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Johan Ugander* (jugander@stanford.edu). *A random walk around the block: personalized PageRank and stochastic block models.*

Diffusion-based methods for graph ranking are popular and powerful, with two leading examples being personalized PageRank and heat kernel ranking. These two specific methods can be viewed as different linear discriminant functions in the space of landing probabilities of a uniform random walk – two different ways to linearly weight landing probabilities of different walk lengths. In this talk we investigate optimal discriminant functions in the space of such landing probabilities for the popular model of separable graph structure known as the Stochastic Block Model. Surprisingly, the optimal weights for separating two classes of a Stochastic Block Model have the form of personalized PageRank, for a specific value of the personalized PageRank parameter α that depends on the parameters of the Stochastic Block Model. This connection provides a novel formal motivation for the success of personalized PageRank in graph ranking. We use this connection to also propose more advanced linear and quadratic discriminant functions that account for higher moments of landing probabilities; we show that this strengthening yields much better results for stochastic block models. This is joint work with Isabel Kloumann and Jon Kleinberg. (Received July 31, 2017)