Statistical population genetics, Spring 2016

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Teacher: Sirkka-Liisa Varvio

Scope: 5-10 cr, this means that a student can take either 5 cr or 10 cr

Type and prerequisites: Intermediate / advanced studies in statistics. For other students: background from at least basic probability calculus and statistical inference courses needed.

Teaching: The course consists of lectures, discussions, tutorials during computer sessions, assignments initiated during the sessions and completed during student´s own, additional, time. The spirit of the course is learning by doing: data-analysis, exercises by pen-and-paper, simulations and reading scientific papers, rather than listening lectures.

Time schedule: Period III, Thursdays 14-19 in computer class C128, Exactum, Kumpula is a 5 cr module. Each session will start by a (~2 hours) lecture and/or tutorial for assignments. Another 5 cr module in period IV, time schedule will be negotiated during the III-period**.**

Passing the course:

- Weekly assignment sets / home-exercise sets. You can perform these so that you form groups of 2-4 students.
- Three assignment sets will be pen-and-paper exercises, including some simulations and literature references, getting familiar with scientific articles, one is a data-analysis exercise. There is also to possibility write an essay instead of data-analysis.
- Home-exam will be given 3. March and answer submission (to Moodle) deadline will be 14. March.

STAGE_MOODLE

- This is course working area for assignment solutions and reports, discussions, questions, etc. The link is now open.

Week 1

- **Topic:** Probability calculus and basic statistics applied on genetic problems
- **Lecture material including the first assignment set:** *Basic concepts: Probability, inheritance, population genetics*
- *Link to a simple simulation program*
- **Background literature:**
    - *A century of Hardy Weinberg equilibrium,*
    - *LD_understanding the evolutionary past and mapping the medical future*

Week 2

- **Topic:** Classical population genetics - selection, mutations, drift are the evolutionary factors in terms of population genetics. How has the understanding of genetic polymorphisms evolved, introduction to (human) genetic polymorphisms
- **Lecture material including the second assignment set:** *Modelling selection, mutation, drift*
- **Background literature:**
    - *Revising human mutation rate, understanding human evolution,*
    - *Human genomic disease variants, A neutral evolutionary explanation*

Week 3

- **Topic:** Coalescence theory in population genetics: relating theory to data.
- **Lecture material and assignment set 3:** *Coalescence theory and selection tests, An illustrative guest lecture on coalescence, Assignment set 3*
- **Background literature:**
    - *Kingman´s Coalescence paper*

Weeks 4, 5

There will not be a session 18. Feb. and there is more information in Moodle! To compensate this, there will be sessions Mon 22. Feb. 12-14, Wed 24. Feb. 12-14 and Thu 25. Feb 14-18. These sessions will not include any lectures, just practical advise for those who want to come. You can also ask for help by Moodle, or by email (sirkka-liisa.varvio at helsinki.fi)

- **Choose one assignment.** 4.1. and 4.2. are data-analysis assignments, by using the software DnaSP 5.10.1 (Manual) to get familiar with polymorphisms as well as some key concepts. If you don´t want to do practical data-analysis, choose 4.3. and write an essay.

- *Assignment 4.1.*
  - HLA_DRB1_freqtable.xlsx , HLA_DRB1_alleles.txt   (Note that you don´t need these two files as the population sample files are ready for analyses)
  - Czech.txt, Portug.txt, Swed.txt, Bari.txt, Chile.txt, Xavant.txt, Camero.txt, Oromo.txt, Pygmi.txt
- *Assignment 4.2.*
  - USA_before_vacc.txt, USA_after_vacc.txt, Skand_before_vacc.txt, Skand_after_vacc.txt
- *Assignment 4.3.*
  - *Natural selection and infectious diseases in human populations*
  - *Recent human adaptation, genomic approaches, interpretations and insights*
  - *No evidence that selection has been less effective at removing deleterious mutations in Europeans than in Africans*
  - *Molecular sprandels, tests of adaptation at the genetic level*
  - *Selective sweeps in dogs*

Week 6

- Home-exam will be given in March 4., deadline for submitting the answers March 14.

Period IV, the other 5 cr part of the course

- # Registration

Did you forget to register? What to do?