Semi-Supervised Domain Adaptation for EEG-based Sleep Stage Classification

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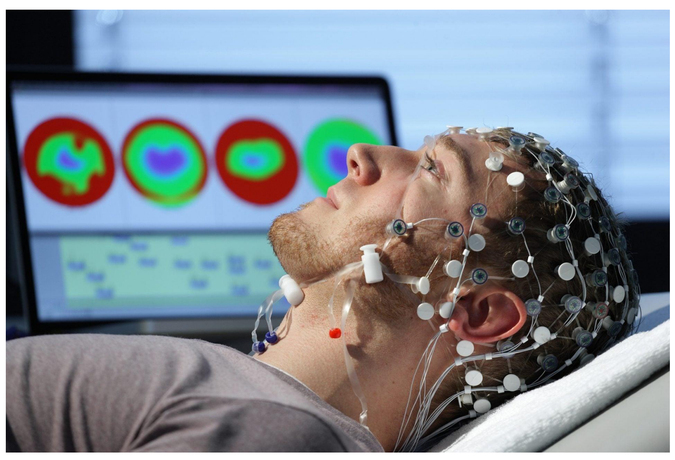
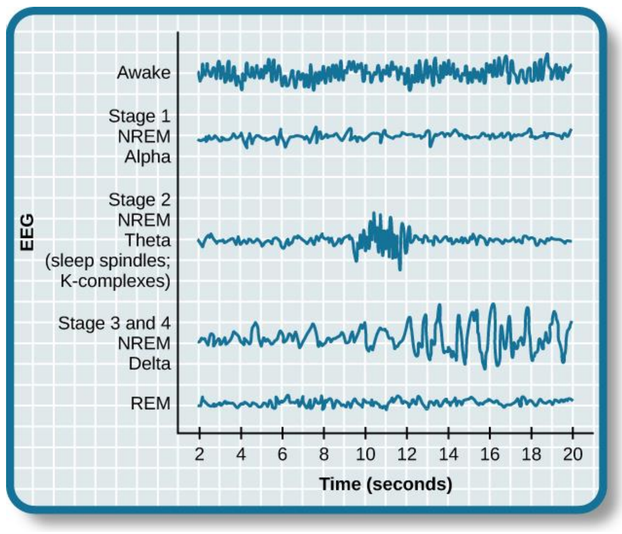
Background





Why sleep stage classification?

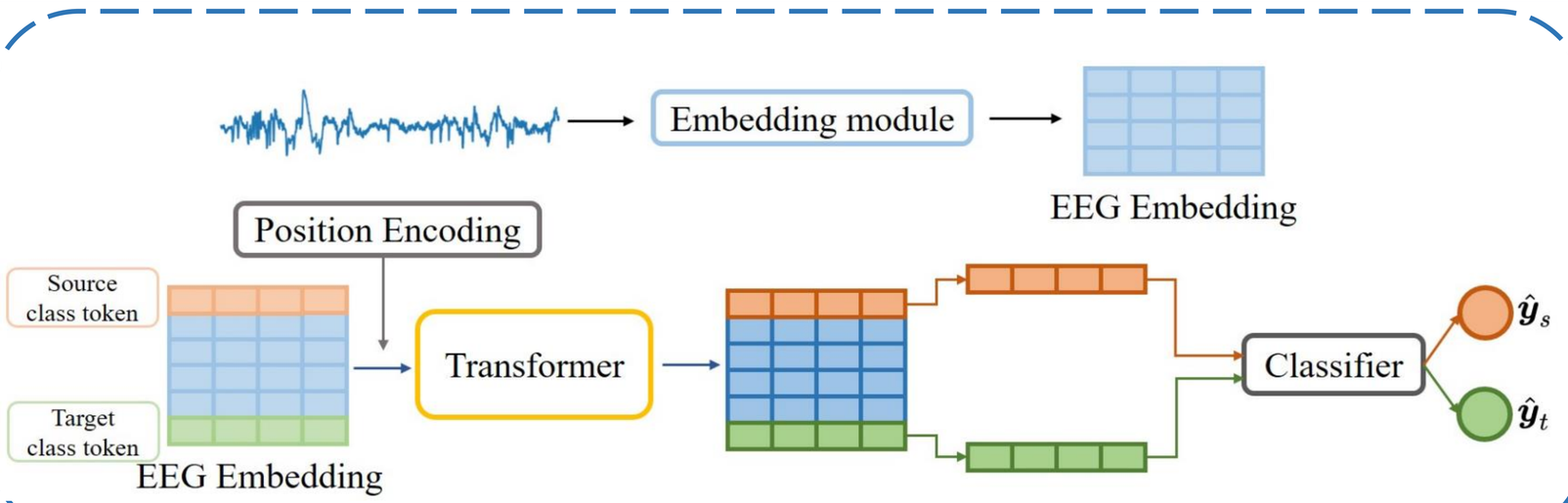
① **Facilitates diagnosis and treatment of sleep disorders**

② **Optimizes sleep environments and enhances sleep quality**

③ **Explores links between sleep and overall health**

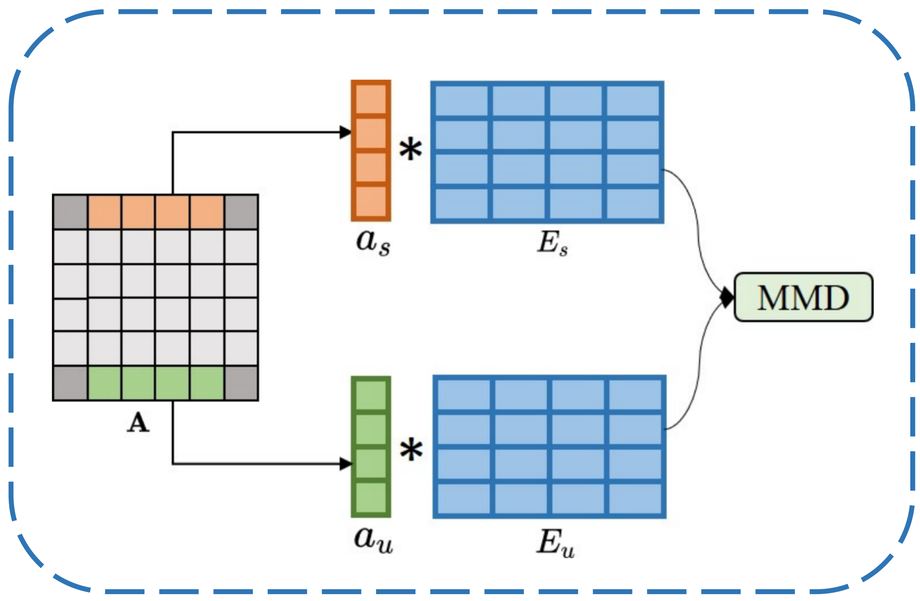
④ **Understanding the physiological intricacies of sleep**

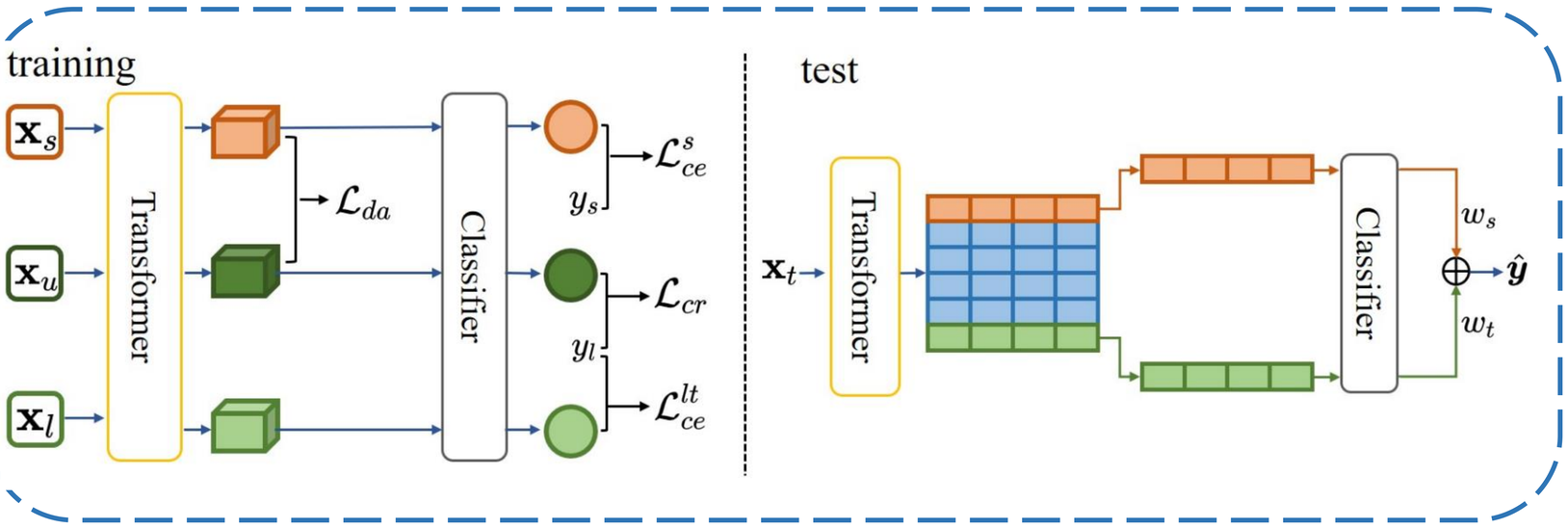
Methods



The proposed dual class tokens for source and target classification separately in SSDA

We propose a Transformer-based SSDA approach, using two class tokens to learn corresponding knowledge from the source and target domains.



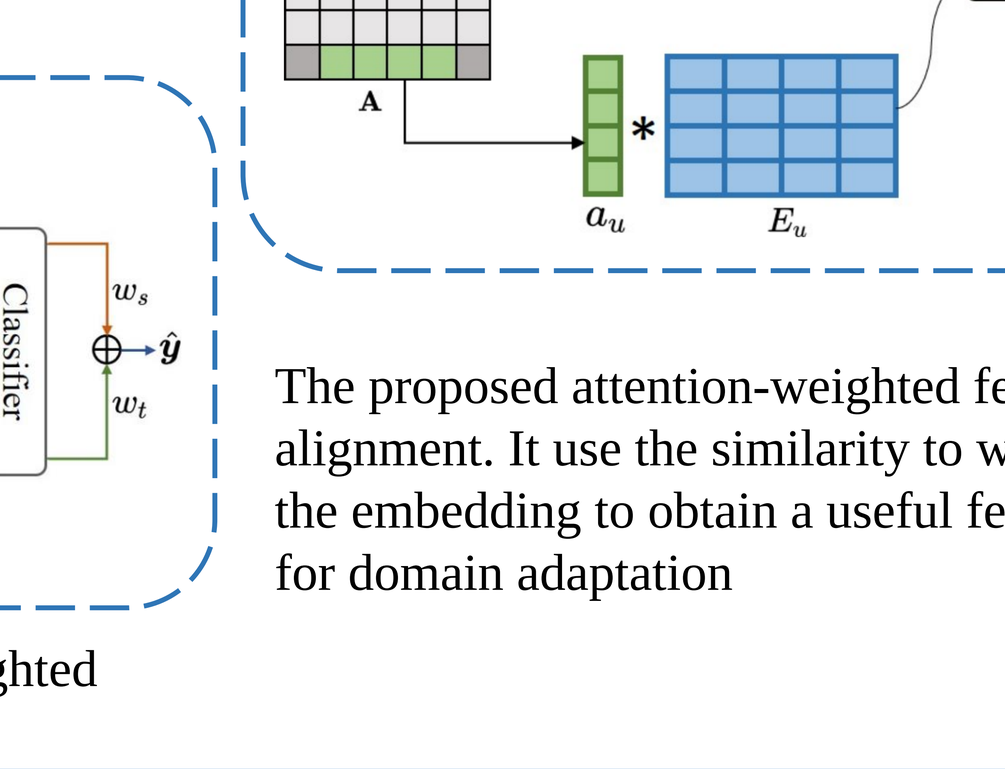


The proposed training-test strategy with adaptive entropy-weighted ensemble

The proposed attention-weighted feature alignment. It use the similarity to weight the embedding to obtain a useful feature for domain adaptation

Results & Conclusions

Approach	Params(M)	v1→ST BCA	v1→ST MF_1	v2→ST BCA	v2→ST MF_1
S+T	3.86	.601±.003	.578±.013	.586±.010	.583±.002
ENT	3.86	.604±.010	.608±.006	.591±.012	.597±.006
MME	3.86	.605±.007	.619±.004	.619±.011	.600±.024
APE	3.86	.615±.008	.621±.009	.620±.008	.613±.002
ECACL	3.86	.587±.009	.560±.005	.557±.026	.539±.026
CDAC	3.86	.590±.005	.562±.011	.578±.013	.552±.018
Ours	3.86	**.648**±.005	**.641**±.000	**.647**±.009	**.628**±.012



To cope with domain shift problem and insufficient labeled data in sleep staging for patients, this paper has proposed a Transformer-based SSDA to transfer from healthy subjects to patients. We uses two class tokens and a training-test strategy with adaptive ensemble. Experiments on two sleep stage classification datasets demonstrated the superior performance of our approach.