

# **COMP3018**

# **Human-Robot Interaction**

**20 CREDIT MODULE**

**ASSESSMENT: 100% Coursework**      **W1: 30% Set Exercises**  
**W2: 70% Report**

**MODULE LEADER: Dr. Amir Aly**

**MODULE AIMS**

- Equip students with an understanding of multimodal human-robot interaction and its applications in daily life.
- Enable students to create, and evaluate, a robot system for interaction with users.
- Provide insights into the current and future challenges facing human-robot interaction.

**ASSESSED LEARNING OUTCOMES (ALO):**

- Explain the elements included in the field of human-robot interaction.
- Describe what differentiates cognitive robotics from the other sub-branches of robotics.
- Design a human-robot interaction experiment and evaluate the performance of the system through appropriate metrics and evaluation methods.

## Overview

This document contains all the necessary information pertaining to the assessment of *COMP3018 Human-Robot Interaction*. The module is assessed via **100% coursework**, across two elements: **30% Set Exercises**, and **70% Report**.

The sections that follow will detail the assessment tasks that are to be undertaken. The submission and expected feedback dates are presented in Table 1. All assessments are to be submitted electronically via the respective DLE module pages before the stated deadlines.

	Submission Deadline	Feedback
Set Exercises (30%)	<b>20<sup>th</sup> March 2025 at 3 PM</b>	Within 20 working days
Report (70%)	<b>6<sup>th</sup> May 2025 at 3 PM</b>	Within 20 working days

Table 1: Assessment Deadlines

All assessments will be introduced in class to provide further clarity over what is expected and how you can access support prior to submission. Whilst the assessment information is provided at the beginning of the module, it is not necessarily expected you will start this immediately – as you will often not have sufficient understanding of the topic. The module leader will provide guidance in this respect.

## **Assessment 1: Set Exercises in Human-Robot Interaction**

This assignment contributes **30% of the overall mark** of the module COMP3018 and is an **individual assignment**. The focus of this assessment is to evaluate your understanding of the theory behind different topics of the module through different tasks.

### **Task (1) Reading Critiques (40% of the total mark of assessment 1)**

- 1- Write a critique of one of the readings below providing a non-trivial insight into the selected paper. You must show that you understood and thought critically about the core concepts presented. The critique could include the following points (but is not limited to):
  - Questions or points of confusion about the paper
  - Critical discussion of the methods used, hypotheses, analysis, or results
  - Compare and/or contrast the findings (to other related papers in the literature)
  - Ideas for future work
- 2- **Presentation:** In addition to the written critique, present the findings in an oral presentation using slides (10 mins presentation & 10 mins discussion) that will be held on **10<sup>th</sup> & 11<sup>th</sup> March at 9 AM** (more details will be available with the module leader). Some ideas to make your slides and presentation more exciting (but are not limited to):
  - Controversial statements or questions that can fuel discussion
  - Experiments that provide insight into the methods presented in the paper
  - Examples of problems that would require a novel extension to the presented methods
  - References to other work or results that can be compared and contrasted

**List of papers** (*Example papers to choose one per student, or you choose a paper yourself subject to approval from the module leader*):

- 1- Aly, A. and Tapus, A. (2013) 'A model for synthesizing a combined verbal and nonverbal behavior based on personality traits in human-robot interaction'. In *Proceedings of the 8th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, pages 325–332, Piscataway, NJ, USA.
- 2- Breazeal, C., et al. (2005) 'Effects of nonverbal communication on efficiency and robustness in human-robot teamwork'. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 708–713, Edmonton, Alberta, Canada.
- 3- Mumm, J. and Mutlu, B. (2011) 'Human-robot proxemics: Physical and psychological distancing in human-robot interaction'. In *Proceedings of the ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, pages 331–338, Lausanne, Switzerland.
- 4- Lim, A. and Okuno, H. G. (2014) 'The MEI robot: Towards using motherese to develop multimodal emotional intelligence', in *IEEE Transactions on Autonomous Mental Development*, 6(2): 126-138.
- 5- Sharkey, A. J. C. (2016) 'Should we welcome robot teachers?' in *Ethics and Information Technology*, 18(4):283-297.

- 6- Coyne, A.K., Murtagh, A., and McGinn, C. (2020) ‘Using the Geneva emotion wheel to measure perceived affect in human-robot interaction’. In *Proceedings of the ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, pages 491-98, Cambridge, UK.

In this task, please **justify your answers** in detail through necessary discussion and analysis.

### **Task (2) Cultural Differences and HRI Design (30% of the total mark of assessment 1)**

Consider the following instructions and discuss the following points in a report in detail. You should use relevant papers in the literature to answer these questions.

1. Summarize the cultural factors discussed in Kaplan (2004) that impact the acceptance of humanoid robots in the West and the East.
2. Based on your knowledge and experience, propose cultural factors that might have an impact on the acceptance of humanoid robots in Africa.
3. Suggest ways in which these cultural factors can be used to determine traits (e.g., in appearance or behavior) that would make humanoid robots more acceptable in (a) the East, (b) the West, and (c) Africa.
4. Suggest how these traits can be used to adapt or refine the design patterns for sociality in human-robot interaction proposed by Kahn et al. (2008) for (a) the East, (b) the West, and (c) Africa.

### **References**

- 1- Kaplan, F. (2004) “Who is afraid of the humanoid? Investigating cultural differences in the acceptance of robots”. In *International Journal of Humanoid Robotics*, 1(3): 1–16.
- 2- Kahn, P. H., et al. (2008) ‘Design patterns for sociality in human-robot interaction’. In *Proceedings of the 3rd ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, pages 97–104, Amsterdam, Netherlands.

In this task, please **justify your answers** in detail through necessary discussion and analysis.

### **Task (3) Models for Human-Robot Collaboration (30% of the total mark of assessment 1)**

The Partially-Observable Markov Decision Process (POMDP) is one of the widely used models for human-robot collaboration. Discuss the following points in detail (You should use relevant papers in the literature to support your discussion and analysis):

1. Discuss the efficient role that POMDP plays in modelling and solving problems related to trust, cooperation, coordination, and collaboration in human-robot teams.
2. Analyze the role of uncertainty in human-robot collaboration and how POMDPs can be used to make decisions in uncertain environments.
3. Discuss the challenges of modelling trust in human-robot collaboration and how POMDPs can help address them.
4. Develop a POMDP model for a specific scenario in human-robot collaboration and explain how it takes into account trust and uncertainty. What are the benefits and limitations?

5. Discuss the ethical and social implications of using POMDPs in human-robot collaboration.

In this task, please **justify your answers** in detail through necessary discussion and analysis.

**Deliverables & Assessment Criteria** (All submissions should be in one ZIP file)

- **Task (1)** requires writing a critique article for one of the papers in the reference list, and you might need to use the related literature to support your analysis and arguments. All **citations** should follow the **Harvard style**. The references that you will use should be peer-reviewed journal papers or conference papers. The format of the critique article is PDF, and it should be structured as follows: **introduction** (10% of the task mark), **summary** (20% of the task mark), **critique** (50% of the task mark), **conclusion** (10% of the task mark), and **references** (10% of the task mark). The article should not exceed **1,750 words**. The critique article is worth **30% of the total mark of assessment (1)**, and the presentation is worth **10% of the total mark of assessment (1)**.
- For **tasks (2 and 3)**, please reply to all the questions in detail and justify your answers using related papers in the literature. All **citations** should follow the **Harvard style**. The **report of each task** should not exceed **1,750 words** each in PDF format.

**Threshold Criteria for the Set Exercises (these are indicative only):**

**< 40%** Little or no analysis, and answers are largely incorrect. Little understanding of the subject. Almost no evidence of investigation and research for answering the questions. The writings are not clear and not well-written or structured.

**40–49%** Brief discussion and little analysis for the different tasks. Answers are partially correct and/or complete and missing elaborate details and explanations. There is little evidence of investigation and research for answering the questions. The content and structure of the writings are appropriate to a limited extent.

**50–59%** The discussion and analysis for the different tasks are relatively detailed and clear. Different answers are correct and complete with a sufficient level of detail explaining how results are obtained. There is medium evidence of investigation and research for answering the questions. The writings are of relatively good standards and quality.

**60–69%** Detailed discussion and analysis for the different tasks. A significant majority of answers are correct and complete with a very good level of detail explaining clearly how results are obtained. There is very good evidence of investigation and research for answering the questions. The writings are of very good standards and quality.

**> 70%** The different tasks are very well discussed in detail supported by excellent argument. Answers are correct and complete, especially with clear and well-justified analysis and description. There is strong evidence of investigation and research for answering the questions (e.g., deep analysis and full investigation). The writings are of high standards and quality (focused and concise).

## **Assessment 2: Report on Human-Robot Interaction**

This assignment contributes **70% of the overall mark** of the module COMP3018 and is an **individual assignment**. The focus of this assessment is to evaluate your understanding of the theory behind different topics of the module through different tasks.

### **Task (1) Literature Review (30 % of the total mark of assessment 2)**

You have studied different topics in human-robot interaction, write an essay about **social robotics and its societal applications** describing the impact it has on different sectors, the challenges it faces, future applications, and ethical issues that need to be considered.

### **Task (2) Cognitive Robotics (30% of the total mark of assessment 2)**

Answer the following questions (you are encouraged to use relevant papers in the literature to support your arguments):

1. What are affordances? Try to give your own definition. Why is it that robots need to learn affordances rather than pre-programming affordance-related knowledge in advance?
2. What is the difference between learning from demonstration and reinforcement learning in the context of cognitive robotics?
3. Human beings do not learn complex tasks from scratch and instead, learn via a curriculum that may be formal (i.e., school) or informal (i.e., a progression through more complicated environments as we grow older). Describe something that a robot may need to learn to operate in human environments (e.g., a concept, a motor skill) and sketch out a curriculum for learning that task. How would you structure the robot's environment in ever more complex ways to make learning the task easier?
4. As a robotics scientist, think of a research question that interests you. What kind of a test would you need to perform to answer it? What type of a method would need to be developed to enable the robot to solve the problem you're thinking of? What else would you need to know to accomplish the task?
5. What are the challenges of designing and implementing cognitive architectures for robots? For each challenge, you can cite, and briefly describe, a paper that addresses the challenge.
6. How does the embodiment of robots impact their ability to learn and perceive the environment in comparison with the non-embodiment? How can this impact language learning?

In the above points, please **justify your answers** with the necessary explanation and analysis.

### **Task (3) Programming Project (40% of the total mark of assessment 2)**

During this module, you've explored various aspects of human-robot interaction through lectures and workshops. Your assignment now is to conceptualize and suggest a unique project. This will provide you with an opportunity to engage more extensively with the intricacies of human-robot interaction.

- **The requirements for the project are as follows:**

1. The project should include a novel intellectual contribution that addresses a problem of interest, ideally demonstrating the application of this new idea through the use of robots or other empirical methods.
2. The focus of the chosen project should be, whether similar or related, to a core topic(s) we have covered in class.
3. The project could be about (but is not limited to) creating an exciting robot application, extending a model/application in a novel way, or designing a new approach to attack a problem relevant to the class.

In this task, please **justify your choices** through necessary discussion and analysis (as applicable).

**Deliverables & Assessment Criteria** (All submissions should be in one ZIP file)

- **Task (1)** requires writing an academic essay and the style should reflect that by including references (**Harvard style**). The references that you will use should be peer-reviewed journal papers or conference papers. The essay - in PDF format - should be structured as follows: introduction (10% of the task mark), literature review (20% of the task mark), applications (30% of the task mark), discussion (20% of the task mark), conclusion (10% of the task mark), and references (10% of the task mark). The essay should not exceed 2,000 words.
- For **tasks (2 and 3)**, please justify your answers with detailed explanations to demonstrate your level of understanding of the different topics of the tasks. All **citations** should follow the **Harvard style**. The report of each task - in PDF format - should not exceed 1,750 words each. Besides, for the **task (3)**, please submit your code and a video of 5 minutes describing briefly your contribution and showing clearly a running demo of your work.
- For **task (3)**, the report should be structured as follows: introduction (10% of the task mark), background (10% of the task mark), method and setup (35% of the task mark), results/outcome/or system analysis (30% of the task mark), conclusion (10% of the task mark), and references (5% of the task mark).

**Threshold Criteria for the Report (these are indicative only):**

**< 40%** Little or no analysis, and answers are largely incorrect. Little understanding of the subject. Almost no evidence of investigation and research for answering the questions. The writings are not clear and not well-written or structured.

**40–49%** Brief discussion and little analysis for the different tasks. Answers are partially correct and/or complete and missing elaborate details and explanations. There is little evidence of investigation and research for answering the questions. The content and structure of the writings are appropriate to a limited extent.

**50–59%** The discussion and analysis for the different tasks are relatively detailed and clear. Different answers are correct and complete with a sufficient level of detail explaining how

results are obtained. There is medium evidence of investigation and research for answering the questions. The writings are of relatively good standards and quality.

**60–69%** Detailed discussion and analysis for the different tasks. A significant majority of answers are correct and complete with a very good level of detail explaining clearly how results are obtained. There is very good evidence of investigation and research for answering the questions. The writings are of very good standards and quality.

**> 70%** The different tasks are very well discussed in detail supported by excellent argument. Answers are correct and complete, especially with clear and well-justified analysis and description. There is strong evidence of investigation and research for answering the questions (e.g., deep analysis and full investigation). The writings are of high standards and quality (focused and concise).

## **General Guidance**

### **Extenuating Circumstances**

There may be a time during this module when you experience a serious situation that has a significant impact on your ability to complete the assessments. The definition of these can be found in the University Policy on Extenuating Circumstances here at this [\[link\]](#).

### **Plagiarism**

All of your work must be in your own words. You must use references for your sources, however, you acquire them. Where you wish to use quotations, these must be a very minor part of your overall work.

To copy another person's work is viewed as plagiarism and is not allowed. Any issues of plagiarism and any form of academic dishonesty are treated very seriously. All your work must be your own and other sources must be identified as being theirs, not yours. The copying of another person's work could result in a penalty being invoked.

Further information on plagiarism policy can be found here:

Plagiarism: <https://www.plymouth.ac.uk/student-life/your-studies/essential-information/regulations/plagiarism>

Examination Offences: <https://liveplymouthac.sharepoint.com/sites/x70/SitePages/Exam-rules-and-regulations.aspx>

Turnitin (<http://www.turnitinuk.com/>) is an Internet-based 'originality checking tool' which allows documents to be compared with content on the Internet, in journals, and in an archive of previously submitted works. It can help to detect unintentional or deliberate plagiarism.

It is a formative tool that makes it easy for students to review their citations and references as an aid to learning good academic practice. Turnitin produces an 'originality report' to help guide you. To learn more about Turnitin go to: <https://guides.turnitin.com/hc/en-us>

### **Referencing**

The University of Plymouth Library has produced an online support referencing guide which is available here: <http://plymouth.libguides.com/referencing>.

Another recommended referencing resource is [Cite Them Right Online](#); this is an online resource, which provides you with specific guidance about how to reference lots of different types of materials.