

Coursework 2: Utility of Cooperation

Based on the coursework by Joanna J. Bryson (with W. Li and H. Wilson)

March 2, 2020

1 Introduction

All of the ICCS courseworks are designed primarily to give you experience in developing intelligent control and/or cognitive systems. This course also gives you experience and feedback in reading and writing about research.

The present coursework lets you explore the utility of cooperation, which is core to many cognitive strategies. Your introduction should both specify exactly what your hypothesis is, and motivate why that is a good hypothesis. You may choose for your hypothesis one of the claims from Powell et al. (2009), thereby extending that research to a spatial model. Or you can choose your own hypothesis based on more contemporary data about when people do or do not cooperate.

2 Approach

This coursework should be done either alone or with *one* collaborator (not the one you worked with already on CW1). This coursework is due 6:00pm, 20th March 2020. The writeup for its submission should be at *most* two pages including all figures, though citations can run over a little (do not waste lots of time on a few lines). You may choose to use “as is” or expand from (alter) one of two agent-based models provided to you:

- Smaldino et al. (2013), a NetLogo replication of that model is available here: <https://www.comses.net/codebases/5500/releases/1.0.0/>
- Cace and Bryson (2007), a version of that model is available on Moodle.

You may also write your own simulation or start from another model such as those distributed in the NetLogo library, but that is almost certainly not worth your time. If you want more information than you had in the lecture about replications or ABM, you may want to read the first section of Bryson et al. (2007).

There are many different types of social simulation, but in keeping with the emphasis of ICCS, you will be doing a *spatial simulation*, where you are meant to be simulating some approximation of: •
real time,

- real space,
- real animal capacities, e.g., motion, perception, and metabolism.

Note that spatial reasoning is not really necessary in this task, at least not for the simulated agents.

But for *you*, learning to reason about how agents move in virtual space may help you with the game

AI in CW3. More importantly, this coursework should help you learn about social behaviour and its outcomes.

Your approach should document which model you used, and how the features of your hypothesis mapped to the variables in the model. For example, if you use Smaldino et al. model, specify what adversity you are testing the impact of, and explain which of the two types of adversity in the model you used to model that, and why. You should also say what your expected outcome would be that would verify your hypothesis.

3 Results

Given the length constraint of your report, you should probably only have one figure showing the testing of your hypothesis. Remember that NetLogo provides a tool for running experiments (BehaviourSpace) and more tools for drawing graphs. Thus it is pretty easy to get NetLogo to run experiments for you, if you can think of parameters you might like to vary or code you might want to add that would be experimentally interesting.

With respect to your own results, if you describe a reasonably-well working system in a comprehensible manner, you will pass. If you clearly justify your hypothesis from the literature (e.g. say which result you are trying to replicate, and what you thought was needed to do so) you will get at least 55. Getting a mark over 70 requires demonstrating insight, creativity and/or understanding that goes beyond the basics laid out for you in this document. For example, you could relate your outcome to other scientific articles, or describe further experiments you would like to do if you had time and space. Doing a little more statistical analysis is another way to get over 70. But again, don't spend too much time on this one coursework.

4 Discussion and Conclusions

You are not obliged in this coursework to come to a definite conclusion, just to show that you can design and execute an experiment in a social software simulation. However, you should say something about what conclusions might (or might not) be drawn from your results, and possibly discuss other approaches that might further illuminate your outcomes.

Please be aware that plagiarism is a serious academic offence. For more details, please refer to <http://www.bath.ac.uk/library/help/infoguides/plagiarism.html>. As a consequence, any disclosed plagiarism of you will lead to zero marks for the coursework. You will be referred to the Director of Studies for disciplinary action.

References



Bryson, J. J., Ando, Y., and Lehmann, H. (2007). Agent-based models as scientific methodology: A case study analysing primate social behaviour. *Philosophical Transactions of the Royal Society, B — Biology*, 362(1485):1685–1698.



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Smaldino, P. E., Schank, J. C., and McElreath, R. (2013). Increased costs of cooperation help cooperators in the long run. *The American Naturalist*, 181(4):pp. 451–463.

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