# Colloquium

## Department of Computer Science

## Dr. Darren Strash

Darren graduated in 2011 with a PhD in Computer Science from University of California, Irvine, with Mike Goodrich and David Eppstein as advisors. After graduating, he spent three years in Intel's Computational Lithography Group, a research and development team dedicated to maintaining Moore's Law among significant computational challenges. Since 2014, he has been working as a postdoctoral researcher with Peter Sanders at Karlsruhe Institute of Technology in Karlsruhe, Germany, solving combinatorial problems on huge complex networks. Though he has many interests in algorithms and data structures, his passion is to reveal and resolve the mismatch between the theory and practice of algorithms, with applications in large-scale network analysis and computational geometry.

## November 13, 2015
## 2:00 p.m.
## Guyon Auditorium, Morris Library

### Computing Large Independent Sets in
### Huge Complex Networks

### Abstract

The maximum independent set problem is a classic NP-hard problem with many applications in biology, sociology, and transportation (to name a few). Unfortunately, it is especially difficult to compute an exact maximum independent set in the complex networks that arise in these applications, as the best-known exact algorithms can still take exponential time. Recent results show that medium to large complex networks can be solved exactly using the branch-and-reduce paradigm, which recursively kernelizes the graph and performs branching. However, larger graphs still remain intractable. In this talk, I present several key insights into this problem, and introduce a new heuristic algorithm that combines kernelization with an advanced evolutionary algorithm to quickly find high-quality independent sets in huge complex networks. Though the algorithm is inexact, experiments show that it is capable of finding a true maximum independent set much faster than the exact branch-and-reduce algorithm when the graph is particularly difficult to solve. Not only does this technique speed up the computation of large independent sets drastically, but it also enables us to compute high-quality independent sets on much larger instances than previously reported in the literature. This is joint work with Sebastian Lamm, Peter Sanders, Christian Schulz and Renato F. Werneck, and contains results to be presented at ALENEX 2016.