

# RE-USABLE ONLINE ASSESSMENT MATERIALS FOR TEACHING ARTIFICIAL INTELLIGENCE

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# Overview

- Aims of Project
- Accessibility Issues
- Methodology for developing questions
- Description of Materials Produced
  - Question types employed
  - Content Covered
- Use for summative & formative assessment
- Conclusions and Recommendations

# Aims of Project

- HEA grant to create Reusable On-Line Materials in form of question bank
- Aim was to facilitate:
  - teaching of AI materials
  - incorporation of AI into other courses
- Self-assessment for students
  - Widening participation
  - Targetted support
  - Identify “at risk” students

# Issues

- When developing new materials and methods need to consider effect on all students
- Effect of computer mediated self-assessment on students with:
  - visual disabilities :
    - how well do screen readers work?
  - dyslexia:
    - are some ways of asking questions inherently harder?

# Methodology

- Consultations with UWE's Disability Resource Centre to establish guidelines.
- Implemented as *question pool* in Blackboard.
- Regular discussion slot in tutorials informed question development
- Monitored usage of materials via Blackboard
- 2 additional volunteers with different forms of dyslexia provided feedback on sample

# Use in 2007-8

- Questions deployed as weekly tests on level 1 module “Introduction to Artificial Intelligence”
  - 103 students, range of awards and experience
  - 1 lecture + 90 min. group work tutorial per week,
  - discussion boards, directed reading for self-study
  - “adaptive release” of subsequent materials to encourage usage
- Mid-project review:
  - decided to use same approach for final

# Types of Question Available

- Initial Question Bank contains 107 questions
- Each question has meta-data
- Each question has feedback
- Version on my web site is periodically updated
  - [www.ics.heacademy.ac.uk/resources/rlos/smith/index.php](http://www.ics.heacademy.ac.uk/resources/rlos/smith/index.php)
  - [www/bit.uwe.ac.uk/~jsmith/rlo](http://www/bit.uwe.ac.uk/~jsmith/rlo)
  - new questions, same ones asked in different ways

# Types of Question Available

- Multiple Choice
  - User selects exactly one of a series of options.
- Multiple Answer
  - User selects any number from a series of options. Incorrect selections are penalized.
- Numerical Calculation
  - User provides numerical response in dialogue box
- Ordering
  - User makes series of choices form pull-down boxes to rank a set of items

# Types of Question Available

- Missing Blanks
  - User provides series of text responses in dialogue boxes to complete sentences.
- Jumbled Sentences
  - User makes series of selections from pull-down boxes to complete sentences.
- Matching
  - User makes series of choices from pull-down boxes to match two sets of items

# Subjects Covered:

- Philosophy: what is AI?
  - Turing's test and Searle's Chinese Room argument.
- Learning/Problem Solving as Search:
  - decomposing problems into sub-tasks
  - Optimization vs. model building vs. simulation
- Search Strategies:
  - Depth/Breadth first/A\*/ Hill climbing.
  - Global/Local search, search landscapes/ Meta-heuristics.
- Knowledge Representation:
  - First order logic, rules, Frames.
  - Semantic Nets, Semantic Web.

# Subjects Covered

- Artificial Neural Networks:
  - perceptron.
  - Use of simple MLPs.
- Evolutionary Computing:
  - Simple Genetic Algorithm.
  - Different representations
  - Genetic Programming.
- Swarm Intelligence
  - Boids, etc.

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### Preview Assessment: Summer Exam UFCE3H-20-1

**Name** Summer Exam UFCE3H-20-1

**Instructions** This examination will be delivered to you one question at a time. You should attempt every question, but you may scroll through them and return to questions if you wish.

On finishing the examination you should press the final "submit button".

Each person will see the test questions in a different randomised order.

You may access the internet for purposes of reference only, but any attempt to use communications such as email or messaging programs during the course of this examination will be viewed as a breach of examination regulations.

This examination will be made available later for the purposes of gaining feedback, you will be informed by e-mail to your UWE account when this happens.

**Multiple Attempts** Not allowed. This Test can only be taken once.

**Force Completion** This Test can be saved and resumed later.

**Question Completion Status:**

#### Question 2

2 points [Save](#)

A number of on/off switches control a nuclear power plant, and a given configuration can be thought of as a state. It is desired to search the space of possible states to find one that minimises temperature fluctuations within the plant. What representation would be most suitable for this problem if there are  $n$  switches?

- A string of values each coming from the set  $\{1, \dots, n\}$ .
- A string of  $n$  binary values.
- A tree with  $n$  terminal nodes (leaves).
- A permutation of the numbers  $\{1, \dots, n\}$ .
- A vector of  $n$  floating point numbers.

Moving to another question will save this response.

◀◀ | ◀ | Question 2 of 40 | ▶ | ▶▶

# Example weekly test

- [steve-test-week3.htm](#)
- Included some questions which are not transparently worded

# Analysis of use: weekly tests

- Some types of question less popular:
  - missing blanks, very hard to preguess all possible answers
- Some more popular
  - True/false, multiple choice, multiple answer
    - Can be hard to formulate testing questions
    - Sometimes need to join concepts to generate plausible alternatives
- Use of materials dropped during first semester
  - Competing coursework from other modules
  - Students get a measure of how well to trust their perceptions of understanding?
  - People “save” tests to use as revision tools

# Analysis of use: final exam

- Internally moderated by four staff to ensure consistency of difficulty
- Informally post-exam: students happy:
  - Felt it was transparent and fair
  - pleased with familiarity of tests
- Higher pass rate than previous year
- **Over 80% of students had used one or more on-line test in the week prior to the exam**

# Exam Results by Question Type

Multiple Choice	47.4%
Multiple Answer	49.7%
Jumbled Sentence	74.7%
Matching	53.9%
True/False	73.2%
Multiple Blanks	15%
Ordering	54.1%

Mean Percentage of possible marks gained, grouped by question type

# Accessibility

- Each question needs to be very explicit about what input is required.
- Lots of care with formatting needed for screen readers to work properly
  - Even so, not all do with Blackboard
- Chose not to use pictures in questions
  - But later version of pools will include some e.g. “hot-spot”, ...

# Conclusions

- Provision of extra methods for on-line assessment good for students.
  - 2008/9 cohort of 150 using tests far more
  - Highly effective tools for self-assessment
  - Effective way of providing feedback
  - Effective at identifying problem areas
- Question Bank is an ongoing project and resource for the community

# Conclusions

- Thanks to:
  - HEA for funding part of this project
  - Steve Cayzer (HP)
  - Anonymous volunteers for feedback
- Any Questions?