Statistics and Simulation

Welcome

Prof Hans Georg Schaathun

Høgskolen i Ålesund

Spring 2014 – First Session

Outline

The lecturer

Siebe van Albada
- Physicist
- Affiliated with Section for Mathematics and Natural Sciences

Hans Georg Schaathun
- You may know me from *Discrete Mathematics*
- jack of many trades
- affiliated with computer engineering

Simulation and Statistics

Why is this computing?

- Simulation is a key application of computers
  - one of the top applications in the 1950-s and 60-s
  - still many important problems for simulation
- Simulation gives synthetic generation of empirical data
  - when field data are scarce or overly costly
- Statistics allows *quantitative* analysis of empirical data
  - quantify the confidence in your conclusions
- Simulation data must be analysed with statistics

Simulation and statistics in intertwined throughout the module.

Applications of Simulation

- Estimation of error probabilities in engineering systems
- Evolution of eco-systems over time (e.g. fox and rabbit)
- Diffusion of e.g. bush fires
- Traffic flow

Learning Objectives (abridged)

1. Be able to use basic statistical techniques
   - statutory requirement in the national framework for engineering degrees
   - 5-credit statistics
2. Programming experience
   - be able to implement computer simulations in particular
   - free choice of language, we give examples in Matlab and Java.
3. Be able to model real-life problems mathematically
   - the model is the basis for the simulator

Outline

Time table and work load

- 10 credits ECTS
  - Expected work load is 250–300h
  - about 15–20h(!) per week
- Three two-hour sessions per week (6h)
  - schedule another 10–14h per week to read, watch video, and prepare
  - at least 2h before each session

Sessions

- Three main learning activities
  - video clips – to be watched in *your own time*
  - exercise sheets – to practice skills and test understanding
  - supervised sessions – for questions and answers, individual help, etc.
    - work on exercises during the sessions
  - Frisvold and Moe: *Statistikk for Ingeniører*

You need to study the videos and exercises before session, so that you can ask about your problems.

Corrections

- Learning material is not static
- Changes will be made to
  - Correct errors
  - Correct omissions
  - Make material easier to understand
- Changes announced on web page

Make sure you are familiar with the latest version before the exam.

Textbook

Core	Frisvold and Moe: *Statistikk for Ingeniører*
Supplement	Shiflet and Shiflet: *Introduction to Computational Science*

university-logo

Mandatory coursework

- One individual project — due after Week 4 of teaching.
- Three group projects
  - Three weeks per project, starting in Week 5.
  - Oral class presentation every week from Week 5–13

Group projects

- Groups of three
- Three stages of each project (one week per stage)
  1. Modelling
  2. Implementation and Simulation
  3. Analysis
- Oral presentation after each stage.
  - One student presents on behalf of the group.
  - Individually assessed.
- Each students must present
  - once per project
  - once per stage (each of modelling, implementation, and analysis)

Web page

`http://www.hg.schaathun.net/StatSim/`

- All material is found here.
- Some is password protected. See fronter for password.

  Remember copyright. Redistribution of the material is prohibited.

Contact us

1. hasc@hials.no
2. siva@hials.no