Intelligent Search

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**CSC 480- Artificial Intelligence I**

**Jan. 17, 2014**

Search is a powerful and prolific mechanism within the field of artificial intelligence and agents providing search can be called “artificially intelligent.” Search can solve important problems independently by executing its algorithm over a domain. Search also provides the underpinnings machine learning techniques to assist in codifying the knowledge into a reusable form, thus simulating learning. This paper will first discuss the role of one’s perspective in whether search is called “artificially intelligent.” Then it will cover the intelligent merits of search agents themselves as well as their usefulness in machine learning. The terms search and search agent are used interchangeably.

The term “artificial intelligence” has different definitions based on the context in which it is being used and the expectations of the people observing it. For instance, I believe that watching the Deep Blue computer square off against Kasparov in chess or Watson computer clobber the vaunted Jeopardy champions looks like artificial intelligence to many people. However, there is still room for skepticism because these computers’ acquisition, model and rendering of intelligence is so different than a human’s. This paper will not go into the “rabbit hole” about the differences between human and computer intelligence other than to make the point that this shows a continuum where intelligence is defined by the perspective of the person observing it. There is a similar spectrum within the field of artificial intelligence between algorithms and machine learning and one can debate the point at which they become intelligent.

Search algorithms are heavily researched for good reason. As search is used on many high-order complex domains, improvements and innovation to search can have a profound effect on the speed to solution. While arriving at more rapid solutions can be critical to running a business, country or even saving a life someone may still question whether this is artificial intelligence or just running a program on a set of data to produce a useful result. The company employing advanced search techniques to streamline their logistics beyond the typical capabilities of humans would likely call them intelligent. Similarly, the doctor and patient benefitting from advanced diagnostics or genetic research utilizing search agents would likely consider them intelligent.

In addition to the direct benefit of search agents to these thousands of domains, search algorithms make other sub-fields of artificial intelligence possible. Machine learning mechanisms use search to adjust and optimize the internal representation of their acquired knowledge in order to improve their predictive capabilities. These internal applications include adjusting weights in an artificial neural network and wherever gradient minima/maxima must be determined. Bayesian search uses search algorithms to optimize the traversal path of a probabilistic graph from points of higher to lower probabilities. These, and other, artificial intelligence fields rely heavily on search.

This paper discussed whether search agents can be called intelligent. While search algorithms don’t typically evolve and learn on their own over time, they are certainly intelligent. First of all they provide services and optimizations beyond what humans can reasonably perform. This in itself can appear to be intelligence from the perspective of those benefitting from them. The point being that “intelligence is in the eye of the beholder,” or to bastardize another phrase, “if it looks smart and acts smart, it is smart.” Finally, search agents provide the underpinnings of other artificial intelligence fields, including machine learning. Search is smart.