F21/20CA

Conversational Agents and Spoken Language Processing

Course descriptor CA24-25

This course aims to give students the opportunity to develop:

- An extensive, detailed and critical knowledge of design, implementation and evaluation techniques for conversational agents and spoken language processing.
- An awareness of current research and emerging issues in the field of conversational agents and spoken language processing.

• A range of interdisciplinary research methods and specialised practical skills involved in building working

conversational interfaces. This course covers current and emerging topics in conversational agents, spoken language processing, and multimodal

• Introduction to research areas, such as spoken dialogue systems, multi-modal interaction, natural language processing, and human-robot interaction (HRI).

Spoken input processing and interpretation.

and evaluate their own end-to-end conversational agent. This generally involves using all components of a

- Interaction Management. • Output generation, multimodal fission, speech and gesture synthesis
- System development and evaluation.
- Assessment

interfaces, including:

conversational agent (speech recognition and synthesis, language understanding and generation, dialogue management) and integrating them into a demonstration system in some domain (e.g. providing information about a shopping mall, controlling an automated house, etc). Projects are assigned by week 3 (or earlier). Project groups contain up to 10 people. Masters students have an additional element of the mark given for the quality of the literature review and the level of critical analysis of the field demonstrated therein, and their understanding of the applicability of the technologies and methods used in emerging technologies and application areas. Each project group is expected to record minutes and agendas for each project meeting, these will be submitted as a supporting document for the final report. In summary, 15% is awarded for a project presentation mid course, 15% for the project demo, and 55% for the final report in week at the end of the course. Please see the course timetable for the week and hand in/presentation times.

The coursework is worth 100% of the mark, and is based around a technical project, where the students have to build

15% is also given for an individual self-assessment report. <u>Deliverables</u>

There are 4 main coursework deliverables:

1.Project presentation, mid course. This is a powerpoint and/or video presentation covering the following issues, and the class includes peer review of the proposed work, weighting 15%:

What components will it have?

- What will your system do?Example dialogues; screen shots / mock-ups.
 - Which tools / subsystems will you use?
- How will you evaluate it?

• What is the main research question / focus of the project?

- What are your different roles in the group project?
- Project plan for remaining of course.
- 2.Demonstration of your working system, week towards the end of the course weighting 15%
- This should show several dialogues in the chosen application domain, illustrating the main research issue and/or system component that is focused on.

3.A Research Report describing the technical project in the area of Conversational Agents. This will be submitted at

report should cover: Main research or technical question addressed

course end. Format is an ACL style 6-8 page conference paper, with appendices if relevant. Weighting: 55%. The

- Literature review / related work, including a critical analysis of the field, and commentary on applicability of the technologies and methods used in emerging technologies and application areas. Design and implementation of the system: components and architecture
- Evaluation of the system and presentation of results Suggestions for future work

4.Individual self-reflection report, weighting 15%

the work of your group?

have further implications on your degree.

the other members.

- You will upload the record of your project meetings as a set of minutes and agendas recorded for each meeting. These minutes are not assessed but used to help understand project team organisation and roles. An example of this
- record should be formatted is here: <u>Example Minutes Agendas.docx</u>
- A short individual report on work undertaken addressing the following questions:

1. How did you plan and manage your own work within the group?

- 2. To what extent did you independently solve problems and take initiative within the group? 3. How did you take responsibility for your own and other's work by contributing effectively and conscientiously to
- 5.Did you lead the direction of the group project or any aspect of it? 6.Critically reflect on your roles and responsibilities within the group, and the roles and responsibilities of

4. How did you actively maintain good working relationships with group members?

<u>Plagiarism statement for students:</u>

This project is assessed as group work. Readings, web sources and any other material that you use from sources other

than lecture material must be appropriately acknowledged and referenced. Plagiarism in any part of your report will

result in referral to the disciplinary committee, which may lead to you losing all marks for this coursework and may

<u>Lateness penalties</u>

https://www.hw.ac.uk/students/studies/examinations/plagiarism.htm

Standard university rules and penalties for late coursework submission will apply to all coursework submissions. See the student handbook.

Course Timetable

Monday AM:

Tuesday PM: ■ F20CA Project Group Meeting Time: 2pm, 2.30pm, 3pm ■ 30 mins supervision (wks 2,3,4,7,9,10,11,12)

Lecture + Demos + Lab [2hrs] Room: PGC1

<u>Timetable S1 - January (Edinburgh Campus)</u>

 Specific project meeting rooms will be allocated in week 1 Thursday PM:

WEEK 2

Time: 9-11am

■ Time: 9-11am

■ F21CA Project Group Meeting Time: 2-3pm Varying from [30 mins supervision+ 30 mins group meeting] (wks 2,3,4,7,9,10,11,12) to group only discussion (see below) Specific project meeting rooms will be allocated in week 1

Lecture + Lab

systems and conversational Supervisors will be agents. Intro to Natural availble in meeting rooms WEEK 1 Language Processing. System to give further details on architectures. project and project • Intro to Projects. Intro to requirements.

Lecture AS: Neural Response

language models

Student project demos/ reports +

Your demo presentation should be a

mixture of slides and video or a live

demo – recommended length about

in creating your system

• the main software / NLP

• what your demo is showing –

i.e. what your system's new

modules that your team has

the evaluation plan (and any

• how it could be improved /

future work roles of different

team members in the system

- the overall concept and aims of $_{F21CA\ 30\ min}$

• the main problems to be solved F20CA 20 min

Conversational Analysis

feedback session (ALL).

10 mins - used to explain:

your system

features are

worked on

results you have)

development

WEEK 12

FINAL

REPORT/INDIVIDUAL

REPORT Friday 4th APRIL

Project Management

Project Supervision: Report

Writing

Report Writing

Project Demo

• Deadline: student project report (minimum 6 pages, maximum 8

conference-paper style, use either the <u>latex template</u>, or <u>word</u>

of your project meetings as supporting documentation.

following questions:

group?

Submit via canvas

group members?

initiative within the group?

template. Send completed report by email as pdf to your project

pages: appendices and bibliography not counted in page count: ACL

supervisor by the report deadline. You must also submit the minutes

Deadline: Individual self-reflection report: Write a report (maximum)

1 page) on your experience of the group process answering the

1. How did you plan and manage your own work within the group?

3. How did you take responsibility for your own and other's work by

contributing effectively and conscientiously to the work of your

4. How did you actively maintain good working relationships with

and the roles and responsibilities of the other members.

5. Did you lead the direction of the group project or any aspect of it?

6. Critically reflect on your roles and responsibilities within the group,

2. To what extent did you independently solve problems and take

follower demo

system.

LLMs

Generation

Introduction GA, OL, MPA:

Intro to spoken dialogue

Teams. Project selection

• State of the art generative

All you need to know about

Tutorials

Project Selection

F21CA 30 min

F20CA 20 min

Project Management

Project Supervision: Progress

Assignments

Demo presentation description

WEEK 3	Lab: Ollama		
		F21CA 30 min	
	Lecture GA: Ethics/Safety and Response Generation NLG	F20CA 20 min	
		Project Supervision: Project Plan	
	Lab: Etnics Approvai		
		Review Task Allocation	
WEEK 4	Lecture OL: Understanding Natural Language in Context		
	Theory and methods for NLU.	F21CA 30 min	
	SLU, and pragmatic issues in	F20CA 20 min	
	language understanding. • How can we get machines to		
	understand what words	Project Supervision: Progress	
	"really" mean.	Project Management	
	Lab: Reading assignment class quiz and group discussion		
	Lecture GA: Evaluation and Data		
	Collection		
WEEK 5	evaluation methods	Groups meet without supervision manage project	
	crowdsourcing dialogue data		
WEEK 6 Consolodation	Lab: evaluation plan for each group		
Week	No Lecture	No Tutorial	
	Student Project presentations + feedback session (ALL)		
WEEK 7			
	Your presentation should cover:		
	What will your system do?Example dialogues; screen		
	shots / mock-ups.	F21CA 30 min	
	 What is the main research question / focus of the project? 	F20CA 20 min	
	• E.g. SLU, DM, NLG or?	Project Supervision: Progress	Project presentations
	• Which tools / subsystems will		
	you use? • How will you evaluate it?	Project Management	
	 e.g. User tests? Simulations? 		
	 What are your roles in the project? 		
	• Project plan – from week 7-12		
	Lecture OL: Dialogue Management		
WEEK 8	and NLG		
	• "what to say and how to say it"		
	in conversational systems.Reinforcement Learning		
	1 0	Groups meet without supervision manage project	
	 DM and NLG in the era of 	super vision manage project	
	LLMs		
	Lab/practical : RASA CALM: conversational AI with Language		
	models		
WEEK 9	Lecture MPA: Speech Technology		
	Text to Speech (TTS)		
		F21CA 30 min	
	Expressive TTSVoice Cloning	F20CA 20 min	
	Vocal Puppetry		
	Automatic Speech Recognition	Project Supervision: Progress	
		Project Management	
	PriniciplesTools		
	Lab: Using cloud ASR and TTS		
WEEK 10	Guest Lecture: Hazel Morton -		
	Speech Graphics		
	Augmenting conversational AI with animated digital characters		
	 Speech graphics' animation technology: our roots in the 		
		F21CA 30 min	
	 Animations and gestures as they apply to conversation 	F20CA 20 min	
	 Crafting conversational experiences with digital 	Project Supervision: Progress	
	characters		
	Applications and cases studies (I will share a few examples)	Project Management	
	from our Rapport clients across different verticals/use		
	cases)		
	Challenges and Opportunities		
	Lab: Speech Graphics Intro to Rapport		
	Lecture MPA: Conversational	F21CA 30 min	
WEEK 11	Interaction		
	m	F20CA 20 min	
WEEKII	Turn taking and Interruption Multi-speaker systems		

Course Team

Course Leader:

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<u>Course Team Members:</u> Oliver Lemon - <u>O.Lemon@hw.ac.uk</u> Gavin Abercrombie - <u>G.Abercrombie@hw.ac.uk</u> External Project Leaders: Alessandro Suglia - <u>A.Suglia@hw.ac.uk</u>

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