Ansökan om medel för fakultetsgemensam forskarutbildningskurs 2018
Application for funding of faculty common course 2018

Kursnamn Digital Image Analysis for Scientific Applications
Name of course

Omfattning (högskolepoäng) 8 for the whole course, 5 for a shorter version
ECTS credits

Tidsperiod October-December 2018
Course period

Antal platser 40
Maximum number of participants

Undervisningsspråk English
Language of instruction

Kursens syfte samt motivering till varför den bör vara fakultetsgemensam (max 150 ord)
Aim of course and motivation as to why it should be considered “multidisciplinary” to the extent that the faculty should allocate extra financing.

Today, many research projects at the TekNat Faculty, in areas as diverse as biology, chemistry, materials science, and astronomy, require imaging and the analysis of images¹. Digital image analysis (IA) has become an indispensable tool for objective, quantitative and fast analysis of large amounts of image data. Such analyses are often needed to extract specialized knowledge and increase the scientific value of image-based experiments. A number of IA tools are available, but in order to use them in a correct and meaningful way, a basic understanding of the underlying methods is necessary. This course aims at giving doctoral students from across the faculty sufficient understanding to solve basic IA problems. The course will also offer an introduction to freely available software tools, as well as Matlab, preparing the students to start using IA in their own research.

Students from the research subject computerized image analysis are not expected to take this course.

Kursinnehåll, kursens uppläggning samt examinationsform (max 150 ord)
Contents, study format and form of examination

The focus of the course is on reaching a broad understanding of IA and a basic understanding of the theory and algorithms behind the IA methods. The course starts with basic IA methods and computer exercises, including IA research methodology and IA research ethics. In the second part of the course, participants choose at least four lectures/computer exercises to tailor the course to match their own research interest (see Fig 1).

The examination will be divided into

- four computer exercises, both to get familiar with the interfaces of common software and to solve realistic image processing problems,
- a written exam on part 1,

¹See the research projects, list of publications and list of cooperation partners in the Centre for Image Analysis Annual report, www.cb.uu.se/annual_report/AR2016.pdf
a project (oral presentation and written report), where the course participants apply the collected knowledge to a project within their own domain. The course participants will study literature relevant to their project, practice their ability to scientific analyses, find and test appropriate IA methods, and present and discuss their scientific results. The course participants will get eight credits for taking the whole course, or five credits for taking part 1.

Figure 1: Course structure. The first part gives 5 ECTS credits, and the whole course, part I and II, gives 8 ECTS credits. The lectures in the second part will be adjusted to match the students’ research interest. We will invite guest lecturers when needed.

Målgrupp/er (specify, if possible, subject/specialization) and recommended background

The target group is graduate students from all subjects where IA is used as a research tool. No previous experience in IA is required from the course participants, but an interest in its potential as a tool in their own research is important. The course can be followed with a basic knowledge of mathematics (corresponding to upper-secondary level entry requirements) and basic computer skills.

In the second part of the course, we plan to have a set of lectures focused on IA usage in the research domains in which we have extensive experience and for which we expect many students: microscopy, radiology, materials science and medical engineering. To match all students’ interests, we will use our IA network and tailor lectures/literature suggestions to fit specific research areas where IA is used. By using this flexible structure, we will attract students from all sections within the TekNat Faculty, including life science, medical engineering, and materials science.
Huvudansvarig institution
Department with main responsibility
Dept. of Information Technology, Division of Visual Information and Interaction, Vi2

Andra inblandade institutioner (specifiser hur).
Other departments involved (specify how).

We have previous and current collaborations on application oriented research projects together with many departments within the TekNat Faculty. In areas where we lack experience, we plan to work with examples from literature or invite lecturers from other image analysis groups to cover the research areas relevant for the participating doctoral students.

Kontaktperson/er (namn, e-postadress)
Contact person (name, e-mail address)
Robin Strand, Robin.Strand@it.uu.se
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Anmälan om kursdeltagande till
Application from course participants should be sent to
Robin Strand, Robin.Strand@it.uu.se

Senast 1 September 2018
Not later than

Kursen har tidigare givits HT 2015 (med fakultetsgemensam finansiering) med 36 deltagare
The course has previously been given (specify when and number of participants)

The name of the course was previously Application Oriented Image Analysis.
The participants in 2015 included doctoral students from Dept. of Engineering Sciences, Dept. of Earth Sciences, Department of Ecology and Genetics, Department of Cell and Molecular Biology, Department of Information Technology, Department of Applied Mechanics, Department of Chemistry, Department of Physics and Astronomy at the TekNat Faculty.
The course has been given at several occasions since the 1980-ies. Hundreds of researchers have learnt how to use image analysis through this course and we have received much appreciation for this. The content is of course updated every time to reflect the rapid development of the field.