INTELLIGENT INTERACTION DESIGN

Module Manual

Module 6 Technical Computer Science / Business & IT

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UNIVERSITY OF TWENTE.

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1. Introduction

This is the manual for the module Intelligent Interaction Design, module 6 of the bachelor programmes Technical Computer Science (TCS) and Business & IT (BIT). This module mainly is about designing and realizing interactive and intelligent systems and investigating the interaction between people and these systems. It includes a small component on intelligent systems in cyber security.

This document gives an overview of all *general* aspects of the module, such as the overall learning objectives, the module parts, assessment scheme, and organization and scheduling.

Further information that is specific for one part of the module (activities, learning objectives, study materials, assessment, assignments, etc.) will be provided by the teachers responsible for that course; also see the relevant content area in Canvas.

2. The role of the module within the TCS and BIT curriculum

This module provides an extension of your existing technological skills. Its main components are briefly introduced here, and in a bit more detail in Chapter 5.

The Statistical Techniques in this module build upon the knowledge of "Probability Theory" in M4. This course aims to introduce the basic topics in statistics: Descriptive statistics, Estimation (theory), Confidence intervals and Testing of hypotheses.

Artificial Intelligence & Cyber Security gives an introduction into the field and its basic formalisms and methods and their applications. The course offers knowledge and techniques for Logic (building upon Discrete Mathematics in M5), Search, Probabilistic Reasoning, Machine Learning (building upon what was introduced in M1) and applications of AI in Cyber Security. These foundational techniques are widely applicable. In this module they are applied in combined theoretical and practical tutorial sessions with weekly mandatory practical assignments connected to the AI theory of that week.

The Human Computer Interaction (HCI) component focuses on the process of designing technology solutions for specific users and specific task domains using a user-centered design (UCD) process. This builds upon the User Requirements topics from M4. In this module we add (among other things) academic skills for qualitative and quantitative user research. Topics include discovery, design, research methods and a general introduction to the field of human-computer interaction and value-sensitive design. You will learn about techniques of designing, evaluating and prototyping, then you will apply those techniques to your own group project.

3. Module team/contacts

You can find the office location and other details of these people under http://people.utwente.nl

Module coordinator

Randy Klaassen	r.klaassen@utwente.nl	

Assistant module coordinator

Jur van Geel	j.g.j.a.vangeel@utwente.nl	

Study adviser

Rianne de Jong (TCS)	studyadviser-tcs@utwente.nl	
Andrea Rijkeboer - van Gemert (TCS)	studyadviser-tcs@utwente.nl	
Sanne Spuls	studyadviser-tcs@utwente.nl	
Bibian Rosink (BIT)	studyadviser-bit@utwente.nl	

Artificial Intelligence & Cyber Security

Birna van Riemsdijk	m.b.vanriemsdijk@utwente.nl	Coordinator
Nacir Bouali	n.bouali@utwente.nl	
Estefanía Talavera Martínez	e.talaveramartinez@utwente.nl	
Andrea Continella	a.continella@utwente.nl	

Statistical Techniques

Fulya Kula	f.kula@utwente.nl	Coordinator
Valente Ramirez	v.ramirez@utwente.nl	
Katharina Proksch	k.proksch@utwente.nl	

HCI Design and Evaluation (including project)

Randy Klaassen	r.klaassen@utwente.nl	Coordinator
Lorenzo Gatti	l.gatti@utwente.nl	
Luc Schoot-Uitenkamp	l.schootuiterkamp@utwente.nl	
Sara Falcone	s.falcone@utwente.nl	
Jur van Geel	j.g.j.a.vangeel@utwente.nl	
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Jelte van Waterschoot	j.b.vanwaterschoot@utwente.nl	

4. Learning Goals

- The student can design, develop and evaluate low fidelity and high fidelity prototypes of an intelligent interactive system that is well justified in context.
- The student is able to take real users into account in the analysis, design, and evaluation of interactive systems with respect to both usability and user experience.
- The student can formulate a research question and answer it by choosing and applying various research methods, collecting data, analyzing the data using the appropriate statistical or other methods, and drawing conclusions from this.
- The student can explain and apply the main AI techniques concerning logical reasoning, search, Bayesian networks and machine learning.
- The student can compare different types of AI techniques and discuss their advantages and disadvantages.
- The student can recall the historical development of the AI field.
- After this course the student can apply a variety of statistical techniques, e.g. on results of a user`s survey, use SPSS properly and understand the meaning of statistical statements in papers.
- The student can reflect on the relationship between scientific research and design.

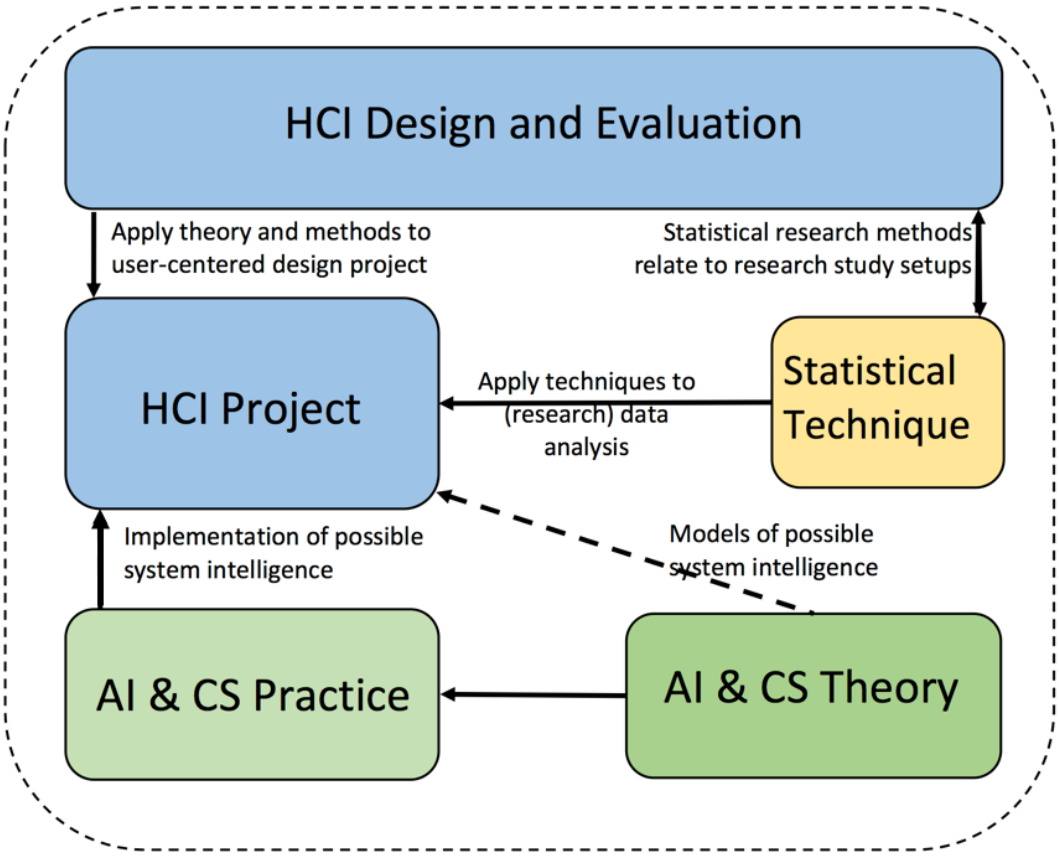
For more specific learning objectives of module parts, information will be provided by the responsible teachers via the respective Canvas areas.

5. Course Descriptions

The module consists of three courses, each with a theoretical and a practical part. This section provides a summary and brief explanations; for more detailed information about the different parts of the module, see the respective Canvas areas.

Units	**study load**
Intelligent Interaction (202001032)	12 EC
- Artificial Intelligence & Cyber Security *(theory)* *history and overview of AI, search methods, logic, probabilistic inference, Bayesian networks, machine learning, cybersecurity*	3 EC
- Artificial Intelligence & Cyber Security *(practice)* *practical assignments*	3 EC
- HCI Design and Evaluation *(theory)* *the theory behind the user centered design and evaluation of interactive systems, to be applied in the project*	2 EC

- HCI Project *(practice)* *user centered design, development and evaluation of an interactive system for users*	4 EC
Statistical Techniques (202001033)	3 EC
- Statistical Techniques *(theory and practice)* *statistical methods for data analysis*	3 EC
Total EC	**15 EC**



5.1. Artificial Intelligence & Cyber Security (theory and practice)

The AI approach taken is based on the concept of a rational agent which has to act (not only to think) in a (partially observable) environment. The following AI formalisms are covered: logical reasoning, search, reasoning under uncertainty, how an agent can learn from data, and how an agent can learn from interacting with the environment (reinforcement learning). In the practical part students work in groups of two on weekly practical assignments to design and implement intelligent systems using the techniques of the corresponding lecture.

5.2. HCI Design and evaluation (theory and project)

The Human Computer Interaction (HCI) component focuses on the process of designing technology solutions for specific users and specific task domains using a user-centered design (UCD) process. This builds upon the User Requirements topics from M4, adding (among other things) academic skills for qualitative and quantitative user research. Topics include discovery, design, information architecture, research methods, visual design and a general introduction to the field of human-computer interaction and value-sensitive design. You will learn about techniques of designing, evaluating and prototyping user interfaces, then you will apply those techniques to your own group project. The topic of group projects will be a match between pre-selected research areas and student interests as much as possible. Project work includes a proposal, discovery work, prototyping, preliminary user evaluation and communication of project ideas and results.

5.3. Statistical Techniques

Based on the knowledge of Probability Theory" in M4 the Statistics course aims to introduce the basic topics in statistics: Descriptive statistics, Estimation (theory), Confidence intervals and Testing of hypotheses. Apart from applying the techniques correctly we will focus on understanding: what is the meaning of the confidence level 95% of an interval and what do concepts as significance level, p-value and the power of a test mean?

After introducing the basics for one-sample-problems, where the normal or the binomial distribution applies, we will extend our techniques to two-sample-problems and cross tables. Assessing the assumption of a normal distribution with numerical and graphical methods, such as QQ-plots, is completed with a test on normality. For the case that the normal distribution does not apply we will discuss two non-parametric methods.

6. Prerequisites

We expect students (1) to be able to apply the basic rules of probability; and (2) to be able to program applications by writing and combining algorithms. No prior knowledge on Artificial Intelligence is expected.

7. Assessment Schedule, Grading, PASS/FAIL regulation

The table below provides the assessment schedule. Some general remarks:

- All tests and assignments are in English.
- A list of all module test dates and deadlines of assignments can be found on Canvas under "Syllabus"
- In line with the OER, we will make all test results available (and, if desired, provide an inspection opportunity) at least five working days before the resit.
- Retakes of written tests are open to all students, but may require signing up in order to estimate the number of participants.

202001031 Intelligent Interaction Design (TCS/BIT)						
Unit	Type of test(s)	Individual / Group	Weight within module part (%)	Minimum grade	Weight module part (%)	Resits
Intelligent Interaction CS/BIT (202001032)						
HCI Design & Evaluation	Written test 1	I	50	5.5*	17	Combined written test
	Written test 2	I	50			
HCI project	Project	G	100	5.5	33	Repair work last week
AI & CS Theory	Written test***	I	100	5.5*	50	Written test
AI & CS Practice	Practical assignments	G	5*Pass***	-	-	Repair work**** week 7-9
Statistical Techniques for CS/BIT (202001033)						
Statistical Techniques	Written test	I	100 – HWA grades x 5 **	5.5	100	Written test
	4 HWA grades count in the final result	I	5% each**			
	Use of SPSS	I	Pass			Repair work

*Of the grades indicated with * ONE is allowed to be below 5.5, but at least 5.0 (5.0 =< grade < 5.5) IF the weighted average of these grades is 5.5 or higher.

** IF grade of homework assignment > grade written exam

*** 5*PASS need to be obtained for the regular weekly assignments. IF the 6th bonus assignment is a PASS, it can be used to either 1) compensate for a FAIL in 1 of the 5 regular practical assignments, or 2) if all 6 practical assignments (week 2-6 + bonus) have a PASS, a 0.5 point bonus will be added to the exam grade of the AI theory part.

**** A maximum of 3 regular practical assignments can be handed for a repair opportunity. There is no repair opportunity for the bonus assignment.

7.1. Assessment details and timing per module part

Statistical Techniques Techniques is graded based on a written test in week 6 of the module, about the contents of the reader. There is a resit of the written test in week 10. There are four mandatory homework assignments (individual), to be handed in at the end of weeks 2, 3, 4 and 5. These also test the correct application of use SPSS; therefore they are obligatory and will be graded twice: (1) for the

use of SPSS: sufficient (+, pass) or insufficient (- : obligatory repair before the test), and (2) For the applications of statistical concepts and procedures a grade is assigned. The graded solutions are returned to the students; each of the homework-grades will count for 5% in the final result, where the grade only will be counted, if it is higher than the test result. Homework assignments that require a pass for SPSS can be repaired before the written test.

Artificial Intelligence & Cyber Security theory is graded based on a written test in week 7 of the module. There is a resit of the written test in week 10.

Artificial Intelligence & Cyber Security practice is graded with PASS/FAIL based on 5 practical assignments to be made during weeks 2-6, respectively. The practical assignment of week 1 is not handed in. There is furthermore a bonus practical assignment based on the material of week 1-6, which is to be made throughout these weeks Practical assignments are made in groups of two students and are handed in during the corresponding week. There will be opportunities to ask questions about both the practical assignment and the tutorial assignments (theory) during the weekly tutorial in week 1-6. To achieve a PASS grade for AI&CS practice, 5 out of 5 practical assignments need to have a PASS grade. If the bonus assignment is a PASS, it can be used to either 1) compensate for a FAIL in 1 of the 5 regular practical assignments, or 2) if all 6 practical assignments (week 2-5 + bonus) have a PASS, a 0.5 point bonus will be added to the exam grade of the AI theory part. There is no repair opportunity for the bonus assignment.

HCI Design & Evaluation is graded based on two written tests in weeks 5 and week 8 of the module (each covering a part of the study material, detailed on the corresponding Canvas area). There is a minimum grade for their 50%/50% weighted average (see table), but not for each individual test.

HCI Design & Evaluation is graded based on two written tests in weeks 5 and week 8 of the module (each covering a part of the study material, detailed on the corresponding Canvas area). There is a minimum grade for their 50%/50% weighted average (see table), but not for each individual test. There is a combined resit of the written tests in week 10.

The **HCI project** (carried out by groups of five students) is graded based on the report, prototype and possibly other final deliverables; details can be found in the “HCI Design & Evaluation course manual” on Canvas. Final deliverables need to be handed in in week 10 of the module. During the project, deliverables (draft versions of chapters of the report) must be handed in at regular intervals. Students will receive formative feedback on these deliverables; they are not graded. Individual students’ grades may deviate from the group grade based on a card system, which is explained in the project canvas area. If and how a project can be repaired is decided by the project coordinator in consultation with the project coach. The module ends with a Demo Market, where the interactive systems (prototypes) are demonstrated. All project groups and group members are expected to attend.

7.2. Redoing the project

Students who redo the module after having failed the module, but who already received a passing grade for the project, have the choice to either redo the project or participate in the project in an alternative role as peer reviewer. Peer reviewers provide feedback on the deliverables of a number of project groups. If they give feedback that is in time and sufficient quality (to be decided by the coordinator and the project coaches), the old grade of the project is re-used as the final grade for this year's HCI project.

7.3. Missed assignment deadlines or tests

If you are clearly unable to finish an assignment, ***contact the teacher or coordinator responsible for that assignment as soon as possible***. We want you to take your study seriously, but we are not necessarily unreasonable when you have clear and compelling reasons.

If because of illness or other personal circumstances you cannot attend a test, inform the study adviser and the module coordinator.

If, for any reason, such as illness or severe personal problems, you are more often unable to comply with the rules, please contact the study adviser to discuss your situation in a confidential setting:

Rianne de Jong (TCS)	studyadviser-tcs@utwente.nl
Andrea Rijkeboer - van Gemert (TCS)	studyadviser-tcs@utwente.nl
Sanne Spuls	studyadviser-tcs@utwente.nl
Bibian Rosink (BIT)	studyadviser-bit@utwente.nl

7.4. Fraud

In some module activities, for example assignments that involve working together with other students, the boundaries of what constitute fraud (plagiarism) may not always be clear. As a reminder, Chapter 11 of this manual includes some excerpts of the relevant regulations.

7.5. Repair options

There is no possibility to compensate test results with results from other modules.

In contrast to earlier years, the programme management of TCS and BIT have explicitly stated that there will be ***no*** resits or supplementary repairs for any of the courses in this module allowed outside of the regular resits indicated in the table at the start of this chapter.

Of course, in case of special circumstances it is always possible to make a request to the Examination Board. Make sure to motivate your request, explaining why you think you deserve an exception to the assessment rules. It is recommended to consult with the study adviser first.

8. Timeline

All module parts are scheduled in parallel. A list of all tests, assignments and deadlines can be found on Canvas.

The module ends with a joint Demo Market for TCS, BIT, and CreaTe, where the interactive systems (prototypes) developed in the HCI project are demonstrated. All project groups and all project group members must attend.

9. Communication in the module

For content-related questions, contact the teachers or coordinators of the relevant module part.

For questions concerning the organisation of the module, contact first Jur van Geel j.g.j.a.vangeel@utwente.nl and Randy Klaassen r.klaassen@utwente.nl

9.1 Canvas announcements policy

Announcements will not be sent by e-mail, but only published on Canvas, unless they are urgent (for example, in case of location changes or cancellations). Please check Canvas regularly for new announcements, or turn on the option that sends you an e-mail notification when a new announcement is posted.

9.2 Assignments on Canvas

Assignments or deliverables that need to be handed in via Canvas can be found in the content area of the relevant module part.

9.3 Publication of grades

Grades will be published on Canvas.

10. Study materials

Mandatory Books

- Artificial Intelligence: A Modern Approach: Global Edition (4th edition) Stuart Russell; Peter Norvig. ISBN: 978-1292401133
- Research Methods in Human Computer Interaction. ISBN: 9780128053904 (eBook in UB)

Mandatory Readers

- Reader Statistics for Engineers: Union Shop

Extra materials

- As provided via Canvas in the respective content areas

Mandatory software

- SPSS: this statistical package with free UT-license is available on the software site of UT. Download and use it on campus: at home you need a VPN-connection, but often correct downloading or using it fails. Any version is okay.

11. Fraud

Please be aware of the consequences of fraud as discussed in the Rules and Guidelines of the EEMCS examination board. The boundaries are not always clear, so before giving the formal definitions and consequences the section below shows a few borderline scenarios.

11.1. Scenarios

[This section has been reproduced from the module manual of M1 TCS, wk2, by Arend Rensink]

When it comes down to handing in assignments of this module, every year there are students who do not understand the borderline between, on the one hand, cooperating and discussing solutions between groups or individuals (which is allowed), and on the other, copying or sharing solutions (which is forbidden and counted as fraudulent behaviour). Here are some scenarios which may help in making this distinction.

- **Scenario**. Peter and Lisa are quite comfortable with programming and have pretty much finished the assignment. Mark and Wouter, on the other hand, are struggling and ask Lisa how she has solved it. Lisa, a friendly girl, shows her solution and takes them through it line by line. Mark and Wouter think 28 Week 2 – Pearl 001: Algorithmics they now understand and go off to create their own solution, based on what they saw. *Is this allowed or not?*

  Verdict. No problem here, everything is in the green. It is perfectly fine and allowed for Lisa to explain her solution, even very thoroughly. The important point is that in implementing it themselves and testing their own solution, Mark and Wouter are still forced to think about what is happening and will gain the required understanding, though probably they will not get as much out of it as Lisa (explaining stuff to others is about the best possible way to learn it better yourself!)

- **Scenario**. The start is as in the previous case. However, while Mark and Wouter implement their own solution, inspired by that of Lisa, some error crops up which they do not understand. Lisa has left by now; after they mail her, still trying to be helpful she sends them her solution for them to inspect. They inspect it so closely that in the end their solution is indistinguishable from Peter and Lisa's, except for the choice of some variable names and the comments they added themselves. *Is this allowed or not?*

  Verdict. This is now a case of fraud. All three are at fault: Lisa for enabling fraud by sending her files (even if it was meant as a friendly gesture) and Mark and Wouter for copying the code.

Peter was not involved, developed his own solution (together with Lisa) and is innocent.

- **Scenario**. Alexandra and Nahuel are not finished, and the deadline is very close. The same holds for Simon and Jaco. On the Friday night train home, Jaco and Nahuel meet and during the 2-hour train ride work it out together. They type in the same solution and hand it in on behalf of their groups. *Is this allowed or not?*

  Verdict. This is also a case of fraud. Actually there are two problems here. The first is that both Nahuel and Jaco handed in code on behalf of their groups that had been developed by them alone, without their partners. This is unwise and against the spirit of the assignment (Alexandra and Simon also need to master this stuff!) but essentially undetectable and not fraudulent. The second problem is that the solution was developed, and shared, in collaboration between two groups; this is definitely forbidden. All four students are culpable; Alexandra and Simon cannot hide behind the fact that they did not partake in the collaboration, as they were apparently happy enough to have their name on the solutions and pretend they worked on it, too.

Note that we are not on a witch-hunt here: let us stress again that cooperating and discussing assignments is OK, even encouraged; it is at the point where you start copying or duplicating pieces of code that you cross the border.

11.2. Plagiarism

One important type of fraud is plagiarism: using someone else's work or your own work without a proper citation. What counts as plagiarism is officially defined in the students' charter, p. 22/23:[2]

Academic misconduct

(...) Plagiarism includes, but is not limited to:

- Copying or using (parts of) other people's work (original terms, ideas, results or conclusions, illustrations, prototypes) and presenting it as one’s own work; in addition using parts of another text (printed or digital) without referencing (also if minor changes have been made), is considered to be plagiarism;
- Using visual and/pror audio materials, test results, designs, software and program codes without referencing, and presenting that as one’s own original work;
- Using verbatim citations without clear referncing or without a clear indication of quotation (e.g., by omitting quotation marks, indentation, empty lines, etc.) and thereby creating the falsE impression that (part of) these citations is/are one’s own original work;
- Referring to literature that one has not read oneself (e.g. using references taken from someone else’s work);
- Using texts that have been written in collaboration with others without explicitly mentioning this to be the case;
- Submitting work that has already been published in whole or in part elsewhere (e.g. work from other courses or educational programmes), without references to the original work.

Fraud [furthermore] includes but is not limited to:

- Manipulating research data in (group) assignments;
- Falsifying data (for example, by filling in questionnaires or answering interview questions oneself);
- 'Free-riding': i.e. not or hardly contributing to a group assignment.

11.3. Possible consequences

What happens if you are suspected of fraud is explained in Appendix 4 of the Rules and Guidelines of the EEMCS examination board. [3]

1. If academic misconduct is suspected, the exam supervisor or examiner informs the student about the observed irregularities, collected evidence if applicable, procedure for reporting the misconduct to the subcommittee and suspends marking pending investigation.

2. In case of observed irregularities during a written test, after being informed by the exam supervisor or examiner the student may continue the test or choose to stop; in the latter case, the work should be handed over to the exam supervisor.

3. The exam supervisor or examiner writes a (brief) report describing the assignment, his/her findings, the student(s) involved and the circumstances and if applicable proof of evidence. This report is submitted to the subcommittee. The subcommittee will address this report in the next subcommittee meeting.

4. The student(s) and the exam supervisor will be given an opportunity to be heard by the subcommittee. In case the student admits the committed misconduct upfront, a hearing may not be necessary.

5. After the hearings, the subcommittee will determine whether academic misconduct has occurred and what measures will be taken.

6. In principle, the student will be informed of the decision no later than 6 weeks after the suspicion of fraud has arisen. Exceptions can be made in complicated cases that need further investigation by the subcommittee**.**

[2] https://www.utwente.nl/en/ces/sacc/regulations/charter2021.pdf

[3] https://www.utwente.nl/en/eemcs/education/rules-guidelines/rg/21-22-final.pdf

12. Evaluation

12.1. Formal evaluations

The CEEP[1] will organize a number of evaluation panels; details will be communicated with students in the module. If there are any issues that you want to be discussed, you can contact them through the regular channels[2]. At the end of the module the standard UT SEQ evaluation survey will be conducted. The results of these evaluations will be used to write an improvement plan for next year's edition.

12.1. Summary of Improvement plan for 2021/2022

A detailed analysis of the exact modifications and the reasoning behind these is available upon request. In short, the main modifications of this module with respect to the previous edition are as follows:

HCI: selected problem domains for the project, 2 extra tutorial groups, more support for tutorial sessions.

Feedback mechanism for peer reviews if review was sufficient.

- HCI Design & Evaluation: selected problem domains for the project to help groups to define their own topic, 2 extra tutorial groups, more support for tutorial sessions.
- AI: addition of an overarching 6th (bonus) practical assignment to connect the various parts of the course; more elaborate introduction of different types of AI techniques and explicitly connecting to these in the respective weekly lectures; The lecture covering neural networks will be adapted to give students the required theoretical background to design and implement their own neural network; assignment 4 will be extended to cover neural networks in addition to the previous reinforcement learning exercises;
- Statistical Techniques: One extra teachers, better prepared to grade exam, redesign of workload over the weeks.

12.2. Other

Informal evaluations can be organized by the teachers in this module. Any feedback can be sent to the assistant module coordinator (j.g.j.a.vangeel@utwente.nl). Students can request an evaluation with a teacher. Students can also approach the educational officer of the study association, Inter-Actief, to provide informal feedback.

For urgent problems that come up during the module, send mail to j.g.j.a.vangeel@utwente.nl and r.klaassen@utwente.nl

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2 ceep-cs-bit@utwente.nl