KCNI School Virtual Learning Series

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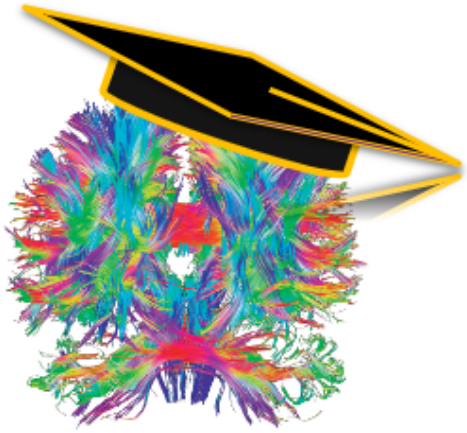
Krembil Centre for Neuroinformatics Summer School

Solving Problems in Mental Health using Multi-Scale Computational Neuroscience

Distribution Date: June 2022

Krembil Centre for Neuroinformatics, Centre for Addiction and Mental Health



Topics

Introductory Concepts

A collection of lectures on overaching concepts in Neuroinformatics Research.

	Topic	Instructor	Video	Slides
	A Multiscale Approach to Brain Disorders	Sean Hill, Ph.D. Director, Krembil Centre for Neuroinformatics Senior Scientist, Centre for Addiction and Mental Health Professor, Departments of Psychiatry and Physiology, University of Toronto, Canada Titular Professor, École Polytechnique Fédérale de Lausanne, Switzerland krembilneuroinformatics.ca	YouTube (1:09:33)	slides
	Problems and opportunities in the diagnosis and treatment of major depression	Victor Tang MD MSc, Clinician-Scientist/Resident,Centre for Addiction and Mental Health, Twitter: @victormarktang Brett Jones MD MSc, Clinician-Scientist/Resident, Centre for Addiction and Mental Health	YouTube (1:29:28)	slides

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Computing Fundamentals

For those who need more help with computing fundamentals - going into the later content. We recommend content available from the KCNI Scientific Computing Working Group.

Topic	Tutorial Videos / Online Tutorials	Prerequisit to
R	R Workshop Material (Apr-Jun 2022)	• Fundamental Methods for Genomic Analysis • Fundamental Methods for Single-Cell Transcriptome Analysis
Python	Introduction to Python	• Simulating Brain Microcircuit Activity and Signals in Mental Health • Neuroimaging Connectomics • Whole Brain Modeling
Git/Github	Introduction to Git and GitLab	
Linux/Bash	Introduction to Linux and Bash (Youtube)	

many recordings available via from last falls series. 2021 Fall - SCWG Workshop Recordings

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Reproducible Science (including Git, Docker and Binder)

Session	Video	Materials
Workshop 1: Guiding principles for FAIR and open science - Erin Dickie, Sejal Patel Why reproducible science? The things you need to know to get through this course: Versioning and publishing code (github) Versioning and publishing software (docker)	Watch on Youtube	slides
Workshop 2: Tools for Reproducible Science - Erin Dickie, Sejal Patel R with Rmarkdown (walk through) Python in ipython notebooks (walk through) -also google colab The fancy bits: - building your own binder environments - building your own containers (docker & singularity)	Watch on YouTube	github code rstudio example blocked URL jupyter example blocked URL

Applied Ethics in Machine Learning and Mental Health

Topic	Video	Materials
Lecture 1: Introduction to AI Ethics - Daniel Buchman	Watch on YouTube (1:22:07)	slides
Lecture 2: Fairness and Health Equity - Laura Sikstrom	Watch on Youtube (1:06:36)	slides
Workshop 1: Research Design, Data Collection, Model Construction and Validation - Part 2: Intersectional Bias Assessment Marta Maslej & Laura Sikstrom	Watch on Youtube (52:27)	Google Colab Notebooks Python: Intersectional Bias Assessment (Part 2) - Python - Colaboratory (google.com) R: Intersectional bias assessment (Part 2) - R - Colaboratory (google.com) Data: train.csv | test.csv

All videos previously recorded July 6th, 2021 as part of the KCNI Summer School

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Digital Health for Mental Health

Dr. Abhishek (Abhi) Pratap

Independent Scientist & Lead of the Augmented Intelligence and Digital Tech for Mental Health (AID 4 Mental Heath) Lab,
The Krembil Centre for Neuroinformatics, Campbell Family Mental Health Research Institute, CAMH

Computing environment: Python (jupyter)

Session	Instructor	Video	Materials
Lecture 1: Digital Health for Mental health	**Abhi Pratap**	Youtube (1:20:28)	slides (pdf)
Workshop 1: accessing reproducible datasets from Synapse as part of integrated workflow	**Abhi Pratap**	YouTube (1:15:12)	slides (pdf) code (GitHub) blocked URL

All videos previously recorded July 13th, 2021 as part of the KCNI Summer School

The workshop demostates how to work with the Synapse platform.

Workshop 1 will use push and pull data to the synapse platform for sharing biomedical datasets using the `synapseClient` python package. In order to be able to run all the commands in tutorial 1, a "verified" synapse account is required. *For folks who are not able to create an account or get certified before the session tomorrow the instructor will cover the concepts for tractable data analysis that can still be generally applicable beyond synapse platform*. Getting a Verified Account is a two step process.

- Step 1: Create an account on synapse - https://www.synapse.org/#!RegisterAccount:0
- Step 2: Become Certified (allows to upload data to synapse) by passing the synpase quiz to show you understand data use principles - https://www.synapse.org/#!Quiz:Certification

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Fundamental Methods for Genomic Analysis

Presented by Dr Dan, Felsky - Independent Scientist and Head of Whole Person Modelling at KCNI, ***Assistant Professor*** in the Department of Psychiatry, University of Toronto. ***Assistant Professor*** at the Dalla Lana School of Public Health, University of Toronto.

- *Dr Felsky has a PhD* in neuroimaging and genetics of Alzheimer's disease at U of T, *Postdocs* in computational neuroimmunology and bioinformatics at Broad Institute, Harvard Medical School & Columbia University.

Session	Instructor	Video	Materials
Lecture 1: Basics of genotype, central dogma, GWAS, and polygenic risk scores	Dan Felsky	YouTube (1:28:17)	slides (pptx)
Workshop 1: Managing genotype data using PLINK	Dan Felsky	YouTube (1:27:18)	code (GitHub)
Workshop 2: Calculation of polygenic risk scores in PRSice	Dan Felsky	YouTube (1:53:34)	code (GitHub)
Considering population stratification and admixture in modern GWAS; concepts and tools	Dan Felsky	Register for the live webinar	slides (pptx)

All videos previously recorded July July 7th, 2021 as part of the KCNI Summer School

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Fundamental Methods for Single-Cell Transcriptome Analysis

Presented by Shreejoy Tripathy & the Computational Genomics Lab

- ***Independent Scientist*** and Head of Computational Genomics at KCNI, ***Assistant Professor*** in the Department of Psychiatry, University of Toronto., ***Assistant Professor*** in the Department of Physiology, University of Toronto
- *PhD* in Computational Neuroscience from Carnegie Mellon and *Post-doc* in neuroinformatics and bioinformatics at University of British Columbia.

Session	Instructor	Video	Materials
Lecture 1: Transcriptomics at the single-cell and bulk level level	Shreejoy Tripathy	YouTube (1:29:08)	slides
Workshop 1: Intro to transcriptomic data types, including single-cell and bulk RNAseq	Sonny Chen	YouTube (1:19:17)	code (GitHub) blocked URL
Workshop 2: Explore cellular changes in major depression using bulk and single-cell RNAseq data	Keon Arbabi	YouTube (1:15:14)	code (GitHub) blocked URL

All videos previously recorded July 7th, 2021 as part of the KCNI Summer School

TA's: Keon Arbabi, Sonny Chen, Micaela Consens, Amin Kharaghani

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Simulating Brain Microcircuit Activity and Signals in Mental Health

Register for Virtual Q&A - June 23, 2022 3:30pm EST

Presented by Etay Hay and Brain Circuit Modelling Group

Register for Virtual Q&A - June 22, 2022 3:30pm EST

Session	Instructors	Video	Materials

Lecture 1: Simulating brain microcircuit activity in mental health	Etay Hay & Frank Mazza	YouTube (1:20:43)	slides
Lecture 2: Simulating EEG from brain microcircuits in mental health	Etay Hay & Frank Mazza	YouTube (1:11:04)	slides
Workshop 1: Simulating and analyzing spiking from neurons and microcircuits	Etay Hay & Frank Mazza	YouTube (1:39:51)	code (github) blocked URL
Workshop 2: Simulating and analyzing EEG signals from brain microcircuits	Etay Hay & Frank Mazza	YouTube (1:30:41)	code (github) blocked URL

All videos previously recorded July 8th, 2021 as part of the KCNI Summer School

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Neuroimaging Connectomics

Presented by:

John Griffiths Ph.D - Lead - **Whole Brain Modeling Group**, Krembil Centre for Neuroinformatics - CAMH, Assistant Professor, University of Toronto Depts. Psychiatry & Medical Sciences, Twitter: @neuro didact, Github: @JohnGriffiths, @GriffithsLab, Website: grifflab.com

Erin Dickie Ph.D - Education and Knowledge Lead - KCNI, Scientist - **Kimel Family Translational Imaging-Genetics Lab**, Twitter: @ErinWDickie ,Github: @edickie

Session	Instructors	Video	Materials
Lecture 1: Introduction to neuroimaging connectomics	Erin Dickie & John Griffiths	YouTube (1:47:22)	slides
Workshop 1: Calculating Neuroimaging Connectomes	Erin Dickie & John Griffiths	YouTube (1:39:04)	code (github) blocked URL

All videos previously recorded July 9th, 2021 as part of the KCNI Summer School

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Whole-Brain Modelling

Presented by:

John Griffiths Ph.D - Lead - **Whole Brain Modeling Group**, Krembil Centre for Neuroinformatics - CAMH, Assistant Professor, University of Toronto Depts. Psychiatry & Medical Sciences, Twitter: @neuro didact, Github: @JohnGriffiths, @GriffithsLab, Website: grifflab.com

Session	Instructors	Video	Materials
Lecture 2: Intro to whole-brain modelling (Lecture)	John Griffiths	YouTube (1:24:44)	
Workshop 2: simulating whole-brain activity, EEG, evoked responses, brain stimulation	John Griffiths	YouTube (1:16:10)	code (github) blocked URL

All videos previously recorded July 9th, 2021 as part of the KCNI Summer School

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Bayesian Models of Learning and Integration of Neuroimaging Data

Presented by Andreea Diaconescu and the Cognitive Network Modelling (CogNeMo) Group

Coding Language: MATLAB more setup info

Session	Instructor	Video	Materials
Lecture 1: Modelling Cognition using Bayesian Inference	Andreea Diaconescu	YouTube (1:28:14)	slides
Workshop 1: Modelling Abnormal Beliefs	Daniel Hauke	YouTube (1:15:04)	code (github)
Lecture 2: Integration of Neuroimaging: Dynamic Causal Modelling for fMRI and EEG Data	Andreea Diaconescu, Colleen Charlton	YouTube (1:32:42)	slides
Workshop 2: Dynamic Causal Modelling for fMRI: Extensions and Simulations	Peter Bedford, Povilas Karvelis	YouTube (1:22:21)	code (github)

All videos previously recorded July 12th, 2021 as part of the KCNI Summer School

TA's: Colleen Charlton, Daniel Hauke, Peter Bedford, Povilas Karvelis

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Population-Based Data Resources & Integrative Research Methods

	Session	Instructor	Video	Materials
	Lecture 1: Population-based resources and the BrainHealth Databank	Joanna Yu	YouTube	slides
	Workshop 1: Introduction to interactive methods	Daniel Felsky	YouTube (1:24:30)	slides (pptx)
	Lecture 2: Types of integrative research and Whole Person Modelling	Daniel Felsky	YouTube (1:28:14)	slides (pptx)
	Workshop 2: SNF / Subtyping	Daniel Felsky	YouTube (1:21:38)	code (GitHub) blocked URL

2020 Summer School Overview