Streamlined Epilepsy Diagnosis: An EEG GUI and Semiology Classifier

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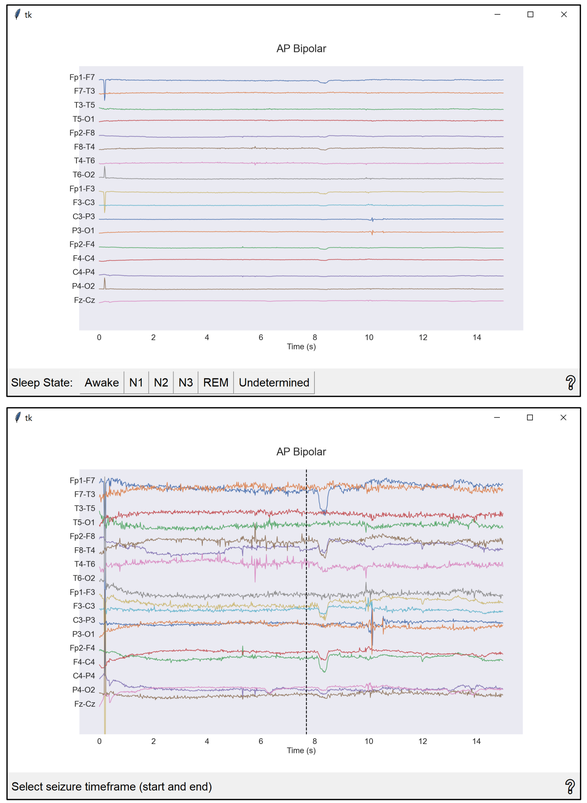
Scalable GUI Design for EEG Analysis

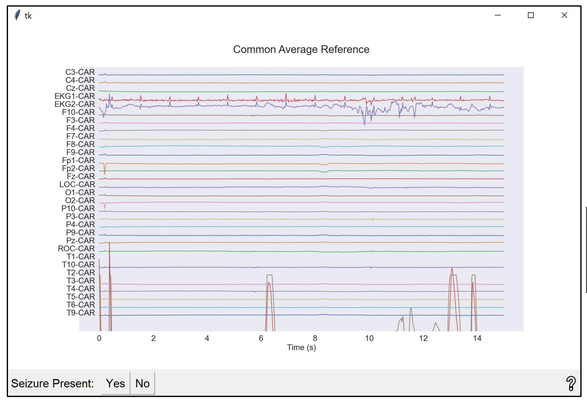
- Epilepsy affects a large population and is a major cause of disability
- EEG data is crucial to diagnosing epilepsy
- Manual review process of EEGs can be time-consuming and error-prone
- A scalable GUI can streamline the manual annotation process of EEG data

- Python- widely available
- Libraries- no external package required
  - tkinter, seaborn/matplotlib, numpy/pandas
  - Custom module to access ieeg.org

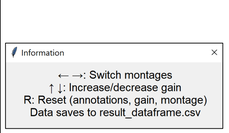
Goals

- Efficient data visualization, multiple dataset handling, intuitive UI
- Automatic annotation organization, collaborative annotation support

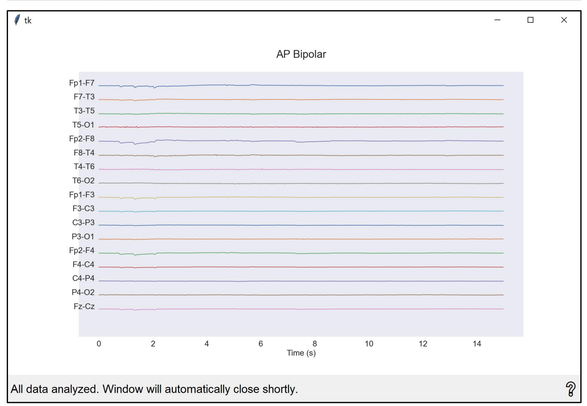




Various sample states of GUI



Key binds for GUI (above)



	A	B	C
1	dataset_name	dataset_start_time	duration
2	EMU0001_Day03_1	12353500000	15000000
3	EMU0001_Day03_1	12368500000	15000000
4	EMU0001_Day03_1	12383500000	15000000
5	EMU0001_Day01_1	18854000000	15000000
6	EMU0001_Day01_1	18869000000	15000000

Sample data format for GUI use (above)

Annotations by first user

	A	B	C	D	E	F	G	H	I	J	K	L
1	sleep_state_0	prediction_0	start_0	end_0	sleep_state_1	prediction_1	start_1	end_1	sleep_state_2	prediction_2	start_2	end_2
2	1	1	6.086712	8.287323	1	0			3	1	7.893977	9.222848
3	0	0			0	1	9.722503	11.01948	1	0		
4	4	1	6.341855	8.797609	2	0			4	1	8.765716	10.41352
5	1	0			-1	-1	-1	-1	-1	-1	-1	-1
6	5	0			-1	-1	-1	-1	-1	-1	-1	-1

Compiled analysis of first data segment

Diagnostic Capabilities of Semiology

- While spike detection through EEG data analysis is essential, overreliance on presence of interictal spikes for diagnosis of epilepsy can be sub-optimal
- Patient semiology can be used to help classify PNES vs. ES through NLP methods
- Certain signs useful for distinguishing, but no single sign exclusive

Goal

- Explore use of semiology to predict epilepsy or its absence

"A brown fox" [1 1 1 0]

Cosine Similarity: $(a \cdot b) / (\|a\| \times \|b\|)$

"A brown duck" [1 1 0 1]

0.667

Heatmap of cosine similarities between 30 semiology descriptions, generated using TF-IDF

Key
Red: Epileptic
Blue: Non-epileptic