ARTIFICIAL INTELLIGENCE
with SPEECH and
MULTIMODAL INTERACTION
MSc / PG Diploma

School of
Mathematical and
Computer Sciences

Full-Time / Part-Time

Distinctly Ambitious
www.hw.ac.uk
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 semester.

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>F21DL Data Mining and Machine Learning</td>
<td>F21CA Conversational Agents and Spoken Language Processing</td>
</tr>
<tr>
<td>F21SA Statistical Modelling and Analysis</td>
<td>F21RP Research Methods and Project Planning</td>
</tr>
</tbody>
</table>

Options:

- F21GA 3D Graphics and Animation
- F29AI Artificial Intelligence and Intelligent Agents
- F21BC Biologically Inspired Computation
- F21DV Data Visualization and Analytics
- F21SC Industrial Programming

Options:

- F21AD Advanced Interaction Design
- F21BD Big Data Management
- F21GP Computer Games Programming
- F21DP Distributed and Parallel Technologies

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.
SEMESTER 1 COURSES

F21GA 3D Graphics and Animation
- 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.

F21SA Statistical Modelling and Analysis
- To impart a range of statistical modelling and analysis techniques for data analysis and demonstrate their practical application.
- To develop the ability to deal with complex issues and make informed professional judgements about them using statistical models and analysis.

SEMESTER 2 COURSES

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 the 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.

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.

F21DP Distributed & Parallel Technologies
- To explore technologies and techniques underlying advanced distributed and parallel software development including distribution technologies, parallel program design and performance analysis.

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.

We may alter the courses offered at any time. Some courses may not run every year. Not every course combination may be possible to take. Students must satisfy each course’s prerequisites and their course choice must be agreed with the programme’s director.
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.

Honours graduates without relevant computing knowledge, who wish to retrain and become AI professionals, may like to consider doing our 2 year MSc in AI instead.

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 and in other ways. English language training can also be undertaken at Heriot-Watt University before starting the MSc.

How to apply

Apply online at

www.hw.ac.uk/study/apply/uk/postgraduate.htm

Supporting documents including 2 academic references, degree certificates, transcripts of marks and English test results can be uploaded digitally to the online application facility.

Contact information

Postgraduate Admissions
Room 1.24
Earl Mountbatten Building
School of Mathematical & Computer Sciences
Heriot-Watt University,
Riccarton, Edinburgh EH14 4AS SCOTLAND

+44 (0) 131 451 8444
+44 (0) 131 451 3327
MACSpgenquiries@hw.ac.uk
www.macs.hw.ac.uk/cs/pgcourses

Post-Study Work Opportunities in Scotland

Opportunities exist for students who graduate in a specialism in demand in the Scottish economy to get employment here. The Scottish government is keen to help talented individuals from around the world come to study, work and live here. More information can be found at www.talentscotland.com

Career Prospects

Graduates from this programme can expect to get employment with AI businesses, software houses, IT companies, R and D divisions of companies, financial services organisations, defence contractors or government IT agencies and as researchers or research students within universities.

Scholarships and Awards

International students can apply for a variety of scholarships from the Scottish executive, other bodies and our school. Please visit

www.macs.hw.ac.uk/cs/pgcourses/finance.htm#international

Scottish and EU citizens can apply for SAAS loans covering most of the fees. Please visit

www.saas.gov.uk

Other scholarships may be available from the university. Please visit

www.hw.ac.uk/study/scholarships/postgraduate-taught.htm

Employment

First destinations of some of our recent MSc graduates:

- Software Engineer, Ion Concept Systems
- Software Engineer, Logica
- PhD Computer Science, Heriot-Watt University
- IT Manager, NCS
- Database Administrator, Pension Fund Commission
- System Specialist, UBS AG (Bank)
- Test Engineer, IBM
- Systems Engineer, GEC Marconi Avionics
- Graduate Software Engineering, Thomson Marconi Sonar Ltd
- Computer Programmer, Bull Europe
- Software Consultant, Absoft
- Software Engineer, Thales (UK)

Cost

The Scots/UK/EU fee for this one year full time MSc programme at Heriot-Watt university in Edinburgh starting in September 2019 is £7168. The overseas fee is £18680. The cost of living during one year of study in Edinburgh is estimated at £10800.