On-The-Fly Compute Centers - i.e., our vision of future data centers - face a multitude of new challenges. One of these challenges is energy efficiency, as energy has become a major limiting cost factor in today's compute centers. My talk focuses on fundamental theoretical research in the design of energy-efficient scheduling algorithms. That is, given a suitable abstraction of real-world computers, find provably good algorithms to operate such computers in an energy-efficient way. While the resulting algorithms may not always be directly applicable to real-world systems, the general hope is that one learns something about the underlying real-world problem.

As a demonstration of our techniques and ongoing research, I will present a theoretical scheduling model as well as a corresponding scheduling algorithm based on convex programming. Our analysis represents an interesting new way to take a look at online problems (where we do not know the future) with the help of well-known tools from linear/convex/mathematical programming. Moreover, I will give a short outlook on our future work, and how the concept of "configured software services" may introduce an interesting new aspect on a quite fundamental theoretical level.