

**30% OF ADULTS**



**Common sleep-wake disturbances**

Sleep apnea

Insomnia

Rem Behavior Disorder (RBD)

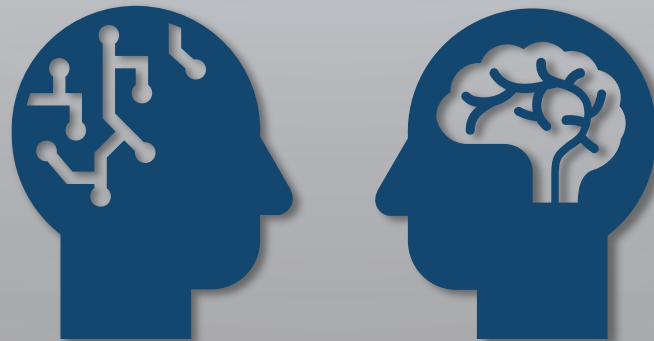
**Associated with neurological/  
psychiatric diseases**



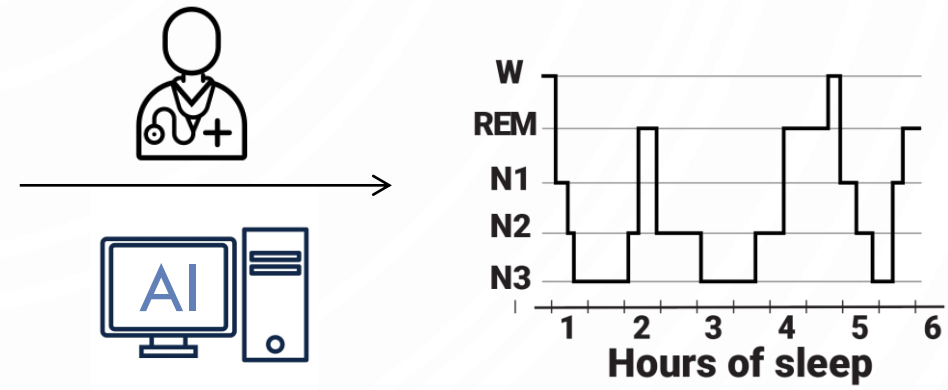
# EXPLAINING UNCERTAINTY IN AI FOR CLINICAL DECISION SUPPORT

ELISABETH HEREMANS, MAARTEN DE VOS

09/22/2023 – ECML-PKDD '23



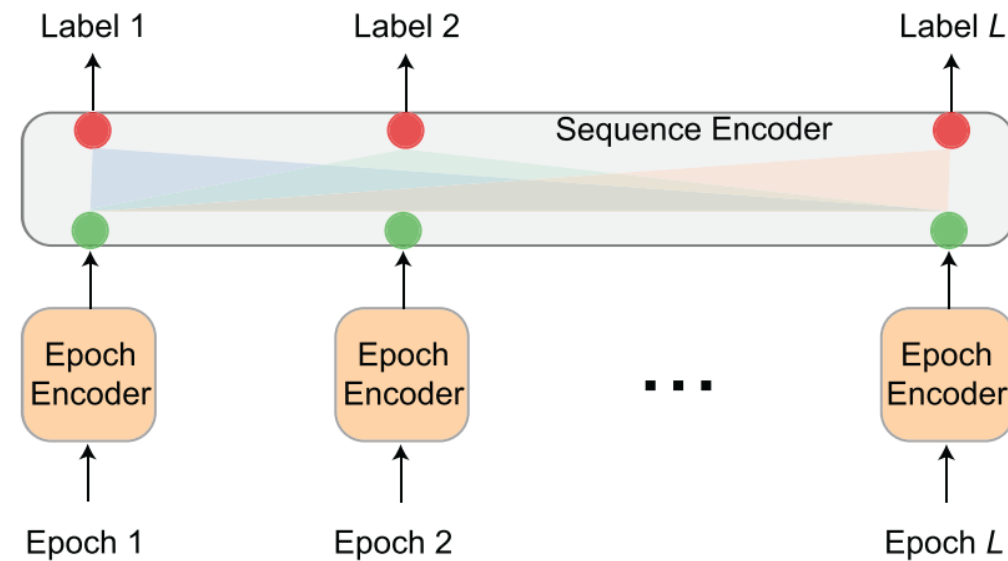
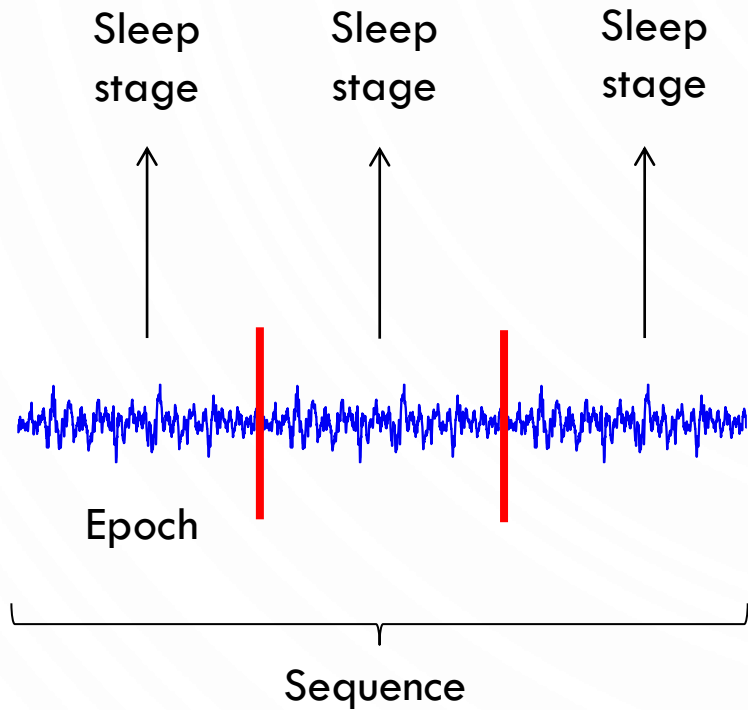
# SLEEP MONITORING



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# DEEP LEARNING METHODS FOR SLEEP STAGING

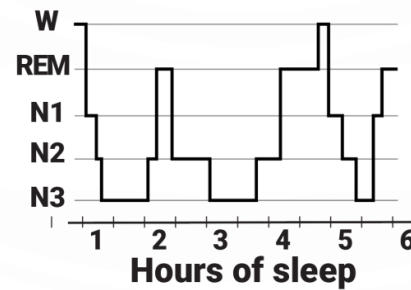
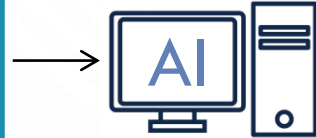
- Modeling long-range dependency
- Sequence-to-sequence frameworks



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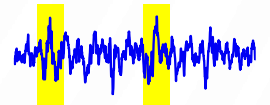
# CAN DOCTORS TRUST DEEP LEARNING?

- High-stakes decisions
- AI needs to be explainable & reliable



Why?

→ Explanations



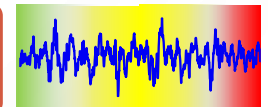
Are you sure?

→ Uncertainty estimation



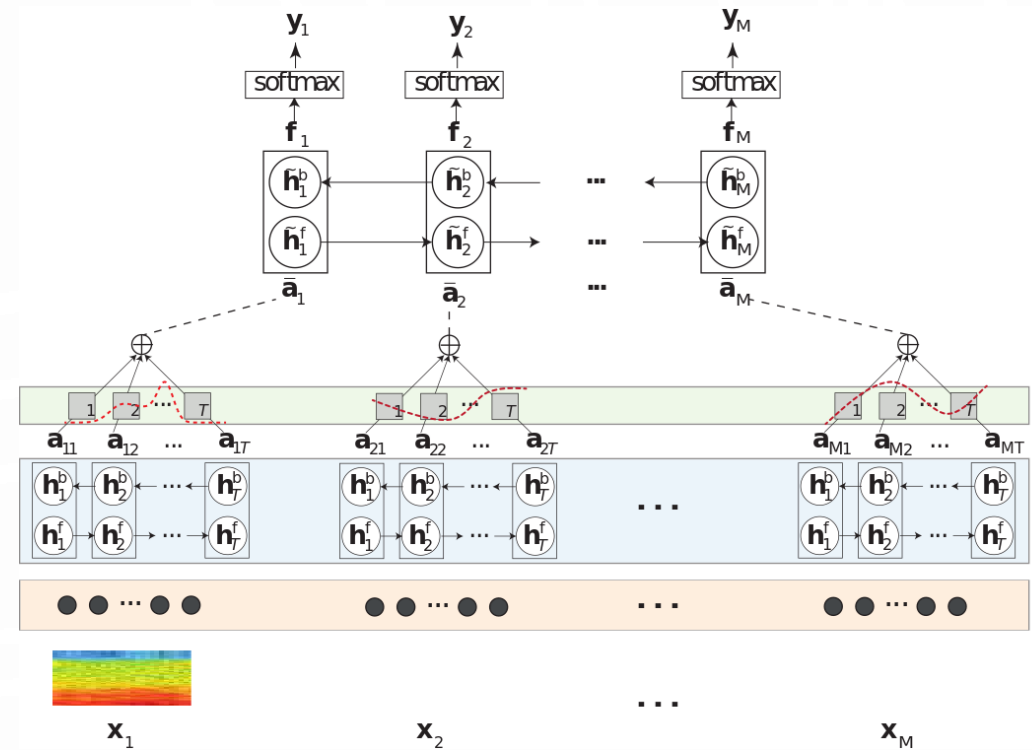
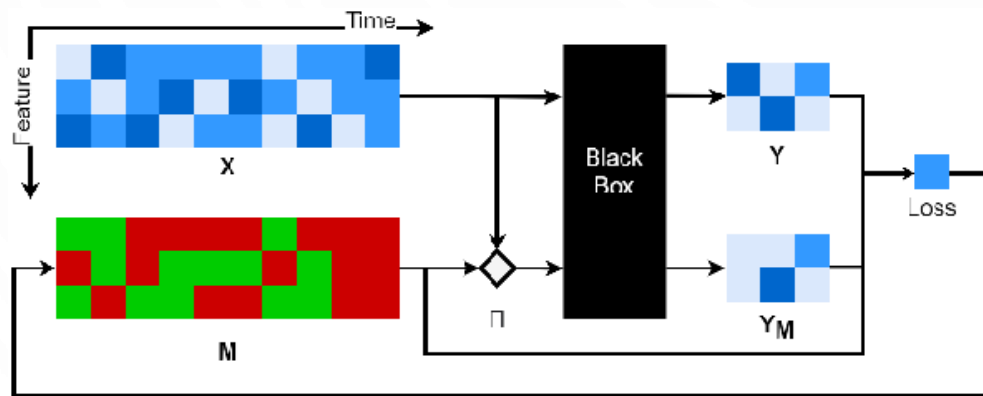
**Why are you (un)sure?**

→ **Uncertainty explanations**



# EXPERIMENTS

- Deep learning model
- Dynamic masking



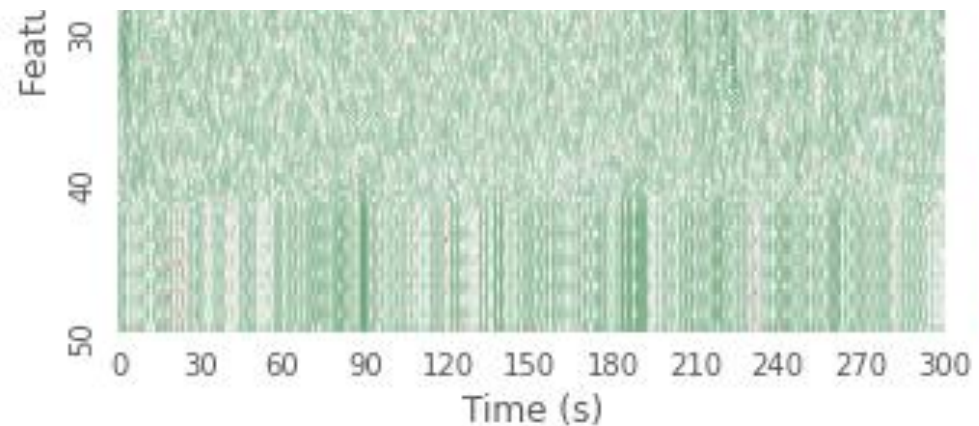
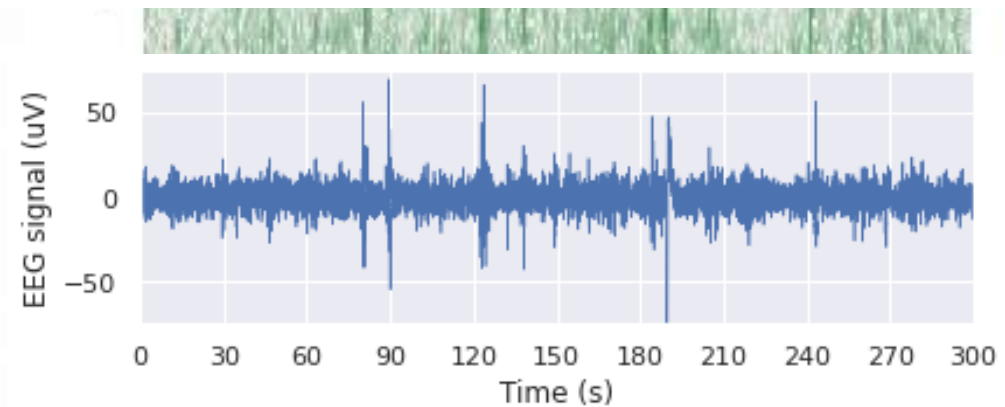
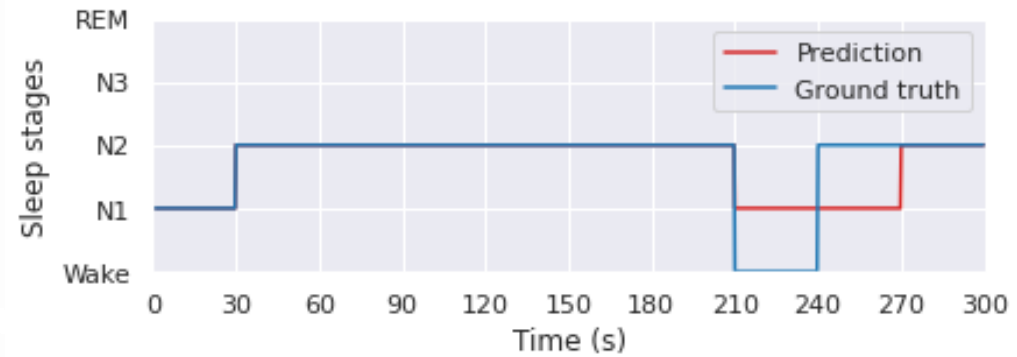
# DATA

One test sample

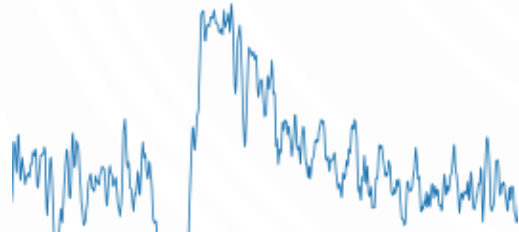
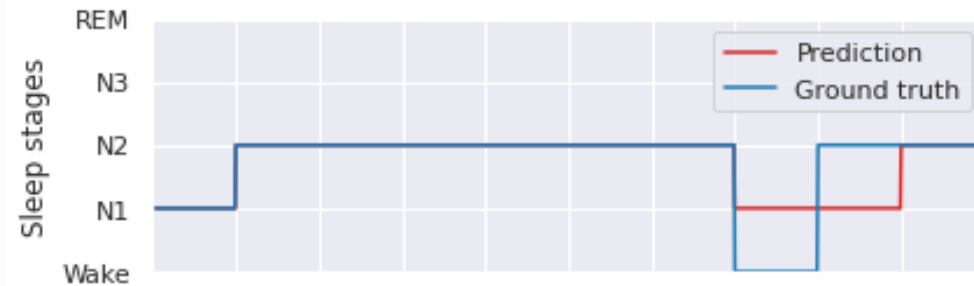
- Sequence of 10 30-sec segments
- EEG signal = time series



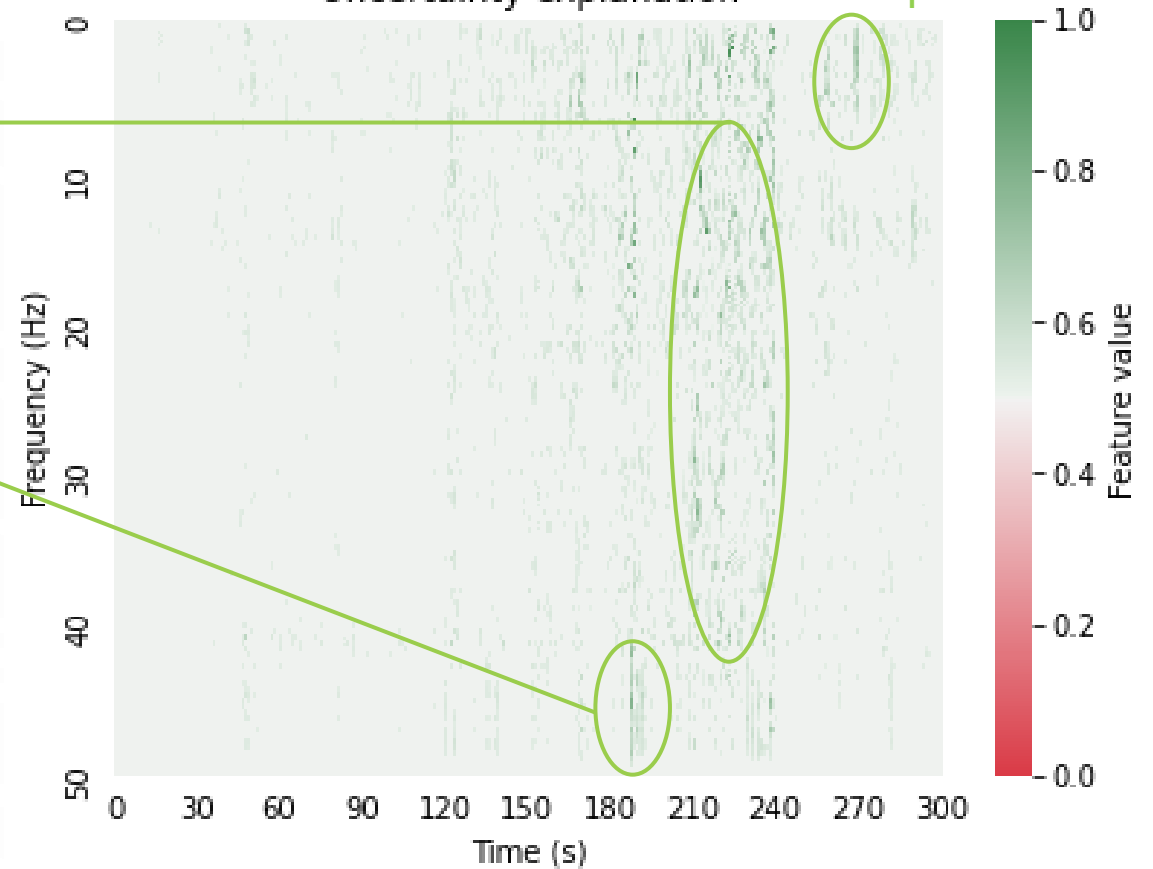
Time-frequency representation



# UNCERTAINTY EXPLANATION



Uncertainty explanation K-complexes!





# CONCLUSIONS

- Proof-of-concept experiments show promising results for uncertainty explanations on sleep data
- Future work
  - Quantitative & qualitative evaluations
  - Compare strategies of post-hoc explanations & uncertainty estimation metrics



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**STADIUS** Center for Dynamical Systems, Signal Processing and Data Analytics **KU LEUVEN**