Master program in Computational Science

University of Oslo

Meeting December 4, 2017

Agenda December 4, 2017, 12-2pm

1. **Welcome and minutes from last meeting. Coffee and light refreshments**
2. Approval of board members and external board members.
   - We may need to select stand-ins (vara-medlem in Norwegian) and one more student representative.
   - Board related practicalities and other guidelines
3. Discussion of courses
4. AOB, larger initiative on Computational Science

Present board members and approval

1. Astrophysics: Mats Carlsson
2. Bioscience: Tom Andersen
3. Chemistry: Michele Cascella
4. Geoscience: TBD
5. IFI: Andreas Austeng
6. Math: Karsten Trulsen
7. Physics and head of program: Morten Hjorth-Jensen
8. Admin representative: Espen Murtnes, Physics
9. Student representative: Oyvind Sigmundson Schoyen
10. External representatives proposed (and they have agreed): Alfred Hansen (UiT) and Ola Skavhaug

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Practicalities to finalize

1. We need to select stand-ins (varamedlemmer). It is natural that each representative has her/his stand-in.
2. Norwegian texts almost done. The mn-fak admin will review our texts this week. As soon as they are done, we should carefully review them again.
3. The English texts are at http://www.uio.no/english/studies/programmes/computational-science-master/index.html

Feel free to review again the content of the website. The Norwegian website will be made public most likely towards the end of this week.

Discussion of courses

An important aspect of this program is to be able to build a true inter-disciplinary program. The easiest things to start with are our present courses and whether they can live up to our scientific and educational needs.

- Compulsory courses
  1. FYS-MAT3155/4155 Data analysis ad Machine learning with numerical projects, Fall semester?
  2. MAT-IN3110 Introduction to numerical analysis, Fall semester?
  3. IN3XXX/4XXX High-performance computing with numerical projects, slides from Xing Cai's talk last time are included with this mail. Spring semester?

Knut gave a summary of MAT-IN3110 last time. This course may need revisions in order to fit properly our needs.

Discussion of courses: Courses of broad interest for several study directions

- Computational methods
  1. INF3331/4331 Problem solving with high-level languages (Python), fall semester
  2. INF3380 Parallel computing for problems in the Natural Sciences (mostly PDEs), spring semester
- Linear Algebra, Spline, Optimization and Partial Differential equations
  1. MAT4170 Spline methods
  2. MAT-INF4110 Mathematical Optimization
  3. INF-MAT4130 Numerical linear algebra
  4. MAT-INF4300, PDEs and Sobolev spaces I
  5. MAT-INF4310, PDEs and Sobolev spaces II
  6. MAT-INF3360 - Introduction to Partial Differential Equations
  7. INF5620 Numerical methods for PDEs, finite element method
  8. INF5670 Numerical methods for Navier-Stokes equations

Discussion of courses: Machine learning

1. FYS-MAT3155/4155 Data analysis ad Machine learning with numerical projects
2. STK4030 Statistical Learning: Advanced Regression and Classification
3. INF3490/4490 Biologically inspired computing
4. INF5860 Machine Learning for Image Analysis

Discussion of courses: Bioinformatics and Bioscience

1. INF3490/4490 Biologically inspired computing, fall
2. INF4350 Introductory Course in Bioinformatics, spring
3. INF-BIO5121 High Throughput Sequencing technologies and bioinformatics analysis
4. INF5380 High-performance computing in bioinformatics
5. INF5560 Computational Physiology, fall
6. MBV-INF4410 Bioinformatics for Molecular Biology, fall

Discussion of courses: Computational Astrophysics, Chemistry and Physics

1. AST5210 Stellar Atmospheres I, spring semester
2. FYS3150/4150 Computational physics I, fall semester
3. FYS4411 Computational physics II (Parallelization (MPI), object orientation, quantum mechanical systems with many interacting particles), spring semester
4. FYS4460 Computational physics III (Parallelization (MPI), object orientation, classical statistical physics, simulation of phase transitions, spring semester
5. KJM4XXX Computational Molecular dynamics in life science and materials science
6. KJM4XXX Advanced course in Electronic structure

Discussion of courses: Geoscience

1. GEO4310 - Stochastic methods in hydrology
2. GEO4450 - Geophysical Fluid Dynamics
3. GEO5440 Cryosphere modeling
4. GEF4530 - The General Circulation of the Atmosphere
5. GEF4600 - Methods in physical oceanography
6. GEO4131 - Geomechanics
7. GEO4620 - Seismic waves and seismology
8. GEO4630 - Geodynamics
9. GEO4520 - Advanced remote sensing and topographic analysis
10. GEO4320 - Hydrological modelling

Discussion of courses: Imaging and Biomedical computing

1. INF4300 - Digital image analysis
2. INF4470 - Digital signal processing
3. INF4480 - Digital signal processing II
4. IN4010 - Acoustic Imaging
5. IN5450 - Array signal processing

Discussion of courses: Mechanics

1. MEK4300 - Viscous Flow and Turbulence
2. MEK4350 - Stochastic and Nonlinear Ocean Waves
3. MEK4100 - Mathematical Methods in Mechanics
4. MEK4450 - Offshore Technology
5. MEK4570 - Computational Solid Mechanics
6. INF4331 - Problem solving with high level languages
7. MEK4250 - Finite Element Methods in Computational Mechanics
8. MEK4320 - Hydrodynamic Wave Theory
9. MEK4420 - Marine Hydrodynamics
10. MEK4470 - Computational Fluid Mechanics
11. MEK4600 - Experimental Methods in Fluid Mechanics
12. UNIK4660 - Visualization of scientific data
13. UNIK4900 - Advanced Turbulence Modeling and Simulations

AOB: Discussion of larger initiative on Computational Science at UiO

- I would like to propose that we try to establish a new initiative at UiO called **Computing across the Disciplines**
  1. Can be established as a center
  2. It could coordinate education and research initiatives across disciplines. Our program fits excellently here
  3. It can have strong ties with the recently established center of excellence on computing in science education
  4. Unleash new research funds for computational science research

More material will presented during the meeting, if time allows.