University of Rome "La Sapienza"

Master in Artificial Intelligence and Robotics

Artificial Intelligence - Section 2.B Probabilistic Reasoning and Learning

1B. Information about final projects

Luca Iocchi

Organization of the exam

Individual and **original** project

- Output to deliver
  - **report** including a description of the learning task, the developed solution, the data used for training and testing, a (possibly comparative) evaluation of performance, and a discussion of the results;
  - **code** including the developed code

Partial overlap with other students and other projects is allowed.

Project steps

- Think of a problem you would like to solve
- Describe the problem in detail (write it down)
- Discuss your proposal with the teacher
- Define the model (states, observations, ...)
- Choose a proper representation of the information in the model
- Select one or more solution methods
- Implement the method(s) (also using existing libraries)
- Experimental evaluation
- Write the report
- Deliver the report and the code
- Obtain the reward (i.e., the grade)

Choose the problem

Examples

- Autonomous and Service Robots
- Adversarial games (board games, arcade games, ...)
- Web Agents
- Control system
- ...

Any dynamic system with reasonable level of difficulty.

Define the model

Formal definition of

- set of states
- set of actions
- transition function
- reward function
- other parameters of the problem

What is known to the agent?
What is the goal of the project?

Choosing a solution method

Choose a solution algorithm for the problem

Choose a language (with tools, libraries, etc.) for the implementation

Representation of the model

Representation (data structures) for:

- states
- actions
- transition function
- reward function
- value function
- Q function
- other information relevant for the problem

Implementation of the solution methods

Implement the algorithm in the chosen framework

Use simplified versions of the problem to test the implementation

Experimental evaluation

Define some relevant use cases for the problem

Define a number of variants (not too many) of the solution

- same algorithm with different parameters
- different algorithms

For each use case and each variant of the solution:
Repeat many experiments (not too many) and collect the results

Choose an effective way of presenting the results (e.g., plot of rewards over time).

Structure of the report

- Introduction (goal of the project)
- Description of the problem
- Formal model of the problem
- Solution algorithm
- Implementation
  - Data structures
  - Main implementation details
- Experimental evaluation
  - Use cases
  - Comparative solutions
  - Presentation of the results
- Discussion of the results
- Conclusions (possible future work)

Delivery

Delivery of the report and code by e-mail at any time, before some exam session.

Discussion

- no presentation is required
- demonstration of the running system is optional: a video attached in the report is preferred

Evaluation criteria for your project

- Clarity of the description
- Correctness of the used methods
- Clear and proper presentation of the results
- Difficulty of the problem
- Difficulty of the solution
- Comparative results
- Appropriate comments about the results