Power Law Complexity

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The aim of this work is to give a plausible theoretical explanation why many algorithms run faster on real-world data then predicted by algorithmic worst-cases. In particular, we are able to show that on power law networks many graph problems have much lower algorithmic complexity then implied by classical/book solutions. The problem that we are able to solve faster on such networks include classical P-time problems like: transitive closure, maximum matching, eigenvalue problem, page-rank, shortest paths, counting triangles, etc. Additionally, we observe that some NP-hard problem allow faster exponential time algorithms, e.g., maximum clique. Finally, we prove that there exist structure oblivious algorithms that run faster on power law networks without explicit knowledge of this fact.

This is joint work with Marek Cygan, Paweł Brach and Jakub Łącki