1135-68-1850 **A. Roxana Pamfil*** (roxana.feier@maths.ox.ac.uk), **Sam D. Howison** and **Mason A. Porter**. *Optimal modularity maximization in multilayer networks.*

Identifying clusters or "communities" of densely connected nodes in networks is an active area of research, with relevance to many applications. Recent advances in the field have focused especially on temporal, multiplex, and other kinds of multilayer networks.

One method for detecting communities in multilayer networks is to maximize a generalized version of an objective function known as "modularity". Writing down multilayer modularity requires the specification of two types of resolution parameters, and choosing appropriate values is crucial for uncovering meaningful community structure. In the simplest case, there are just two parameters: γ and ω. γ controls the sizes of detected communities, and ω influences how much communities change from layer to layer. By establishing an equivalence between modularity optimization and a multilayer maximum-likelihood approach to community detection, we are able to determine statistically optimal values for these two parameters.

We test our method on several existing multilayer benchmarks, and we find that our optimized approach performs significantly better than using parameter choices guided by heuristics. We also apply the method to supermarket data, revealing changes in consumer behaviour over time. (Received September 25, 2017)