We study online scheduling policies for buffer management models, in which packets are arriving over time to a buffer of a network switch to be sent through its single output port. However, the bandwidth of the port is limited and some packets need to be dropped, based on their weights. The goal of the scheduler is to maximize the weighted throughput, that is, the total weight of packets transmitted. Due to the natural lack of information about future, an optimal performance cannot be achieved, we thus pursue competitive analysis and its refinements to analyze online algorithms on worst-case inputs.

Specifically, in the first part of the thesis, we focus on a simple online scheduling model with unit-size packets and deadlines, called Bounded-Delay Packet Scheduling. We design an optimal ϕ-competitive deterministic algorithm for the problem, where $\phi \approx 1.618$ is the golden ratio. It is based on a detailed understanding of an optimal schedule of pending packets, called the plan, which may be of independent interest. We also propose a semi-online setting with lookahead that allows the algorithm to see a little bit of future, namely, packets arriving in the next few steps. We provide an algorithm with lookahead for instances in which each packet can be scheduled in at most two consecutive slots and prove lower bounds for both deterministic and randomized algorithms with lookahead.

In the second part, we consider a model with packets of various sizes and no deadlines, called Packet Scheduling under Adversarial Jamming. The hardness of scheduling decisions comes from unreliability of the channel through which packets are transmitted. This is modeled by an adversary that at any time may interrupt the current transmission by a jamming error. The corrupted packet is lost completely but may be retransmitted immediately or at any time later. The packets are weighted according to their size, thus the goal is to maximize the total size of successfully transmitted packets. We focus on online algorithms with the resource augmentation of speedup which allows the algorithm to run packets faster than the offline solution it is compared against. In particular, we propose an algorithm for which speedup of 4 suffices to be 1-competitive, i.e., to achieve an essentially optimal throughput. We complement it by a lower bound of $\phi + 1 \approx 2.618$ on the speedup of 1-competitive deterministic algorithms.