# 数学与系统科学研究院

# 计算数学所定期学术报告

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报告题目：

**Fast algorithms inspired deep neural networks**

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报告时间：**2018** 年 **12** 月 **20** 日（周四）

下午 **16:00-17:00**

报告地点：　思源楼一层

报告厅

# Abstract:

**Butterfly factorization is a data-sparse approximation for the matrices that satisfy a complementary low-rank property. For an N × N matrix, the resulting factorization is a product of O(log N) sparse matrices, each with O(N) nonzero entries. Hence, it can be applied rapidly in O(N log N) operations. Under mild assumptions, the structure of Butterfly factorization coincides with a low-complexity convolutional neural network (CNN), which is named as Butterfly-Net. Theoretical analysis of the approximation power of Butterfly-Net to the Fourier representation of input data shows that the error decays exponentially as the depth increases. Due to the ability of Butterfly-Net to approximate Fourier and local Fourier transforms, the result can be used as an approximation upper bound for CNNs in a large class of problems. Numerical results demonstrate the efficiency of Butterfly factorization and validate analysis results of Butterfly-Net.**


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