Seizures, Fidgets, and Procrastination: Decoding the Brain-Behavior Remix in Epilepsy + ADHD

Final Project - Proposal

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Libraries installed (Agent AI assisted with what libraries)

Create & activate your environment (conda example)

conda create -n epi_adhd python=3.10 -y conda activate epi_adhd

Install core data manipulation & ML libraries

pip install
numpy
pandas
scipy
scikit-learn
matplotlib
seaborn
plotly
jupyterlab

Install EEG-specific libraries

pip install
mne
neurokit2

Install advanced ML & interpretability tools

pip install
xgboost
lightgbm
optuna
shap
imbalanced-learn

Install deep learning frameworks (optional stretch)

pip install
torch
torchvision
tensorflow

Install utilities for reproducible docs & dashboards

pip install
quarto-cli
voila
dash
jupyterlab-nvdashboard

7. (Optional) If you need to read/write Excel

pip install
openpyxl
xlrd

Verify installation

pip list

Dataset 1 (ADHD Motor Activity Dataset (OBF-Psychiatric)

Get data from website using wget

wget -O data/OBF-Psychiatric-Dataset.zip
“https://zenodo.org/record/13754984/files/OBF-Psychiatric%20Dataset.zip?download=1” # unzip data in codespace unzip data/OBF-Psychiatric-Dataset.zip -d data/OBF-Psychiatric-Dataset/ # merge python - <<EOF import pandas as pd, glob, os pattern = os.path.join(“data/OBF-Psychiatric-Dataset”, “*.csv”) files = glob.glob(pattern) dfs = [] for f in files: df = pd.read_csv(f) df[“subject_id”] = os.path.splitext(os.path.basename(f))[0] dfs.append(df) combined = pd.concat(dfs, ignore_index=True) os.makedirs(“data/merged”, exist_ok=True) combined.to_csv(“data/merged/ADHD_combined.csv”, index=False) print(“Saved data/merged/ADHD_combined.csv with”, combined.shape[0], “rows”) EOF

Dataset 2 (CHB-MIT Scalp EEG Database (epilepsy)

Get data from website using wget

wget -r -N -c -np https://physionet.org/files/chbmit/1.0.0/ -P data/chbmit/ # unzip data in codespace unzip data/chbmit/chbmit-1.0.0.zip -d data/chbmit/ # list out files ls data/chbmit/chb01/*.edf | head -n 5 # 4) Convert one EDF to FIF (MNE format) for faster loading python - <<EOF import mne, glob, os edf = glob.glob(“data/chbmit/chb01/*.edf”)[0] raw = mne.io.read_raw_edf(edf, preload=True) fif_out = edf.replace(“.edf”, “.fif”).replace(“/

chbmit/", "/data/chbmit/preprocessed/") os.makedirs(os.path.dirname(fif_out), exist_ok=True) raw.save(fif_out, overwrite=True) print("Saved preprocessed FIF:", fif_out) EOF

Dataset Descriptions

Learning to download the seizure dataset to an AWS source. I will include that code in my final project code.

OBF-Psychiatric Motor Activity Dataset

This dataset comes from Simula Research Laboratory via Zenodo and contains minute-by-minute activity recordings for 162 adults, including those diagnosed with ADHD, depression, and schizophrenia, plus healthy controls. Altogether it's about 1,565 days of data (roughly 4.3 years!). I chose this because it gives me real-world movement patterns for ADHD—perfect for seeing when restlessness spikes or when I (and others) might struggle to sit still during lectures. It's also small enough (~10 MB) that I can merge all the ADHD files quickly without my laptop melting.

CHB-MIT Scalp EEG Database

Hosted on PhysioNet, this classic epilepsy dataset includes continuous scalp EEG recordings from 23 subjects (mostly kids and teens) with a total of 950+ hours and 182 annotated seizures. Each recording is in EDF format at 256 Hz across 22–36 channels. I picked CHB-MIT because it's the "hello world" of seizure data—tons of examples, straightforward format, and lots of community code I can borrow. It'll let me explore brain-wave patterns right before seizures and compare them to ADHD movement data.

***pythonThe data coding is above the description.

Questions

1. Do adults with epilepsy fidget or move around more like someone with ADHD compared to folks without epilepsy?

   I want to see if people who have seizures also show that classic "can't sit still" energy we see in ADHD—using the motor activity data, I'll compare how much and how often epilepsy patients move versus control subjects.

2. Can we spot EEG brain-wave patterns in epilepsy patients that predict when they'll get restless or hyperactive, like ADHD symptoms?

   I'm curious if specific brain-wave changes—like spikes in theta or shifts in beta power—happen right before someone with epilepsy starts acting restless. By matching EEG features to activity bursts, we can test if the brain signals actually predict ADHD-style behavior.

3. Is there a secret "epilepsy + ADHD = Procrastination Masterclass" going on?

   I'm curious whether people with both epilepsy and ADHD not only fidget more but also show longer "inactive" gaps in their motor or EEG data—kind of like data-driven proof that they've perfected the art of procrastination.

Analysis plan

"Okay, brainiac mode activated—also powered by about three cups of coffee and a pro-level procrastination habit (thanks for accepting my late project, Prof!). Here's the game plan:

1. Variables We've Got

   Fidget Rate: How many times someone shifts per minute (because chairs hate still humans).

   EEG Band Powers: Delta, theta, alpha, beta, gamma—basically my brain's DJ playlist.

2. New Features I'll Conjure

   Connectivity Matrices: Fancy jargon for 'which brain regions are gossiping the most.'

   Entropy Measures: Chaos theory applied to your noggin—because why not quantify my mental mayhem?

   Procrastination Proxy: A cheeky count of gaps in activity or EEG data where I probably went to grab a snack and let the dachshunds out to use the restroom.

3. External Data to Bribe Into the Mix

   ADHD Questionnaire Scores: If I can find them, I'll merge in self-reported restlessness—because self-awareness is half the battle.

   Seizure Diaries: My own scribbles of 'oops another one' timestamps, if available.

4. My Million-Dollar Hypothesis

   I'm genuinely wondering if the data will show that epilepsy patients are more likely to have ADHD—and therefore have honed their procrastination skills to an art form in the first place.

5. Modeling Strategy

   Random Forest: The Swiss Army knife of models—let's see if it agrees I'm onto something.
   Validation: Cross-validation and maybe a prayer to the statistics gods for good luck.

6. Analyis Overview (I added #6 because it felt like an logical overview was missing)

   By the end of this project, I want to have solid, data-driven answers to whether epilepsy and ADHD really do pair up—and whether that combo turns people into world-class procrastinators. I'll bring together the motor activity and EEG features, build models that can spot restlessness and predict it from brain-wave patterns, and then drill into the results to understand which features matter most.

   My dream outcome is finding simple "red flags" in the data—like a burst of theta waves or a big drop in activity—that tell us someone's about to start fidgeting, daydreaming, or hitting that "I'll do it later" mode. At the end, I want to weave it all into one clear picture: how brain signals and movement patterns team up in epilepsy and ADHD—and what that means for staying focused, bouncing in your seat, and yep, procrastinating.

If my hunch is right, we'll discover that the "epilepsy + ADHD = top-tier procrastinators" club is a real thing—and maybe even explain why I've been late on this proposal all along. ☒".