

Adapting a General-Purpose EEG Foundation Model for Pediatric Sleep Staging: Development of a Channel-Agnostic Multimodal Framework

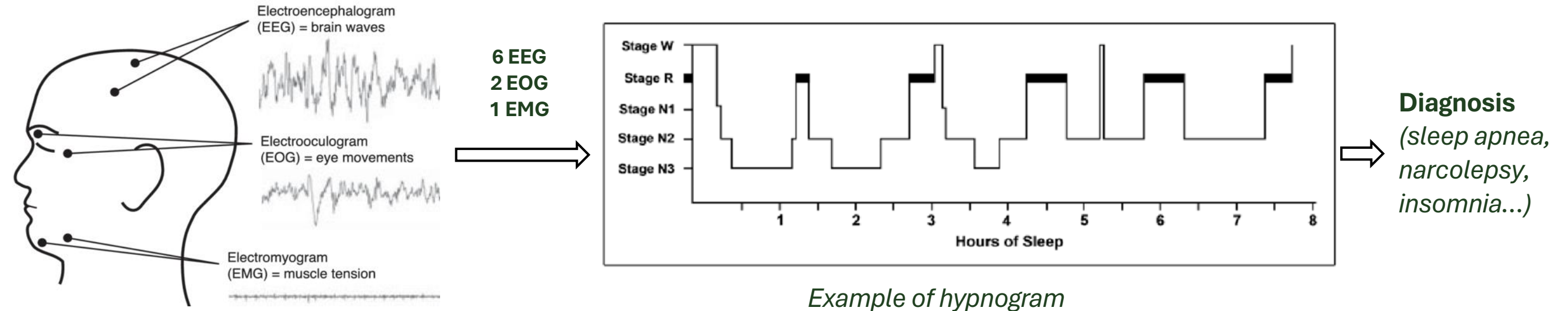
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Introduction - Sleep stages classification



Current situation :

- Annotation for 30sec of signal
- Rules for pediatric sleep stages are more complex due to age dependency indicators

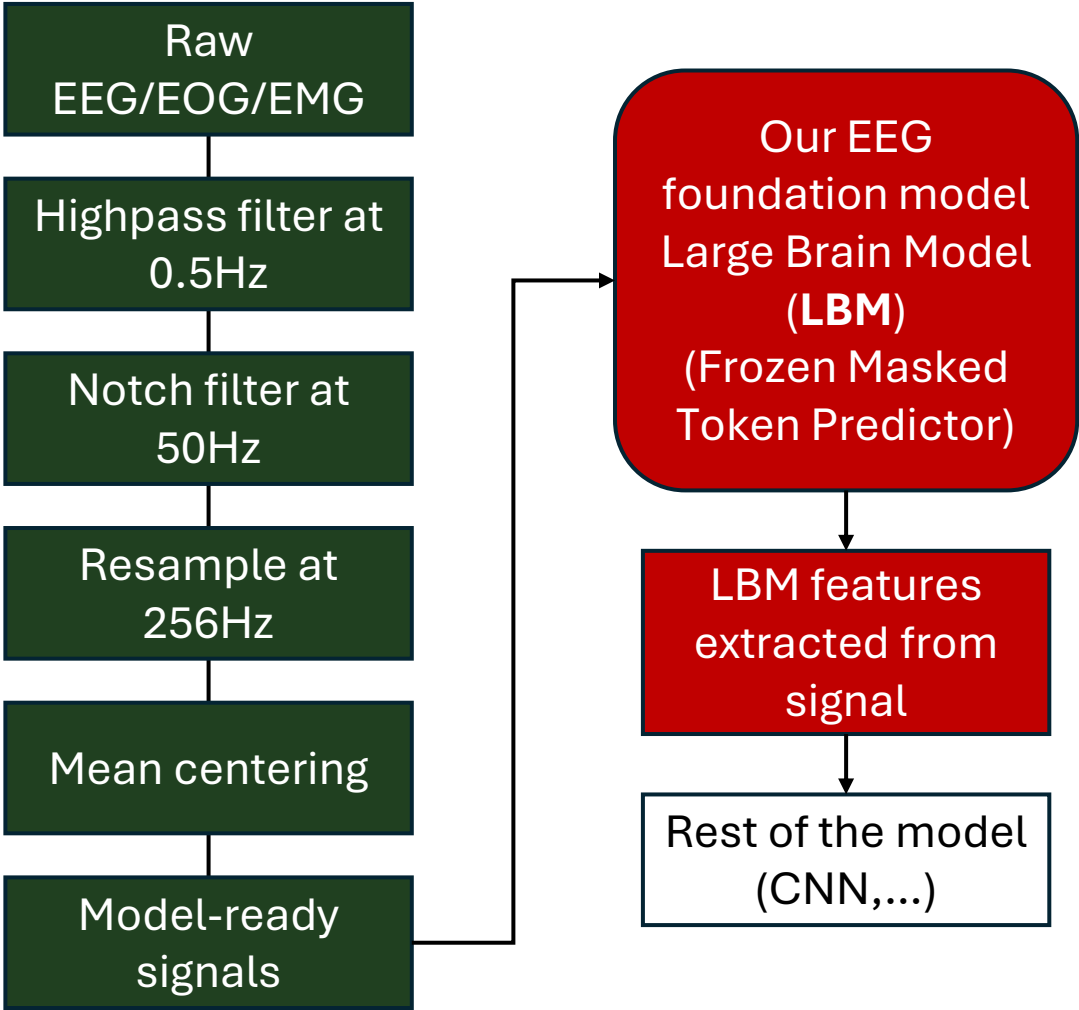


- Time consuming
- Need of additional specific expertise

OBJECTIVE : fine-tuning an **EEG foundation model** on our **pediatric cohort** and measure its **generalization** on an external dataset, to assess the potential of a **multipurpose** EEG foundation model compared to state-of-the-art non-foundation approaches.

Methods - Data

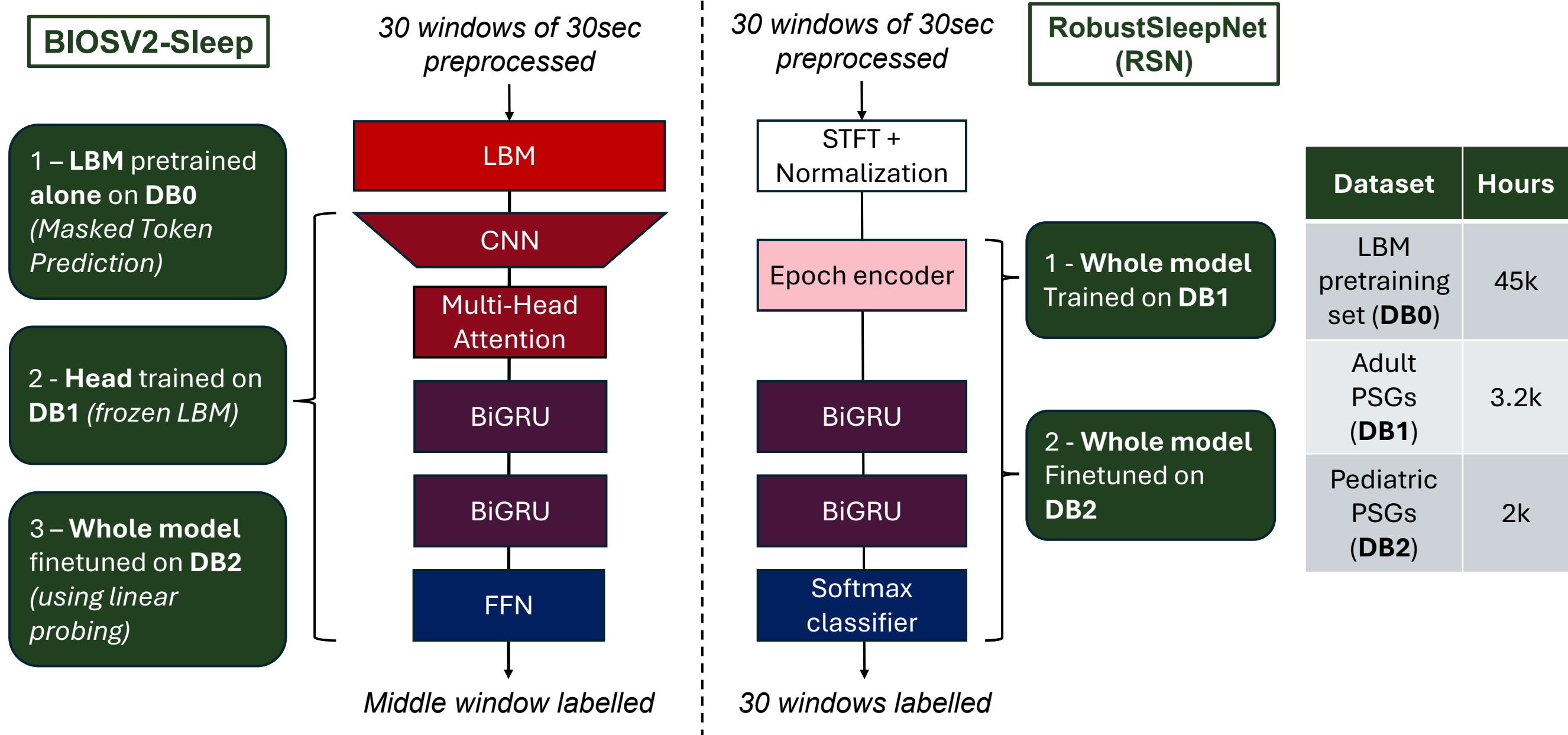
Signal processing



Datasets	Size		Signal
LBM pretraining set (DB0)	45 000h (with ~22% of sleep EEG)		EEG only (Normal, lesional, seizure, AD, depression, sleep, ...)
Adult PSGs (DB1)	Train/Val : 3280h 410 records	Test : 640h 80 records	6 EEG, 2 EOG, 1 EMG Data with sleep pathologies
Pediatric PSGs (DB2)	Train/Val : 2015h 209 records	Test : 515h 53 records	6 EEG, 2 EOG, 1 EMG Data with sleep pathologies
HFME pediatric PSGs (DB3)	External Test : 500h 46 records		6 EEG, 2 EOG, 1 EMG Data of healthy patients

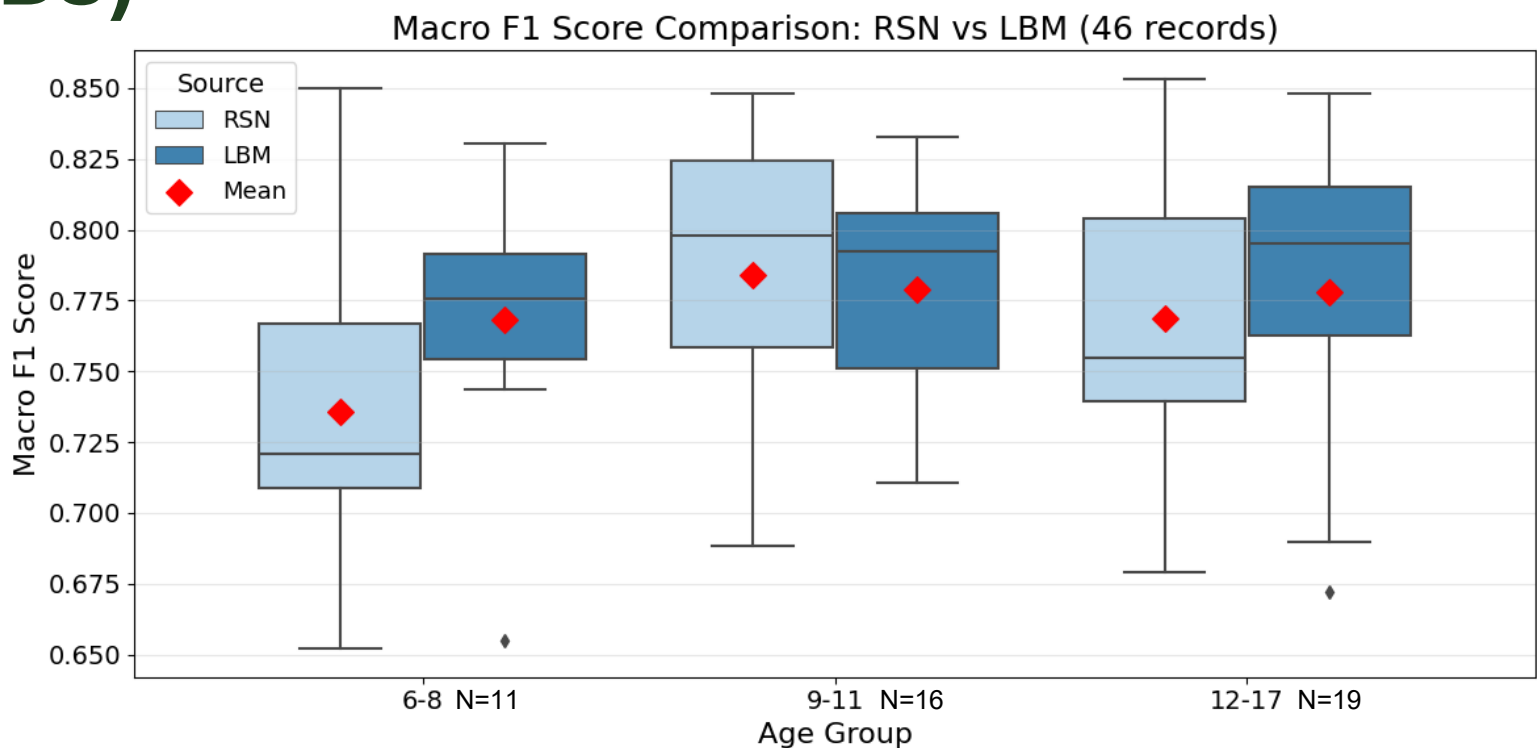


Methods - Models



Results – HFME test set (DB3)

Models on DB3	Macro F1 score	Mean macro F1 score by records
RSN	78.15	76.6
BIOSV2-Sleep	78.96	77.6



True label

W	0.91	0.05	0.01	0.02	0.01
N1	0.04	0.59	0.15	0.03	0.19
N2	0.01	0.08	0.80	0.07	0.05
N3	0.00	0.00	0.13	0.87	0.00
REM	0.01	0.07	0.01	0.00	0.91
	W	N1	N2	N3	REM

Predicted label

BIOSV2-Sleep on DB3

True label

W	0.89	0.04	0.01	0.02	0.04
N1	0.04	0.46	0.22	0.03	0.25
N2	0.01	0.03	0.81	0.09	0.06
N3	0.01	0.00	0.13	0.87	0.00
REM	0.02	0.02	0.02	0.00	0.94
	W	N1	N2	N3	REM

Predicted label

RSN on DB3

Discussion

- We demonstrated the feasibility of adapting a general-purpose EEG foundation model to pediatric sleep staging, despite minimal sleep-specific pretraining.
- We reached performances in the range of SOTA models, foundational based and non-foundational based.

Future steps :

- Further testing on bigger HFME dataset with NT1 and SAOS patients
- Validate the model on public datasets
- Aim to develop a sleep specific foundation model

Model	Testset	Macro F1
SleepFM (Thapa et al., 2026)	SHHS : 9736 adult PSGs	78
Ensemble of DL models (Phan et al., 2021)	CHAT : 1200 pediatric PSGs	85.5
PedSleepMAE (Saurav et al., 2024)	NCH : 1549 pediatric PSGs	71.3
BIOSV2-Sleep	HFME : 46 pediatric PSGs	78.9