**Stackelberg Security Game Tournament**

This assignment challenges you to create intelligent and robust agents in a security game context.

What is a [Stackelberg Game](https://en.wikipedia.org/wiki/Stackelberg_competition)?

This is a special type of game named for German economist [Heinrich Freiherr von Stackelberg](https://en.wikipedia.org/wiki/Heinrich_Freiherr_von_Stackelberg) and involves two player games with one leader agent and one follower agent. Consider the [Divide and Choose](https://en.wikipedia.org/wiki/Divide_and_choose) game where the cutter (leader) decides on how to split a cake in two and the chooser (follower) decides on which piece is his. The cutter makes a choice knowing that the chooser will capitalize on any advantage and therefore tries to equalizes the pieces.

This concept can be applied to a game of [security](http://dl.acm.org/citation.cfm?id=1558108). There are two agents a defender (leader) and an attacker (follower). The defender’s action is to protect various targets by allocating resources to protect them however there are always more targets than there are resources. The follower can see these targets and knows how they have been covered then decides on which target to attack.

Consider the following game:

|  |  |  |  |
| --- | --- | --- | --- |
| Defender |  | Attacker | |
|  | 1 | 2 |
| 1 | 1 , 2 | 0 , 5 |
| 2 | 1 , 3 | 3, 1 |

Assume the Defender has 1 resource to allocate and for simplicity let us say he’ll decide to apply the resource fully to one target instead of dividing it among the two targets. If the agent decides to protect Target 1 then a rational Attacker will respond by attacking Target 2 where the outcome is (1,5). Should the defender decide to defend target 2 then the

**Analysis:**

The Game Master will keep track of all game actions. It will first execute all defender code on each generated game and save the coverages. Then it will execute each attacker on each game with the known coverages. Afterwards it will perform an analysis of the results and measure the performance of all agents.