Description for the general public

The goal of this project is to deliver new algorithmic methods for various problems related to online optimization. The considered problems span vast areas of computer networks, telecommunications, distribution networks and supply-chain management.

Online optimization deals with a variety of questions whose common denominator is *lack of knowledge about the future*. For example, given a group of technicians, how to distribute them efficiently in a city to minimize the distance travelled to their clients? Should some specific facility be leased or bought if one cannot be sure about its future utilization? Given unpredictable demand for a given commodity, how to organize its supply chain, so that this good is delivered on time to the clients with the lowest cost possible? An algorithm solving any of these problems has to work in an *online manner*, i.e., it has to make irrevocable decisions solely on the basis of current and past requests.

Rather than focusing on specific applications, we address fundamental building blocks, crucial in many optimization procedures. Within this project, we will construct and rigorously analyze online algorithms for these blocks. In particular, we aim to deliver worst-case bounds on the performance of the algorithm, under arbitrary demands, without any probabilistic assumptions on the input. The particular research directions we pursue are split into three categories: (i) developing online algorithms for efficient dynamic placement of resources in a graph, (ii) developing online algorithms for leasing of resources, (iii) investigating gains of reordering and aggregating demands.