CCNM17-104: Informatics
Course Description

Aim of the course

Aim of the course: introduction to cognitive informatics

Learning outcome, competences
knowledge:

- understanding computational cognitive modelling
- has an overall view of the field of informatics

attitude:

- is capable of cooperation and solving tasks in teams;

skills:

- is able to see causal relationships, can think logically, and can prepare comprehensive reviews;

Content of the course

Topics of the course

- Introduction to cognitive informatics
- 1. What is computational cognitive modelling, types of cognitive modelling, what is computational cognitive modelling good for, multiple levels of cognitive modelling, successes and pitfalls of cognitive modelling
- 2. Introduction to symbolic modelling
- 3. Introduction to connectionist type modelling
- 4. Connectionist vs Symbolic vs Hybrid Modelling
- Connectionist Modelling
- 1. What is an artificial neuron and how it transmits information – Activation functions, connection weights, output computation
- 2. McCulloch-Pitts neuronal type
- 3. Learning rules
- 4. Network behaviour
- 5. Worked examples
- Learning and memory and knowledge representation, concepts, categories
- 1. Psychological studies and computational models of concept formation, concept learning and knowledge representation
- Symbolic Modelling (Systems and Architectures)
- 1. ACT-R
- 2. Soar
- 3. CLARION
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Learning activities, learning methods:
Lectures and interactive discussions

Evaluation of outcomes

Learning requirements, mode of evaluation, criteria of evaluation:
requirements

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Reading list

Compulsory reading list

- Polk, T. A., & Seifert, C. M. (2002). Cognitive Modelling. Cambridge, Mass.: MIT Press.
- (http://api.ning.com/files/pFUGNH4chIZY4rfEDP1DSg-pM7eUjJOa-wYjcjvSp0xyhMqBucXw37KXqOPz6xkymUfvtqMbaeF3dMEmJHkR5dSTzcjWP2PS/CognitiveModelingBradfordBooks.pdf)
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Recommended reading list

- Sun, R. (2008). Introduction to computational cognitive modeling. In: R. Sun (Ed.), The Cambridge Handbook of Computational Psychology (pp.3-19). New York: Cambridge University Press. (http://www.cogsci.rpi.edu/~rsun/folder-files/sun-CHCP-intro.pdf)
- Sun, R. (2001). Artificial intelligence: Connectionist and symbolic approaches. In: N. J. Smelser, & P. B. Baltes (Eds.), International Encyclopedia of the Social and Behavioral Sciences (pp.783-789). Oxford: Pergamon/Elsevier. (http://www.cogsci.rpi.edu/~rsun/sun.encyc01.pdf)
- Plautt, D. C. (1999). Connectionist modeling. In A. Kasdin (Ed.), Encyclopedia of Psychology. Washington DC: Americal Psychological Association. (http://www.cnbc.cmu.edu/~plaut/papers/pdf/Plaut00chap.conn.pdf)
- Stufflebeam, R. (2006). Connectionism: An introduction. Retrieved from http://www.mind.ilstu.edu/curriculum/connectionism_intro/connectionism_1.php?modGUI=76&compGUI=1928&itemGUI=3343
- Marsalli, M. (n.d.). McCulloch-Pitts neurons. Retrieved from http://www.mind.ilstu.edu/curriculum/modOverview.php?modGUI=212
- Hinton, G. (2002). How Neural Networks Learn from Experience. In: T. A. Polk, & C. M. Seifert. Cognitive Modelling (pp. 181-197). Cambridge, Mass.: MIT Press.
- Concept Learning. (2014). In Wikipedia. Retrieved from http://en.wikipedia.org/wiki/Concept_learning
- Semantic network. (2014). In Wikipedia. Retrieved from http://en.wikipedia.org/wiki/Semantic_network
- Sowa, J. F. (1992). Semantic networks. In: S. C. Shapiro (Ed.). The Encyclopedia of Artificial Intelligence (pp.) New York: Wiley. (http://www.jfsowa.com/pubs/semnet.htm)
- Rogers, T. T., & McClelland, J. L. (2003). Categories, hierarchies and theories. In: T. T. Rogers & J. L. McClelland. Semantic Cognition: A Parallel Distributed Processing Approach (pp. 1-26). Cambridge, MA: MIT Press. (http://nwkpsych.rutgers.edu/~jose/courses/578_mem_learn/2012/readings/Rogers_McClelland_2003.pdf)
- Rogers, T. T., & McClelland, J. L. (2003 A PDP Theory of Semantic Cognition. In: T. T. Rogers & J. L. McClelland. Semantic Cognition: A Parallel Distributed Processing Approach (pp. 27-44). Cambridge, MA: MIT Press. (http://nwkpsych.rutgers.edu/~jose/courses/578_mem_learn/2012/readings/Rogers_McClelland_2003.pdf)
- Prince, A., & Smolensky, P. (2002). Adaptive Resonance Theory. In: T. A. Polk, & C. M. Seifert. Cognitive Modelling (pp. 289-316). Cambridge, Mass.: MIT Press.
- Anderson, J. R. (2002). ACT: A Simple Theory of Complex Cognition. In: T. A. Polk, & C. M. Seifert. Cognitive Modelling (pp. 49-70). Cambridge, Mass.: MIT Press.

- Lehman, J. F., Laird, J., & Rosenbloom, P. (2006). A gentle introduction to Soar: An architecture for human cognition. Retrieved from http://ai.eecs.umich.edu/soar/sitemaker/docs/misc/GentleIntroduction-2006.pdf
- Allison, R. (n.d.). A short tutorial on CLARION. Retrieved from http://www.cogsci.rpi.edu/~rsun/ra-tutorial.pdf