least $n+1$ vectors in an $n$-dimensional variable space.**

**We introduce the worst case complexity theory of direct search, and discuss how to choose the positive spanning set so as to minimize the complexity bound. The discussion leads us to a long-standing open problem in Discrete Geometry. We present a recent result on this problem, which enables us to establish the optimal order for the worst case complexity of direct search.**

**After obtaining the optimal bound, we show how to achieve even better complexity bound by randomization. We prove that polling along two random directions in each iteration is sufficient to guarantee the convergence of direct search for any dimension, and the resultant algorithm enjoys lower complexity both in theory and in practice. Our analysis relies on martingale theory and large deviation techniques. We will address the distinctions between our analysis and that of other randomized algorithms (e.g. Randomized Block-Coordinate Descent Methods).**

**This talk is based on joint works with M. Dodangeh, S. Gratton, C. W. Royer, and L. N. Vicente.**


# 欢迎大家参加！