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

ADVANCED GENE MAPPING COURSE January 27 - 31, 2020

The course will be held every day from 9:00AM - 5:30 PM in 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), Nancy Cox (Vanderbilt University), Andrew Dewan (Yale University), Suzanne Leal (Rockefeller University & Columbia University), Bogdan Pasaniuc (UCLA), and Shamil Sunyaev (Harvard University).

MONDAY – January 27th

Instructors – Heather Cordell and Suzanne Leal

Statistical framework for association testing common and rare variants (population and family based); linear and logistic regression; variance components analysis; generalized linear mixed models (GLMM) and linear mixed models; Controlling for population admixture and substructure; Analyzing imputed data; Data quality control of genotype and sequence data

Special session on responsible conduct of research: conflict of interest and research ethics.

Exercises: PLINK 2.0, EPACTS, GCTA-MLMA, FaST-LMM, Variant Association Tools (VAT), SEQSpark, PSEQ

Evening Program

5:35PM Get-together for course participants and instructors at The Rockefeller Faculty Club

TUESDAY – January 28th

Instructor - Heather Cordell and Suzanne Leal

Rare variant association analysis using exome and sequence data for population- and familybased data; rare variant association tests; meta-analysis, detecting gene x gene and gene x environment interactions, linear mixed models, power and sample size analysis

Special session on responsible conduct of research: data management (security) and ethical use of human research subjects

Exercises: VAT, SEQSpark, PSEQ, SKAT R library (power analysis), Armitage-test for trend tool, R and Cassi

WEDNESDAY – January 29th

Instructor – Nancy Cox

Linear mixed models; eQTL mapping; predication models using RNAseq and array data; challenges and inferences for heritability estimation and prediction

Exercises: Maxtrix-eQTL, GCTA-MLMA, PrediXcan

THURSDAY – January 30th

Instructor – Andrew DeWan

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

Exercises: MultiPhen, PLINK2.0, MR-base

Instructor - Bogdan Pasaniuc

Fine mapping - probalistic, Bayesian, trans-ethnic, functional annotation, chromatinQTL and expressionQTL

Exercises: PAINTOR, FOCUS

FRIDAY – January 31st

Instructor – Shamil Sunyaev

Population and evolutionary genetics; prediction of variant functionality; incorporating functional information in rare variant association tests; analysis of epigenomic data; polygenic risk scores

Exercise: ANNOVAR, CADD, GERP, Polyphen-2, SIFT, LDpred, etc