Assignment 5: Probabilities & Bayesian Nets

Artificial Intelligence

WS 2023

Due: 2024-01-15, 12:00 noon

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1 Environment re-installation

You will use the **same** `conda` environment that you set up for assignment 1. However, you need to **download** a new version of our Python framework from MOODLE, and **re-install** the package it contains in the virtual `conda` environment.

- Activate the virtual environment you previously created:
  `$ conda activate py311_ai_assignments`
- For most shells, your command prompt should now have changed, to indicate that the virtual conda environment named `py311_ai_assignments` is now active.
- Download the file `ai_assignment5.zip` from the MOODLE course page.
- Unzip the `ai_assignment5.zip` into an empty directory.
- We will refer to this directory as your base directory.
- In your shell, navigate to the base directory.
- Issue the following command:
  `$ pip install -e .`
  (it will install the new `ai_assignments` package and its dependencies into your active `conda` environment)
- You are now ready to tackle the practical part of assignment 5!

2 Probabilistic Reasoning & Conditional Independence (6 pts)

There is a separate quiz on MOODLE (Theoretical Questions | Probability Theory & Bayesian Nets) for theoretical questions, covering probabilistic reasoning and conditional independence. For the theoretical questions you have an unlimited number of attempts, but no feedback whether or not your answers are correct.

3 Constructing a Bayesian Net (6 pts)

In short (details have been discussed in class):

- Look at the story from Moodle ("A5 "Constructing a Bayesian Net": The Story")
- Construct a Bayesian Net using the `BayesianNet` class of the framework in `ai_assignments/bayesian_nets/construct_a_net.py`
- Visualize the Bayesian Net, make sure to include your (first) **name and matriculation number** in the title!
- Upload the source code and the visualization in Moodle (in a .zip together with the source code for the next task)

4 Exact Inference (Quiz + Code = 6 + 6 pts)

In short (details have been discussed in class):

- Look at the graph in Moodle ("A5 Exact Inference")
- Follow the TODOs in `ai_assignments/bayesian_nets/exact_inference.py`
- Compute the probabilites for the quiz with your script, then enter the required numbers in Moodle
- Upload your source code in Moodle (in a .zip together with the source code and the visualization of the previous task)