ARTIFICIAL INTELLIGENCE
with SPEECH and
MULTIMODAL INTERACTION
MSc / PG Diploma

Full-Time / Part-Time

Distinctly Ambitious
www.hw.ac.uk
Heriot-Watt University offers a first-rate environment for postgraduate study and top-level research. We are one of the UK’s leading universities, recognized internationally for excellent teaching and research in our specialist areas of science, engineering, business management, languages and textile design.

Heriot-Watt became a university in 1966 and its origins go back to the foundation of the School of Arts in Edinburgh in 1821. We are Scotland’s most international university. Over 30% of our students come from outside the UK.

We introduced the first Computer Science degree in Scotland in 1966, have taught MSc degrees in this subject from 1970 and are part of the world class SICSA research cluster that aims to sustain and expand Scotland’s research excellence in Informatics and Computer Science.

Aim of Programme

The aim of this MSc programme is to impart the understanding and skills to develop intelligent software applications, such as those involving evolutionary computation and learning, but with a specialist emphasis on developing interactive multimodal and spoken interfaces.

Students will acquire detailed understanding and skills in mainstream artificial intelligence research areas while also learning the techniques and skills needed to develop conversational agents and other kinds of interactive multimodal interfaces.

Duration of Programme

The full-time MSc programme starts in mid September and lasts 1 year. The Postgraduate Diploma starts at the same time but only lasts 8 months. Students completing the PG Diploma at MSc level may transfer to the MSc.

Part-time study for the MSc over 2 years is also possible by special arrangement with the programme director.

Programme Structure

The first two semesters (September-May) are spent studying taught courses in AI, multimodal interaction and spoken interfaces. At the same time research skills are developed as a preliminary for work on an MSc project. Exams take place at the end of each semester.

In the third semester (May-August) students undertake a specialist project and write it up as a dissertation. It enables development and consolidation of skills introduced in the taught courses, applying them to a challenging practical problem in the subject area.

The project is carried out under the supervision of an academic who is an expert in the field. In some cases the project can be carried out in collaboration with an outside industrial or academic organisation.

The table shows the essential and optional courses in the first 2 semesters. Full time students must study 4 courses each

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<td>F21CA Conversational Agents and Spoken Language Processing</td>
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- To investigate 2D and 3D graphics concepts including lighting, materials, modelling, occlusions, projections, reflections, rendering, scene graphs, shading, texture mapping, transformations, viewpoints.
- To explore animation including blending, clipping, poses, skeletons and skinning.
- To develop programming skills in 2D/3D graphics and animation.

F29AI Artificial Intelligence and Intelligent Agents
- To introduce the main concepts and techniques of AI, including planning, search and knowledge representation.
- To introduce the scope, subfields and applications of AI, topics to be taken from a list including natural language processing, expert systems, robots and autonomous agents, machine learning and neural networks, and vision.
- To develop skills in AI programming in appropriate languages.

F21BC Biologically Inspired Computation
- To impart why traditional computation finds it hard or impossible to perform key tasks in pattern recognition, problem solving and autonomous intelligence.
- To show how some natural and biological systems approach these tasks.
- To introduce the main biologically-inspired algorithms and techniques which are researched and applied.
- To establish a practical understanding of the real-world problems to which these techniques may be fruitfully applied.

F21DL Data Mining and Machine Learning
- To introduce the fundamental concepts and techniques used in machine learning.
- To develop a critical awareness of the appropriateness of different methods.
- To provide familiarity with common applications such as data mining.

F21DV Data Visualization and Analytics
- To show how to develop graphical applications to search, explore, and retrieve information in various data sets.
- To impart principles of data visualization and analysis for big, complex, dynamic, heterogeneous, linked, or dirty data.
- To impart the ability to implement interactive web-based visualisation systems and assess their effectiveness.

F21SC Industrial Programming
- To develop proficiency in modern industrial programming languages such as C#, C++11, Python, PHP.
- To enable the elaboration and combination of system components in different languages;
- To enable an agile and flexible response to changes in industrial practices;
- To enable participation by industrial practitioners to provide context and applicability.

F21MC Mobile Communications and Programming
- To introduce the main problems of building networks with mobile computing devices and explain how current technology can overcome them.
- To introduce ad hoc networking and give an understanding of how its issues can be addressed.
- To introduce programmable mobile and handheld devices and develop skills in creating mobile apps.

F21AD Advanced Interaction Design
- To develop extensive, detailed and critical knowledge of requirements gathering, design and evaluation techniques in interaction design.
- To develop awareness of current research and emerging issues in the field of interaction design.
- To impart a range of specialised skills, and research methods involved in working with users.

F21BD Big Data Management
- To review principal abstractions, methods and techniques for the management of large and complex data sets (“Big Data”).
- To develop an understanding of the foundations and tools of the Semantic Web.
- To impart ability to appreciate critically a range of data integration solutions.

F21GP Computer Games Programming
- To develop appreciation of the history and types of computer games and the elements of game design and theory.
- To give an understanding of games physics, obstacle avoidance, path planning, group movement and learning and adaptation in games.
- To impart knowledge of current computer games tools and environments.
- To develop programming skills and techniques specific to the area of 2D and 3D computer games.

F21RO Intelligent Robotics
- To introduce concepts and techniques used in robotics and applications ranging from industrial automation to robotic companions.
- To impart understanding of the basic concepts used in evolutionary, swarm and other bio-inspired robotics.
- To impart understanding of the basic concepts used in developmental robotics and human-robot interaction.
- To give exposure to the main issues involved in building intelligent robot controllers.

F21CA Conversational Agents and Spoken Language Processing
- To impart extensive, detailed and critical knowledge of the design, implementation and evaluation techniques for conversational agents and spoken language processing.
- To develop an awareness of current research and emerging issues in the field of conversational agents and spoken language processing.
- To introduce a range of interdisciplinary research methods and specialised practical skills involved in building working conversational interfaces.

F21RP Research Methods and Project Planning
- To develop skills in critical thinking, research planning, academic writing and experimental design appropriate for a post-graduate programme.
- To enable students to gain skills in project planning and an awareness of legal, social, ethical and professional issues relevant for IT professionals.
- To enhance students' employability by development of job seeking and career planning skills.
### Entry Requirements

Applicants require a 1st or 2nd class honours degree or its equivalent with a substantial academic component of Computing or IT. Graduates with a little less than this may sometimes be admitted to the Postgraduate Diploma programme. If their exam and coursework performance is MSc level by May, they may then be recommended for transfer to the MSc.

Non-native English speakers must also satisfy the university’s requirements for competency in English. This can be done with an IELTS score of 6.5, an ECCE certificate, Pearson Test of Academic English 58, Cambridge First Certificate in English A or B, level C in academic English from our own English language teachers or by proving they have studied wholly in English at university level. A full range of English language training courses can be taken at Heriot-Watt University before starting a programme.

Applicants requiring sponsorship for a tier 4 visa to study in the UK via a CAS letter must also satisfy the UK Borders Agency’s minimum English language requirements. They are IELTS 5.5 in reading, writing, speaking and listening.

### How to apply

Apply online or using the printed form at

[www.postgraduate.hw.ac.uk/apply](http://www.postgraduate.hw.ac.uk/apply)

Supporting documents including 2 academic reference letters, copies of degree certificates, transcripts of marks and English test results can be sent to us by post or as colour scanned documents attached to an email.

### Contact information

Postgraduate Admissions  
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Earl Mountbatten Building  
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Heriot-Watt University, Riccarton, Edinburgh EH14 4AS SCOTLAND

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