

## Abstract

### CS41 Final Project: Online Algorithms Tahmid Rahman, Dylan Jeffers

We plan to research online algorithms through a case analysis of splay trees, an interesting self adjusting online search tree that is runtime competitive with offline search trees counterparts. We first plan to study the core online algorithm concepts such as the Competitive Ratio, the Least Recently Used Property and the Marking Strategy. Afterwards, we will apply these concepts in solving a currently unsolved splay tree problem, known as the Dynamic Optimality Conjecture, which claims that splay trees can perform as well as offline search tree algorithms, up to a constant factor. There are modern research papers on this topic that we plan to use as reference.

As solving the above conjecture may prove difficult, we are also interested in implementing our own splay tree, with the objective of testing previous theoretical work on splay tree runtimes. Through a careful study of how splay trees evolve over different input sets (i.e. a random set vs. partially ordered set) we hope to not only determine for which inputs splay trees prove the most preferable tree structure, but also ways to alter its implementation to competitively handle more general inputs.

We are both excited to learn more about this interesting topic, and believe it will positively impact our algorithmic studies.