ARCLG055
Model Building in Archaeology

2008–2009

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1 Introduction

This handbook contains basic information about the content and administration of this course. If you have queries about the objectives, structure, content, assessment or organisation of the course, please consult the Course Co-ordinator.

Further important information, relating to all courses at the Institute of Archaeology, is to be found at http://www.ucl.ac.uk/archaeology/handbook/common/ and in the general MA/MSc handbook. It is your responsibility to read and act on it. It includes information about originality, submission and grading of coursework; disabilities; communication; attendance; and feedback.

This document is also available (in HTML or as a PDF file) from the course website: http://moodle.ucl.ac.uk/course/view.php?id=337.

2 Aims

The aims of the course are:

• To help you gain knowledge and understanding of the benefits and limitations of computer-based modelling;
• To help you appreciate the cycle of activities involved in computer-based modelling;
• To help you gain basic knowledge of a range of current applications of computer-based modelling in archaeology and related disciplines;
• To give you hands-on experience building and using agent-based simulation models.
• To provide a basic introduction to programming in Java.

3 Objectives

At the end of the course you should be able to:

• Evaluate whether computer-based modelling is an appropriate technique for research problems that you encounter;
• Choose the appropriate modelling paradigm;
• Schedule the modelling process within an overall research design;
• Design and implement a simple agent-based simulation model using Java and the Repast framework.

4 Learning outcomes

In meeting these objectives you will also be able to demonstrate the following generic learning outcomes:

• An understanding of the role of formal model building in the social sciences;
• The ability to use quantitative data to support an argument;
• Basic Java programming skills;
• The application of acquired knowledge.

5 Teaching methods

Teaching will be by a mixture of lecture, seminar, demonstration and supervised practical exercises. Lectures and seminars will last for 2 hours, or (usually) 1 hour when followed by a practical class. Practical classes will normally involve direct supervision for one hour; in most cases you will also be offered the option of an additional hour during which time the tutor will be available to help as you work through exercises on your own.

N.B. Participation in practical exercises is limited by the availability of suitably equipped computers, and is guaranteed only for those who are taking this course as an examined module for a Masters degree.

6 Prerequisites

There are no formal prerequisites for this course, but it is essential that you have an aptitude for computer methods and you may find some of the exercises easier if you have basic familiarity with use of spreadsheets and/or GIS.

7 Workload

There will be 10 hours of seminars/lectures for this course and 15 hours of supervised practicals. Students will be expected to undertake around 115 hours of reading and independent project work for the course, plus 40 hours producing the assessed work. This adds up to a total workload of 180 hours for the course.

8 Methods of assessment

This course is assessed by means of a total of 5000 words of coursework, divided into one 2000 word report (50%) and one 3000 word essay (50%). The topics and deadlines for each assessment are specified below. If students are unclear about the nature of an assignment, they should contact the Course Co-ordinator. The Course Co-ordinator will be willing to discuss an outline of their approach to the assessment, provided this is planned suitably in advance of the submission date.

9 Libraries and other resources

In addition to the Library of the Institute of Archaeology (5th floor), other libraries in UCL with holdings of particular relevance to this course are the Science Library (D.M.S. Watson building on the central UCL site) and the Environmental Studies Library in Wates House on Gordon Street. You may also wish to consult the list of electronic journals available through UCL (http://metalib-a.lib.ucl.ac.uk:8331/V?func=find-ej-1). A full list of UCL libraries and their opening hours is provided at http://www.ucl.ac.uk/library/.

The University of London Senate House Library (http://www.ull.ac.uk/) also has holdings which may be relevant to this course.
10 Teaching schedule

The course will be taught in Term 2. Unless advised otherwise, classes will be held from 14:00–16:30 on Mondays. In many cases I will remain in the AGIS lab. until 17:00 to assist with practicals and you may well find that you need the extra time to complete the class exercises. Lectures will be held in room 410; seminars and practicals will all be held in room 322C (the AGIS Lab.). There will be no taught class on 16th February (Reading Week).

11 Course timetable

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<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Session</th>
<th>Subject</th>
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<tbody>
<tr>
<td>1</td>
<td>12 Jan</td>
<td>1</td>
<td>Simulation modelling in archaeology: history and future</td>
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<td>2</td>
<td>29 Jan</td>
<td>2</td>
<td>Agent-based models and human decision-making</td>
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<td>3</td>
<td>26 Jan</td>
<td>3</td>
<td>Specialisation and cooperation</td>
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<td>4</td>
<td>2 Feb</td>
<td>4</td>
<td>Networks, power laws and the small-world phenomenon</td>
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<td>5</td>
<td>9 Feb</td>
<td>5</td>
<td>Approaches to demography</td>
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<td>6</td>
<td>16 Feb</td>
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<td>Reading week</td>
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<tr>
<td>7</td>
<td>23 Feb</td>
<td>6</td>
<td>Introduction to programming in Java</td>
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<td>8</td>
<td>2 Mar</td>
<td>7</td>
<td>Programming an agent-based model in Java</td>
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<td>9</td>
<td>9 Mar</td>
<td>8</td>
<td>Programming an agent-based model in Java continued</td>
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<td>10</td>
<td>16 Mar</td>
<td>9</td>
<td>Programming a spatial agent-based model with Repast</td>
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<td>11</td>
<td>23 Mar</td>
<td>10</td>
<td>Further programming with Repast</td>
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12 Seminar/Lecture summaries

The following is a session outline for the course as a whole, and identifies essential readings relevant to each session. Information is provided as to where in the UCL library system individual readings are available; their location and Teaching Collection (TC) number, and status (whether out on loan) can also be accessed on the eUCLid computer catalogue system (http://library.ucl.ac.uk/). The recommended readings are considered essential to keep up with the topics covered in the course sessions, and it is expected that students will have read these prior to the session under which they are listed. Copies of individual articles and chapters identified as essential reading are in the Teaching Collection.

In addition, a research bibliography is available on the course website (http://moodle.ucl.ac.uk/course/view.php?id=337) (note that because this is a research bibliography there is no guarantee that all items are available in UCL libraries—please consult the course co-ordinator in cases of difficulty).

Session 1: Simulation modelling in archaeology: history and future prospects

An introduction to simulation modelling in archaeology in which we will consider: a) what problems it has been used to address; b) how it has been used and c) the steps in creating and using a simulation.

Practical There is no practical this week, beyond ensuring that all participants have an account in the Institute of Archaeology AGIS laboratory.
Essential reading


Additional reading


Session 2: Agent-based models and human decision-making

An introduction to agent-based modelling and discussion of how it has been used to model past human decision-making.

Practical  Demonstration of an agent-based simulation (Sugarscape).

Essential reading


**Additional reading**


**Session 3: Specialisation and cooperation**

An introduction to recent ideas about the origins of specialisation and cooperation in human societies and how they have been modelled.

**Practical** Repast ENN.

**Essential reading**


**Additional reading**


**Session 4: Networks, power laws and the small-world phenomenon**

An introduction to recent ideas about the the importance of network structure for understanding human social and commercial life and how it may explain why many phenomena have a power law distribution (e.g. why there are few very large firms and many small ones).

**Practical** Investigation of baby name, pastoralist and long barrow data. Calculation of clustering coefficient of network.

**Essential reading**


**Additional reading**


**Session 5: Approaches to demography**

A survey of approaches to modelling demography.

**Practical** Spreadsheet implementation of difference equation and Leslie Matrix model.
Essential reading


**Session 6: Introduction to programming in Java**

You will learn the basics of Java programming, including use of an appropriate integrated development environment (IDE).

**Practical** Java programming.

**Essential reading**


**Session 7: Programming an agent-based model in Java**

You will learn more about Java programming, focusing on aspects of the language commonly used when developing agent-based models.

**Practical** Java programming.

**Session 8: Programming an agent-based model in Java continued**

You will refine the model developed in week 7, including the addition of a basic graphical display.

**Practical** Further programming.

**Session 9: Programming a spatial agent-based model with Repast**

You will learn the basics of how to program an agent-based model using the Repast toolkit.
Essential reading


Additional reading


### Session 10: Further programming with Repast

You will learn to program a simulation model in which agents move around in a world represented by a GIS map.

**Practical**  Repast programming.

Essential reading

*How to Use GIS Data with Repast* ([http://repast.sourceforge.net/repast_3/how-to/Gis_How_To.html](http://repast.sourceforge.net/repast_3/how-to/Gis_How_To.html)).

Additional reading


### 13 Basic texts

Key texts for this course are:


14 Course reading list

Please see the reading listed in the lecture summaries.

15 Assessments

This course is assessed entirely by coursework consisting of the two assignments described here.

1. One 2500 word essay (50%) giving you an opportunity to demonstrate your theoretical understanding of an important issue in archaeological computer simulation. You should choose one of the following questions:

- For what purposes has computer simulation been used in archaeology (or anthropology) and how do you expect it to be used in future?
- Does agent-based modelling provide a vehicle for exploring agency in the past? You may wish to consult papers in Agency in Archaeology¹ and Agency Uncovered² to see how archaeologists are using the idea of agency.
- How might the idea of emergence be of use to archaeologists? Discuss with reference to at least one case study.
- Drawing on appropriate examples, discuss the benefits of integrating GIS and agent-based modelling?
- What relevance, if any, do the power law and small-world phenomena have for archaeology?
- What are the strengths and weaknesses of analytical versus simulation approaches to understanding past demography?
- What can we learn from simulation experiments about the origins of cooperation and/or specialisation?

2. One report of project work (50%) designed to demonstrate basic skills in computer-based modelling using Repast. Further details will be made available once you have gained some programming experience.

Submission dates

1. Essay: Monday 23 February;

16 Citing of sources

Coursework should be expressed in a student’s own words giving the exact source of any ideas, information, diagrams, etc. that are taken from the work of others. Any direct quotations from the work of others must be indicated as such by being placed between inverted commas. Plagiarism is regarded as a very serious irregularity which can

carry very heavy penalties. It is your responsibility to read and abide by the requirements for presentation, referencing and avoidance of plagiarism to be found in the Coursework Guidelines document at [http://www.ucl.ac.uk/archaeology/handbook/common/cfp.htm](http://www.ucl.ac.uk/archaeology/handbook/common/cfp.htm) (or in your MA/MSc Handbook).

17 Submission of coursework

The coursework must be stapled to a completed blue coversheet (available from the web ([http://www.ucl.ac.uk/archaeology/intranet/forms/index.htm](http://www.ucl.ac.uk/archaeology/intranet/forms/index.htm)), from outside Room 411A or at Reception) and submitted to the course co-ordinator’s pigeon hole via the red essay box at Reception by the appropriate deadline. Late submission will be penalised unless permission has been granted and an Extension Request Form (ERF) completed. Please see the Coursework Guidelines document at [http://www.ucl.ac.uk/archaeology/handbook/common/submission.htm](http://www.ucl.ac.uk/archaeology/handbook/common/submission.htm) (or your MA/MSc Handbook) for further details on the required procedure.

Some of the assessed work for this course will require you to include illustrations, such as maps, graphs and screenshots of software. Please ensure that these are carefully presented. General guidance is available at: [http://www.ucl.ac.uk/archaeology/handbook/common/illustrations.htm](http://www.ucl.ac.uk/archaeology/handbook/common/illustrations.htm). All illustrations should have informative captions. Where appropriate, maps should include indicators of scale and orientation, as well as a legend (key) based on sensible ranges of data values. Graphs should include informative labels for the X- and Y-axes.

18 Submission of coursework to Turnitin

In addition to submitting your coursework as described above, it is now a requirement that you submit it electronically to the Turnitin system ([http://www.submit.ac.uk/static_jisc/ac_uk_index.html](http://www.submit.ac.uk/static_jisc/ac_uk_index.html)). The Turnitin ‘class ID’ for this course is 89876 and the enrolment password is IoA0809.

Students who fail to submit their coursework to Turnitin will not receive the mark for the work in question until they have done so (although they will receive written feedback in the usual way). The maximum mark for work that has not been submitted to Turnitin prior to the meeting of the Board of Examiners will be a bare pass.

In advance of submitting your coursework for marking you may, if you wish, run your work through the system in order to obtain a report on the originality of the wording and then make any necessary adjustments prior to final submission. Please email the Turnitin Advisers (ioa-turnitin@ucl.ac.uk)

It is important to recognise that the final decision about whether work contains plagiarism rests with academic staff. Consequently, the presence or absence of matches in a Turnitin report does not, by itself, provide a guarantee that the work in question either contains or is free from plagiarism.

Detailed instructions on the use of the system will be supplied separately.

19 Keeping copies

Please note that it is an Institute requirement that you retain a copy (this can be electronic) of all coursework submitted. When your marked essay is returned to you, you should return it to the marker within two weeks. You may like to keep a copy of the comments if you are likely to wish to refer to these later.
20 Communication

If any changes need to be made to the course arrangements, these will normally be communicated by email. It is therefore essential that you consult your UCL e-mail account regularly.

21 Dyslexia and other disabilities

If you have dyslexia or any other disability, please make your lecturers aware of this. Please discuss with your lecturers whether there is any way in which they can help you. Students with dyslexia are reminded to indicate this on each piece of coursework.

22 Health and safety

Students enrolled on this course are particularly reminded of the measures that should be taken to reduce possible discomfort arising from the extended use of computer workstations. See the advice provided on the web at http://www.ucl.ac.uk/efd/safety_services_www/guidance/dse/index.htm.

23 Feedback

In trying to make this course as effective as possible, we welcome feedback from students during the course of the year. All students are asked to give their views on the course in an anonymous questionnaire which will be circulated at one of the last sessions of the course. These questionnaires are taken seriously and help the Course Co-ordinator to develop the course. The summarised responses are considered by the Institute’s Staff-Student Consultative Committee, Teaching Committee, and by the Faculty Teaching Committee.

If students are concerned about any aspect of this course we hope they will feel able to talk to the Course Co-ordinator, but if they feel this is not appropriate, they should consult their Degree Tutor, the Academic Administrator (Judy Medrington), or the Chair of Teaching Committee (Dr. Sue Hamilton).