COMP596 – Brain-inspired AI – Essay Assignment

Winter 2021

Due: May 3rd, 2021, before 11:59 PM.

In your final assignment you will be tasked with writing a 4-page perspective essay. The piece is fairly open ended, but it must address the following question: ***Which capabilities that animals/humans possess do current AI technologies not possess, and what would be required to give AI these capabilities?*** You must provide supporting evidence and citations to justify both aspects of your claim, i.e. you must provide some psychology or neuroscience evidence regarding the capabilities of humans or other animal species, and you must provide some evidence about what current AI can do and what it does not possess with respect to these capabilities. Finally, you should also finish by giving some speculative ideas as to potential means of endowing AI with these capabilities, both in terms of the system design and the training regime.

Here is a rough outline of a potential (not required) workflow for this assignment:

1. Pick some human behaviour that current AI is incapable of doing (to the best of your knowledge). It can be very high-level and cognitive, or low-level, whatever you like.
2. Do some literature review in neuroscience or psychology: what is known scientifically about human or animal behaviours in this area?
3. Describe this behaviour at a computational level (think Marr). What must be computed for this behaviour to occur? *Example*: to catch a fly ball in baseball you must compute how to position your body at the drop point of the ball's arc.
4. Do some literature review in the AI field. Are there any systems that come close to approximating these computational capabilities? How close do they come? What are the gaps that remain?
5. Speculate as to how you may be able to implement that behaviour at an algorithmic level using an artificial neural network. This can be fairly abstract. *Example*: to position your body at the drop point of a fly ball you can move so as to keep the ball moving straight horizontally and at a constant velocity vertically in your field of view.
6. Describe the environment (i.e. the dataset) that would be required to train your proposed ANN. *Example*: a 3D simulation of an agent moving in a baseball field.

The assignment is out of **30 marks**, and you will be marked as follows:

- How well do you describe the capability in question? **7 marks**
- Do you provide supporting evidence that humans/animals possess the capability? **7 marks**
- Do you provide good background on what current AI can do and what it doesn't possess in respect to the capability? **7 marks**
- What are your ideas for how to endow AI with these capabilities? **5 marks**
- What is the general clarity of your writing? **4 marks**