Improved Approximations for Orienteering and Related Problems

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In the point-to-point orienteering problem, we are given a (directed or undirected) graph $G(V, E)$, two nodes $s, t \in V(G)$, and a budget B. The goal is to find an s-t walk of total length at most B that maximizes the number of distinct vertices visited by the walk. This problem is closely related to tour problems, such as TSP, as well as network design problems, such as k-MST. We give improved approximations for both the directed and undirected versions of this problem. Our main results are the following: (1) A $(2 + \epsilon)$ approximation in undirected graphs, improving upon the current 3-approximation; (2) An $O(\log^2 OPT)$ approximation in directed graphs. Previously, only a quasi-polynomial time algorithm achieved a poly-logarithmic approximation (a ratio of $O(\log OPT)$). These results are based on, or lead to, improved approximations for several other related problems. This is joint work with Chandra Chekuri and Martin Pal.