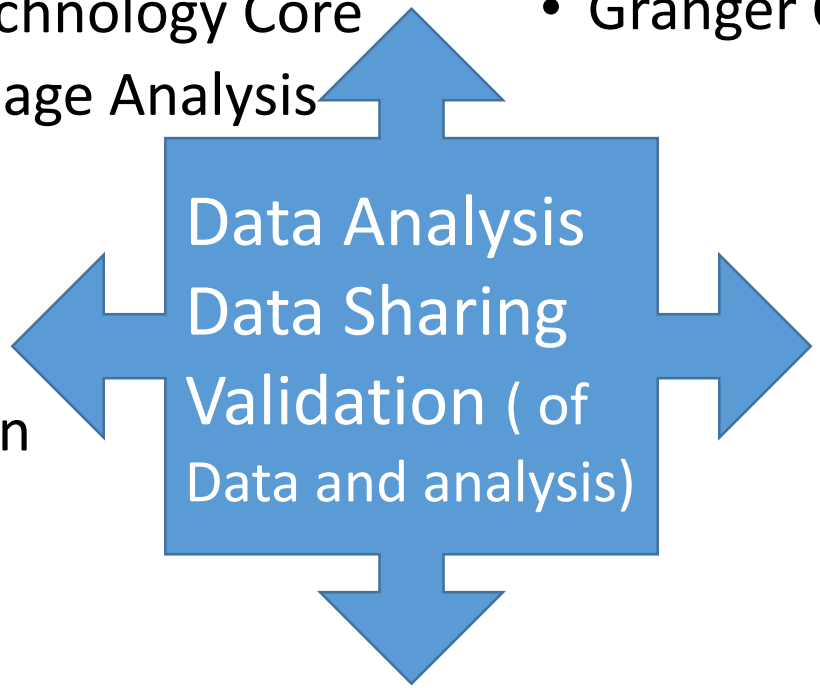
U19 SENSATION Data Science Core (**Maunsell,** PI, **Losert,** Core Lead)

Data Science & Technology

- Wolfgang Losert
  - Technology Core
  - Image Analysis
- Behtash Babadi
  - Granger Causality



Theory

- Stefano Panzeri
  - Intersection Information
- Dante Chialvo
  - Criticality

Experiment

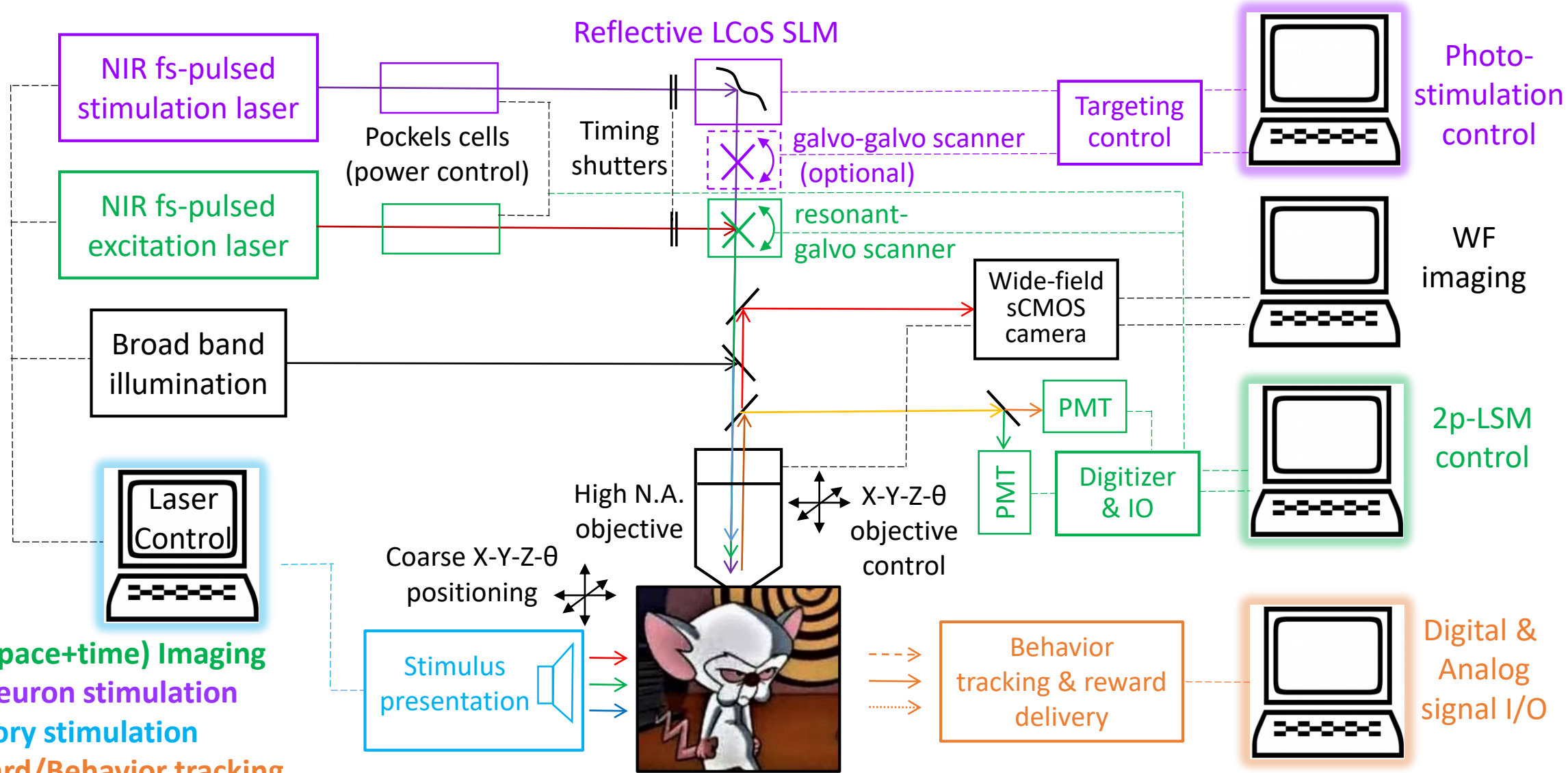
- Staff in Center Labs of:
  - Maunsell
  - Kanold
  - Plenz
  - Histed
  - Fellin
  - Losert
  - Rinberg
  - Shoham

Systems Software Engineering

- Madeline Diep and Gudjon Magnusson, Fraunhofer CESE

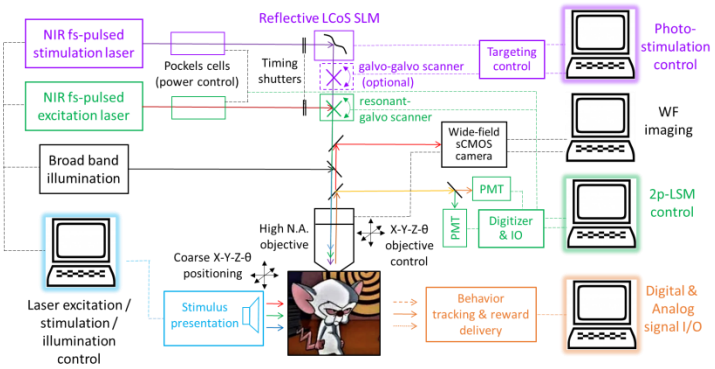
U19: Holographic Stimulation of Sensory Systems

Integrating Data Science and Technology

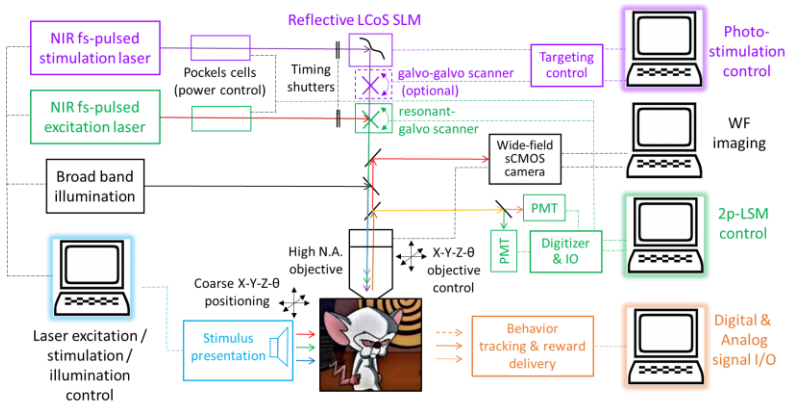


- **4D (space+time) Imaging**
- **4D Neuron stimulation**
- **Sensory stimulation**
- **Reward/Behavior tracking**

Many Sites



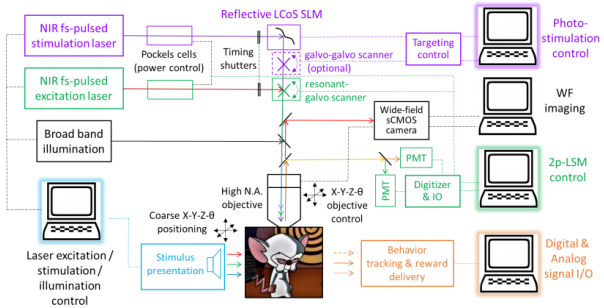
UMD



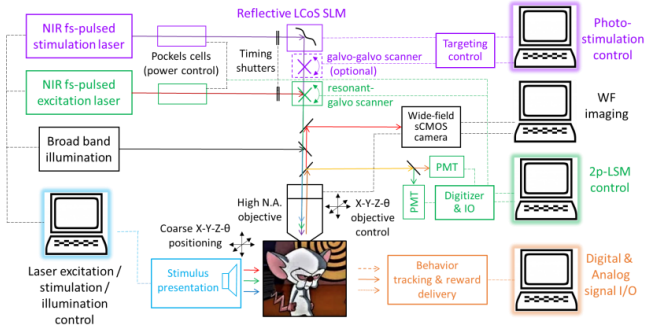
NIH

Different Hardware
Different Metadata
Different Analysis Software

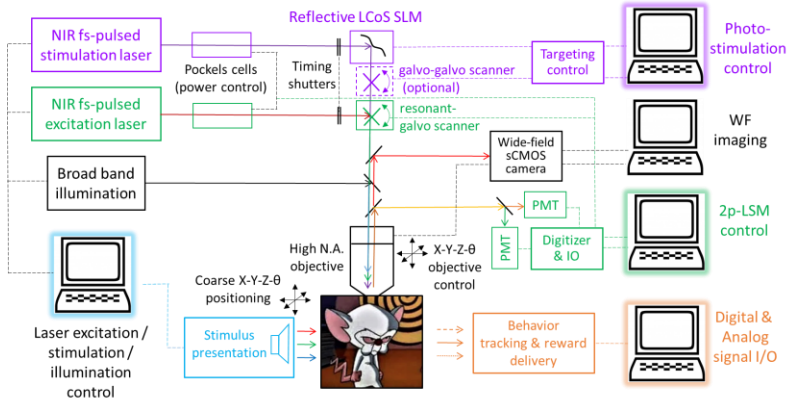
Data & Analysis Tools



NYU



Chicago

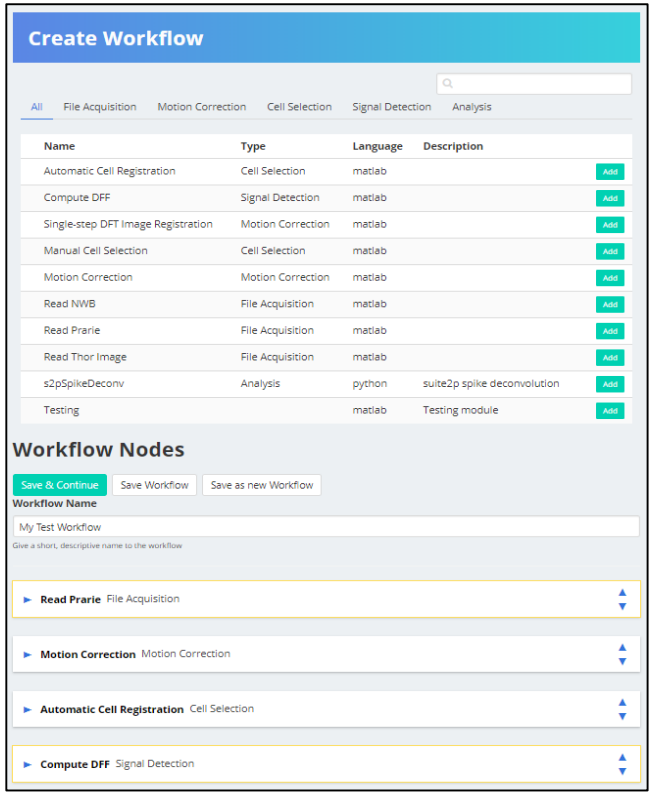


Italy

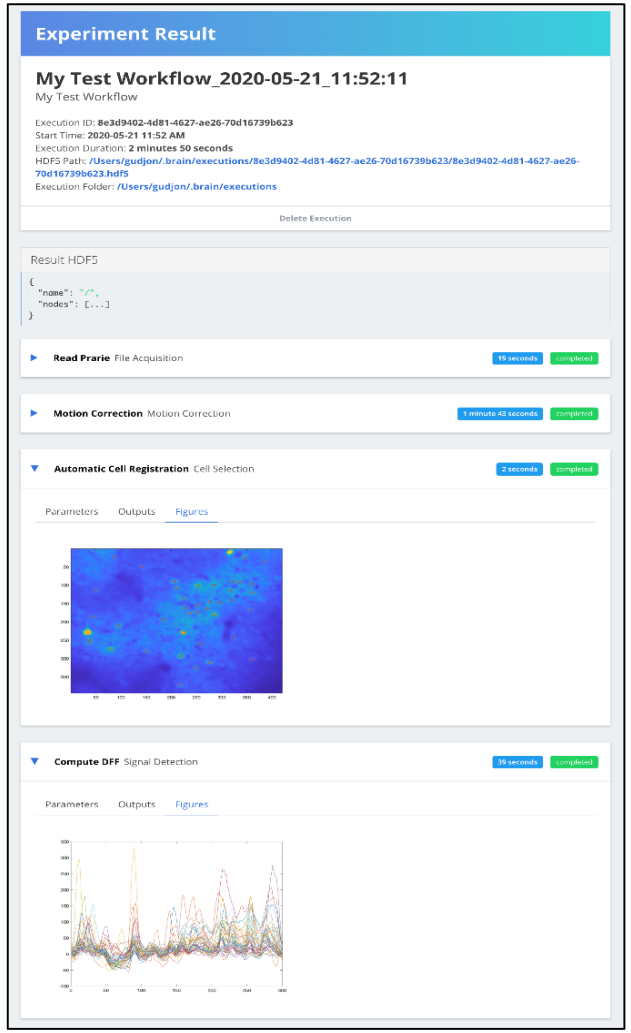
Shared Software and Data Analysis Platform

Fraunhofer CESE leads development

BRAIN Platform GUI: *Manage, Share & Validate Workflow*



Workflow is created using a **combination of any modules**. A number of modules already available in the platform.



Streamlines the process of **collaborating and sharing** data, algorithms and analysis pipelines

Key Features

Adaptive workflow management: **Integrates** multiple open source and custom built calcium imaging modules in **multiple languages**

Create custom modules or **browse** from library of community-created modules

Interface with cloud storage to manage contents

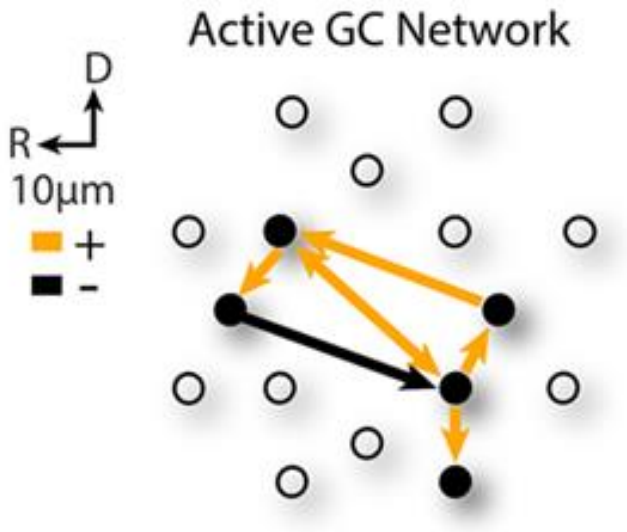
HDF5-based file system (enable NWB)

Track workflow **execution data, module configuration, and result** for **reproducibility**

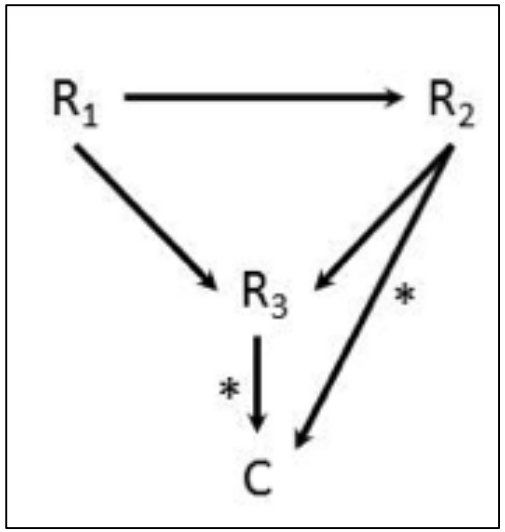
Theory Guided Experiment Design

- Integrate multiple approaches to analysis of experimental data

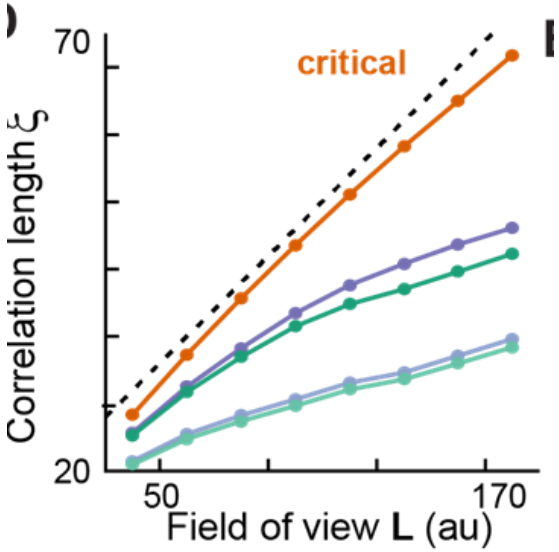
Babadi: Granger Causality (GC)



Panzeri: Intersection Information (II)



Chialvo: Criticality



Ongoing:

- **Integrating GC and II Analyses.**
- **Computational Speedup, Real Time Analysis of Imaging Data**

Core Activities

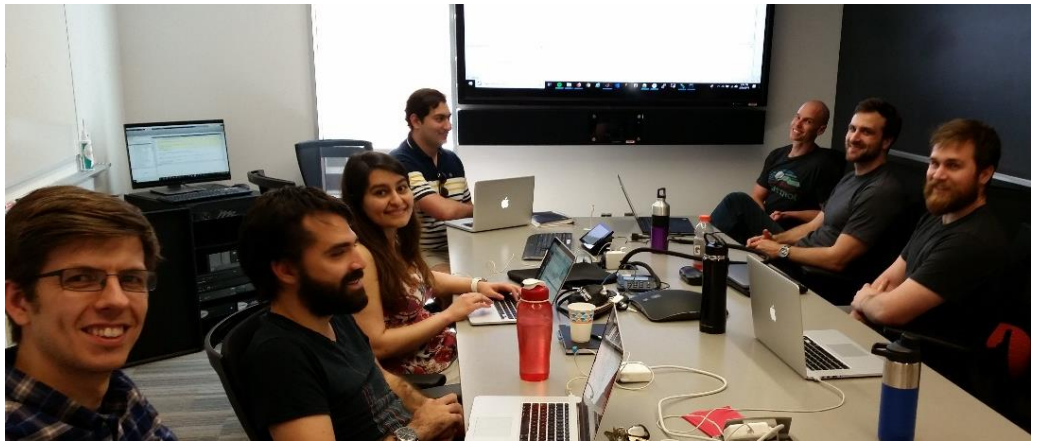
Data Science Hackathons:

Students/Postdocs working on Ca data shared their analysis workflow with each other and systems software engineers and theory groups

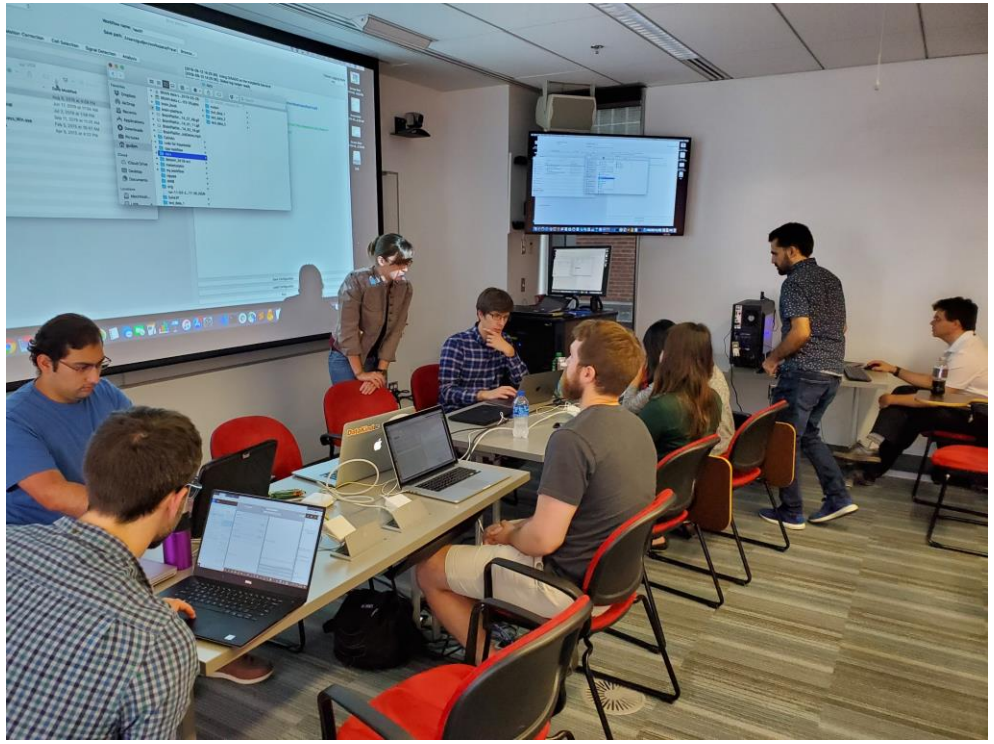
Data Sharing:

AWS

NwB Hackathon Participation



May 2019



Dec 2019