

# Discrete Mathematics Seminar

Illinois State University

2:00–2:50 pm, September 19@ STV 121

Speaker: Michael Plantholt, Illinois State University

## *f*-derangements and a graph decomposition problem

Recall that a derangement on  $n$  items is a permutation in which no item stays in its original position. It is well known that as  $n$  gets large, the fraction of permutations that are derangements approaches  $1/e$ . Now let  $f : \{1, 2, \dots, n\} \rightarrow \{1, 2, \dots, n\}$ . We call a permutation  $s$  on  $n$  items an  $f$ -derangement if for each  $i$ , we have  $s(i) \neq f(i)$ . Note that when  $f$  is the identity function, an  $f$ -derangement is merely a derangement. We discuss the problem of decomposing 5-regular bipartite graphs into paths of length 5, and show how a probabilistic algorithm will be successful when a certain perfect matching corresponds to an  $f$ -derangement for a particular  $f$ -function. We then show that the long-term probability that the permutation under consideration is an  $f$ -derangement approaches  $1/e$  as  $n$  gets large. This talk is based on work done with ISU students Ben Mussell and Hamid Habibi.

