SF2524 Matrix computations for large-scale systems
7.5 ECTS

Course data

- Study period 2. Exam in January. Lectures: 15. Exercise sessions: None
- Homeworks (3): corresponding to 3.5 ECTS
- Exam: corresponding to 4 ECTS
- Students: 21 on exam, 31 on CANVAS, 80% pass (of those who took the exam)
- Four blocks
  - Eigenvalue problems
  - Linear systems
  - QR-method
  - Matrix functions
- Learning activities:
  - Lectures (with black-board, slides and live programming)
  - Homeworks
  - Course training area (moderated wiki) collected into exam prep problems
  - Online video demos
  - Quizzes (with videos)

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

More written material was added. In particular, a background.pdf was extended to include things that were covered in basic linear algebra courses (but the students do not have fresh). This was complemented with an optional quiz on that material. The background quiz seemed successful.

The course training wiki was also viewed as successful. As a comment from last year, there we had an exercise about the wiki. We included this, but hardly anyone showed up. We will use a different setup next year.

The course material are now self-contained based on the teacher written PDF-files. References to the text book by Trefethen were given for further reading.

Several minor things were updated in homeworks.

This year had a substantial increase in number of partitipants.

Conclusions

Overall the teacher is satisfied with the achieved level of understanding. The students results on exam and homeworks were satisfactory from teachers perspective. Only 6 students filled out the course evaluation, but the answers were consistent with the teachers view of the course.

Some comments from evaluation and during course comments

- The live coding part [was the best thing with the course].
- The variety of ways to learn: lecture notes, quizzes, wiki [was the best thing with the course]
- Interesting issues and new-thinking teaching [was the best thing with the course]
- Some videos where in low quality. Sometimes hard to see what was being written. I would like the videos content also in pdf format like for the blocks
- One of the best courses I have ever taken
- Both teachers were very helpful with any questions or issues I had during the course.
- Interesting subject. Combination of theory and laborations, not just theory.
- Matrix functions and their uses were mostly new to me, and very interesting. In other courses I had already encountered CG and GMRES – so seeing something so different and versatile was eye opening.

For next year

We will certainly continue and develop the course. Some parts of the written PDF-files for block 1 and 3 can be sligthly extended. In particular the Lanczos method which is only explained in a video. When videos are uploaded in CANVAS, they are processed and loose quality. I can put the original video on a separate page.

To increase the student motivation, I would like to change some homeworks to include problems from applications, e.g., matrices generated in fenics, and allow students to also visualize the solution. I believe this can increase how relevant the algorithms are.

The setup with an wiki exercise needs to be changed in some way.

I will clearer communicate that how bonus points are related to wiki work, and also reorganize CANVAS (by removing the Modules as in SF2526).