APPLIED MATHEMATICS COLLOQUIUM

Faster Algorithms for Sparse Fourier Transform

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Abstract:
The Fast Fourier Transform (FFT) is one of the most fundamental numerical algorithms. It computes the Discrete Fourier Transform (DFT) of an n-dimensional signal in O(n log n) time. The algorithm plays an important role in many areas.

In many applications (e.g., audio, image or video compression), most of the Fourier coefficients of a signal are "small" or equal to zero, i.e., the output of the transform is (approximately) sparse. In this case, there are algorithms that enable computing the non-zero coefficients faster than the FFT. However, in practice, the exponents in the runtime of these algorithms and their complex structure have limited their applicability to only very sparse signals.

In this talk, I will describe a new set of algorithms for sparse Fourier Transform. Their key feature is simplicity, which leads to efficient running time with low overhead, both in theory and in practice. In particular, we can achieve a runtime of O(k log n), where k is the number of non-zero Fourier coefficients of the signal. This improves over the runtime of the FFT for any k = o(n).

Joint work with Haitham Hassanieh, Dina Katabi and Eric Price.

Monday December 12, 2011
4:30 PM
Building 2, Room 105
Refreshments are available in Building 2, Room 290
(Math Common Room) between 3:30 – 4:30 PM

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