Report - DD2423 - 2024-08-20

Respondents: 1
Answer Count: 1
Answer Frequency: 100.00%

Please note that there is only one respondent to this form: the person that performs the course analysis.

Course analysis carried out by (name, e-mail):

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DESCRIPTION OF THE COURSE EVALUATION PROCESS

Describe the course evaluation process. Describe how all students have been given the possibility to give their opinions on the course. Describe how aspects regarding gender, and disabled students are investigated.

The most valuable tool for evaluation is the questionnaire at the end of the course. The questionnaire is intentionally placed right after the exam results are published to allow the students to comment on the exam corrections. However, given that two months have then passed since the last lecture, it might be better to have the questionnaire earlier, since students might already have forgotten some of their impressions from the course. This could explain why the number of students responding to the questionnaire was limited to only 14, a number that has unfortunately decreased in recent years. Computer science and machine learning students can also provide feedback through the program integration courses DD2300 and DD2301. The lecturer is a mentor in DD2300 for about 35 students in the autonomous systems and data science tracks, many of whom attend the course. Aspects related to gender are evaluated through the questionnaire, which includes average responses reported by gender. Students with disabilities who require individualized exam procedures are asked about the course in connection to the exam.

DESCRIPTION OF MEETINGS WITH STUDENTS

Describe which meetings that has been arranged with students during the course and after its completion. (The outcomes of these meetings should be reported under 7, below.)

The course round this year was run in hybrid mode, with lectures on campus, but broadcasted through Zoom for those who could not physically attend. Students met the lecturer and teaching assistants during 16 seminars (13 lectures and 3 exercise sessions), three individual lab presentations and weekly lab help sessions. The only planned individual meetings were those related to the labs, all online in Zoom. However, students are always encouraged to ask questions related to the course either in Canvas, in connection to the lectures or after exams are corrected and returned. Many of these questions are later brought up during the lectures.

COURSE DESIGN

Briefly describe the course design (learning activities, examinations) and any changes that have been implemented since the last course offering.

The course is an introductory course in image analysis and computer vision. It covers mature areas such as image filtering, enhancement and reconstruction, feature detection and extraction, shape representation, image segmentation, object recognition, as well as stereo and motion analysis. It contains 16 seminars, out of which three are dedicated to exercises, repetition and open questions. Even if the course is heavy on theory, the focus is to make students learn how to do image analysis in practice, something that is done in three labs, one on image filtering, one on edge detection and line extraction, and the last one on image segmentation. Labs are examined by interviewing students individually, with directed questions assessing their understanding of the underlying concepts behind the labs, more than the results of the labs per se. The theoretical part of the material is examined through an online quiz and a final written exam. Even if the lab course is worth more in terms of credit points, the exam has a higher influence on the final grade, given that grades are computed as an average of the lab and exam grades, but rounded towards the exam grade. The reason for that is the fact that theoretical aspects from the labs also end up on the exam and the exam is the last activity of the course. If a student misunderstands an important concept during the labs, the lab presentation can provide feedback in time for the exam.

For students to get an idea of how much in-depth they are expected to study the material, the course also contains a weekly voluntary quiz. Since the course is introductory it spans the whole field of computer vision and the amount of available literature is vast. A second reason is to focus on essential concepts that are often misunderstood. Quiz questions are often phrased such that incorrect answers easily lead to cognitive dissonance when an explanation is given at the end. Finally, the quiz gives the lecturer feedback on what should be reiterated during lectures.

Given that the course went through a major revision last year, with every single slide updated or changed, few changes were made for this course round. Incremental improvements were made, however, with topics presented in a slightly different order to make it more logical and more recent computer vision methods added, especially in the final lectures. A motivation for the limited changes made in this course was that with too many changes made in the same course round, it might be hard to know where real improvements need to be made for future course rounds. It takes a while for the dust to settle and for true weaknesses to become apparent. Another change made last year, which was repeated this course round, was the introduction of a grade E quiz. The only difference was that the set of available quiz questions had been extended, with earlier ambiguous questions updated or removed. Just like last year every individual answer was manually validated, but only in a few cases, scores had to be adjusted due to ambiguities. The motivation was to promote continuous learning, spread examination over time and make the written exam more focused on problem-related questions. After passing the quiz, students were thus given the choice of whether to attend the written exam for a higher grade. Unfortunately, almost half the students decided to skip the exam, which is more than expected and a potential problem in the future.

Given that several students had requested it before the course started, students could attend lectures either on campus or through Zoom. However, only recordings from the previous course round were made available, due to the limited changes in the material since then. It should be observed that with lectures being both recorded and available in Zoom, sessions are less likely to be as interactive as they could otherwise have been since students are less likely to spontaneously ask questions online than in a lecture hall. When it comes to the labs, students had the choice to either use Matlab or Python, where the majority seem to use Python. Given that students come from around 15 different programs, some of which have limited programming experience, Matlab is still valuable to have as an alternative. While lab presentation sessions were densely scheduled during the last days of each lab week, help sessions were more sparsely spread over the whole period giving students and TAs more flexibility for more spontaneous meetings. To benefit fully from spontaneous online meetings in Zoom, there were some Q&A sessions at the end of the course, during which students could ask any question related to the course.

THE STUDENTS' WORKLOAD

Does the students' workload correspond to the expected level (40 hours/1.5 credits)? If these is a significant deviation from the expected, what can be the reason?

The reported course load was everything from 9 to 32 hours a week, which is a very large spread. This is possibly due to differences in levels of ambition and backgrounds of students. Students come from many different master's programs, many of which include less mathematics and programming than others. The median workload of 17 hours a week is closer to what one might expect.

THE STUDENTS' RESULTS

How well have the students succeeded on the course? If there are significant differences compared to previous course offerings, what can be the reason?

Most students successfully completed the course, but there are always a number of students that, depending on background, find either the laboratory exercises or the mathematically oriented exercises on the exam difficult. Out of 140 (169) registered students, 111 (138) passed the lab course, 128 (155) passed the exam, and 111 (138) passed the course as a whole. This is based on numbers recorded in Ladok, which might vary from those in Canvas that include doctoral students and re-registered students who failed to complete the course during an earlier course round. The numbers in parentheses are from the previous course round. Similar to last year, due to the introduction of a quiz for grade E, more students got an exam grade and were able to complete the course, compared to earlier years. However, it should be observed that almost half the students decided not to attend the written exam at all, but settled for a lower grade. It should also be noted since the course is an elective course for most students, the number of students passing the course might vary considerably from year to year, depending on the number of alternative courses given in the same period. The course has a relatively large number of exchange students, 20 in this course round.

STUDENTS´ANSWERS TO OPEN QUESTIONS

What does students say in response to the open questions?

Given the large and diverse group of students, students have different opinions on the course, even if most students enjoy the course as a whole. Some find the labs too easy, while others find the programming parts difficult. The same is true for the more mathematically oriented exercises and exam questions. It is clear that most students enjoy the labs and appreciate that they can be done in either Matlab or Python. Most students also seem to like the lectures, but some students believe the content is too extensive.

SUMMARY OF STUDENTS' OPINIONS

Summarize the outcome of the questionnaire, as well as opinions emerging at meetings with students.

Students were in general positive in their comments, especially regarding the labs, which have always been appreciated despite being heavy and requiring a lot of time. They also liked the online quiz with conceptual questions that was introduced to allow the exam to focus more on problem-related questions. After removing or rephrasing questions which were thought to be too ambiguous last year, students this year did not seem to have any problem completing the quiz within the 30 minutes given. When asked specifically whether to keep the quiz or not, almost all students responded that they wanted to keep it, but two students suggested having the quiz and written exam on the same day. While being positive in general, students had several recommendations for future course rounds. Some students believe more exercise sessions are needed to prepare for the mathematical problems on the exam, e.g. earlier exams solved on the whiteboard. Some students want more labs that include deep learning, while others want to keep the same labs as before and even reduce the amount of time spent on deep learning. Students also suggest improving the grading, especially for the labs, to make grades more fair and transparent.

OVERALL IMPRESSION

Summarize the teachers' overall impressions of the course offering in relation to students' results and their evaluation of the course, as well as in relation to the changes implemented since last course offering.

This is the second year that we had a compulsory online quiz for grade E, a grade that can be improved by later attending the written exam. The hope is that with such a quiz, students are encouraged to also complete the weekly voluntary quizzes and thus learn more during the whole course, instead of the weeks just before the exam. This also seems to be the case, since given the statistics, more students seem to complete the quizzes. What is concerning though is that after receiving a passing grade, only about half the students also attend the exam, which could mean they learn less than before. However, for different reasons, a written exam has always been a problem for some students. With the new option, a larger fraction of students receive an exam grade than before and complete the course. On the other hand, the course has not necessarily become easier to pass, given that students typically spend considerably more time on the labs than on the exam. There is a risk though that students learn to exploit weaknesses in the examination. With an online quiz, it is certainly possible to cheat. There is a risk that students collaborate, even if they are not allowed to. However, since questions come from a large pool of questions, the overlap in questions between two students should be relatively small, which makes collaboration less beneficial.

Since many courses nowadays include deep learning and deep learning has become so important for computer vision, the question of where to strike the right balance between deep-learning-based and traditional methods will remain in the course. Some students argue that the course involves too much mathematics and geometry, forgetting that image projections, transformations and stereo geometry, which involve solving large systems of equations, will always be an important part of the subject. In areas that involve reasoning in 3D space, it is questionable whether deep learning will ever dominate, other than for solving subproblems such as feature learning and matching. The course has been updated with recent developments in mind and will be updated in years to come, but the focus will remain on fundamental problems in computer vision, not on deep learning per se. It is also worth noting that our course already today has quite a lot of deep learning, compared to computer vision courses at other universities.

ANALYSIS

Is it possible to identify stronger and weaker areas in the learning environment based on the information you have gathered during the evaluation and analysis process? What can the reason for these be? Are there significant difference in experience between:
- students identifying as female and male?
- international and national students?
- students with or without disabilities?

Possibly because most changes this year were incremental and aimed at improving the execution of the course rather than the content, the scores on the points in the questionnaire notably improved, with a spread from 4.6 to 6.8 and a median of 6.3, where the maximum score is 7.0. One of the two weakest points was "20. I had opportunities to influence the course activities" (4.7), which keeps being relatively low despite the introduced choice between Python and Matlab for the labs and the option to ignore the exam, after completing the online quiz. It could be that the students believe the question implies some more direct influence on course activities, but with a large group of about 150 students, everything has to be streamlined to be manageable. There are few opportunities for individual choices, regardless of how a course is set up, at least given a limited pool of available TAs. Another weak point was "5. I felt togetherness with others on the course" (4.6), which has rarely been an issue other than during the pandemic. The fact that lectures can be attended in Zoom, with all lab sessions also in Zoom, could be a reason behind this score, together with the fact that many exchange students are attending the course. The two highest scores were for the points "1. I worked with interesting issues" (6.8) and "10. I was able to learn from concrete examples that I could relate to" (6.8). There was no significant difference in assessment between the international students and students from KTH or differences due to gender. However, given the limited number of students responding to the questionnaire, it is hard to tell for sure.

PRIORITIZED COURSE DEVELOPMENT

What aspects of the course should be developed primaily? How can these aspects be developed in short and long term?

It is important to learn from earlier years and gradually refine the course. There is still more to be learned from the online quiz to possibly develop new alternative forms of examination. It would be unfortunate, if even more students decide not to attend the exam, despite then receiving a lower final grade. Something that could easily be changed for next year is to provide a mathematical refresher early on in the course so that students are better prepared for the exercise sessions and eventually also for the exam. Students have typically studied analysis, algebra, statistics and numerical methods early in their education, but might have forgotten since then. One possible change next year could also be an alternative third lab, a lab on feature matching and 3D reconstruction using stereo geometry. This is an area that despite advances in deep learning will remain relevant. In the future one should preferably have two different courses, one in image processing and analysis, and one in computer vision for real-time systems, given that the student group is so diverse. Since this is not possible with current teaching resources, alternative methods should instead be explored, such as more alternative labs or possibly projects.