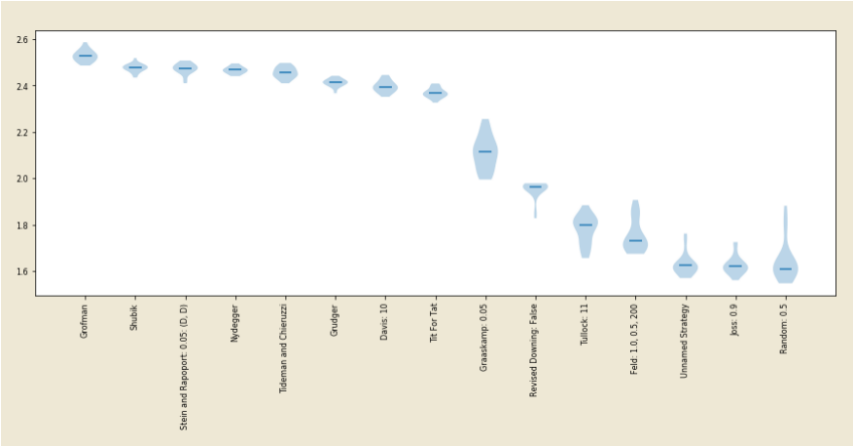
Lab 5.

1. **First Task.** Recreate a modified Axelrod tournament due to your variant. You need to implement the strategies needed and then create a tournament with a variable number of players. Launch for 10000 ticks and fix payoffs of each type, then build a boxplot with payoff distribution for each type.
Example of resulting plot:



But you need to do this for different numbers of players participating (like 1 per each strategy type, 10 per strategy type, … 100 per strategy type). Use the model of tournament from Netlogo PD iterative.
Variant number:
0. Use strategies: Deflect, Cooperate, Random, TitForTat, Grofman, Shubik
1. Use strategies: Deflect, Cooperate, Random, TitForTat, SteinRappoport, Tullok
2. Use strategies: Deflect, Cooperate, Random, TitForTat, Joss, Anonymos
3. Use strategies: Deflect, Cooperate, Random, TitForTat, Appold, Black

2. Based on your experience and any readings you can find, propose your own (rule-based, implemented in Netlogo) strategy. You can have information about other players' history (which will be implemented as a global hash table, which I will send to you later). We put all these strategies in 100 tournaments, 10000 ticks each, and determine the winner.

List of strategies with definitions:
Grofman. "If the players did different things on the previous move, this rule > cooperates with probability 2/7. Otherwise this rule always cooperates."
Shubik. The description written in [Axelrod1980] is:
> "This rule cooperates until the other defects, and then defects once. If > the other defects again after the rule's cooperation is resumed, the rule > defects twice. In general, the length of retaliation is increased by one for > each departure from mutual cooperation. This rule is described with its > strategic implications in Shubik (1970). Further treatment of its is given > in Taylor (1976).
There is some room for interpretation as to how the strategy reacts to a defection on the turn where it starts to cooperate once more. In Shubik (1970) the strategy is described as:
> "I will play my move 1 to begin with and will continue to do so, so long > as my information shows that the other player has chosen his move 1. If my > information tells me he has used move 2, then I will use move 2 for the > immediate k subsequent periods, after which I will resume using move 1. If > he uses his move 2 again after I have resumed using move 1, then I will > switch to move 2 for the k + 1 immediately subsequent periods … and so > on, increasing my retaliation by an extra period for each departure from the > (1, 1) steady state."
This is interpreted as:

The player cooperates, if when it is cooperating, the opponent defects it defects for k rounds. After k rounds it starts cooperating again and increments the value of k if the opponent defects again.

SteinAndRapoport. The description written in [Axelrod1980] is:

> “This rule plays tit for tat except that it cooperates on the first four > moves, it defects on the last two moves, and every fifteen moves it checks > to see if the opponent seems to be playing randomly. This check uses a > chi-squared test of the other’s transition probabilities and also checks for > alternating moves of CD and DC.

This is implemented as follows:

It cooperates for the first 4 moves.

It defects on the last 2 moves.

Every 15 moves it makes use of a chi-squared test to check if the opponent is playing randomly. If so it defects.

Tullock.

The description written in [Axelrod1980] is:

> “This rule cooperates on the first eleven moves. It then cooperates 10% > less than the other player has cooperated on the preceding ten moves. This > rule is based on an idea developed in Overcast and Tullock (1971). Professor > Tullock was invited to specify how the idea could be implemented, and he did > so out of scientific interest rather than an expectation that it would be a > likely winner.”

This is interpreted as:

Cooperates for the first 11 rounds then randomly cooperates 10% less often than the opponent has in the previous 10 rounds.

Joss. The description written in [Axelrod1980] is:

> “This rule cooperates 90% of the time after a cooperation by the other. It > always defects after a defection by the other.”

Anonymous.

The description written in [Axelrod1980] is:

> “This rule has a probability of cooperating, P, which is initially 30% and > is updated every 10 moves. P is adjusted if the other player seems random, > very cooperative, or very uncooperative. P is also adjusted after move 130 > if the rule has a lower score than the other player. Unfortunately, the > complex process of adjustment frequently left the probability of cooperation > in the 30% to 70% range, and therefore the rule appeared random to many > other players.”

Given the lack of detail this strategy is implemented based on the final sentence of the description which is to have a cooperation probability that is uniformly random in the 30 to 70% range.

AppoId

Cooperates for first four turns.

After four turns, will cooperate immediately following the first time the opponent cooperates (starting with the opponent’s fourth move). Otherwise will cooperate with probability equal to:

If this strategy defected two turns ago, the portion of the time (historically) that the opponent followed a defection with a cooperation.

If this strategy cooperated two turns ago, the portion of the time (historically) that the opponent followed a cooperation with a cooperation. The opponent’s first move is counted as a response to a cooperation.

Black

The strategy Cooperates for the first five turns. Then it calculates the number of opponent defects in the last five moves and Cooperates with probability prob_coop`[`number_defects], where:

prob_coop[number_defects] = 1 - (number_defects^ 2 - 1) / 25