COMP596 – Brain-inspired AI – Presentation Assignment

Winter 2021

Due: March 8th, 2021, before 11:59 PM.

In this assignment, groups of 3 students will be required to prepare a 20-minute presentation video on an article from the brain-inspired AI literature. **A list of potential papers is provided below**, but students may request other papers if they wish (though the choice must be approved by the instructor if you do not select one of the papers below). I will leave it up to you to pick your groups, and the paper you want to present. However, note that you must decide your group and paper by February 12 and email me your decision. Anyone without a group and/or paper by this date will have them assigned.

The presentation must be done using slides, but you can make it using any recording device, editing software, etc. It could even just be a recording from your phone. The only requirement is that you submit a video in a standard video file format (e.g. avi, mp4, mov, etc.) by uploading it to myCourses. The presentation cannot be more than 20 minutes—you will lose marks if it is!!!! You are not required to show anyone's face in the video, only slides must be visible, but your voices must be audible. Also, it is important that all 3 students participate and speak. In terms of instructions, the presentation can be structured as you wish, but it must answer the four following questions:

Q1) Background
What is the gap in AI capabilities that the paper is attempting to address, and what neuroscience insights are they using to do it?

Q2) Results
What data, model and/or analyses does the paper present, and how does it help us to fill the gap in AI capabilities?

Q3) Limitations
Does the paper completely fill the gap you identified, or does it leave it incomplete? If it is incomplete, how so?

Q4) Future directions
What new questions does the paper raise and what should other researchers do to address them?

The assignment will be marked out of 20 marks, with the following breakdown:

- 4 marks for success in addressing Q1 above
- 4 marks for success in addressing Q2 above
- 3 marks for success in addressing Q3 above
- 3 marks for success in addressing Q4 above
- 6 marks for clarity of the presentation

Pre-approved papers

- van de Ven, Gido M., Hava T. Siegelmann, and Andreas S. Tolias. "Brain-inspired replay for continual learning with artificial neural networks." Nature communications 11, no. 1 (2020): 1-14.
  - https://www.nature.com/articles/s41467-020-17866-2
- Hung, Chia-Chun, Timothy Lillicrap, Josh Abramson, Yan Wu, Mehdi Mirza, Federico Carnevale, Arun Ahuja, and Greg Wayne. "Optimizing agent behavior over long time scales by transporting value." Nature communications 10, no. 1 (2019): 1-12.
  - https://www.nature.com/articles/s41467-019-13073-w
- Pritzel, Alexander, Benigno Uria, Sriram Srinivasan, Adrià Puigdomènech Badia, Oriol Vinyals, Demis Hassabis, Daan Wierstra, and Charles Blundell. "Neural Episodic Control." In Proceedings of the 34th International Conference on Machine Learning-Volume 70, pp. 2827-2836. 2017.
  - https://dl.acm.org/doi/abs/10.5555/3305890.3305973
- Barreto, André, Shaobo Hou, Diana Borsa, David Silver, and Doina Precup. "Fast reinforcement learning with generalized policy updates." Proceedings of the National Academy of Sciences 117, no. 48 (2020): 30079-30087.
  - https://www.pnas.org/content/117/48/30079.short
- Santoro, Adam, Ryan Faulkner, David Raposo, Jack Rae, Mike Chrzanowski, Theophane Weber, Daan Wierstra, Oriol Vinyals, Razvan Pascanu, and Timothy Lillicrap. "Relational recurrent neural networks." In Advances in neural information processing systems, pp. 7299-7310. 2018.
  - https://papers.nips.cc/paper/2018/file/e2eabaf96372e20a9e3d4b5f83723a61-Paper.pdf
- George, Dileep, Wolfgang Lehrach, Ken Kansky, Miguel Lázaro-Gredilla, Christopher Laan, Bhaskara Marthi, Xinghua Lou et al. "A generative vision model that trains with high data efficiency and breaks text-based CAPTCHAs." Science 358, no. 6368 (2017).
  - https://science.sciencemag.org/content/358/6368/eaag2612.abstract
- Hamrick, Jessica B., Andrew J. Ballard, Razvan Pascanu, Oriol Vinyals, Nicolas Heess, and Peter W. Battaglia. "Metacontrol for adaptive imagination-based optimization." arXiv preprint arXiv:1705.02670 (2017).
  - https://arxiv.org/abs/1705.02670
- Eslami, SM Ali, Danilo Jimenez Rezende, Frederic Besse, Fabio Viola, Ari S. Morcos, Marta Garnelo, Avraham Ruderman et al. "Neural scene representation and rendering." Science 360, no. 6394 (2018): 1204-1210.
  - https://science.sciencemag.org/content/360/6394/1204.full
- Fernando, Chrisantha, Jakub Sygnowski, Simon Osindero, Jane Wang, Tom Schaul, Denis Teplyashin, Pablo Sprechmann, Alexander Pritzel, and Andrei Rusu. "Meta-learning by the baldwin effect." In Proceedings of the Genetic and Evolutionary Computation Conference Companion, pp. 1313-1320. 2018.
  - https://dl.acm.org/doi/abs/10.1145/3205651.3208249
- Fong, Ruth C., Walter J. Scheirer, and David D. Cox. "Using human brain activity to guide machine learning." Scientific reports 8, no. 1 (2018): 1-10.
  - https://www.nature.com/articles/s41598-018-23618-6