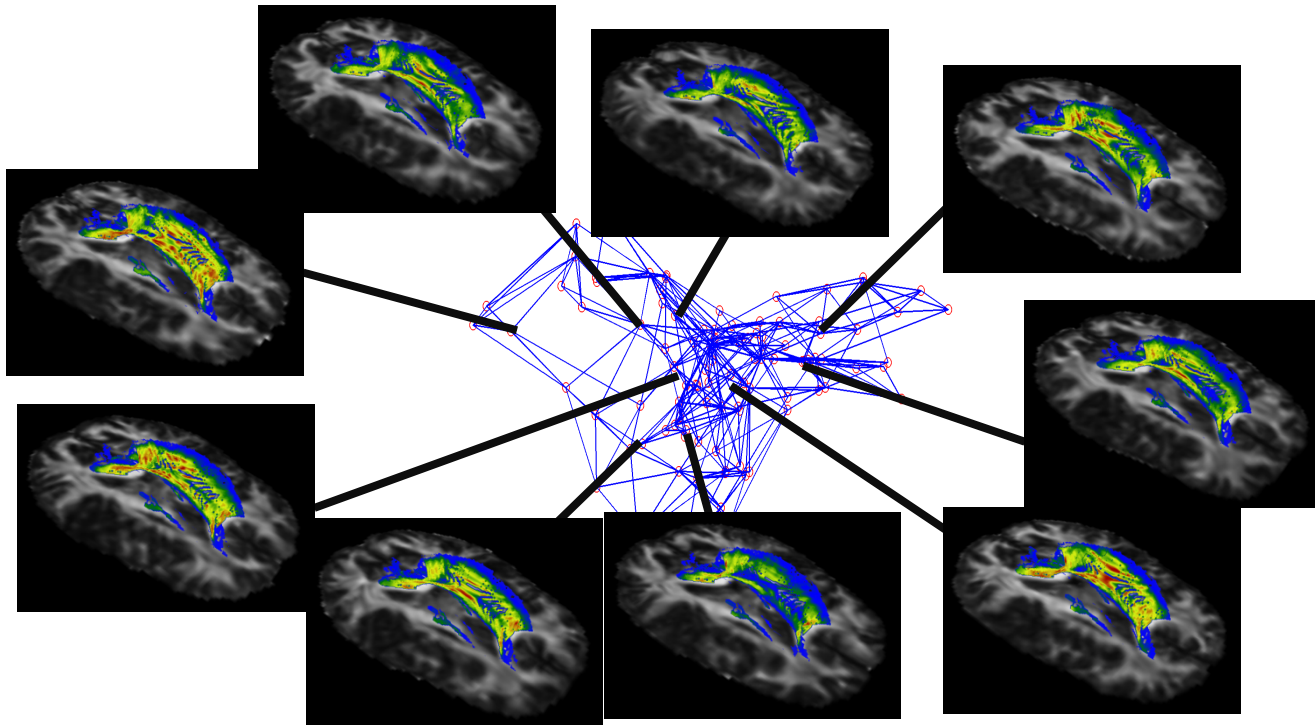
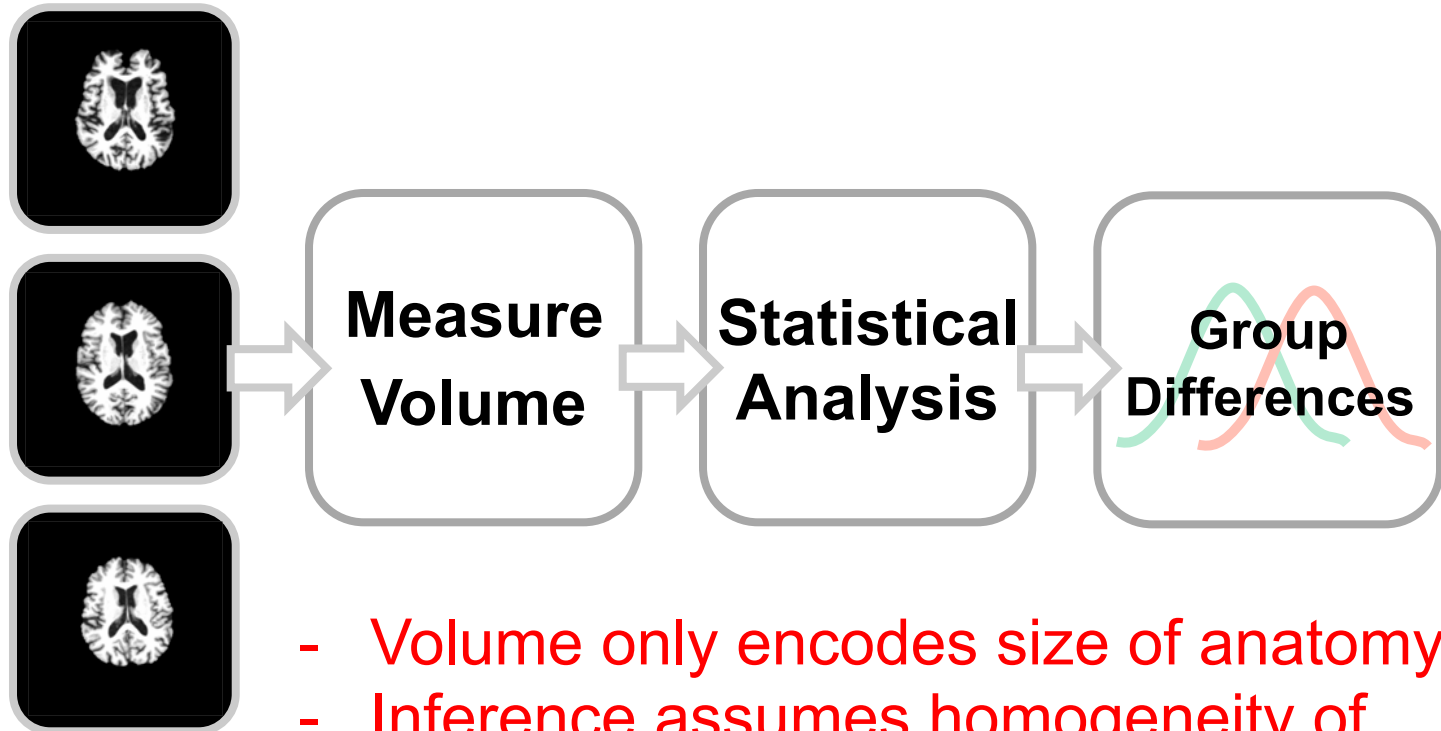


Machine Learning for MRI Phenotype Detection

By
Kilian M. Pohl

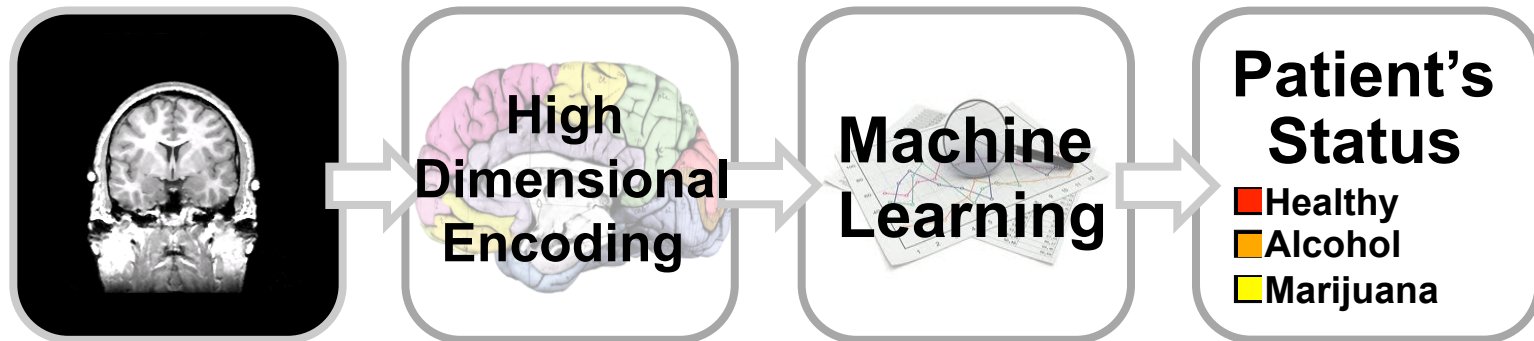


Hypothesis-Driven Analysis



- Volume only encodes size of anatomy
- Inference assumes homogeneity of volumetric scores within cohorts

Data-Driven Approach



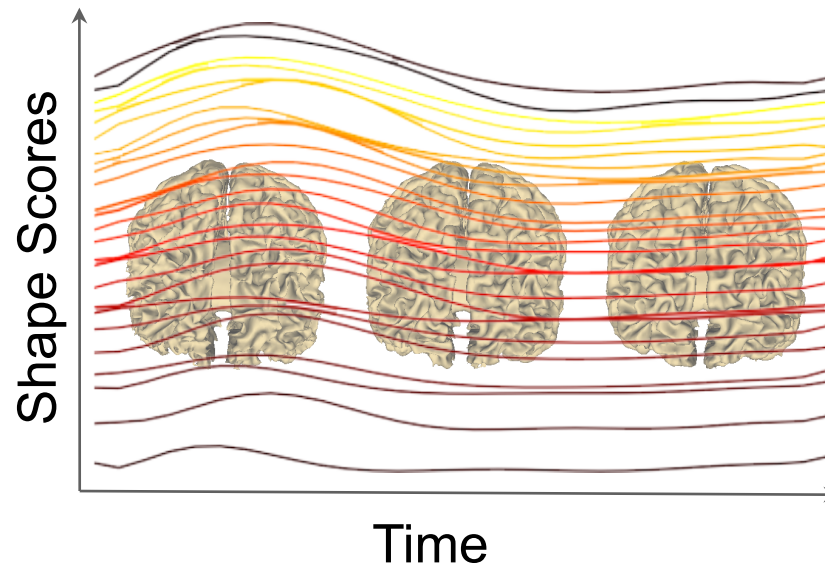
Identify markers by measuring accuracy of model

Questions:

- **What scores to extract?**
- **How to perform inference?**

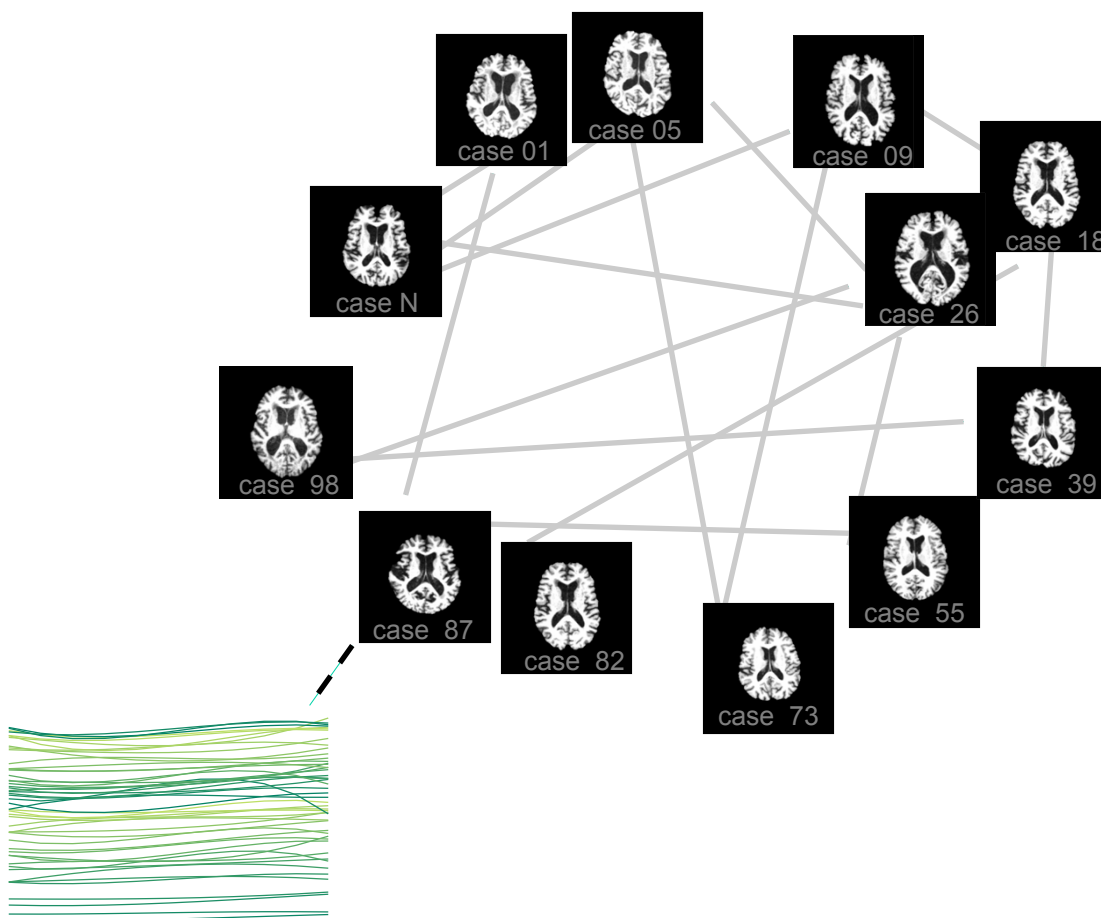
Tracking Morphological Changes*

* Bernardis et al. MICCAI 2012



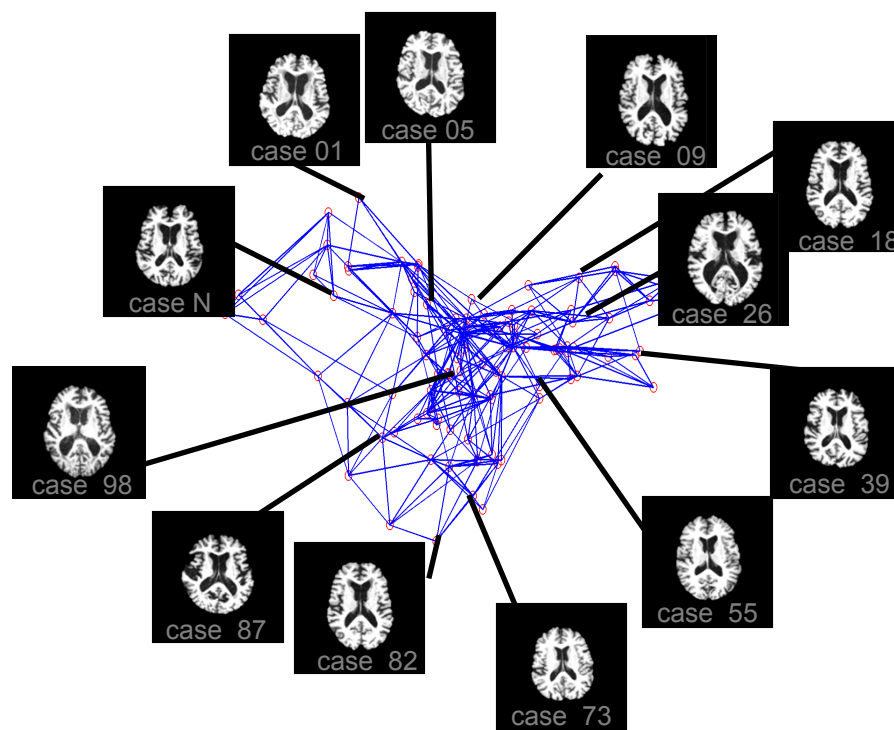
Compare Subjects*

* Konukoglu et al. TMI 2012, PAMI 2013



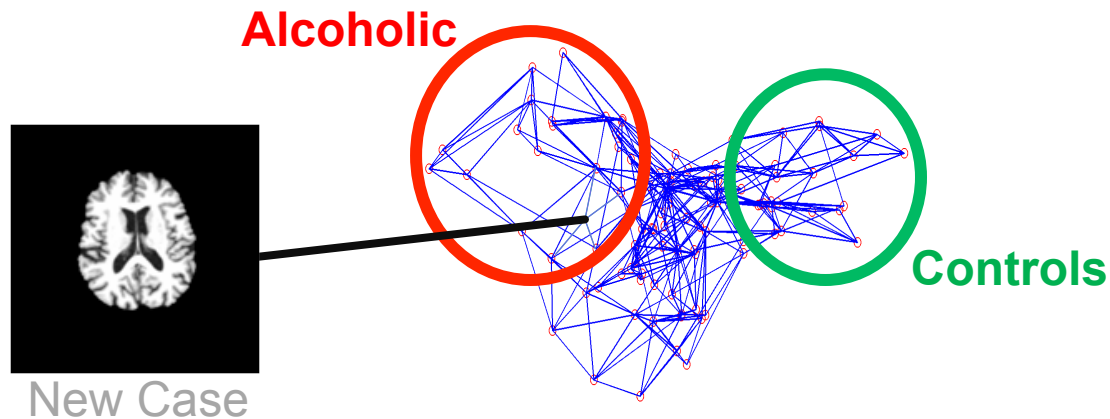
Create image Map*

* Ye et al. MICCAI 2012, ISBI 2012
MICCAI 2013, ISBI 2014



Identify Markers*

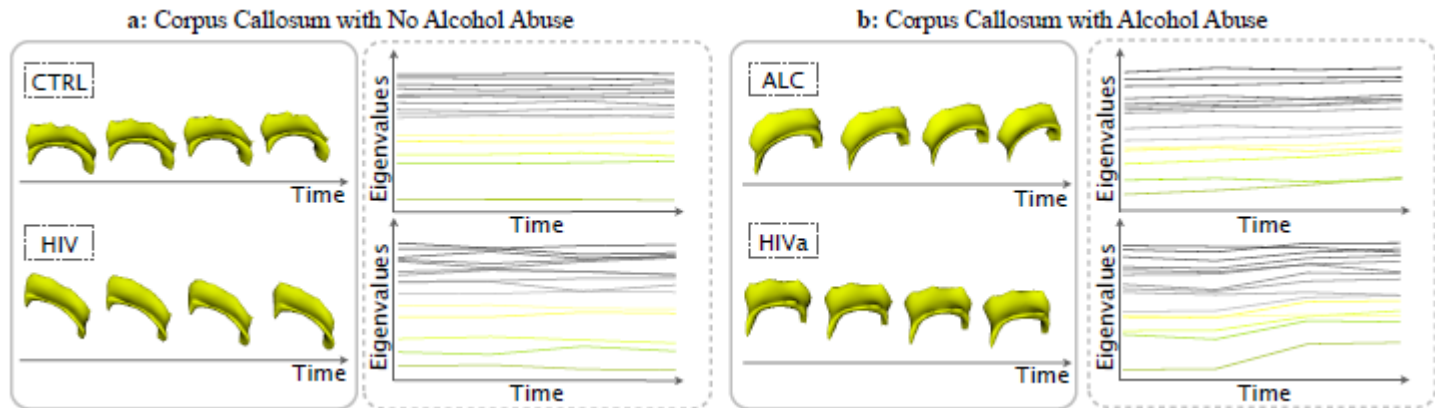
* Ye et al. TMI 2014



- Step 1: Use iMap to identify cohorts
- Step 2: Measure accuracy of cohorts by projecting new scan onto the iMap

Impact of Alcohol*

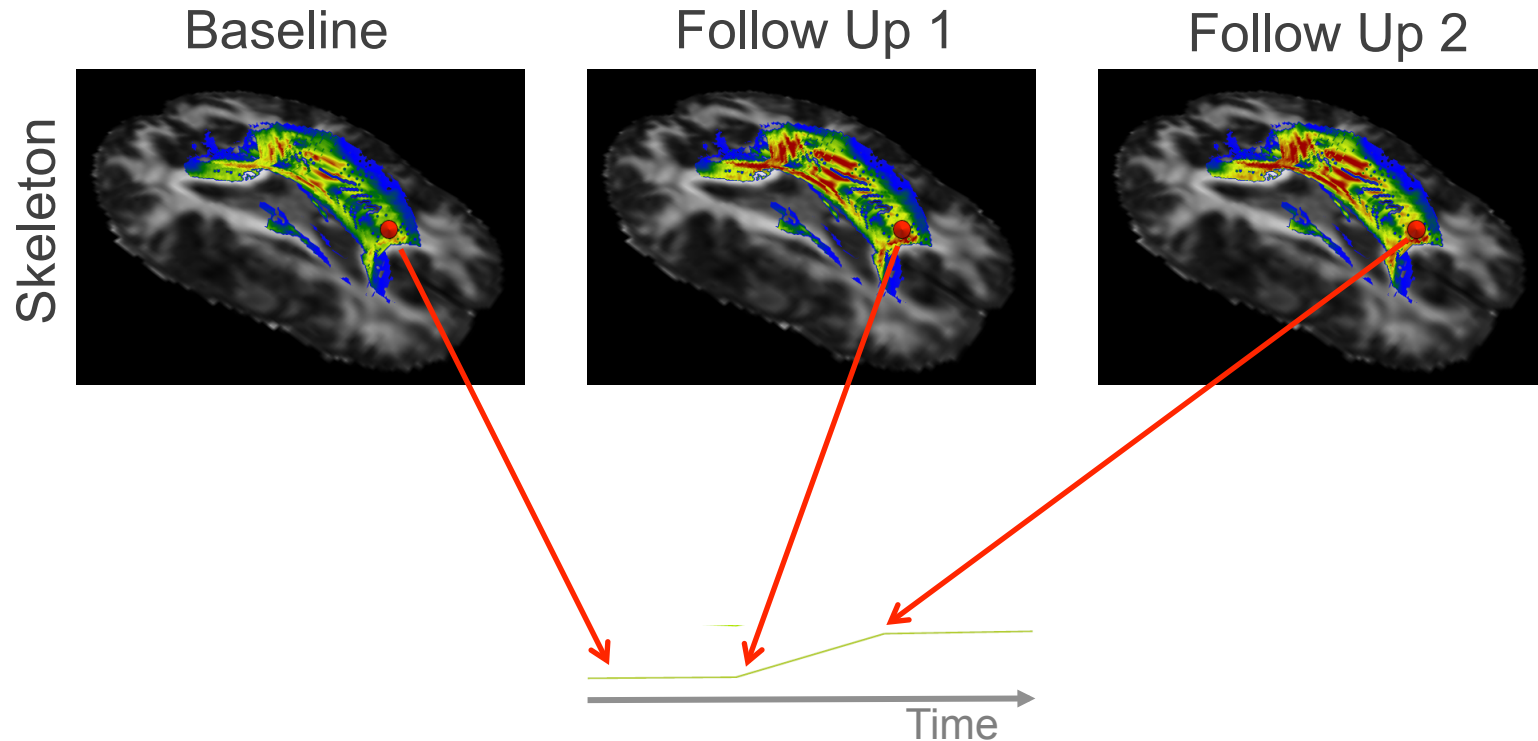
* Bernardis et al. TMI under review



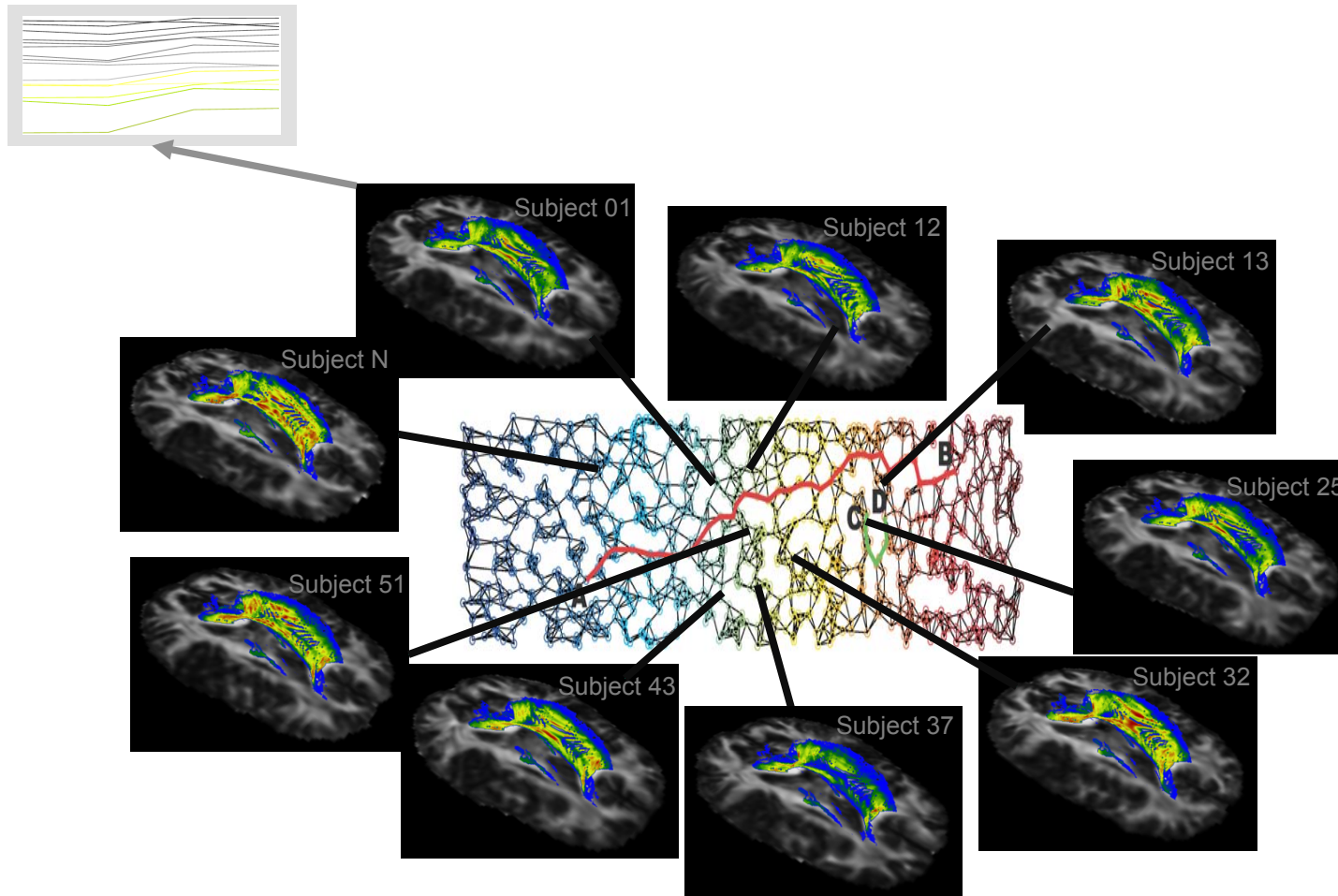
	Volume Measurement
HIV vs. CTRL	53 %
Alc vs. CTRL	55 %
HIV&Alc vs. CTRL	61 %
HIV&Alc vs. Alc	50 %

Significant difference based on two-sided Fischer Exact Test

Next Step: Apply to TBSS

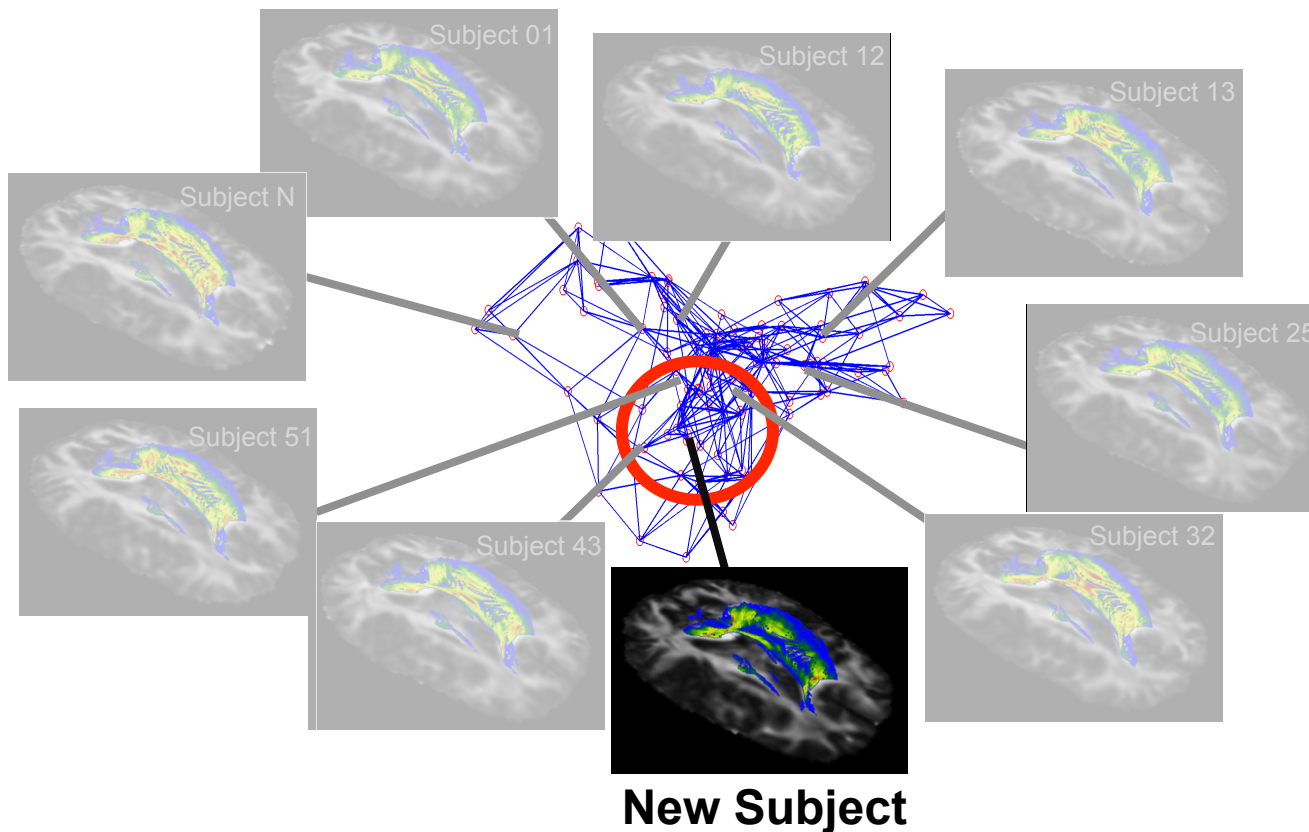


Next Step: Learn Map



Identify predictive markers based on iMap

Next Step: Identify Risk Factors



Thank you

Creating Maps of 4D Brain Images to Unravel Dementia Heterogeneity of Aging HIV Population

National Institute of Allergy and Infectious Diseases, International AIDS Society,
NIH-funded Centers for AIDS Research (CNIHR)

Role: Principle Investigator

The National Consortium on Alcohol and NeuroDevelopment in Adolescence: Data Center Component

National Institute on Alcohol Abuse and Alcoholism (U01 AA021697)

Role: Co-Investigator

Neuroimaging of Connectivity in Alcoholism

National Institute on Alcohol Abuse and Alcoholism (R01 AA012388)

Role: Co-Investigator

