SF2524 Matrix computations for large-scale systems
7.5 ECTS

Course data

- Study period 2. Exam in January.
- Lectures: 12
- Short videos: 64
- World cafés sessions: 3
- Homeworks (3): corresponding to 3.5 ECTS
- Exam: corresponding to 4 ECTS
- Students: 30 registered in CANVAS
- Four blocks
  - Eigenvalue problems
  - Linear systems
  - QR-method
  - Matrix functions
- Course feedback. "Middle of the course survey", "Course evaluation"
- Learning activities:
  - Lectures
  - Homeworks
  - World café
  - Short videos lectures
  - CANVAS Quizzes

Aim

In this course we will learn some of the most common numerical techniques and algorithms used to efficiently solve problems expressed using large matrices. We focus on detailed understanding about the performance of these methods when they are applied to large-scale systems and study topics such as convergence, accuracy and efficiency.

Changes compared to last year

Main change: Short video lectures were recorded, and the world café was introduced. The ALW was removed due to too many different activities. As usual, more written material was added in the course compendium.

Short videos. The short videos (50 new videos 14 from previous year) were used as follows:

- As a part of **quizzes**: Wvery week has a couple of quizes. Every quiz is coupled to a video and questions about it.

- Watched during **lectures**: Most derivations were recorded and many were watched during lectures

- Summary requested in **homeworks**: Students are supposed to write summaries of some of the videos.

World café: Students work in groups with predefined problems. The student groups are decided beforehand and there is a rotation every 25 minutes.

Summary of comments from students:

The middle of the course student comments and the course evaluation were mostly very positive. The use of the world café was interpreted as good, also in comparison to the ALW which some students had in SF2526. The videos were seen as an efficient way of learning, as a) preparation for lectures, b) watch during lectures, and c) as repetition material. Overall an appreciation for the work that has been invested in the course material, e.g. videos. Some students felt sometimes the order of the videos, in relation to lectures was a bit off, in particular for the proof of the QR-method. Some students felt it would be even better if I some derivations would be on the white board as I explain things slower when I do it live. Students request more real-life and bigger-picture examples.

Conclusions

As a teacher, I am pleased with the level of understanding. The students seem to feel the course is between medium in difficulty (previous year medium to difficult). Since the material has not changed, I interpret this as the teaching style has improved.

The use of videos seems to work. Students felt it was an efficient way to learn. The work-load for me as a teacher was very high due to the recording of the videos, but the actual lectures were more relaxing than usual. Next year only minor changes in videos are needed.

For next year I will definitely reorganize some of the videos. The suggestion to do some derivations of the white-board will be considered, although I do like the idea that the white board is only used for side-remarks.

From the perspective of learning, the world café seemed successful and also perceived as "fun". The participation on average was 30%. The world café required a lot of preparation time for me as a teacher to come up with questions, but the atmosphere at the world café was relaxed.

Responses:

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Middle of course survey: *5 responses*

I think the usage of videos in the course in- and outside the class room is great

I went to the world cafe and found it useful. I think the labs so far have been a good way to learn and grasp the material

The large number of videos is a great feature of this course. On the one hand, the student learns the basic concepts directly from the video by both reading and listening, which help the learning process. On the other hand, it also helps to check unclear topics faster and more efficient than reading from the notes. However, I would prefer less videos during the lectures in order to boost the student to go attending lectures.

Homeworks deals with every topic seen in the lectures, so they represent a great tool to learn. Moreover, the difficulty level is well calibrated.

The word cafès are a great idea! They helps the student a lot by both doing and discuss with other students.

Selection of comments.

Message to students next year.

I recommend taking notes, especially since in this course the material comes in different forms, and it might be harder to structure and put in right order otherwise.

Very interesting course, with high quality education from the teacher. Questions are answered with strong technical background and proofs.

It is great if you have time to watch some of the video content connected to the lecture before the actual lecture as it helps with the understanding of concepts a lot. World cafés was super helpful as well!

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Further messages to the teachers.

I had a very good learning experience in this course. Thank you Elias for your passion, advanced explanations and pedagogy.

I liked this course and I thought it was interesting. Something that can be brought up even more are different applications and when/how/what all of these methods and algorithms can be used for, some further real-world and bigger-picture context. In my opinion, it is easier to learn if you know more why you are learning these specific things. Maybe also a discussion forum could be available, were you can ask questions that everyone can see and answer because sometimes you struggle with the same things.   I think the world cafés

should be kept, and I also liked the block-structure with lecture, world café, homework. Since the material contains a lot of details and specifics, I think the repetition you get from the world café and homework is good for learning.   I really felt like you guys were there to help, and wanted to answer questions about the material and homeworks and help in the learning. I have many times at KTH felt like I have to find all the answers on my own.