

Towards continuous mental stress level estimation from physiological signals

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Background

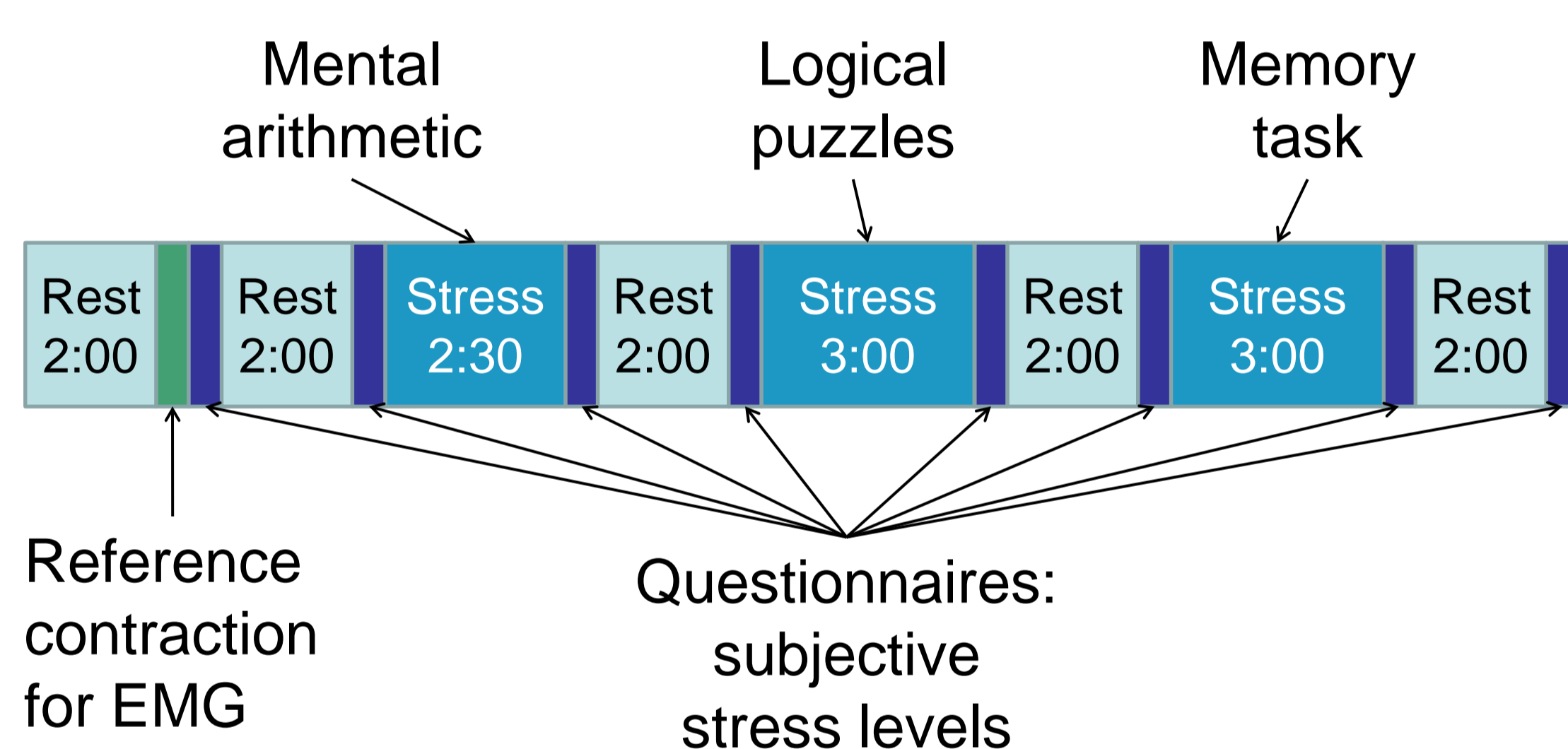
- Over 40 million individuals are affected by work-related stress in the EU [1]
- Chronic mental stress can cause health problems like high blood pressure and cardiovascular diseases
- Timely stress detection can prevent stress-related health problems
- Vision is to estimate stress level from physiological signals continuously to enable adequate feedback

Goal

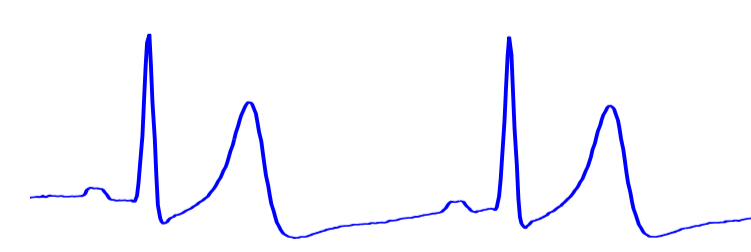
- Measure physiological signals in artificial stressful conditions
- Use the physiological information to estimate stress level on a continuous time scale

Methods

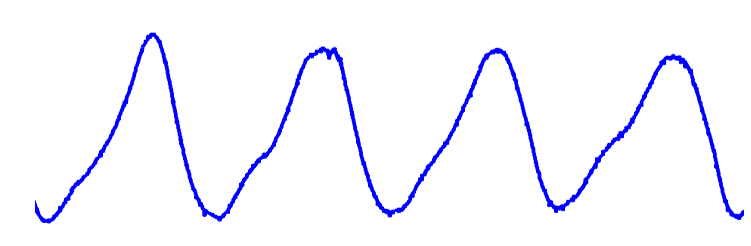
- A protocol was implemented on the PC
- Time pressure
- Distracting news fragments through headphones
- 30 subjects



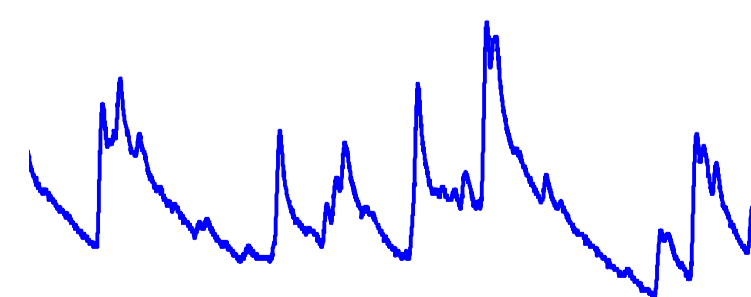
Electrocardiogram (ECG)



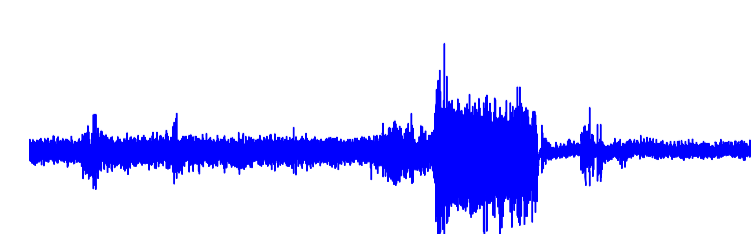
Respiration (RSP)



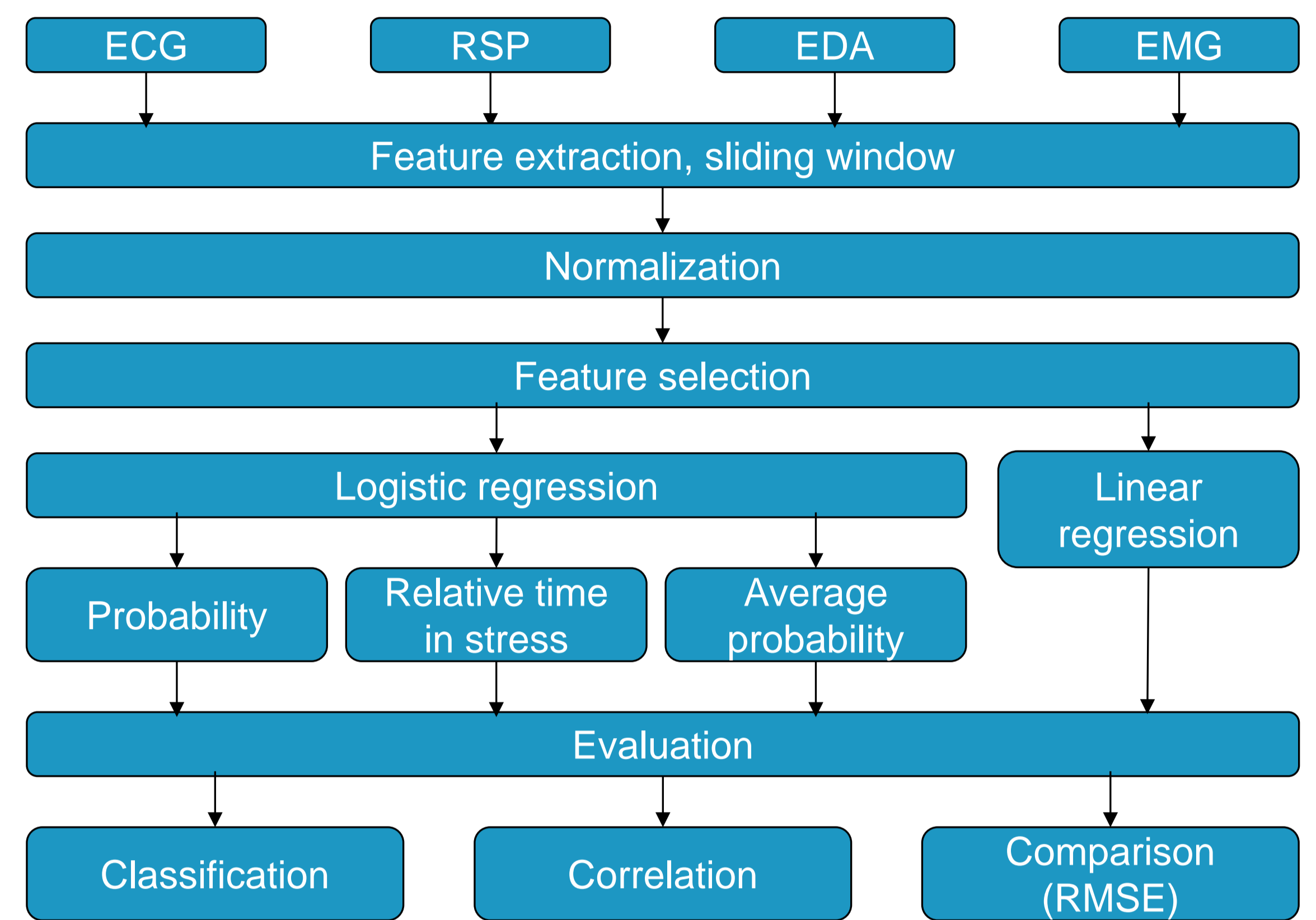
Skin conductance (Electrodermal activity, EDA)



Electromyogram (EMG)
Trapezius muscles



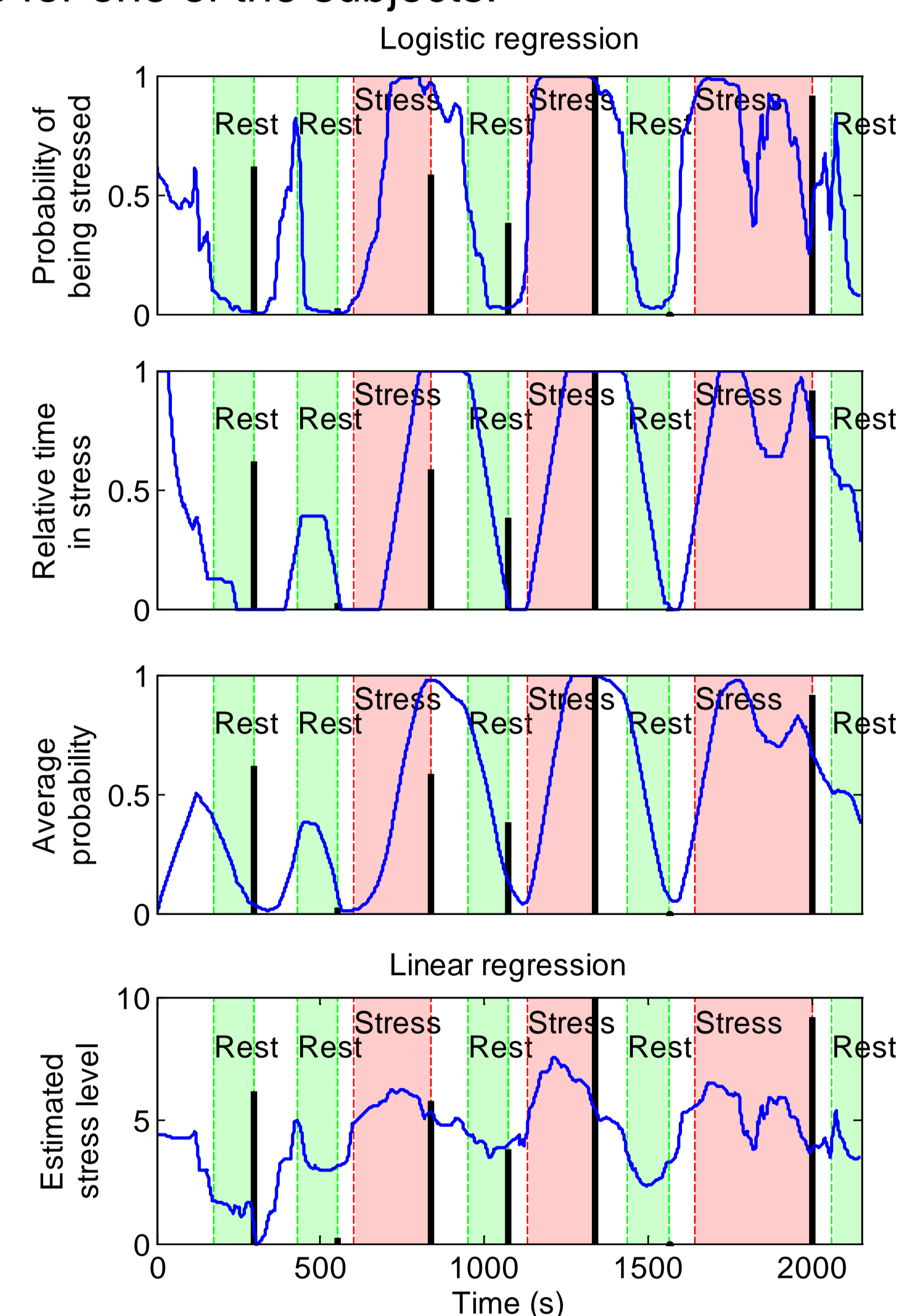
Analysis



Results

Method	Classification %	Correlation	RMSE
Probability	82.7	0.417	3.715
Relative time in stress	79.1	0.230	4.324
Average probability	73.6	0.330	3.701
Linear regression	86.4	0.302	3.253

- Example for one of the subjects:



Conclusion

- Linear regression shows best classification and RMSE
- Logistic regression probability shows highest correlation
- Both linear and logistic regression are good candidates for continuous stress level estimation
- These results will be validated in further investigations

Reference

[1] Institute of Work, Health and Organisations. *Towards the development of a European framework for psychosocial risk management at the workplace*. 2008