Exercise 5: Eye movements

**Objective:** The goal of this assignment is to learn to model a reinforcement learning agent and its way of collecting visual information to improve its state representation. The agent that you are modeling is the same as in the exercises 3 and 4. You should solve this assignment individually.

**Components:** There is only a written component. This is an “open book” exercise, thus you can consult any book, website, etc, during this time. Please do not forget to introduce your references in the section “Bibliography” at the end of the exercise.

**Submission:** Please solve the assignment directly here and convert it to pdf. Change the name of the file to MI210\_Exercise5\_Surname\_Name.pdf, where Surname and Name is your surname and name. Send me the pdf per email to daniela.pamplona@ensta.fr. The subject of the email must be MI210\_Exercise5. Please do not forget to write your name in the header of your report. You should submit until 13H of May 4, 2021

**Recommendation:**

The book “Reinforcement Learning: An Introduction” from Richard S. Sutton and Andrew G. Barto and the class slides are good points to start when you need help. The slides are available in the Moodle of the class, the book is available here:

https://web.stanford.edu/class/psych209/Readings/SuttonBartoIPRLBook2ndEd.pdf

Good luck!

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**Group number: E Engineering system:**

**Q1)** Can humans move their eyes independently? If yes, give examples. If no, why not?

It’s impossible for humans to move their independently. There is a complex structure at the base of the brain dedicated to making sure that the two eyes move together to focus on the object of interest. If they are not looking at the same thing, the person will be confused.

**Q2)** For the engineering system that you are working on, describe a visually guided task that can be modeled as a reinforcement learning problem and write in detail what would be the set of states, the set of actions, rewards and policy (Please choose something different from obstacle avoidance/ litter collection and the ε-greedy policy). Justify your proposal and point its possible benefits and drawbacks.

Task:

Set of states:

Set of actions:

Rewards:

Policy:

**Q3.1)** Would you penalize late rewards? What would be the value of \gamma? Why?

**Q4)** Design a new policy to control the agent’s camera. Please choose something different from minimizing the cost of uncertainty, as defined in the class Explain what would be the advantages and disadvantages of such policy. Justify your proposal and point its possible benefits and drawbacks.