EPILEPSY AI

SEIZURE DETECTION RESEARCH

DATA SHEET

Epilepsy AI Data Sheet

Research models that detect seizures in scalp EEG and show which electrodes their decision rests on



djanai

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70%

of 198 seizures detected in 23 children, model fine-tuned per child

1.9

false alarms per 24 hours at that setting

57%

of 47 seizures caught in 14 adults the model never saw

Executive summary

Epilepsy AI is open research code from djanai for detecting epileptic seizures in multi-channel scalp EEG. Its main model, a graph neural network over the EEG electrodes, reads the recording continuously, raises an alarm when a seizure starts, and shows which electrodes the decision rests on.

Every number is measured the hard way: tested on patients or recordings the model never trained on, counted as whole seizures and false alarms per day rather than as accuracy on short windows, and traced to a saved run with its code version, random seed and dataset checksums.

The code is free for non-commercial research under the PolyForm Noncommercial 1.0.0 licence. **It is research software, not a medical device.** Nothing in it is clinically validated, and it must not be used to diagnose, monitor or treat anyone.

The problem

Around 50 million people live with epilepsy, and some estimates put the number closer to 65 million. Reviewing long EEG recordings by eye is slow, and an automatic detector is only useful if it catches most seizures without raising alarms all day.

Published results often look better than they are. Splitting a recording into short windows and scattering them across training and test sets lets a model recognise the patient rather than the seizure. Reporting accuracy on balanced windows hides how many false alarms a system would raise over a real day. Epilepsy AI was built to measure seizure detection honestly first, and only then to improve it.

Key capabilities

1. Detection on continuous EEG

Four model families on the same 18-channel recordings: features with XGBoost, EEGNet, a CNN-LSTM, and a graph neural network (GNN) that treats each electrode as a node. Alarms are smoothed, merged and scored per seizure, with false alarms counted per 24 hours of non-seizure recording.

2. Two clinical settings, both measured

A new patient (the model has never seen them): the GNN catches 130 to 138 of 198 seizures at 23 to 32 false alarms per day. **A known patient** with a few recorded seizures: fine-tuned on the child's own earlier recordings, it catches 138 of 198 at 1.9 false alarms per day. Learning only from the past, as a bedside device would, it catches 88 of 139 testable seizures at 4.5 per day.

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3. Tested on data it never saw

Trained only on children (CHB-MIT, Boston), the unchanged model detects 27 of 47 seizures in 14 adults from another hospital and country (Siena Scalp EEG) at 7.4 false alarms per day, with a window AUROC of 0.90.

4. Evidence you can see

Integrated gradients show which electrodes drove each detection. The GNN's evidence follows the channels where each child's EEG actually changes (positive agreement in 22 of 23 children), and in the adult test it points to the clinically recorded side of the brain for 11 of 13 patients. A 3-D head view in the web interface shows the EEG change or the model evidence on the electrodes.

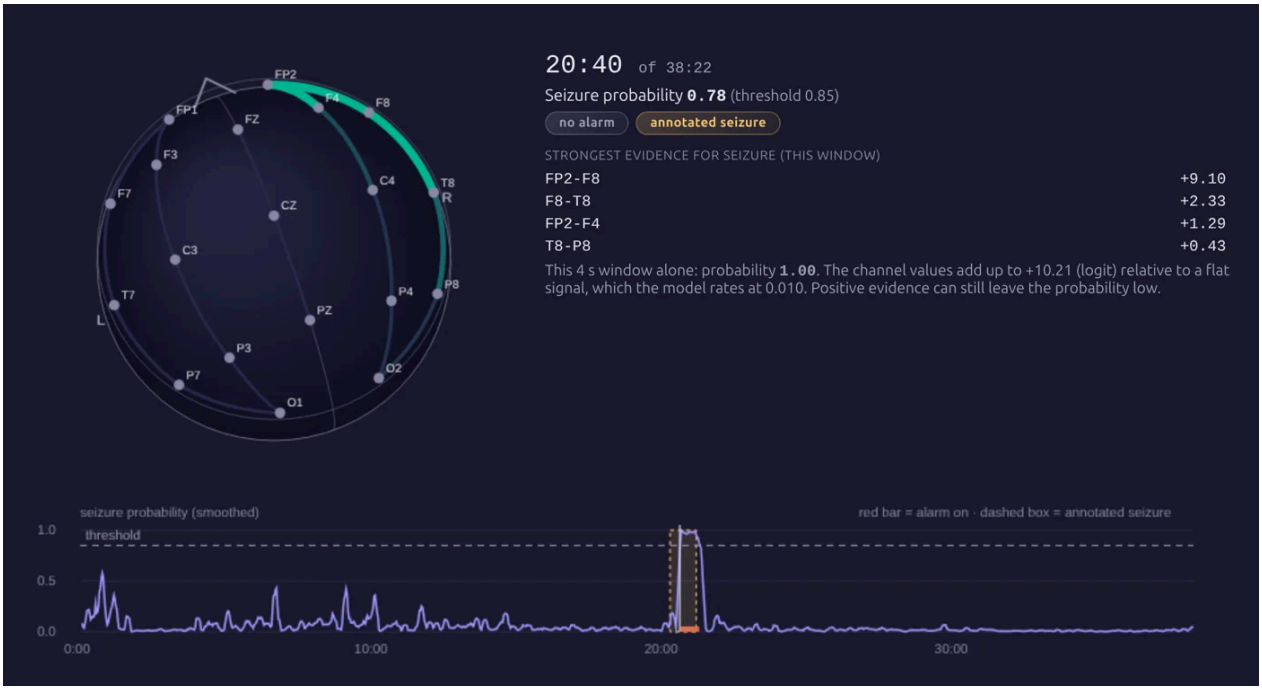


Figure 1: The web interface's 3-D head view: each electrode coloured by how strongly the model's evidence for a seizure comes from it, for one CHB-MIT recording.

5. Your own recordings

An importer reads EDF and EDF+ files, CSV seizure lists and the TUSZ and CHB-MIT annotation formats, removes personal details from EDF headers and gives patients pseudonyms. The web interface can predict on imported EEG and fine-tune a model per patient.

Feature summary

Area	What Epilepsy AI does
Evaluation	Splits by patient or recording, never by window; reports seizures detected, false alarms per 24 h, detection delay, AUROC and AUPRC, mean ± std over patients
Models	XGBoost on EEG features, EEGNet, CNN-LSTM, electrode-graph neural network
Protocols	Cross-patient (leave one patient out), patient-specific (leave one seizure recording out), chronological (past recordings only)
External test	CHB-MIT model applied unchanged to the Siena adult database
Explanations	Integrated gradients for the GNN, SHAP for XGBoost, side-of-brain check against clinical labels
Brain models	Jansen-Rit and multi-region Epileptor models fitted with simulation-based inference, compared with the black-box detectors

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Area	What Epilepsy AI does
Data import	EDF, EDF+ annotations, CSV seizure lists, TUSZ, CHB-MIT summaries; de-identified headers and pseudonyms
Web interface	Browse runs, start experiments from configs, 3-D head view, import, predict, fine-tune
Provenance	Every run saves its config, metrics, code commit, random seed and dataset checksums

Deployment and requirements

- **Hardware:** Linux (x86-64 or ARM64) with an NVIDIA GPU, Docker and the NVIDIA Container Toolkit. Developed on an NVIDIA DGX Spark; on a smaller GPU, lower the batch sizes. Training and prediction need CUDA.
- **Software:** one container built from the NVIDIA NGC PyTorch image (CUDA 13); one command runs any experiment from its config file. The test suite runs without any data.
- **Data:** not included. CHB-MIT and Siena are open on PhysioNet (about 45 GB and 20 GB); TUH EEG needs a signed data-use agreement. Your own EEG is your responsibility (consent, ethics approval).
- **Web interface:** runs on the local machine only (127.0.0.1), with no login; reach it from another computer through an SSH tunnel.
- **Licence:** PolyForm Noncommercial 1.0.0, for personal research, study, charities, education, public research and health organisations and government bodies. Commercial use needs a separate licence.
- **Not included:** EEG data, trained model weights and run folders; the configs reproduce the results.

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About djanai

djanai designs and builds AI products for domains where mistakes are expensive and every decision must be explained. Epilepsy AI is its first research project, built as a data problem by a team with no medical background and shared so that others can check it, reuse it and take it further.

Request the code at **djanai.com/epilepsy-ai**. For commercial licensing or collaboration, write to **info@djanai.com**.

Research software, not a medical device. Nothing here is clinically validated.