

Summer Short Course: Human Population Genomics
Inference and applications of next-generation sequence data
Universidad de Chile
January 2-6, 2017

<http://genomed.med.uchile.cl/2016/11/course-in-population-genomics/>

Instructors:

- Shaila Musharoff, University of California, San Francisco
- Amy Goldberg, Stanford University
- Ricardo Verdugo, Universidad de Chile

Description: This course will cover topics and methods necessary for the analysis of modern genomic data. It will combine theoretical understanding with a focus on practical applications in population and medical genetics. We will introduce commonly used software for demographic inference, go through guided computational exercises on genomic datasets, and have coding demonstrations. We will focus on methods appropriate for data from recently admixed populations.

Program

Days will include lectures, discussions of primary literature, and review of homework and applications. The first few days will develop understanding of methods and best practices. The second half will include example problems with a sample dataset and discussion of data-oriented papers. Morning will begin with a review of computational homework assignments.

Overview reading: Schraiber & Akey 2016 Nature Reviews Genetics

Monday, January 2

- Admixture & ancestry
 - *Structure*, *Admixture*, *distruct*, *clumpp*
 - Reading: Falush et al. 2016 biorxiv, Porras-Hurtado et al. 2013 Front Genet
- Local ancestry inference
 - RFmix, PCAdmix
- Modeling population history and admixture events
 - ASPCA, Admixture-LD, *tracts*, *Globetrotter*, sex-biased admixture, distribution of ancestry components

Tuesday, January 3

- *f*-statistics
 - Reading: Peter 2016 Genetics
- Coalescent, PSMC/MSMC
 - Reading: Rosenberg & Nordborg 2002 Nature Rev Genetics
- Frequency spectra, *dadi*, *fastsimcoal*

Wednesday, January 4

- Simulation, forward and backward, software & questions
- Approximate Bayesian Computation (ABC)
 - Summary statistics, parameter estimates, model choice
 - Reading: Fagundes et al. 2007 PNAS, Beaumont 2010 Ann Rev Ecol, Boitard et al. 2016 Plos Genet

Thursday, January 5

- Medical & statistical genetics in admixed populations
 - Admixture mapping, selection, GWAS
 - Identity by State/Descent, Runs of Homozygosity for demography & medical genetics

Friday, January 6

- Synthesis, application & examples, data visualization (time to catch up on leftover material)