

Siete invitati al seminario di ricerca presso il Dipartimento di Matematica e Informatica, dal titolo:

### **Stability and componentwise accuracy in multilinear PageRank**

 **Aula A3**

 **25 marzo 2026**

 **Ore 12:30 – 13:30**

Speaker:

**Mehdi Najafi Kalyani**

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Abstract:

In this talk, we study the stability with respect to perturbations and the accuracy of numerical algorithms for computing solutions to the multilinear PageRank problem  $\mathbf{x} = (\mathbf{1} - \alpha)\mathbf{v} + \alpha\mathbf{P}\mathbf{x}^{(\mathbf{m}-1)}$ .

Our results reveal that the solution can be less sensitive to perturbations and numerical errors than what is stated by the classical bounds for nonlinear systems of equations (based on the norm of the Jacobian). In detail, one can obtain bounds for the minimal solution which ignore the singularity of the problem for  $\alpha = 1/(\mathbf{m} - 1)$ , and one can show that the limiting accuracy of the Newton method depends not on the norm of the Jacobian but on a quantity that can be much smaller, thanks to the nonnegativity structure of the equation. For the minimal solution, we also suggest subtraction-free modifications to the existing algorithms to achieve componentwise stability. Some of the theoretical results we obtain are interesting even outside the scope of this problem: bounds for more general multilinear vector equations, and a partial inverse for **M-matrices** which remains bounded when the M-matrix approaches singularity.

Cordiali saluti

Bruno Iannazzo