9-2015

Problems in the theory of extremal graphs and hypergraphs

Cory T. Palmer
University of Montana - Missoula, cory.palmer@umontana.edu

University Grant Program 2014-2015, report

Name: Cory Palmer
Department: Mathematical Sciences
Grant number: 325341
Title: Problems in the theory of extremal graphs and hypergraphs.

Objective

Investigate the tree packing conjecture from graph theory and extremal numbers for hypergraphs.

Summary of results

With funding from the UGP grant I was able to host my colleague Dr. Daniel Gerber of the Alfred Renyi Institute of Mathematics for a 9-day visit during September 2014. During this time we made significant progress toward the second topic in the funded proposal; extremal numbers for hypergraphs. In particular, Dr. Gerbner and I were able to prove a hypergraph analogue of the Kovari-Sos-Turan theorem; one of the stated goals of the proposal. This investigation resulted in a new manuscript "Extremal problems for Berge-hypergraphs" that we submitted in May 2015 to one of the top journals in discrete mathematics.

The funding provided by this grant also allowed for me to attend the AMS Special Session in Extremal and Structural Graph Theory in April 2015 in Las Vegas where I presented these new results.

As anticipated, these investigations opened several promising new avenues of research. To continue our investigation of extremal numbers for hypergraphs, I traveled to Dr. Gerbner's home institution in Budapest, Hungary (partially funded by the UGP grant) during the summer of 2015. Here we continued to work on problems related to the new manuscript.

During this visit to Budapest I was able to take side-trips to attend the 5th Emlektabla workshop on Discrete Geometry in Balatonalmadi, Hungary and the Novi Sad Workshop on Foundations of Computer Science in Novi Sad, Serbia. During this second workshop I gave a talk on results stemming from the research initiated during Dr. Gerbner's visit to Missoula in September. Also during this workshop I attended a talk by Dr. Jozsef Balogh who spoke on a new technique in extremal combinatorics that was highly relevant to the topic of this project. A future direction of study will be to apply the techniques from Dr. Balogh's talk to the class of hypergraphs introduced in our manuscript.

The funding from the UGP grant was instrumental in my research during the 2014-2015 academic year and has opened a new direction in my research. As a result, in October of 2015 I plan to submit a grant proposal to the NSA Mathematical Sciences Program to continue the research that was initiated during the UGP funded period.