COURSE DESCRIPTION (GENERAL DESCRIPTION)
Course title: Artificial Intelligence and Cognitive Science
Course code:
Head of the course: Eszter Dóra Szabó, Bálint Forgács

Aim of the course

Aim of the course: The course aims to provide insight into the current questions and the longstanding debates regarding artificial intelligence, deep learning, connectionist networks, computer science and information technologies that are relevant for and bear importance to Cognitive Science. The is a reading intensive seminar that visits outstanding topics of AI research within and around Cognitive Science, in order to provide a balanced picture and evaluate the insights, promises, short comings and successes of AI research from connectionist networks, brute force approaches to computational implementations of symbol manipulation solutions for modelling human and non-human cognition.

Learning outcome, competences

knowledge:

- Current methods and main objectives in the field

attitude:

- Utilisation of knowledge in scientific communication, presentation

skills:

- Skills of integrating knowledge from interdisciplinary approaches
- Creative thinking

Contents of the course

Topic of the course

- The cognitive context of computational and computer science: Why AI matters?
- The computational modelling of artificial reasoning and decision making: can AI be reasonable?
- The computational approach in cognitive science – How simulations and modelling are employed?
- Natural language processing, semantic networks – Content in wetware vs. silicon “intelligences”?
- Learning processes – Parallels and differences with biological organisms?
- Ethical issues – How does our understanding of social world change in light of AI developments?
- Emotional issues – Why and how do chatbots work? Are there computational affections?
- Consciousness & Turing tests– what do we expect humans, monkeys and softwares to exhibit
- Aesthetical issues, artificial creativity – What defines our representations of artistic values?

Evaluation of outcomes

Learning requirements, mode of evaluation and criteria of evaluation:

- Hold three 20min presentations on a relevant topic, incorporating at least 5 scientific papers.
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- Deliver one 20min presentation (at least 5 scientific papers), and write a 10 page essay.

Reading list

Compulsory reading list (tentative)

- Marcus, G. F. (2003). *The algebraic mind: Integrating connectionism and cognitive science*. MIT press.

- Bianchi, F. et al. (2020). Knowledge Graph Embeddings and Explainable AI. ArXiv. https://doi.org/10.48550/ARXIV.2004.14843

- Oltramari, A. et al. (2020). Neuro-symbolic Architectures for Context Understanding (Version 1). arXiv. https://doi.org/10.48550/ARXIV.2003.04707

- Mabee, Paula et al. (2018). Phenoscape: Semantic analysis of organismal traits and genes yields insights in evolutionary biology. https://peerj.com/preprints/26988.pdf

- Ilievski, Filip. (2019). Identity of Long-Tail Entities in Text. https://www.researchgate.net/profile/Filip-Ilievski/publication/336086192_Identity_of_Long-Tail_Entities_in_Text/links/5d8ddcae458515202b6d6117/Identity-of-Long-Tail-Entities-in-Text.pdf

- Toneva, M., & Wehbe, L. (2019). Interpreting and improving natural-language processing (in machines) with natural language-processing (in the brain) (Version 4). arXiv. https://doi.org/10.48550/ARXIV.1905.11833

- Schwartz, D., Toneva, M., & Wehbe, L. (2019). Inducing brain-relevant bias in natural language processing models (Version 1). arXiv. https://doi.org/10.48550/ARXIV.1911.03268

- Elkins, K., & Chun, J. (2020). Can GPT-3 Pass a Writer's Turing Test? In Journal of Cultural Analytics (Vol. 5, Issue 2). CA: Journal of Cultural Analytics. https://doi.org/10.22148/001c.17212

- Aurelio Cortese et al. (2021) Value signals guide abstraction during learning. eLife. https://doi.org/10.7554/eLife.68943

- Hampton, R. R., Engelberg, J. W. M., & Brady, R. J. (2020). Explicit memory and cognition in monkeys. In Neuropsychologia (Vol. 138, p. 107326). Elsevier BV. https://doi.org/10.1016/j.neuropsychologia.2019.107326

- Zhou, L., Gao, J., Li, D., & Shum, H.-Y. (2018). The Design and Implementation of XiaoIce, an Empathetic Social Chatbot (Version 2). arXiv. https://doi.org/10.48550/ARXIV.1812.08989

- Kagan, B. J., Kitchen, A. C., Tran, N. T., Habibollahi, F., Khajehnejad, M., Parker, B. J., Bhat, A., Rollo, B., Razi, A., & Friston, K. J. (2022). In vitro neurons learn and exhibit sentience when embodied in a simulated game-world. In Neuron. Elsevier BV. https://doi.org/10.1016/j.neuron.2022.09.001

- Hans Götzsche (2022), An Approach to Conceptualisation and Semantic Knowledge: Some Preliminary Observations, AI 2022, 3(3), 582-600 https://www.mdpi.com/2673-2688/3/3/34

Recommended reading list

- Computational Cognitive Neuroscience, 4th Edition | R. C. O'Reilly, Y. Munakata, M. J. Frank, T. E. Hazy, & Contributors (compcogneuro.org) - Simulations are available on their github page with detailed, well explained codes.

COURSE-SPECIFIC INFORMATION (SPECIFIC TO A GIVEN LECTURE OR SEMINAR)

General data

Specific (sub)title of the course (if relevant):
Specific (sub)code of the course (if relevant):
Date and place of the course:
Name of the lecturer: Eszter Dóra Szabó, Bálint Forgács
Department of the lecturer:
Email of the lecturer: szabo.eszter.dora@ppk.elte.hu; forgacsb@gmail.com

Specific syllabus/schedule of the lecture/seminar (if relevant)

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Further specific information (eg. requirements) (if relevant)

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