

数学与系统科学研究院

计算数学所学术报告

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报告题目:

**When Optimization Meets Geophysics:
Compressive Sensing and Its
Applications in Seismic Acquisition**

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报告时间: 2017 年 4 月 27 日 (周五)

下午 14:00-15:00

报告地点: 科技综合楼三层

311 报告厅

Abstract:

Geophysics plays a key role in oil and gas industry for both exploration and development. Seismic data is one of the major data types which helps characterize the subsurface down to tens of thousands of meters. For many decades, seismic data acquisition has relied on the Nyquist theory to describe the sampling effort required to recover a given frequency. However, since the cost of seismic acquisition and the sampling effort is strongly related and the fact of dealing with limited budgets, achieving the desired Nyquist sampling is almost impossible.

Compressive sensing provides a new paradigm of sampling which requires much fewer measurements compared to Nyquist. We refer to our framework for applying compressive sensing principles to seismic acquisition and processing as Compressive Seismic Imaging, or CSI. Our CSI technology has three key aspects: 1) in design stage, generate non-uniform optimal sampling design for sources and/or receivers; 2) in processing stage, separate blended sources into conventional shot records if simultaneous sourcing is employed; 3) and prior to imaging stage, reconstruct acquired data into denser sampling to increase unaliased data bandwidth. For each aspect, some optimization techniques were employed as the main driver. In cases where CSI technology can be employed, we can achieve an order of magnitude improvement in field acquisition, along with step function improvement in data quality. These achievements would not have been possible without the advancement in optimization.

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