Collective Intelligence, 2024. fall semester
Endterm Test, 2024-12-18, Group A

What is the rational strategy in the Iterated Prisoner's Dilemma game, when the number of iterations is K? (1p)

Explain your answer.

Analyze the two-person, symmetric game below (1p)

Is there a dominant strategy for the players? If yes, which one and why? If not, why?

Is A an evolutionary stable strategy? Explain your answer!

	A	B
A	5, 5	1, 5
B	5, 1	0, 0

Foraging by Ants (1p)

In the model of foraging ants, consider the matrix below. The agent is in the middle cell (marked by X), heading North-East. The numbers in the cells represent the pheromone levels perceived by the ant at the given location. Write in in each cell the probability that the agent's next step will take it to the given cell.

12	10	15
20	X 33	25
5	11	42

What is an attractor? (1p)

Be as precise as you can. Give examples of at least 2 different types of attractors!

Replicator Dynamics (1p)

Let's consider the game with the payoff matrix below:

	A	B	C
A	3	1	4
B	4	3	1
C	1	4	3

If in a population of players, the ratio of players playing A is denoted by x_A, the ratio of players playing B is by x_B and the ratio of players playing C is by x_C, then using *replicator dynamics* what are the following dynamic rules?

$$\frac{dx_A}{dt} =$$

$$\frac{dx_B}{dt} =$$

$$\frac{dx_C}{dt} =$$

Collective Intelligence, 2024. fall semester
Endterm Test, 2024-12-18, Group B

What was the winning strategy in Axelrod's Tournament of Iterated Prisoner's Dilemma games? (1p)

How did it work? Explain its basic behavior.

Analyze the two-person, symmetric game below (1p)

Is there a dominant strategy for the players? If yes, which one and why? If not, why?

Is A an evolutionary stable strategy? Explain your answer!

	A	B
A	6, 6	2, 3
B	3, 2	1, 1

Foraging by Ants (1p)

In the model of foraging ants, consider the matrix below. The agent is in the middle cell (marked by X), heading South-East. The numbers in the cells represent the pheromone levels perceived by the ant at the given location. Write in in each cell the probability that the agent's next step will take it to the given cell.

12	10	15
20	X 33	25
5	10	65

What is stigmergy? (1p)

Explain the basics of the concept. Give examples!

Replicator Dynamics (1p)

Let's consider the game with the payoff matrix below:

	A	B	C
A	4	2	5
B	5	4	2
C	2	5	4

If in a population of players, the ratio of players playing A is denoted by x_A, the ratio of players playing B is by x_B and the ratio of players playing C is by x_C, then using *replicator dynamics* what are the following dynamic rules?

$$\frac{dx_A}{dt} =$$

$$\frac{dx_B}{dt} =$$

$$\frac{dx_C}{dt} =$$