Title of Project: Go – Life or Death
Type of Project: Game Tree Search
Number of Team Members: 2

Project Description: For our project, we will be using Game Tree search to solve Life-and-Death problems in the game of Go, also known as Tsumego. These problems correspond to situations in a game where a group of pieces are completely surrounded by the wall or their opponent and these pieces must find a way to survive inside the trapped area. During the solving process, certain steps may require sacrificing a few pieces in order to reach the survival state. Therefore, success is defined as a state in which at least some pieces from the initial state are guaranteed to survive. In addition, since we are only concerned with the "life and death" of the pieces, so we will not implement any strategies to maximize the enclosed area. Therefore, all success states will be treated equally. To solve this type of problems, we will use Game Tree Search as the game of Go naturally fits all the requirements of a game tree (zero-sum, finite states, deterministic, perfect information, two-player, discrete values). We will also implement minimax algorithm to determine the optimal moves for the problems and use various heuristics to maximally exploit alpha-beta pruning.

Evaluation Plan: We will be using pre-existing Life and Death Problems for our project collected from several Tsumego apps. These apps interact with the user until the solution is reached. We will try to solve these problem using the moves given by our program. A problem is solved successfully if our program can reach the solution on its first attempt. Our initial goal will be to solve all the problems from 20 to 30 kyus (easiest levels) and at least 80% of the problems from 15-20 kyus. We will evaluate our heuristics based on the time the program takes to solve the problems and the number of nodes pruned.

Roles for Team Members: One teammate will be responsible for encoding the heuristic functions used for pruning. The other will encode the state space for the Go problems and a tool to evaluate the successor states (including possible moves, and other utilities needed for the game tree function). Both members will contribute to the report write-up, split between the game description and methods, and result and discussion report.