Genetic analysis and molecular evolution, fall 2011

Genetic analysis and molecular evolution, fall 2011

Lecturer

Sirkka-Liisa Varvio

Scope, prerequisites and type

4cr by exam, 6-8cr by exam + extra assignments
Basic probabilistics. The course can be used for advanced or intermediate studies in statistics.

Lectures and computer class sessions

I period. Tuesday 14-16, Thursday 14-16 in room C128 (computer class).

Week 1

Theme: Sequence databases

- **Thu 8. Sept:**
  http://www.ncbi.nlm.nih.gov.
  Assignment 1 preliminary dataset..txt
  Assignment 1a - Instructions for data collection and alignment..pdf
  NCBI BLAST..pdf, Multiple sequence alignment review..pdf
  From here you can learn about the classification of living beings: http://tolweb.org/tree/

Week 2

Theme: Phylogeny inference. Read this: Short phylogeny inference review..pdf

- **Tue 13. Sept:**
  Lecture - Maximum parsimony phylogeny inference..pdf.
  Practical MEGA-software demonstration http://www.megasoftware.net/, MEGA4 Manual..pdf.
  - MEGA-link (above) goes to a new version, MEGA5, which has been recently released. Classroom C128 computers have MEGA4 (see the manual above). When you work with your own computers, install MEGA5 and use the online help and manual. Your data should be in this format: Assign 1 prelim dataset in MEGAformat.txt. Use this file for training yourself with MEGA. Instead of aligning your own data with a separate ClustalX -program, you can use the aligning facility within MEGA-package.
  - Collection of phylogeny programs: http://evolution.genetics.washington.edu/phylip/software..html

- **Thu 15. Sept:**
  Distance matrix methods for phylogeny inference (paper copy given during the lecture)
  Lecture - Introduction to maximum likelihood inference for phylogenies..pdf
  Lecture - Introduction to Bayesian inference for phylogenies..pdf
  Assignment 1b - Phylogenies from the dataset..pdf

Week 3

Theme: Nucleotide substitution modelling.

- **Tue 20. Sept:**
  Lecture - Nucleotide substitution modelling..pdf
  Practical tool for model choice: http://www.hiv.lanl.gov/content/sequence/findmodel/findmodel..html

---

Week 4

Theme: The neutral theory of molecular evolution, basic population genetics, genetic diversity.

- **Tue 27. Sept:**
  Lecture - The neutral theory of molecular evolution..pdf,
  Lecture - The basic model in population genetics, Hardy-Weinberg..pdf,
  The basic selection model and Assignment 2..pdf. Submit 11. October, continue working as a group of 2-3 students.

- **Thu 29. Sept:**
  Lecture - Genetic diversity in human populations.pdf
  Read this before lecture Tue 4. Oct: Phylomedicine - an evolutionary telescope to explore and diagnose the universe of disease mutations..pdf

---

Week 5

Theme: More about population genetics, genetic diversity, haplotypes, genome evolution.

- **Tue 4. Oct:** We start with instructions/clarification to Assignment 2 (see above)
  Lecture - Genomes, haplotypes, phylomics..pdf

Thu 6. Oct:
Lecture - Inheritance, pedigree analysis..pdf
Lecture - Inheritance of linked genes, recombination..pdf
Lecture - Random genetic drift..pdf
Assignment 3..pdf, to be submitted Thu 13. Oct

Week 6

- **Tue 11. Oct:**
  No lecture because of overlaps.
- **Tue 13. Oct:** Lecture starts 12.30 in C128 and the plan is to start with going through assignments at ~ 14 and end before 17 o´clock. http://timetree.org/, Lecture - Phylogeny inference, examples..pdf

Exam: In computer class C128, 20. October, 13-17 EXAM 201011.pdf, ^Exam201011 dataset..txt\

EXTRA ASSIGNMENTS: If you have taken this course and still want to do extra assignments for extra credits, wait for assignments for course in fall 2012

1. EXTRA ASSIGNMENT, 1cr..pdf

Registration

Did you forget to register? What to do.