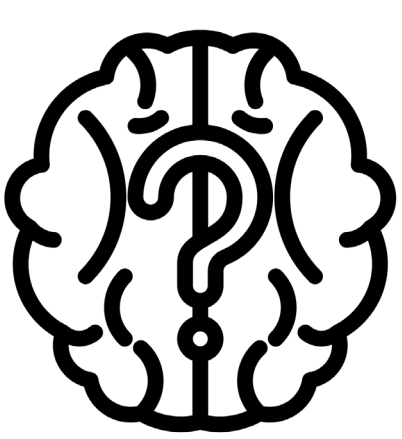




EEG-Based Alzheimer's Disease Detection With Foundation Model

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What's EEG?

- Non-invasive brain signal measuring neurological activity

Why EEG?

- Affordable for routine and longitudinal AD screening, in-clinic and at-home
- Widely available: anywhere, anytime

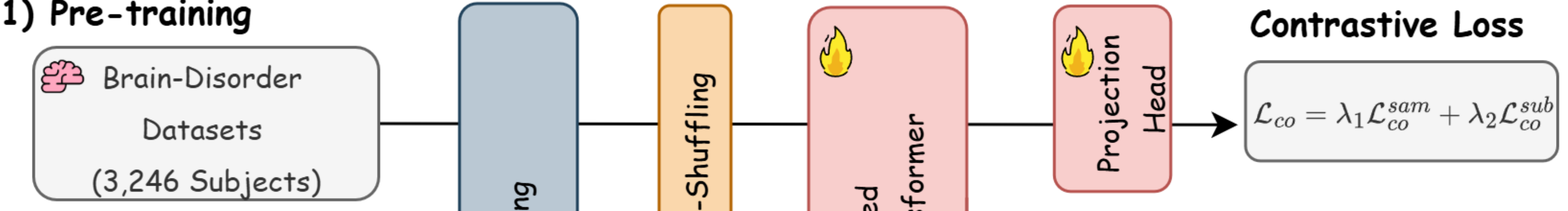
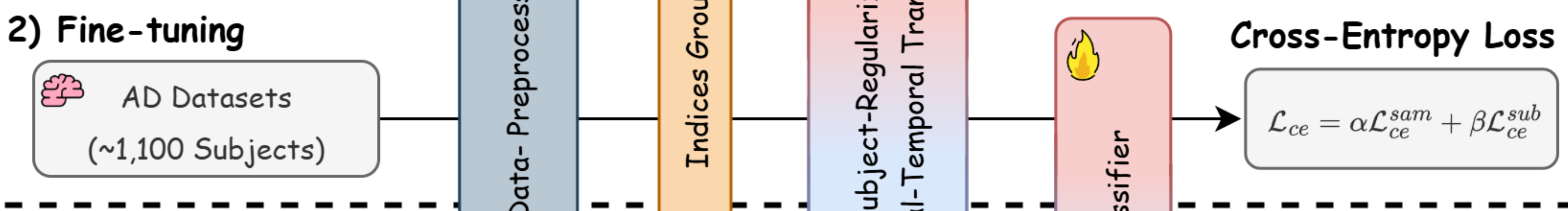


The Challenges

- Brainwave patterns differ greatly from person to person
- Current algorithms are not accurate (60% acc) when used on new patients
- Most studies use small datasets (20–100 subjects), limiting model capacity

How Our Foundation Model helps?

- Like Language Foundation Model (e.g., GPT) learns from massive text, we train an EEG Foundation Model on massive EEG data (2,827 subjects) to understand AD patterns
- The broad training helps handling the variability in brain signals across patients

METHODS	RESULTS	TAKE AWAY
We formulate EEG-based AD detection as a supervised classification problem. ○ An end-to-end Transformer architecture is adopted as the backbone ○ Self-supervised contrastive learning employed during pre-training ○ All EEG recordings are processed using a unified preprocessing pipeline ○ The self-supervised pre-training stage leverages 632.63 hours of EEG data from 2,827 subjects ○ The pre-trained foundation model is fine-tuned for downstream multi-class AD detection 1) Pre-training  2) Fine-tuning  3) Validation & Detection 	• Achieved an average subject-level accuracy of 90.91%, exceeding baseline methods by more than 10% • Pre-training is critical: training from scratch drops performance by ~15% • Model design matters: subject-level loss, index shuffling, and sampling rate embedding are all helpful • Model and code released: to support researchers with limited data • Extended Full manuscript: https://arxiv.org/abs/2502.01678	• We built LEAD, the first EEG foundation model for Alzheimer's detection • Pre-trained on the world's largest EEG-AD dataset • Achieved state-of-the-art accuracy and outperforming 16 existing methods SOURCE CODE  https://github.com/DL4mHealth/LEAD https://xiangzhang.info  ALZHEIMER'S ASSOCIATION AAIC>26