

BCILattice — Technology Stack

Open-source libraries that power BCILattice.

BCINexus Platform · v1.0 · 2026

1. Signal Processing

Library	Purpose
MNE-Python	EEG / fNIRS / MEG reading, filtering, referencing, resampling, and epoch extraction
NumPy	Core numerical arrays and vectorised signal operations
SciPy	Statistical tests, FFT, spectral analysis, and feature extraction
PyWavelets	Wavelet decomposition for time-frequency signal features
librosa	Spectral and rhythm features applied to EMG / EEG envelopes
pyts	Time-series image transformations (Gramian Angular Field, Recurrence Plot)

2. Machine Learning

Library	Purpose
PyTorch	Deep learning — EEGNet, DeepConvNet, Transformer, LSTM, custom architectures
scikit-learn	Classical ML — LDA, SVM, Random Forest, cross-validation, preprocessing, metrics
ONNX Runtime	Inference engine for exported ONNX models (edge / mobile deployment)
SHAP	Model explainability — feature importance and channel contribution plots
Pandas	Tabular data handling for feature frames and session metadata

3. Desktop Interface

Library	Purpose
PyQt6	Native cross-platform desktop UI — windows, panels, dialogs, canvas widgets
PyQtGraph	Real-time signal viewer with GPU-accelerated rendering
QtAwesome	Font Awesome icon integration throughout the interface
Matplotlib	Analysis plots — channel scores, PCA scatter, feature distributions

4. Data & Experiment Tracking

Library	Purpose
MLflow	Experiment tracking — logs every training run, parameters, metrics, and model artefacts
PostgreSQL	Local database for session records, pipeline history, and settings
SQLAlchemy	Database ORM layer

5. Export & Reports

Library	Purpose
Jinja2	HTML templating for auto-generated session reports
WeasyPrint	HTML → PDF conversion for report export
OpenCV	Image processing for signal projection visualisations

6. Licences

All libraries used by BCILattice are open-source.

Library	Licence
PyQt6	GPL v3 / Commercial
PyTorch	BSD 3-Clause
scikit-learn	BSD 3-Clause
MNE-Python	BSD 3-Clause
NumPy	BSD 3-Clause
SciPy	BSD 3-Clause
Pandas	BSD 3-Clause
MLflow	Apache 2.0
PostgreSQL	PostgreSQL Licence
ONNX Runtime	MIT
SHAP	MIT
Jinja2	BSD 3-Clause
WeasyPrint	BSD 3-Clause
PyQtGraph	MIT
OpenCV	Apache 2.0

A full Software Bill of Materials (SBOM) is available on request for enterprise security reviews.

Contact: enterprise@bcinexus.io