

Rockefeller University
Welch – The Great Hall
1230 York Avenue, New York

ADVANCED GENE MAPPING COURSE

April 22-26, 2024

The course will be held every day from 9:00AM - 5:00 PM The Great Hall of the Welch Building on the Rockefeller University campus, located at 1230 York Avenue (entrance at 66th Street). On Monday evening a social gathering will be held at The Rockefeller University Faculty Club.

Each session will start with a theoretical introduction followed by practical exercises. Instructors for the course are Heather Cordell (Newcastle University), Andrew Dewan (Yale University), Suzanne Leal (Rockefeller University & Columbia University), Shamil Sunyaev (Harvard University), and Gao Wang (Columbia University).

A lecture will also be given on ethics and the regulation of human subject research. Additionally, a special guest lecture will also be given by Jurg Ott (Rockefeller University).

MONDAY – April 22nd

Instructors – Heather Cordell (Morning) and Suzanne Leal (Afternoon)

Statistical framework for association testing common and rare variants (population and family based); linear and logistic regression; variance components analysis; linear mixed models (LMM) and generalized LMM; Estimating heritability and genetic correlations; Controlling for population admixture and substructure; Data quality control of genotype and sequence data; Annotation of sequence data

Exercises: PLINK, GCTA, LD Score Regression, FaST-LMM, VCFtools, and ANNOVAR

Evening Program

5:10 PM Get-together for course participants and instructors at The Rockefeller Faculty Club

TUESDAY – April 23rd

Instructors - Heather Cordell (Morning) and Suzanne Leal (Afternoon)

Rare variant association analysis using exome and sequence data for population- and family-based data; rare variant association tests; meta-analysis, detecting gene x gene and gene x environment interactions, Imputation of genotype data and its analysis, power and sample size analysis.

Exercises: REGENIE, Genetic Power Calculator, R, and Cassi

Special Lecture - Responsible Conduct of Research

Instructor - Wayne Patterson, Ph.D. (4:00-5:00)

Conflict of interest, research ethics, protection of human subjects, and data security

WEDNESDAY – April 24th

Instructor – Gao Wang (9:00 - 2:00 and 3:00-5:00)

Molecular QTL mapping; Transcriptome-wide association studies (TWAS)

Exercises: MR-JTI

Statistical fine mapping (concepts and application: trans-ancestry, functional annotation, colocalization and multi-trait analysis).

Exercises: LD-clumping and SuSiE

THURSDAY – April 25th

Instructor – Andrew DeWan (9:00-5:00)

Biological, mediated, and spurious pleiotropy; Methods to detect pleiotropy; Mediation analysis; Mendelian Randomization

Exercises: MultiPhen, PLINK2.0, MR-base

Lecture – Jurg Ott (4:15-5:00)

Association analysis of genotype patterns with digenic traits.

FRIDAY – April 26th

Instructor – Shamil Sunyaev (9:00-5:00)

Population and evolutionary genetics; prediction of variant functionality; estimation of polygenic risk scores

Exercise: LDpred2