

Assignment 2 - What is AI research?

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1 Empirical

Example: “Fault Detection Using Support Vector Machines and Artificial Neural Networks, Augmented By Genetic Algorithms”, <http://www.sciencedirect.com/science/article/pii/S0888327001914542#> In this paper a comparison is made of two different machine learning algorithms, Support Vector Machines and Neural Networks, to see which one works the best in detecting faults in Rotation Machinery. Also both systems were extended on with genetic algorithms to see its potential. The way the algorithms were in the end tested was by using a train and test set on the specific domain. The conclusion is that Artificial Neural Networks are faster to train on the domain and gives an overall better performance.

We can call this kind of AI research empirical as it uses the results specific on the domain to conclude which method is better for it. It would have been formal if instead of these experiments, reasoning would have been used about the machine learning approaches to determine the best possible outcome.

2 Formal

Example: “A Logical Calculus of the Ideas Immanent in Nervous Activity”. <http://www.cse.chalmers.se/~coquand/AUTOMATA/mcp.pdf> The authors of this research paper saw that brain activity on a neurological level could be modelled by means of propositional logic, and so they attempted to do that in their research. This paper shows the first steps towards the idea of neural networks and can be seen as formal research as they tried to model parts of the brain in a formal logic way.

3 Design

Example: “Humanoid robot localisation using stereo vision”, http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=1573539. This research is about implementing humanoid robot localisation by means of stereo vision. Stereo vision has previously been used for localisation of wheeled robots, but poses additional challenges for humanoids due to the jerky motions generated by humanoid locomotion. This is design research because it makes use of previously developed methods for localisation, but applies them to a new domain (humanoid robots instead of wheeled ones).

The conclusion is that the approach works, but is very noisy and will require more computationally intensive or accurate methods for practical tasks such as footstep planning.

4 Watson

The purpose of Watson was to create a general knowledge system that combines natural language processing, hypotheses generation and evaluation and evidence-based learning to make sense out of unstructured data.

The overarching concept of Watson is a problem of design research; it is an implementation of prior research, although in this case much of the research might be done in-house at IBM. Some of this internal research might have been formal. It was empirically tested by participating in the game Jeopardy.