Report - DD2423 - 2023-10-12

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 also comment on the exam correction. 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 possibly explain why the number of students responding to the questionnaire was limited to only 26 students, which is similar to earlier 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, which were all online in Zoom. However, students are always encouraged to ask questions related to the course either in Canvas, in direct 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.

Making lectures available in Zoom was not originally planned, but something that a considerable number of students requested early on. There are both pros and cons. 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 whole field has changed over the years. With the introduction of deep learning in particular, some subjects are nowadays of less interest to practitioners. With this in mind, a full revision of the course was made this year. Every single lecture slide was updated, with some material being either discarded or replaced. Material related to image enhancement and segmentation was considerably shortened and replaced by two new lectures, an introduction to deep learning and a new lecture on novel view synthesis. Since the school has other courses in deep learning, the goal was to focus on traditional methods of computer vision that are just as relevant today, as they were before deep learning was introduced. Whereas the first two-thirds of the course included little deep learning, the remaining one-third was dominated by deep learning.

Another significant change in the course was the introduction of an online quiz for grade E. Quiz sessions were held in Zoom during the last week of the course. Students were expected to respond to 15 randomized quiz questions during a 30-minute period. There were two motivations for such a change, to promote continuous learning throughout the course and convince more students to complete the voluntary quizzes during the course and to relieve students from some of the burden they experience when preparing for the exam by allowing them to focus on more problem-related questions.

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 6 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 14 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 169 (156) registered students, 138 (120) passed the lab course, 155 (126) passed the exam, while 138 (117) passed the course as a whole, based on numbers recorded in Ladok, which might vary from those in Canvas that include doctoral students and re-registered students that failed to complete the course during an earlier course round. The numbers in parentheses are from the previous course round. It seems that with the introduction of an online quiz for grade E, more students got an exam grade and were able to complete the course, compared to the year before. However, it should 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, compared to 5 during the pandemic the year before.

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 when it comes to 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, even if some students thought the quiz questions were too difficult given the short time available. However, due to the introduction of the quiz, students were now given a choice between doing only the quiz for a grade E or also completing the exam for a higher grade. While being positive in general, students had a number of 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 and more advanced labs, but other students believe the labs to already be too heavy. Even if most students like the fact that we use Zoom for labs, face-to-face meetings could be preferable in cases of language barriers and disabilities. Other recommendations are to include more illustrative examples possibly using simulations and allow for more interaction during lectures. Even if the course has been redone with recent deep-learning-based methods in mind, some students request even more deep learning and less traditional computer vision.

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 year the exam grade had two components, an online quiz for a grade E and a written exam for a higher grade. With this change, students were encouraged to do the voluntary weekly quizzes for instant feedback, instead of waiting until just before the exam. They were also given the choice to aim for a higher grade or not. In one way or the other this division in assessment ought to remain as part of the course, even if there are a number of potential weaknesses. There is a possibility that students learn less by skipping the exam altogether. However, the most rewarding part of the course will always be the labs and these are still assessed individually. Furthermore, even when the course contained only an exam, collecting enough points for a grade E probably required less effort than preparing for the new online quiz. Another concern is the risk of cheating. This is the reason why the amount of time given is only 30 minutes. The questions are expected to be quick concept questions. Either you know the answers or not. Students could possibly collaborate, but since questions come from a large pool, the overlap in questions between two students is relatively small.

There is an interest in seeing even more examples of more recent deep learning-based methods in the course, which in practice would mean less coverage of more traditional methods. Part of this could be due to a change in the impression of what computer vision as a subject should contain. 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?

Compared to earlier years, the scores on the points in the questionnaire reverted to what they were before the pandemic, with a spread from 3.9 to 6.3 and a median of 5.5, where the maximum score is 7.0. The weakest point was "20. I had opportunities to influence the course activities" (3.9), 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. However, for a large group of more than 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 "14. I received regular feedback that helped me to see my progress" (4.2). This is very similar to the score before the voluntary weekly quizzes for instant feedback were introduced, possibly because feedback from an online quiz is less effective than feedback from a teacher or TA. The two highest scores were for the points "6. The atmosphere on the course was open and inclusive" (6.3) and "16. The assessment on the course was fair and honest" (6.3), which have always been high in the course. There was no significant difference in assessment between the international students and students from KTH or differences due to gender. Exploiting the benefits of Zoom for more online lab assistance and Q&A sessions seems to be much appreciated by most students, but it should be kept in mind that face-to-face meetings might still be preferable for some students, such as students with hearing difficulties or other disabilities.

PRIORITIZED COURSE DEVELOPMENT

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

Given that the course went through quite a number of changes this year, it should not be changed too much next year, since it always takes a while to understand the pros and cons of the changes you make. Too many changes in a course can easily lead to one or two years of chaos, which is not to the benefit of students. However, one possible change next year could 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 always 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 and optional exams for higher grades.