Artificial Intelligence Techniques

Internet Applications weeks 11-13

Aims of sessions
- Introduce applications of AI on internet
- Neural Networks
- Recap on Semantic Web
- Brief look at agents
- Microformats – useful for AI?

Neural network applications
- Modelling system based on clicks (Segaran 2007)
  - On-line applications can produce large amounts of feedback on user behaviour.
  - So we can build a ‘model’ of what results a user is more likely to choose.
  - An ANN can be used to this.
- A MLP
  - Inputs search terms
  - Outputs gives URLs that were returned
- Training
  - The ANN gives ‘rankings’ for the URLs, predict the users choice.
  - The choice comes from the weights.

- Training (cont)
  - If a URL is selected the weights are strengthen for the URL
  - If a URL is not selected weaken the link.

- Definition
  - “The Semantic Web is a project to create a universal medium for information exchange by putting documents with computer-processable meaning (semantics) on the World Wide Web. Currently under the direction of the Web’s creator, Tim Berners-Lee of the World Wide Web Consortium, the Semantic Web extends the Web through the use of standards, markup languages and related processing tools.” Wikipedia (2006a)
Resource Description Framework (RDF)

- W3C specification originally for metadata modelling in XML
- Metadata model based on statements about resources, three parts (triples):
  - Subject: The resource (often in form of URI)
  - Predicate: aspects of the resource and the relationship between the subject and the object.
  - Object: property
- To read more Wikipedia (2006c)

Illustrative Example

```xml
<rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:dc="http://purl.org/dc/elements/1.1/">
  <rdf:Description
    rdf:about="http://www.computing.northampton.ac.uk">
    <dc:title>Scott Turner</dc:title>
    <dc:publisher>University of Northampton</dc:publisher>
  </rdf:Description>
</rdf:RDF>
```

Ontologies 1

- Typical kind of ontology for Web applications has a taxonomy and a set of interference rules.
- Taxonomy defines classes of objects and the relations among them.
**OWL (Web Ontology Language)**
- A Markup Language for sharing ontologies on the web.
- Designed for applications that need machine-readable content not just for humans.
- Written in XML
- For more information see Wikipedia (2006b)

**AI and the semantic web**
- AI aspects (or weak AI (see Wikipedia (2006a)) comes from the machine-readable aspects.
- Machines ability to perform well defined tasks and well-defined data, for a well-defined problem (Wikipedia 2006a)
- Is this AI?

**Agents**
- This is has been argued is the real power of the power of semantic web to produce machine-readable Web-content.
- Programs collating information form diverse sources.
In computer science, a **software agent** is a piece of software that acts for a user or other program in a relationship of agency. Such "action on behalf of" implies the authority to decide when (and if) action is appropriate. The idea is that agents are not strictly invoked for a task, but activate themselves.

**Intelligent Agents 1**
- Taken from Wikipedia (NA)
- Capabilities include:
  - **ability to adapt**
    - Adaptation implies sensing the environment and reconfiguring in response. This can be achieved through the choice of alternative problem-solving-rules or algorithms, or through the discovery of problem solving strategies. Adaptation may also include other aspects of an agent's internal construction, such as recruiting processor or storage resources.

**Intelligent Agents 2**
- **ability to learn**
  - Learning may proceed through trial-and-error, then it implies a capability of introspection and analysis of behaviour and success. Alternatively, learning may proceed by example and generalization, then it implies a capacity to abstract and generalize.
**Autonomous Agents**
- Modified from Wikipedia (NA)
- Software agents that claim to be self-contained and capable of making independent decisions, and taking actions to satisfy internal goals based upon their perceived environment. All software agents in important applications are closely supervised by people who start them up, monitor and continually modify their behaviour, and shut them down when necessary.

**Distributed and Multi-agents**
- Modified from Wikipedia (NA)
- Agents are well suited to include their required resources in their description, can be designed to be very loosely coupled and therefore executed as independent threads and on distributed processors. When several agents interact they may form a multi-agent system. Such agents will not have all data or all methods available to achieve an objective and thus will have to collaborate with other agents. Also, there may be little or no global control and thus such systems are sometimes referred to as swarm systems. As with distributed agents, data is decentralized and execution is asynchronous.

**Mobile agents**
- Taken from Wikipedia (NA): Agent code that moves itself, including its execution state, on to another processor, to continue execution there. This is also referred to as mobile code.
Agents Attributes 1

Based on Jones (2005) should have one or more of these:

- Autonomous – user can let it get on with it without too much interaction.
- Needs to be goal orientated.
- Adaptive – it learns as it goes!
  - Ideally behaviour should change based on experience.
  - Very difficult to do for a general case.
  - A little easier to when the environment/domain is very closely specified.

Agent attributes

- Communicative – Got get the info!
  - Communicate with user;
  - Communication with other agents;
  - Communication technology has be incorporated.
- Collaborative – works with other agents to get to the goal.
  - Multi-agent systems.
- Personal
  - Certain agents need to have personality especially in entertainment computing.
- Mobile

What attributes to the following have?

- Spend 30 minutes in groups on what attributes each of these have in your opinion:
  - Lego-based robotics;
  - Sociable robots such as Kismet from last week;
  - Search Agent on the internet;
  - An agent involved in on-line auctions;
  - Viruses.
Let’s play with a chatbot.
- Click on the link below:
  - http://www.alicebot.org/
- Now click on Chat with A.L.I.C.E.
- Enter your message.
- How realistic are replies?
- What are attributes would you say this has?

What is AIML?
- What is AIML?
- Why do you think AIML exists?
- Is it useful?
- Where do you think these chatbots can be used?

Microformats
- Designed for humans first and machines second, microformats are simple, open data formats built on existing and widely adopted standards...microformats intend to solve simpler problems first by adapting to current behaviors and usage patterns” (microformats.org)
Examples

- **hCard**: for marking up contact information.
- **hCalendar**: Marking up event information.
- **XFN**: Marking up relationships between people.
- **Hreview**: Marking up reviews.

Microformats and AI

- What, if any, is the potential linkage of microformats and AI?
- Human first, machine second remember what links are there then?
References