

Proposal for a Dagstuhl seminar on

Sparsity

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Abstract

The theory of *sparsity* studies abstract notions of uniform sparsity for classes of graphs, as well as more general logical structures. The main goal is to understand why, and to what extent, sparsity of a given structure can be used to describe its properties, and to develop tools helpful for designing sparsity-based methods. Since the work of Nešetřil and Ossona de Mendez, who laid solid foundations of the theory in the late 2000s, a huge body of work has shown that the two main notions — *bounded expansion* and *nowhere denseness* — have deep connections with classic concepts from combinatorics, model theory, and algorithm design, and can be used to obtain new, powerful results in these areas. It is the synergy of these three fields that makes sparsity a mathematically rich and exciting theory, which is currently under rapid development. The notions of bounded expansion and nowhere denseness also constitute borders of computational tractability for natural classes of problems, most notably for the model-checking problem for first-order logic; this witnesses the fundamental nature of the studied concepts.

The aim of the proposed seminar is to bring together researchers working on various aspects of sparsity, in order to facilitate the exchange of ideas, methods, and questions between different communities. An important part of the seminar will be the discussion of the (still fledgling) area of real-life applications of sparsity-based methods, where theory and practice could meet.

A Metadata

1. Organizers:

- Daniel Král', Masaryk University in Brno, Czech Republic, kral@ucw.cz;
- Michał Pilipczuk, University of Warsaw, Poland, michal.pilipczuk@mimuw.edu.pl;
- Sebastian Siebertz, Humboldt University in Berlin, Germany, siebertz@mimuw.edu.pl;
- Blair D. Sullivan, North Carolina State University, Raleigh, USA, blair_sullivan@ncsu.edu.

2. Title: Sparsity

3. Type: Dagstuhl Seminar

4. Size and duration: Large (45 participants) and Long (5 days)

5. Classification: TODO

6. Keywords: TODO

B Proposal text

Blah blah blah [1]

Introduction.

Combinatorics.

Model theory.

Algorithms.

Applications.

Expected results.

Structure of the seminar.

Other seminars, workshops, and projects.

C Invitee list

TODO

D Organizers' CVs

E Proposed dates

TODO

References

- [1] J. Nešetřil and P. Ossona de Mendez. *Sparsity — Graphs, Structures, and Algorithms*, volume 28 of *Algorithms and combinatorics*. Springer, 2012.