StreamingAI

Federated Embedded AI for the digital transformation of Austrian Industries.

Pro²Future

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MOTIVATION & GOALS

Streaming AI aims to drive low TRL, foundational research to develop AI for industrial applications. In contrast to conventional pre-trained, holistic, and resource-intensive AI,

i. **streaming machine learning methods**
ii. **on-device machine learning methods** are to be introduced,

thereby reducing dependence on mass training data and supporting ecological sustainability.

Project FactBox

Project Name StreamingAI
Project ID -
Duration 18 Months

Area 1
Area Perception

Project Lead
Dr. Bernhard Anzengruber-Tanase

STATIC FEDERATION and FEW-SHOT LEARNING

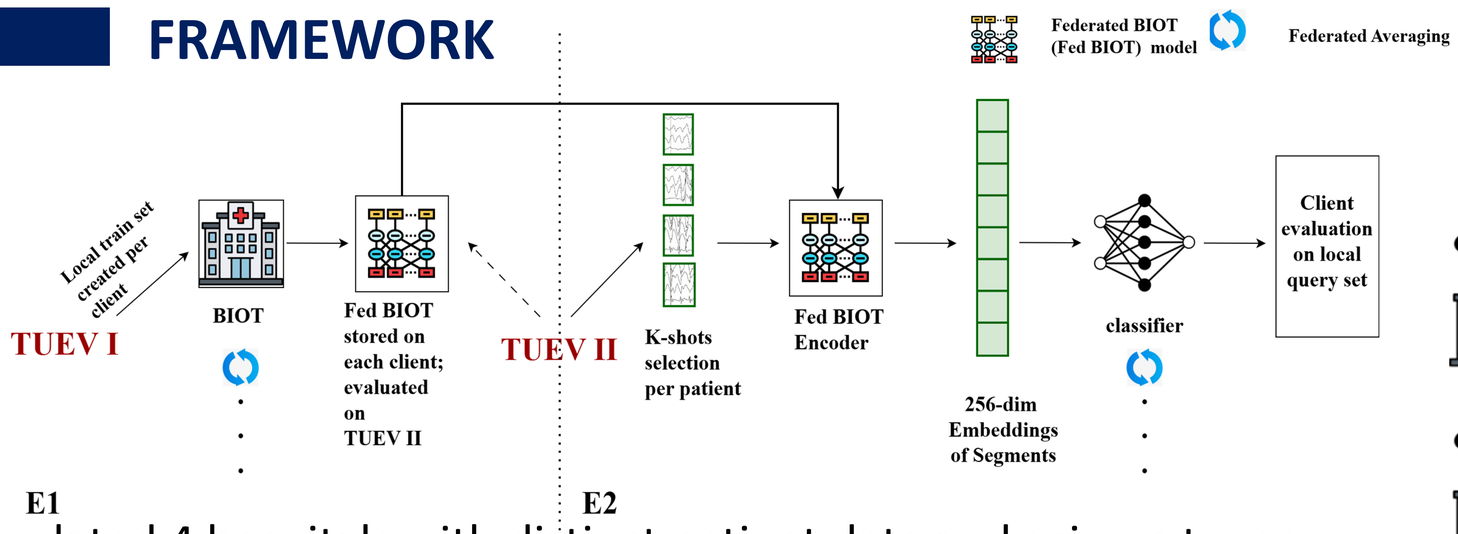
Developing privacy-preserving AI for time-series classification using Federated Few-Shot Learning (FFSL), enabling cross-institutional model training without data sharing and rapid local adaptation to individuals.

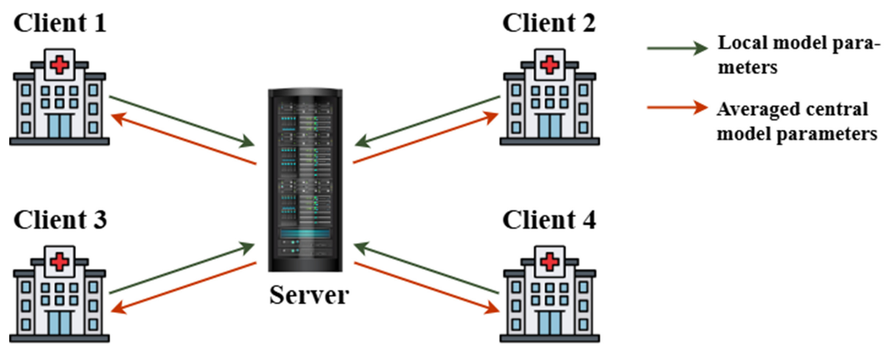
CONTRIBUTION

Scientific contribution
Demonstrating the integration of few-shot and federated learning for privacy-preserving, personalized time series classification.

Economic contribution
Enabling cost-efficient, regulation-compliant deployment of adaptive seizure detection in hospital and home-care settings.

FRAMEWORK





Simulated 4 hospitals with distinct patient data and seizure types.
Two-stage training:
E1: Federated pre-training of a transformer-based seizure classification model on distributed EEG data.
E2: Federated few-shot learning for patient-specific seizure detection.

RESULTS

- Federated model shows slightly lower performance than centralized but gains real-world applicability through privacy compliance.
- FFSL achieves up to 91% balanced accuracy with just 5 labeled samples per patient, demonstrating feasible privacy-preserving, personalized seizure detection.

Client	Patient #	Bal. Accuracy
1	7	0.838
2	7	0.912
3	6	0.533
4	8	0.797

Metric	BIOT	Fed BIOT
Bal. Accuracy	0.5207	0.4328

IMPACT

- Predictive maintenance: cross-site training, local adaptation with few samples.
- Wearable health monitoring: shared model, personalized to each user.

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