



# PSY 462

## Computational Modelling in Psychology

S2 Day 2019

*Department of Psychology*

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## General Information

Unit convenor and teaching staff

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Credit points

3

Prerequisites

Corequisites

PSY490 or PSY495

Co-badged status

Unit description

This unit will provide an introduction to computational modeling in (cognitive) psychology. The main goals of this unit are to foster both a basic understanding of the different approaches to modeling and an appreciation of the practical and philosophical issues related to modeling.

The first part of the unit will focus on the following questions: (1) What are computational models of cognition?; (2) What are the major approaches (e.g., production systems) that are used to model cognitive processes?; (3) How are models developed and used in research?; and (4) How are models compared and evaluated? The second part of the unit will examine these issues in more depth by comparing models that have been developed to account for phenomena in specific areas of cognitive research (e.g., episodic memory). The final part of the unit will consist of student-led discussions of seminal modeling papers from the students' areas of interest. Students will also complete a modeling project or write a critique/review of existing models within their area of interest.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

On successful completion of this unit, you will be able to:

Define and critically evaluate theories and models of human cognition, identifying the need for formal theories to understand cognitive processes.

Apply real-world examples to explain each of the different levels applicable to formal theories of cognition.

Demonstrate knowledge of the main assumptions, advantages and disadvantages of human cognition modeling.

Identify and critically compare the breadth and scope of formal models of human cognition relative to other models in similar domains.

Accurately summarize the core assumptions of formal models by writing a brief description of a model.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">Essay #1: Describe a model</a>	25%	Yes	23/8/19
<a href="#">Essay #2: Compare 3 approaches</a>	25%	No	4/10/19
<a href="#">Essay #3: Compare 3 models</a>	50%	No	15/11/19

### Essay #1: Describe a model

Due: **23/8/19**

Weighting: **25%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

Students will be required to write a brief (500-word) essay describing a computational model (MINERVA 2; Hintzman, 1986) using only words (i.e., not equations). This assessment will demonstrate the capacity to read and understand formal (e.g., mathematical) descriptions of computer models, as well as describe that model in a more informal manner to someone else.

On successful completion you will be able to:

- Define and critically evaluate theories and models of human cognition, identifying the need for formal theories to understand cognitive processes.
- Apply real-world examples to explain each of the different levels applicable to formal theories of cognition.
- Accurately summarize the core assumptions of formal models by writing a brief description of a model.

### Essay #2: Compare 3 approaches

Due: **4/10/19**

Weighting: **25%**

Students will be required to write a brief (500-word) essay summarizing the main differences between three alternative approaches to modeling: mathematical/statistical models, production systems, and artificial neural networks. The assessment will demonstrate knowledge of the different approaches to modeling, as well as their strengths and weaknesses.

On successful completion you will be able to:

- Define and critically evaluate theories and models of human cognition, identifying the need for formal theories to understand cognitive processes.
- Apply real-world examples to explain each of the different levels applicable to formal theories of cognition.
- Demonstrate knowledge of the main assumptions, advantages and disadvantages of human cognition modeling.
- Accurately summarize the core assumptions of formal models by writing a brief description of a model.

## Essay #3: Compare 3 models

Due: **15/11/19**

Weighting: **50%**

Students will be required to compare and contrast 3 models of a particular research domain (e.g., human concept learning). This assessment will demonstrate a high-level capacity to understand descriptions of formal models and the phenomena that they are intended to explain, and to then integrate that knowledge as required to critically evaluate the relative merits of the models in their capacity to explain a set of empirical findings.

On successful completion you will be able to:

- Demonstrate knowledge of the main assumptions, advantages and disadvantages of human cognition modeling.
- Identify and critically compare the breadth and scope of formal models of human cognition relative to other models in similar domains.
- Accurately summarize the core assumptions of formal models by writing a brief description of a model.

## Delivery and Resources

All required articles are provide on iLearn.

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and

Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

Undergraduate students seeking more policy resources can visit the [Student Policy Gateway](#) (<https://students.mq.edu.au/support/study/student-policy-gateway>). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central](#) (<https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central>).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/study/getting-started/student-conduct>

## Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](http://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

## Learning Skills

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

## Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

## Student Enquiries

For all student enquiries, visit Student Connect at [ask.mq.edu.au](http://ask.mq.edu.au)

If you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/).

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

## Graduate Capabilities

### Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

### Learning outcomes

- Identify and critically compare the breadth and scope of formal models of human cognition relative to other models in similar domains.
- Accurately summarize the core assumptions of formal models by writing a brief description of a model.

### Assessment task

- Essay #3: Compare 3 models

### Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

## Learning outcomes

- Define and critically evaluate theories and models of human cognition, identifying the need for formal theories to understand cognitive processes.
- Apply real-world examples to explain each of the different levels applicable to formal theories of cognition.
- Demonstrate knowledge of the main assumptions, advantages and disadvantages of human cognition modeling.
- Identify and critically compare the breadth and scope of formal models of human cognition relative to other models in similar domains.
- Accurately summarize the core assumptions of formal models by writing a brief description of a model.

## Assessment tasks

- Essay #1: Describe a model
- Essay #2: Compare 3 approaches
- Essay #3: Compare 3 models

## Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

## Learning outcomes

- Define and critically evaluate theories and models of human cognition, identifying the need for formal theories to understand cognitive processes.
- Apply real-world examples to explain each of the different levels applicable to formal theories of cognition.
- Demonstrate knowledge of the main assumptions, advantages and disadvantages of human cognition modeling.
- Identify and critically compare the breadth and scope of formal models of human cognition relative to other models in similar domains.
- Accurately summarize the core assumptions of formal models by writing a brief description of a model.

## Assessment tasks

- Essay #2: Compare 3 approaches
- Essay #3: Compare 3 models

## Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

### Learning outcomes

- Apply real-world examples to explain each of the different levels applicable to formal theories of cognition.
- Demonstrate knowledge of the main assumptions, advantages and disadvantages of human cognition modeling.
- Identify and critically compare the breadth and scope of formal models of human cognition relative to other models in similar domains.
- Accurately summarize the core assumptions of formal models by writing a brief description of a model.

### Assessment task

- Essay #3: Compare 3 models

## Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

### Learning outcomes

- Apply real-world examples to explain each of the different levels applicable to formal theories of cognition.
- Demonstrate knowledge of the main assumptions, advantages and disadvantages of human cognition modeling.
- Identify and critically compare the breadth and scope of formal models of human



cognition relative to other models in similar domains.

- Accurately summarize the core assumptions of formal models by writing a brief description of a model.

## **Assessment tasks**

- Essay #1: Describe a model
- Essay #2: Compare 3 approaches
- Essay #3: Compare 3 models