NeuroLit:
A Visualization & Prediction Tool for Reading Research

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80%

of children with learning disabilities have a reading disability

Reading research aims to:

1. Find struggling readers early
2. Individualize treatment
3. Learn how we can tailor a faulty educational system to work for all students

How can NeuroLit help?

Incorporating the power of Data Science

- Building models
- Exploring data in methodical ways
- Looking for hidden relationships

The Data

Two datasets:

1. Behavioral measures of reading skill, standardized
2. Survey responses, mostly binary + 1 Likert scale rating of reading ability

** All data used is de-identified and available by permission of the research participants in accordance with the UW IRB **

UNIVERSITY of WASHINGTON
Reading & Dyslexia Research Program

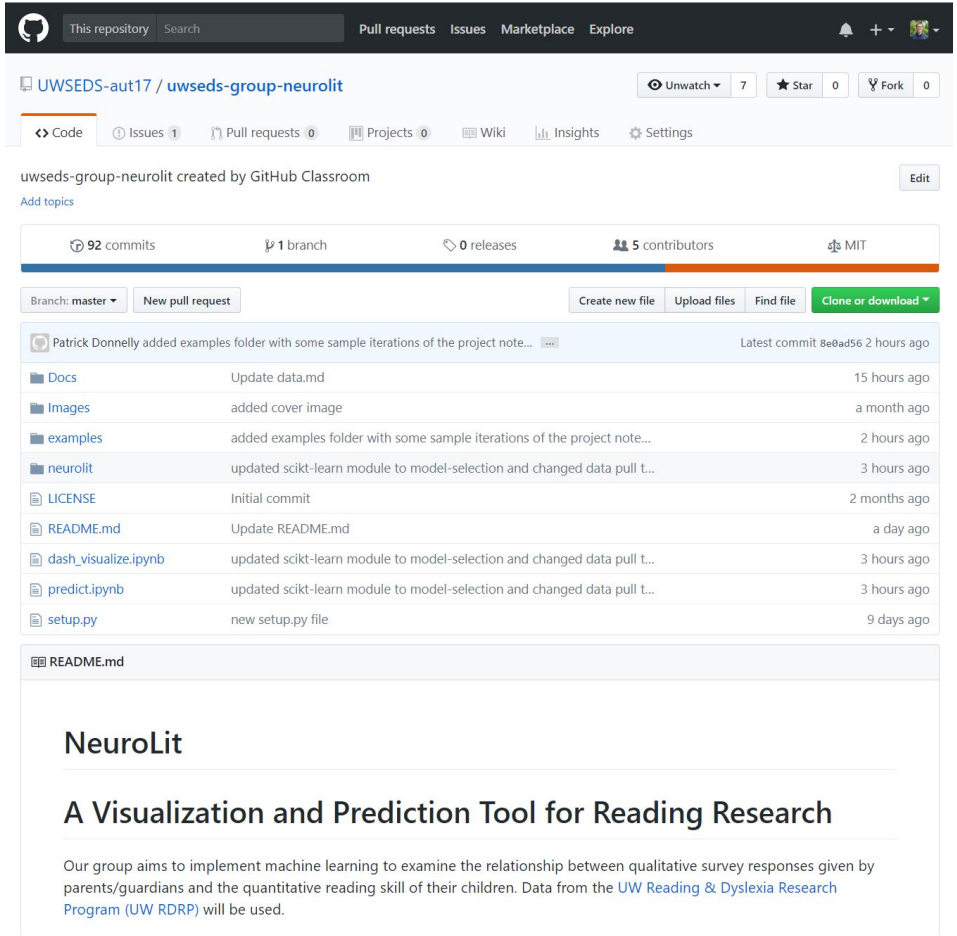
ITHS | Institute of Translational Health Sciences
Accelerating Research. Improving Health.

REDCap™

Brain Development & Education Lab

The Interface

[NeuroLit Github Repository]



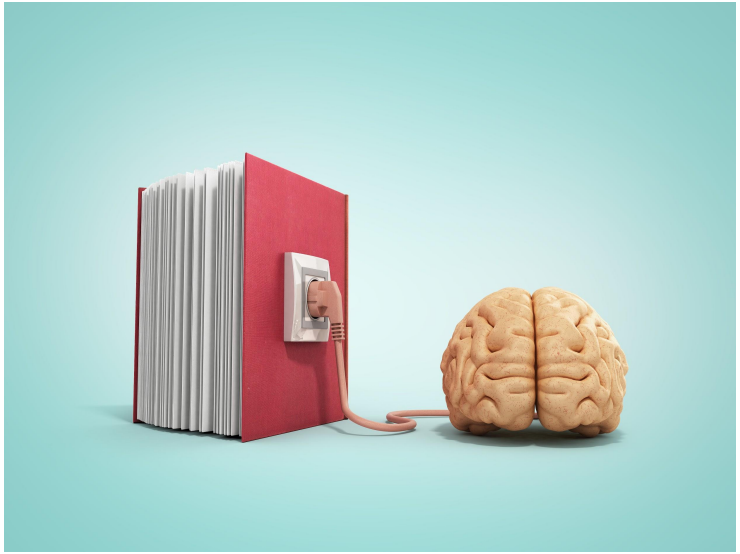
Use Cases

Data Visualization:

1. Can we create a tool that will produce fast, easy, and presentation-worthy visualizations of relationships in our data?
2. Using our survey data, do parent perceptions of reading difficulty correlate with assessed reading skill?

Model-building:

3. Is our reading assessment able to predict the diagnosis of reading disability?



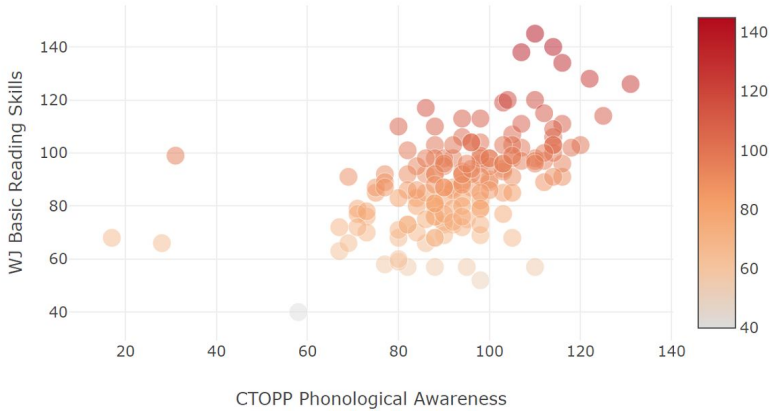
NeuroLit Visualization Tool

UW Reading and Dyslexia Research Program.

Perceived Reading Skill

CTOPP Phonological Awareness

WJ Basic Reading Skills



NeuroLit Model Building

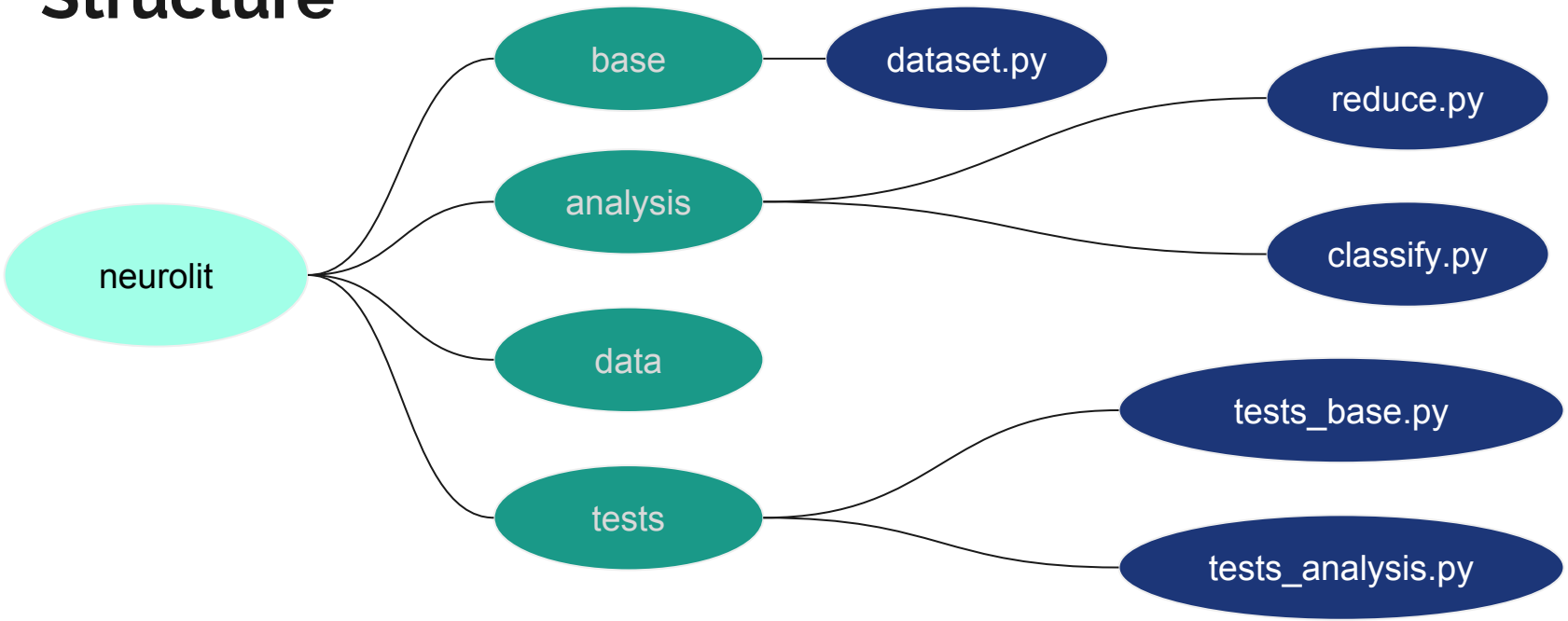
User: UW researchers/students interested in using reading data to predict dyslexia diagnosis

- Pull RedCap data
- Select variables of interest
- Visualize relationships
- Use machine learning to predict outcomes
- Visualize outcomes

Layout

- Setup.py
- Ipython notebook
  - Imports scripts to call functions
  - Visualization script

Structure


neurolit
base
dataset.py
analysis
reduce.py
classify.py
data
tests
tests_base.py
tests_analysis.py

Design

Curating Data

- Data retrieval
- Dataset object
- Variable selection
- Missing data imputation
- Data normalization

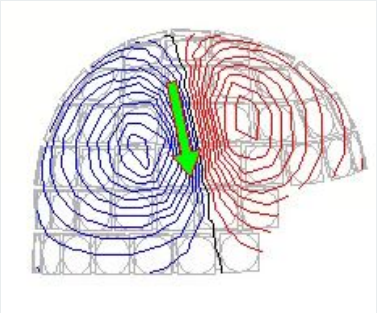
Data Analysis

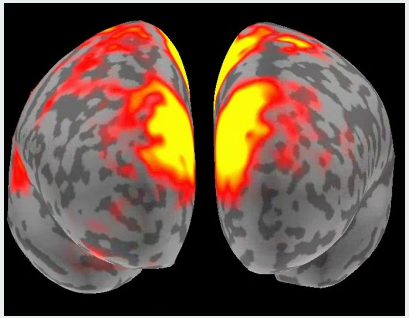
- Dimensionality reduction
- Classification
- Regression
- Clustering

Visualization

- Variable relationships
- Model parameters
- Model performance
- Raw data distributions

Lessons Learned/Future Directions





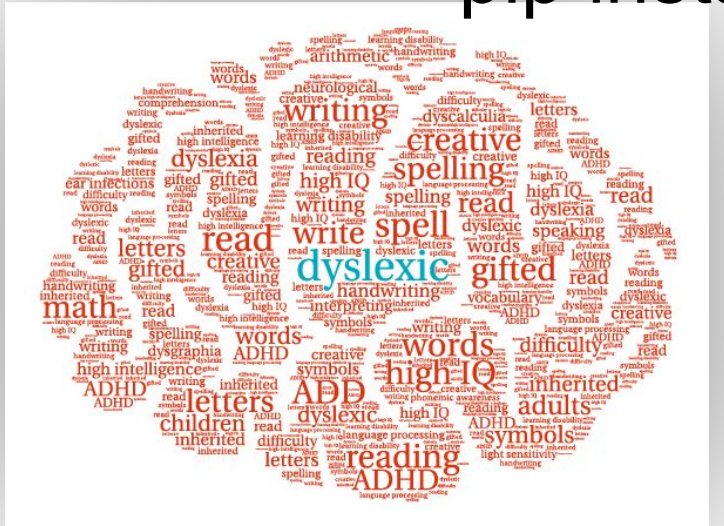
Lessons:

- Time is limited
- Start simple and build on it

Looking to future:

- Visualize machine learning outcomes
- Incorporate functional brain-imaging data
- Generalize to other kinds of categorical data

pip install NeuroLit Today!



https://github.com/UWSEDS-aut17/uwseds-group-neurolit