

**Exact Sciences Seminar**  
**Monday 24.12.2018 on 16:00-17:00, Ficus 303**

**Dr. Yuval Harness**  
**Tel-Aviv University**

**Hierarchical matrix preconditioning for large scale  
boundary value problems.**

**Abstract**

Hierarchical matrix (H-matrix) methods have become prominent means for solving large scale boundary value problems (BVPs). These methods are, in fact, an algebraic realization of fast multipole methods (FMM) which are intimately connected to elliptic PDEs. The significant advantage of the algebraic approach is the availability of matrix arithmetic operations like multiplication and factorization that work in almost linear complexity. These algorithms allow us to construct robust and efficient preconditioners for a wide class of BVPs.

In the first part of the talk the fundamentals of H-matrix theory and its applicability for preconditioning large scale BVPs will be reviewed. A novel and efficient H-matrix preconditioning design for symmetric saddle-point problems arising from incompressible fluid flow problems along numerical demonstrations will be introduced in the second part. The final part of the talk will focus on prospects to further extend the theory and applicability of H-matrix methods for large scale BVPs.

**Coordinators: Dr. G. Ben-Simon, Prof. I. Goldman, Prof. Y. Stancescu,  
Prof. D. Fishelov and Dr. Neta Rabin**

**Afeka Tel Aviv Academic College of Engineering, 38 Mivza Kadash St.,  
Tel Aviv**