1057-15-168   **Jianlin Xia*** (`xiaj@math.purdue.edu`), Department of Mathematics, Purdue University, West Lafayette, IN 47907, and **Ming Gu**. *A new superfast and stable Toeplitz solver.*

In this talk, we will discuss a new stable and superfast solver for Toeplitz linear systems. With the displacement structure, our method solves the Cauchy-like system converted from the Toeplitz system in nearly O(N) flops with a small constant. Strong rank revealing LU factorizations are used in a hierarchical scheme to work on the Cauchy-like matrix. Two layers of structured representations are used: an outer layer HSS structure, and an inner Cauchy-like structure for each dense HSS generator. The method is significantly faster than some existing superfast Toeplitz solvers such as a previous structured solver by the authors in [SIMAX, 2007]. This is joint work with Ming Gu. (Received January 20, 2010)