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 interfaces, including:

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

Assessment

The coursework is worth 100% of the mark, and is based around a technical project, where the students have to build and evaluate their own end-to-end conversational agent. This generally involves using all components of a 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. 15% is also given for an individual self-assessment report.

Deliverables

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 will your system do?Example dialogues; screen shots / mock-ups.
   - What is the main research question / focus of the project?
   - What components will it have?
   - Which tools / subsystems will you use?
   - How will you evaluate it?
   - 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 course end. Format is an ACL style 6-8 page conference paper, with appendices if relevant. Weighting: 55%. The report should cover:
   - Main research or technical question addressed
   - 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
   - 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: Example Minutes Agendas.docx
4. Individual self-reflection report, weighting 15%

   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 the work of your group?
   4. How did you actively maintain good working relationships with group 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, and the roles and responsibilities of the other members.

Plagiarism statement for students:

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 have further implications on your degree.

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

Lateness penalties

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

Course Timetable

Timetable S1 - January (Edinburgh Campus)

Time: 9-11am

Monday AM:

- Lecture + Demos + Lab [2hrs] Room: PGC1
- Time: 9-11am

Tuesday PM:

- F20CA Project Group Meeting Time: 2pm, 2.30pm, 3pm
- 30 mins supervision (wks 2,3,4,7,9,10,11,12)
- Specific project meeting rooms will be allocated in week 1

Thursday PM:

- 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	Tutorials	Assignments
WEEK 1	Introduction GA, OL, MPA: • Intro to spoken dialogue systems and conversational agents. Intro to Natural Language Processing. System Demo. • Intro to OpenAI. • Intro to Teams. Project selection system.	Project Selection • Supervisors will be available in meeting rooms to give further details on project and project requirements.	
WEEK 2	Lecture AN: Neural Response Generation • State of the art generative language models • All you need to know about LLMs Lab: Ollama	F21CA 30 min F20CA 20 min Project Supervision: Progress Project Management	Demo presentation description
WEEK 3	Lecture GA: Ethics/Safety and Response Generation NLG Lab: Ethics Approval	F21CA 30 min F20CA 20 min Project Supervision: Project Plan Review Task Allocation	
WEEK 4	Lecture OL: Understanding Natural Language in Context • Theory and methods for NLU, SLU, and pragmatic issues in language understanding. • How can we get machines to understand what words "really" mean. Lab: Reading assignment class quiz and group discussion	F21CA 30 min F20CA 20 min Project Supervision: Progress Project Management	
WEEK 5	Lecture GA: Evaluation and Data Collection • evaluation methods • crowdsourcing dialogue data Lab: evaluation plan for each group	Groups meet without supervision manage project	
WEEK 6 Consolidation Week	No Lecture	No Tutorial	
WEEK 7	Student Project presentations + feedback session (ALL) Your presentation should cover: • What will your system do? • Example dialogues; screen shots / mock-ups. • What is the main research question / focus of the project? • E.g. SLU, DM, NLG or ...? • What components will it have? • Which tools / subsystems will you use? • How will you evaluate it? • e.g. User tests? Simulations? • What are your roles in the project? • Project plan – from week 7-12	F21CA 30 min F20CA 20 min Project Supervision: Progress Project Management	Project presentations
WEEK 8	Lecture OL: Dialogue Management and NLG • "what to say and how to say it" in conversational systems. • Reinforcement Learning methods for optimising DM and NLG decisions • DM and NLG in the era of LLMs Lab:practical : RASA CALM: conversational AI with Language models	Groups meet without supervision manage project	
WEEK 9	Lecture MPA: Speech Technology • Text to Speech (TTS) • Expressive TTS • Voice Cloning • Vocal Puppetry • Automatic Speech Recognition (ASR) • Principles • Tools Lab: Using cloud ASR and TTS	F21CA 30 min F20CA 20 min Project Supervision: Progress Project Management	
WEEK 10	Guest Lecture: **Hazel Morton – Speech Graphics** Augmenting conversational AI with animated digital characters: • Speech graphics' animation technology: our roots in the games industry • Animations and gestures as they apply to conversation • Crafting conversational experiences with digital characters • Applications and case studies (I will share a few examples from our Rapport chatts across different verticals/use cases) • Challenges and Opportunities Lab: Speech Graphics Intro to Rapport	F21CA 30 min F20CA 20 min Project Supervision: Progress Project Management	
WEEK 11	Lecture MPA: Conversational Interaction Turn taking and Interruption Multi-speaker systems Incremental ASR Lab: Script follows demo Conversational Analysis	F21CA 30 min F20CA 20 min Project Supervision: Progress Project Management	
WEEK 12	Student project demos: reports + feedback session (ALL). Your demo presentation should be a mixture of slides and video or a live demo – recommended length about 10 mins - used to explain: • the overall concept and aims of your system • the main problems to be solved in creating your system • what your demo is showing? (e.g. *some system's new features are* • the main software / NLP modules that your team has worked on • the evaluation plan (and any results you have) • *how it could be improved* / future work roles of different team members in the system development	F21CA 30 min F20CA 20 min Project Supervision: Report Writing Report Writing	Project Demo
FINAL REPORT INDIVIDUAL REPORT Friday 4th APRIL			• Deadline: student project report (maximum 6 pages, maximum 8 pages: appendices and bibliography not counted in page count: ACL conference-paper style, see either the latex template, or word template. Send completed report by email as pdf to your project supervisor by the report deadline. You must also submit the minutes of your project meetings as supporting documentation. • Deadline: Individual self-reflection report: Write a report (maximum 1 page) on your experience of the group process answering 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 the work of your group? 4. How did you actively maintain good working relationships with group 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, and the roles and responsibilities of the other members. Submit via canvas

Course Team

Course Leader:

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Course Team Members:

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