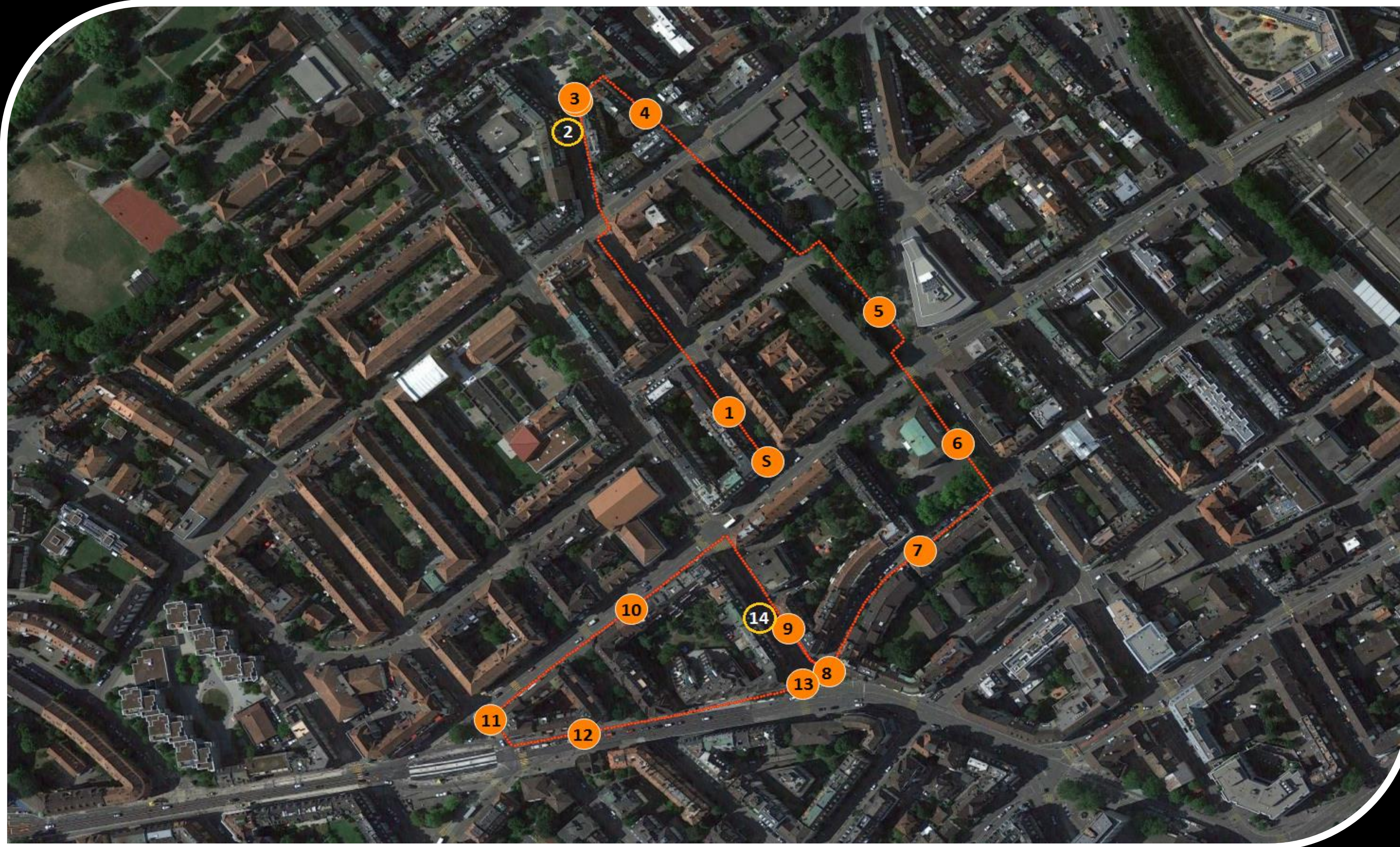


How we perceive our environment?

An analysis through data mining and data visualization



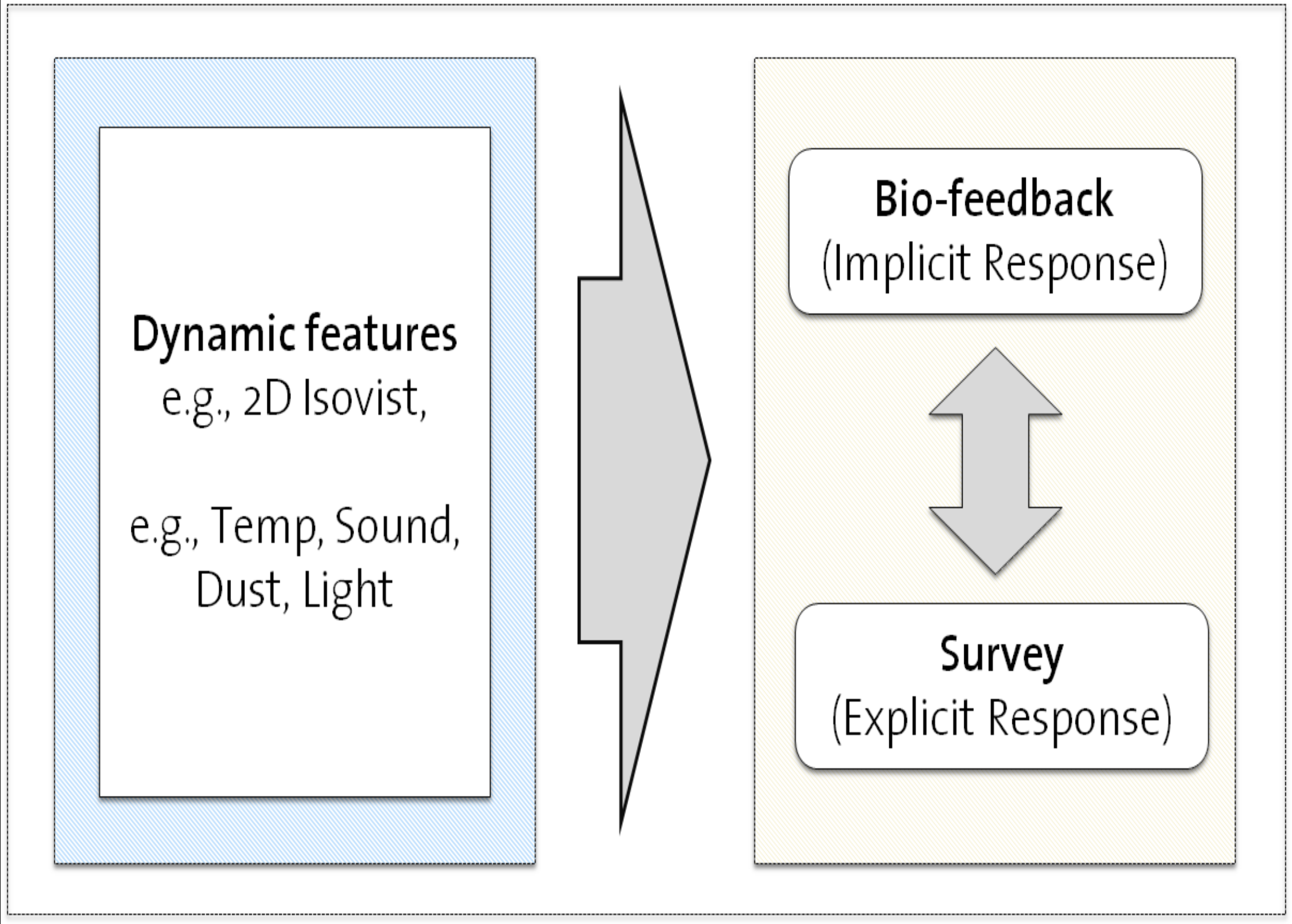
Wiedikon, Zurich

Varun Ojha
Postdoctoral Researcher
ETH Zurich
14-June -2017, Zurich

Frequency of data loggers/sensors

Variables (Sensors)	Frequency (Hz)	Type of Variable	Device
GPS position	1.0	Environment condition [Non-temporal (in this experiment's context)]	--
2D Isovist (Area, Perimeter, Occlusivity, Compactness)	1.0		--
Sound level (db)	0.4		Wasp-City
Dust (mg/m)	0.4		
Environment temperature (°C)	1.0		HOBO data logger
Relative humidity	1.0		
Light (Illuminance)	1.0		
Electro-dermal activity (EDA)	4.0	Participant's response (temporal)	

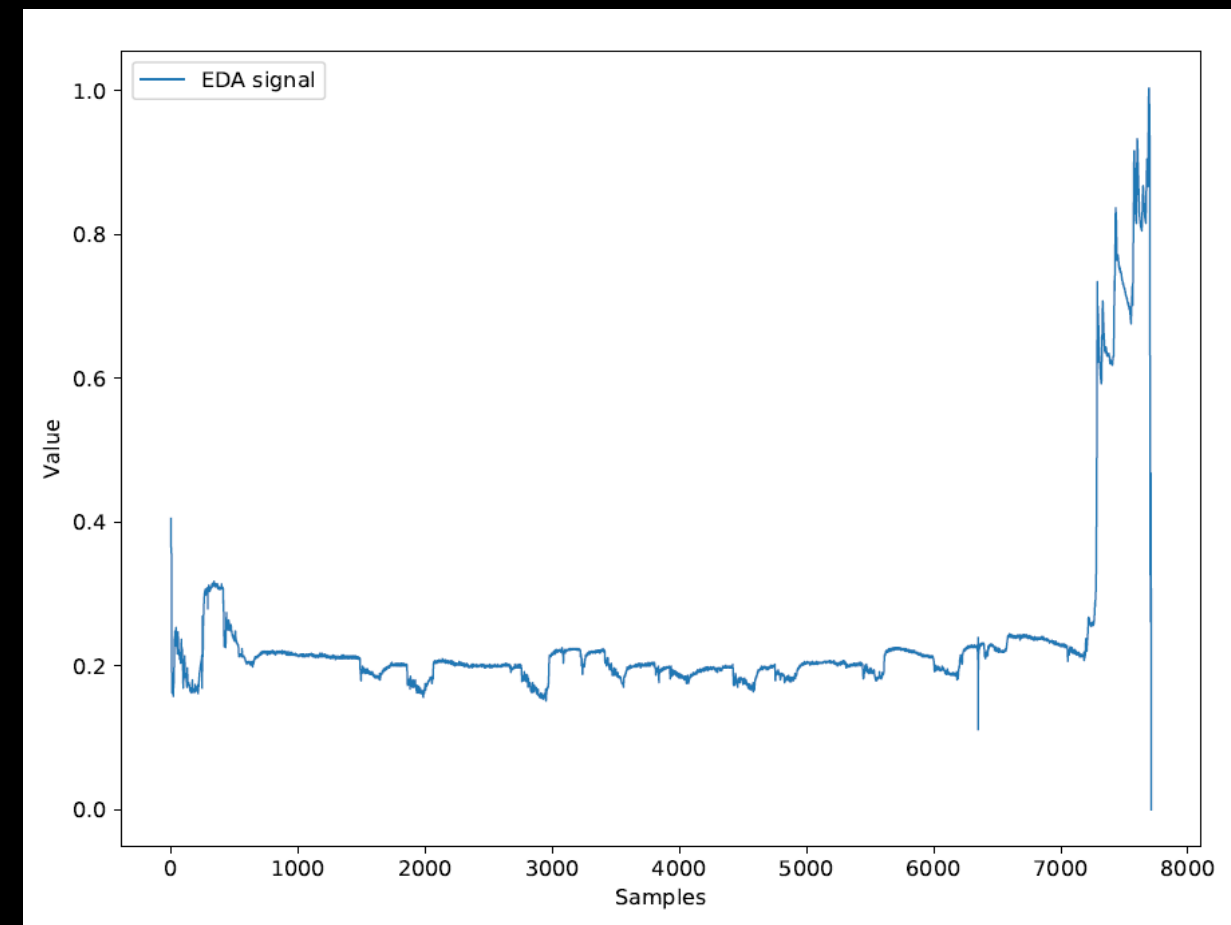
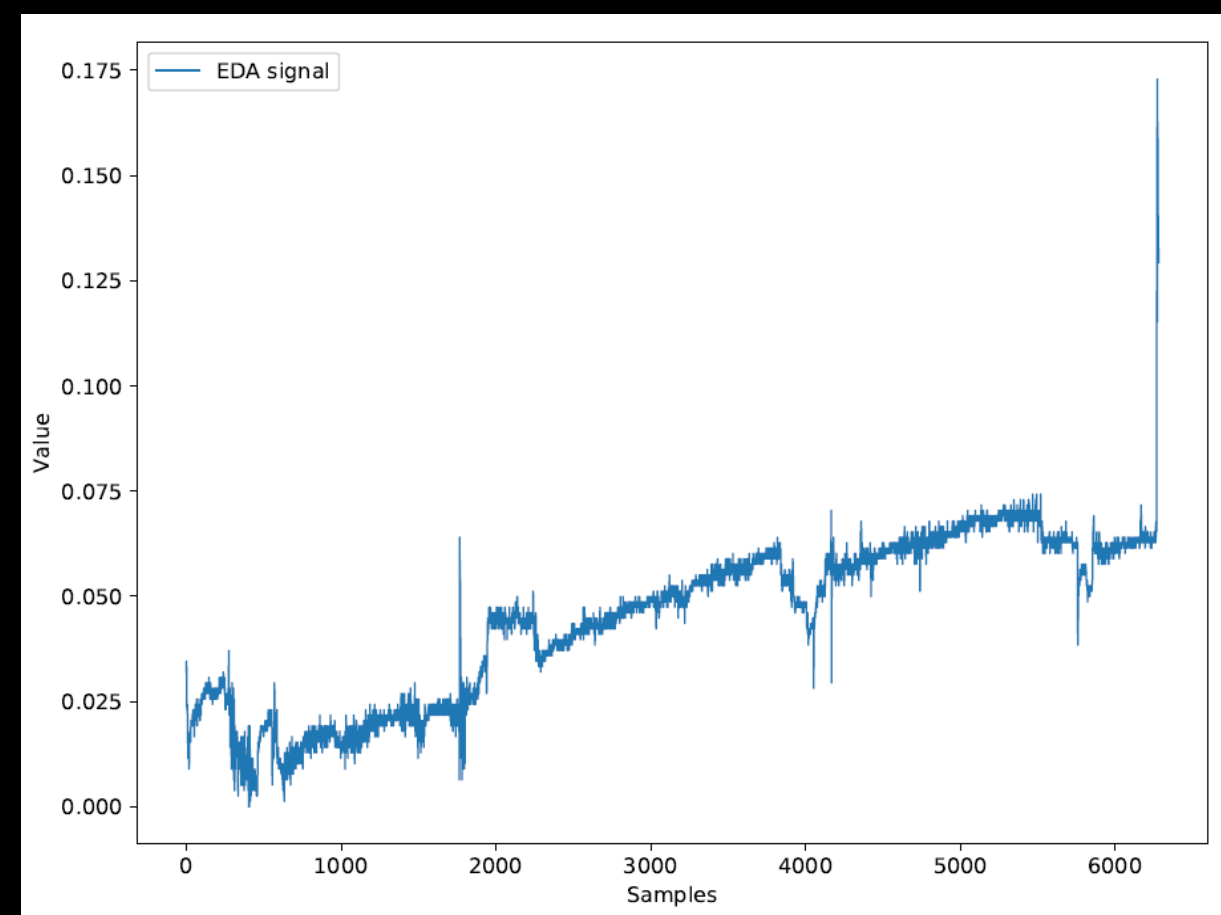
Categories of datasets



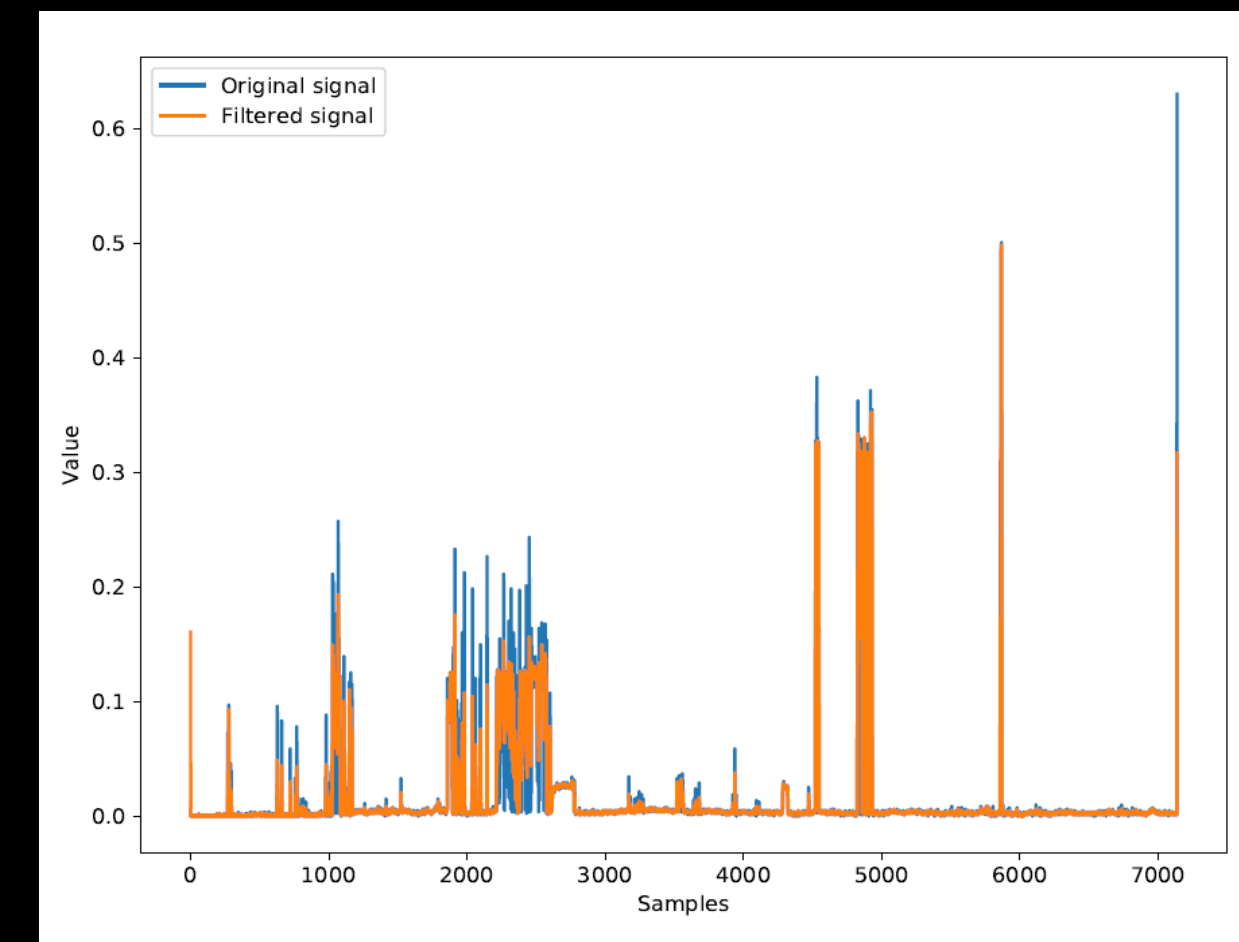
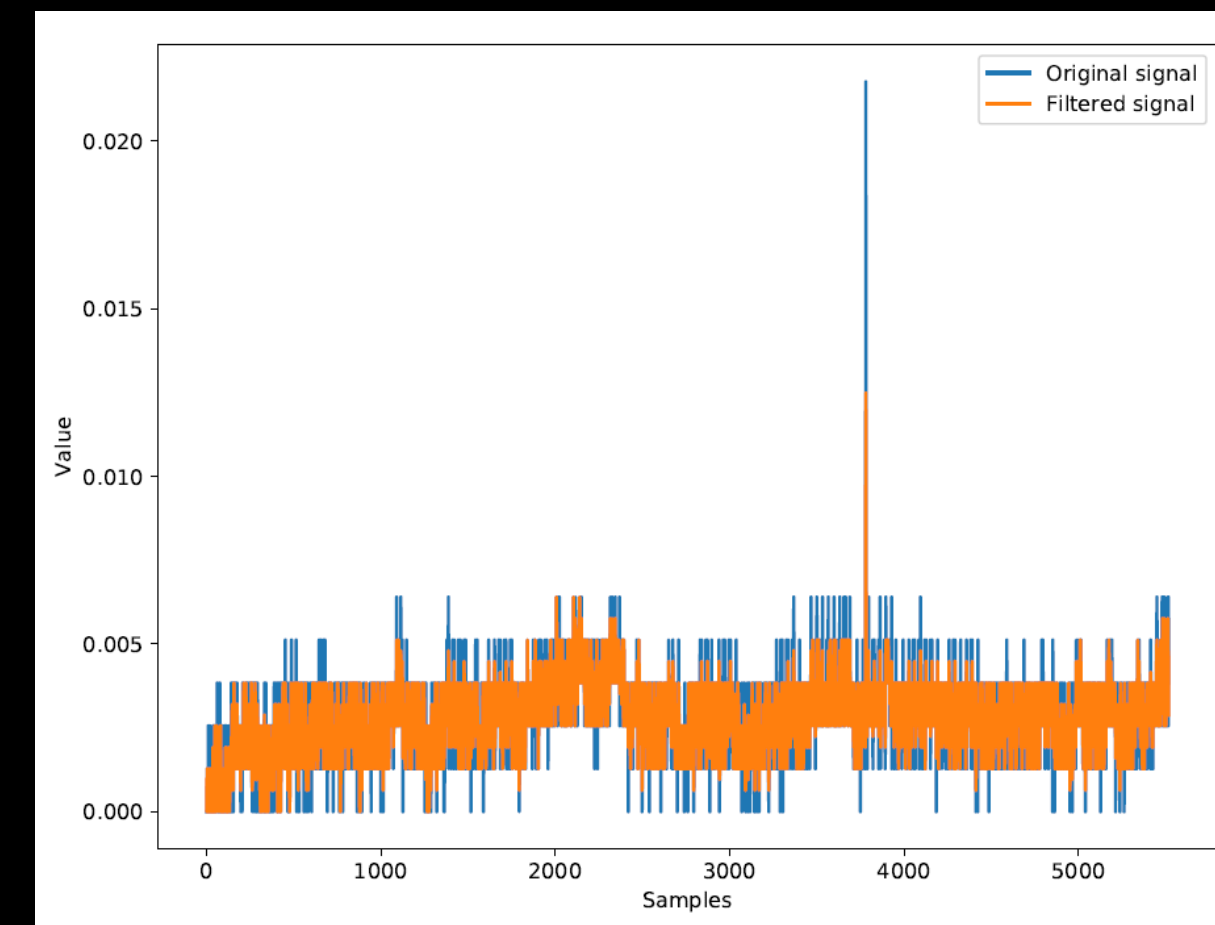
What is clean and what is not?

3

Considered EDA signals



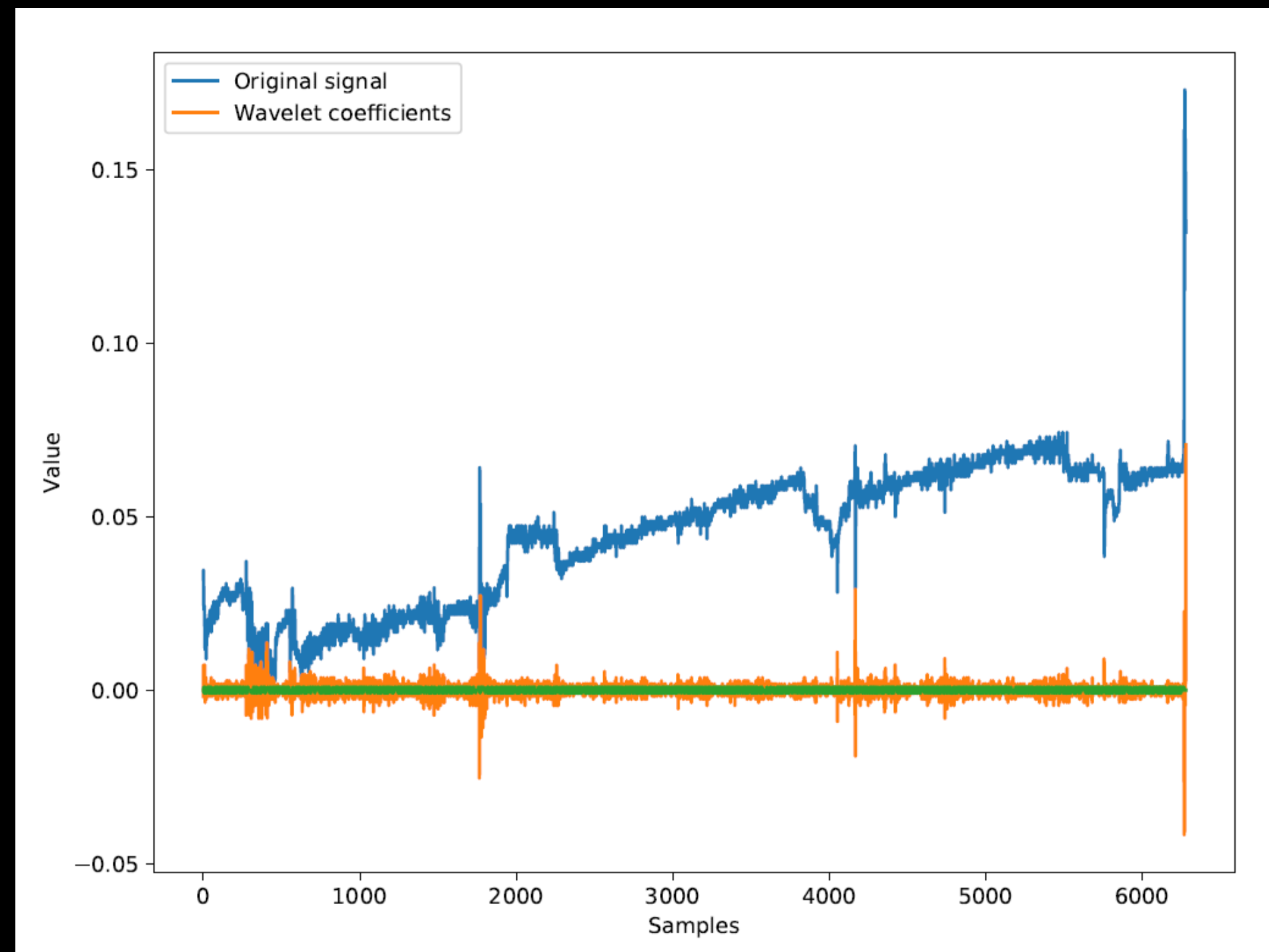
Discarded EDA signals



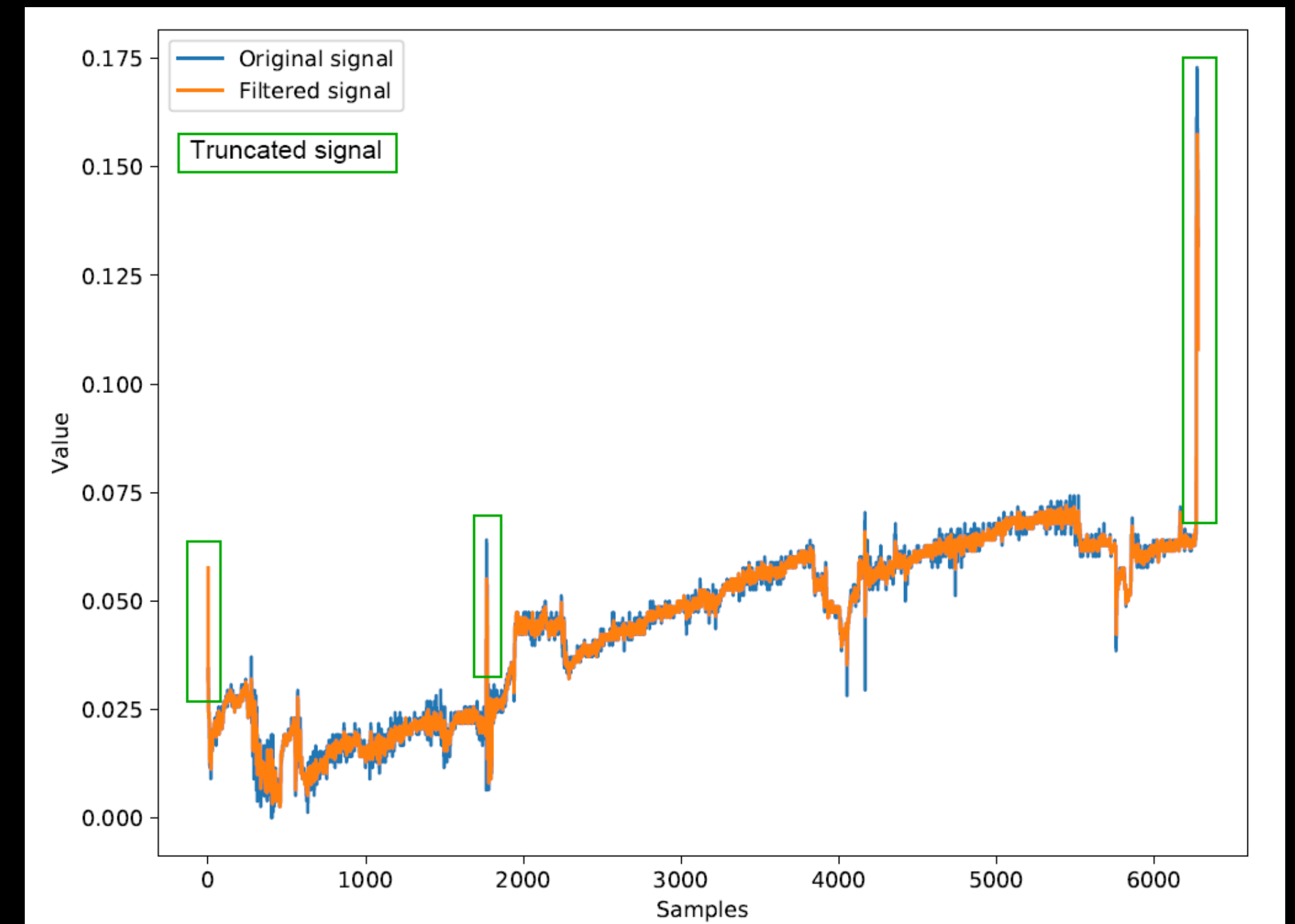
EDA signal filtering

4

Stationary Wavelet Transform



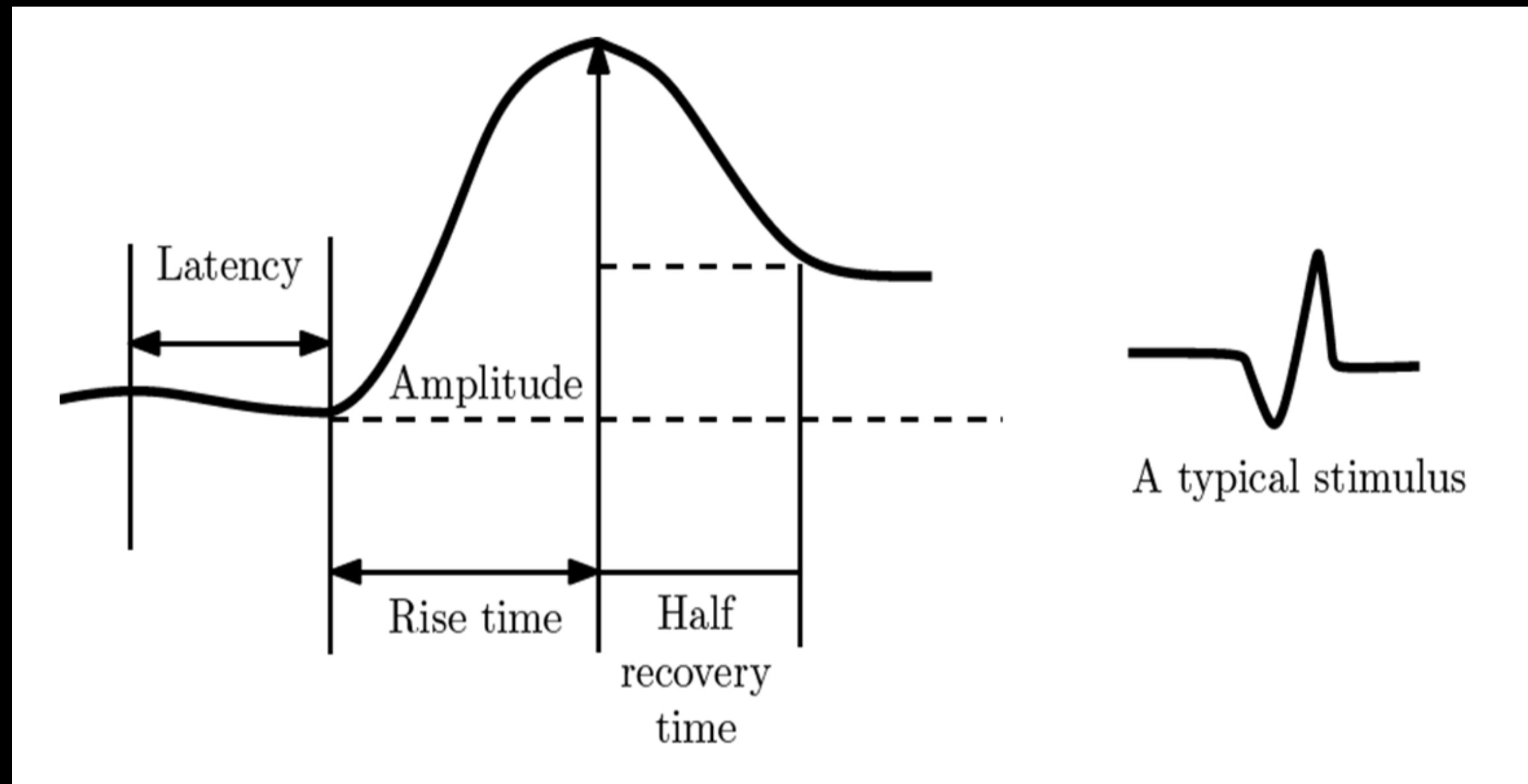
Raw EDA → Smooth EDA signal



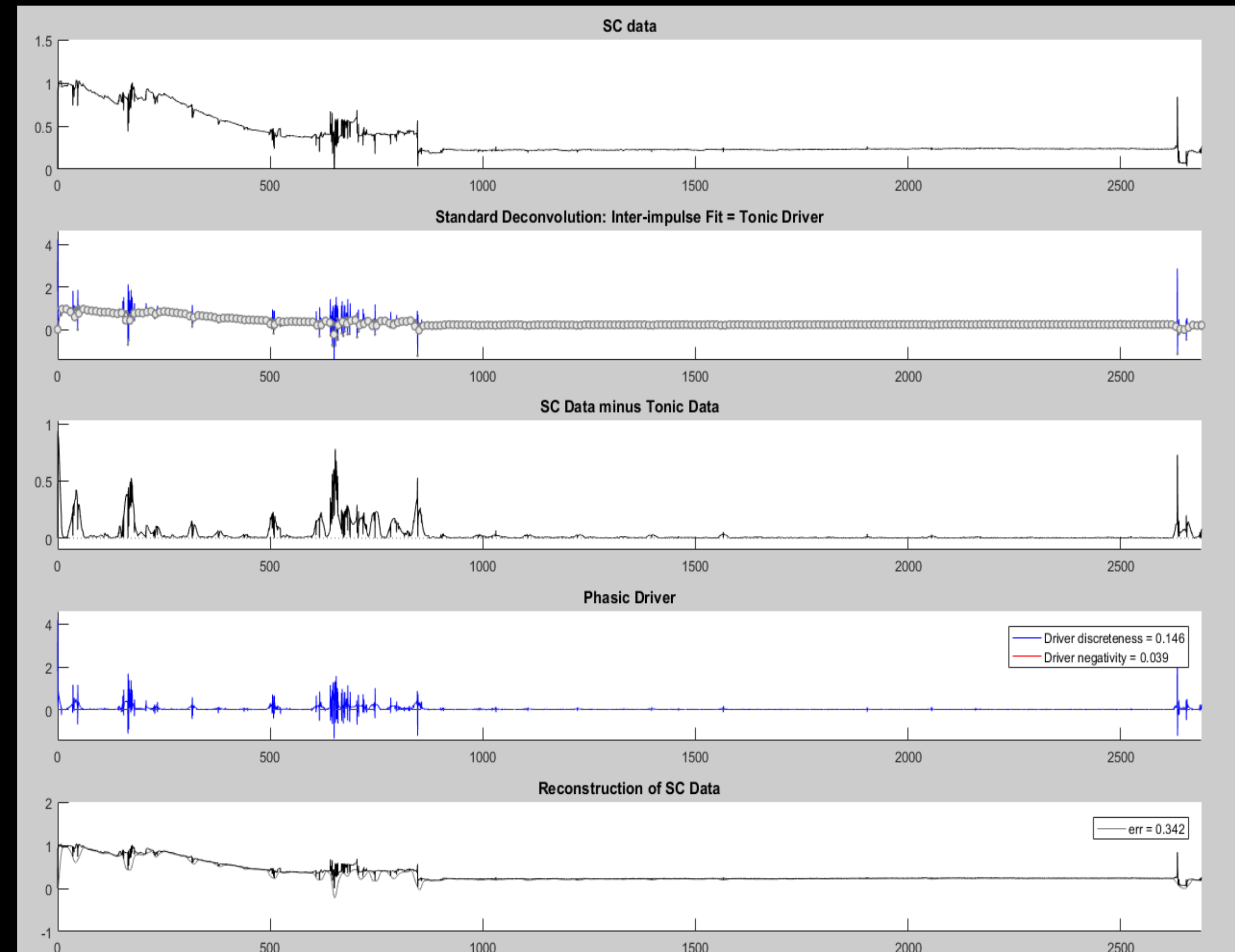
How to understand stress signal in physiological data?

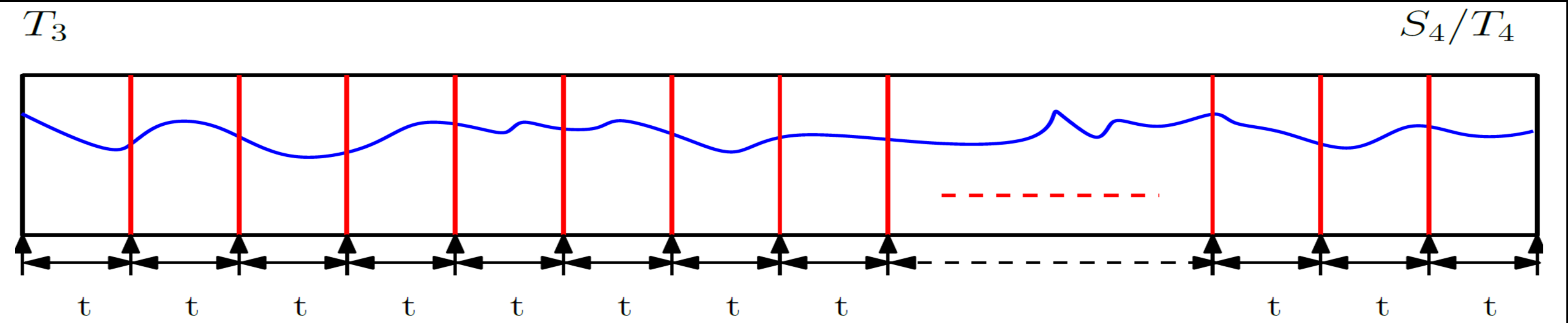
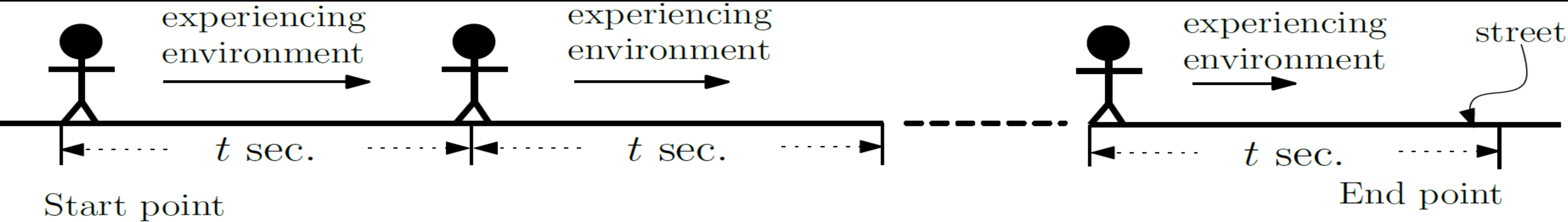
5

Typical signature of an electro-dermal signal



Ledalab for EDA signal analysis

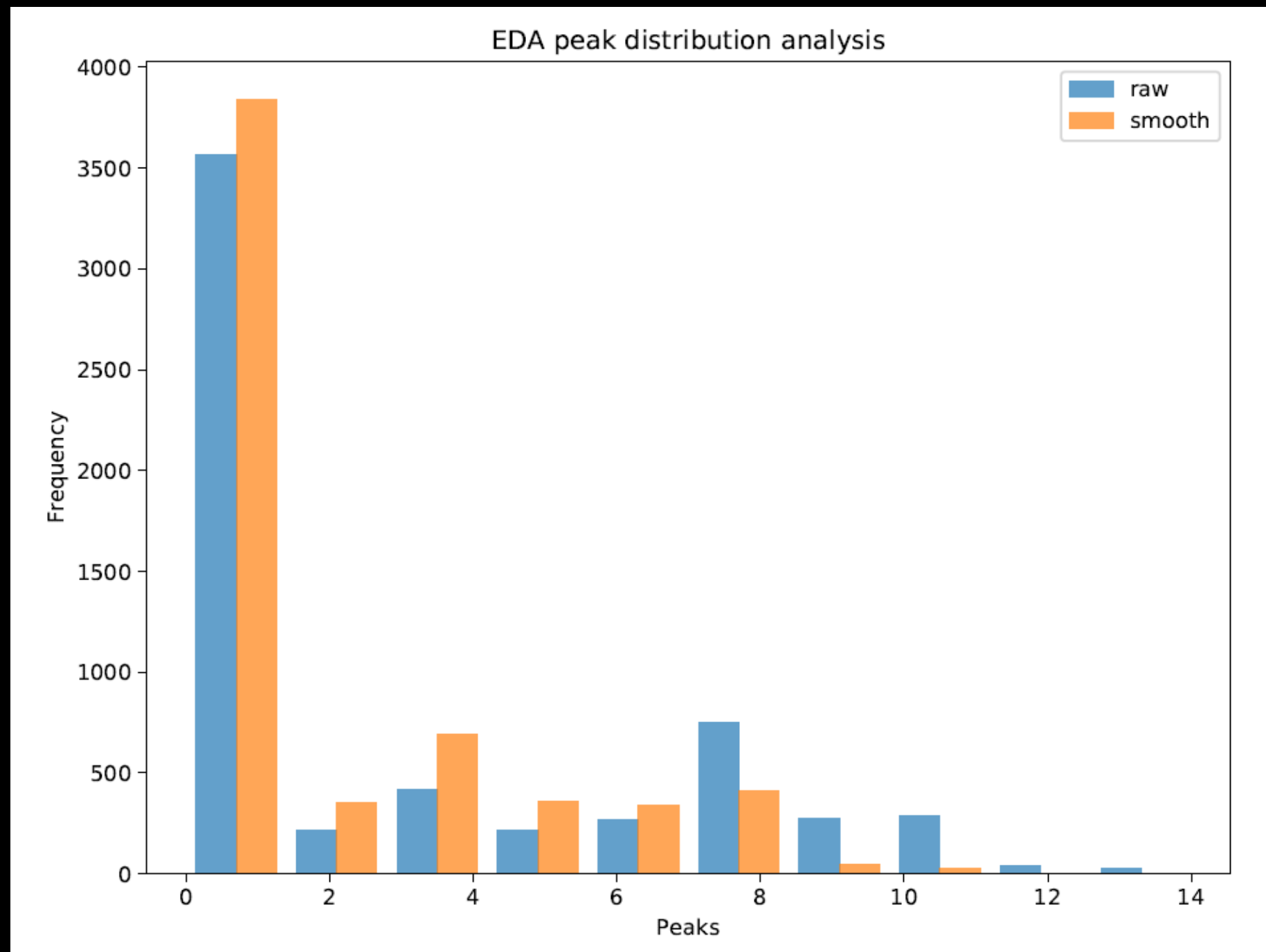




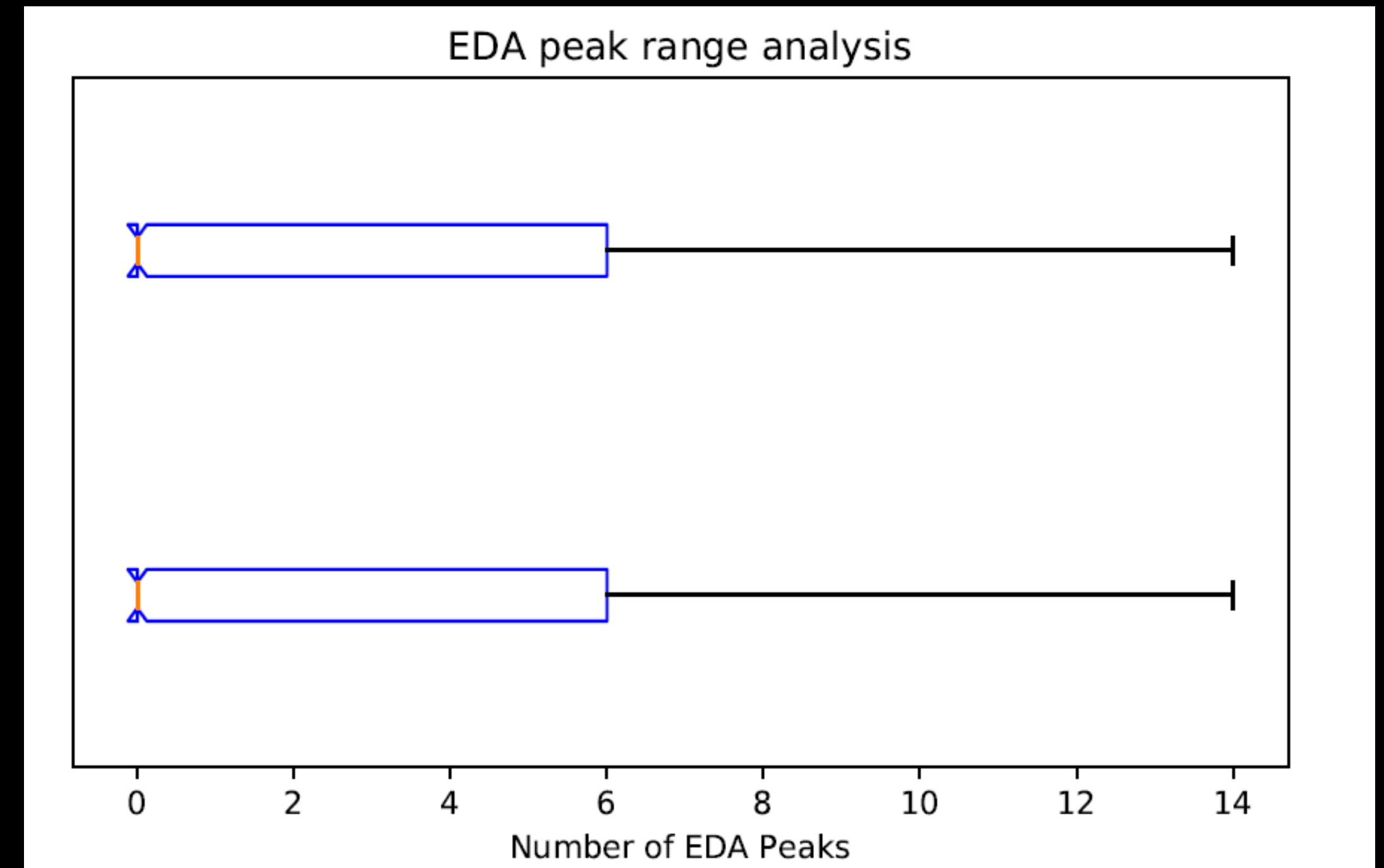
EDA signal (in numbers)

7

Distribution of “Through-to-Peak”

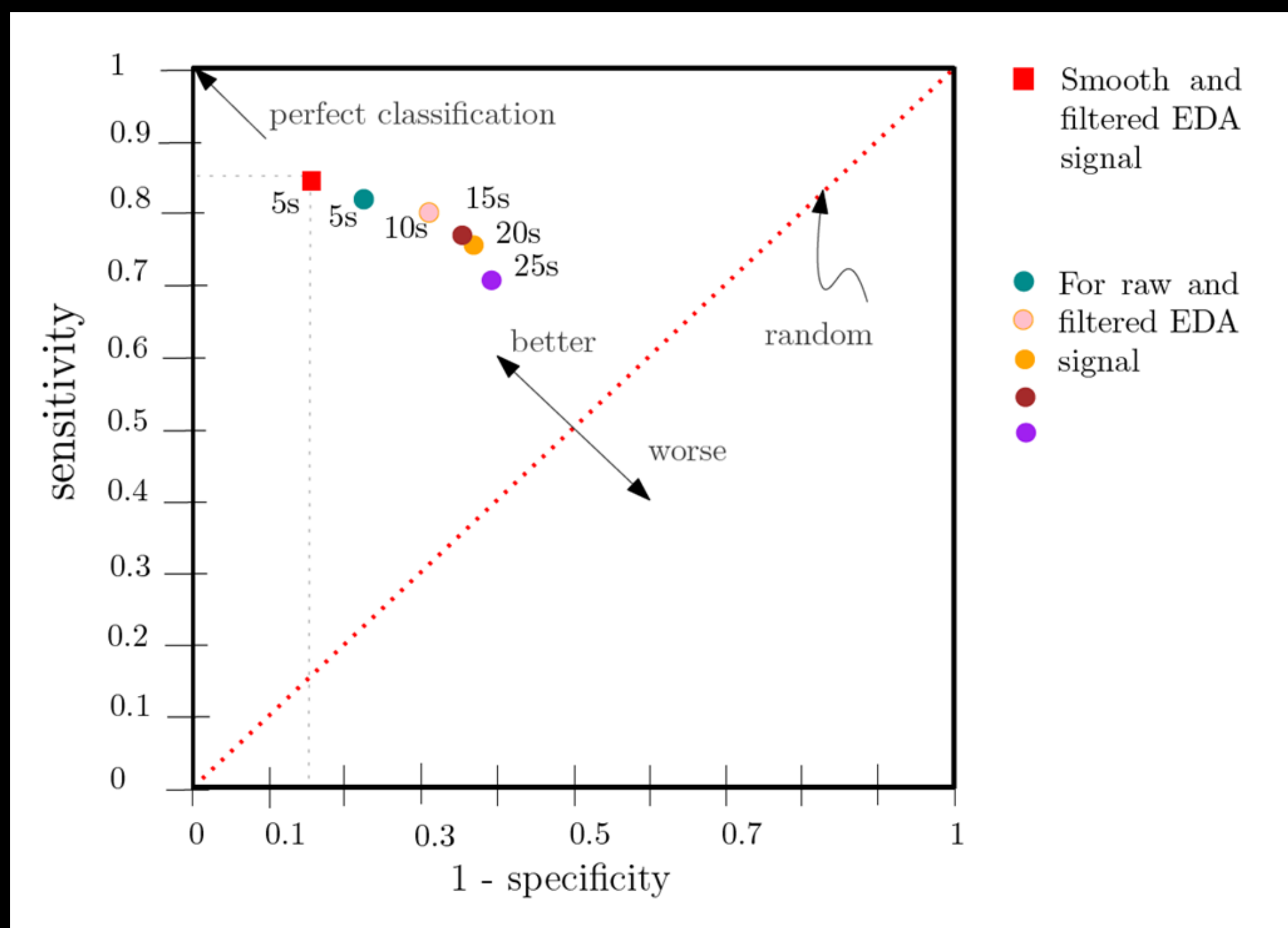


Range of “Through-to-Peak”

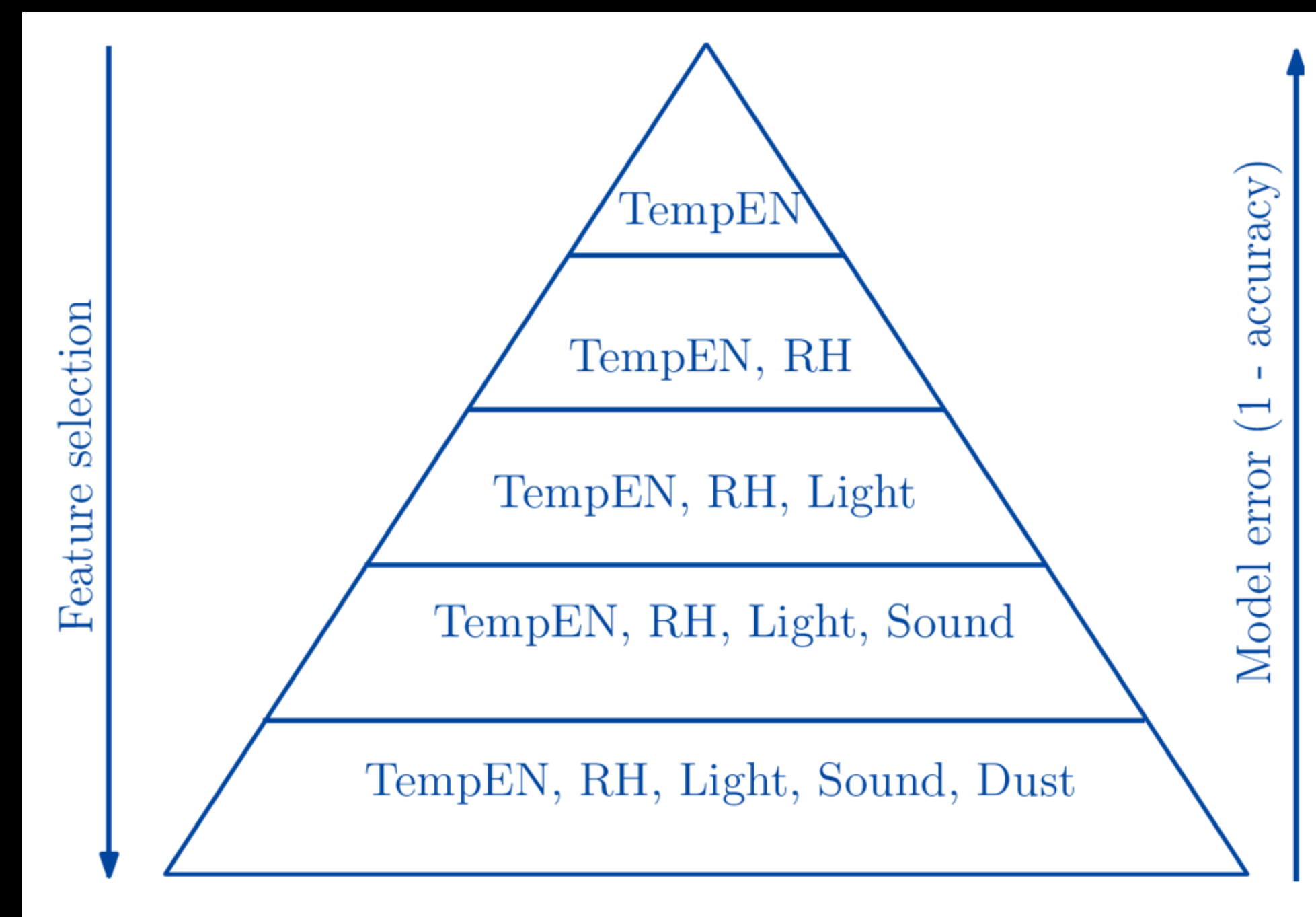


Are EDA “Through-to-Peaks” sensitive to environment variables (features)?

Classifier model

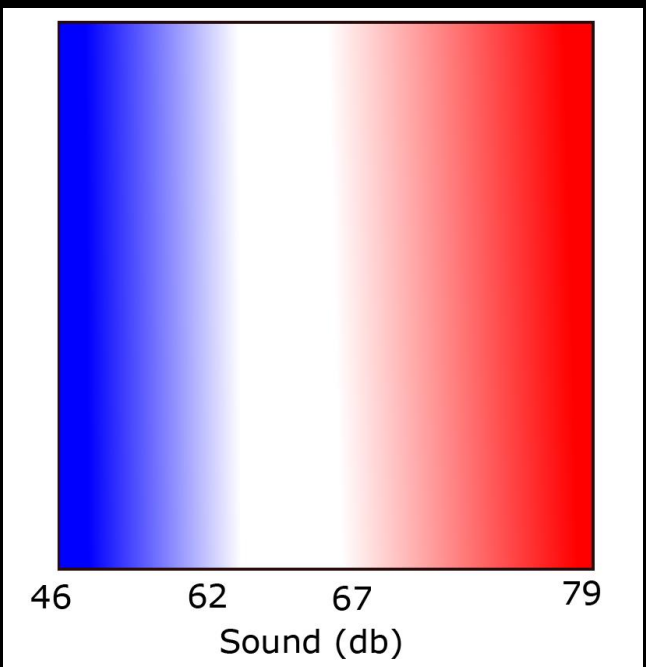
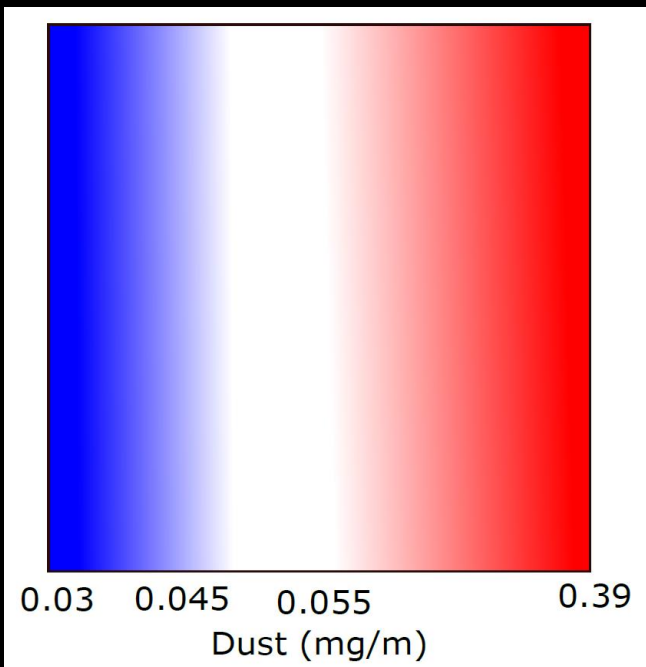
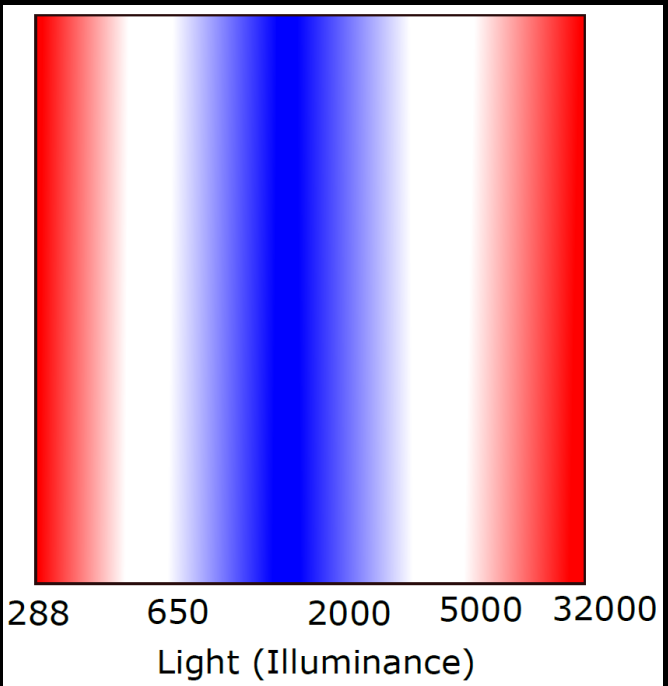
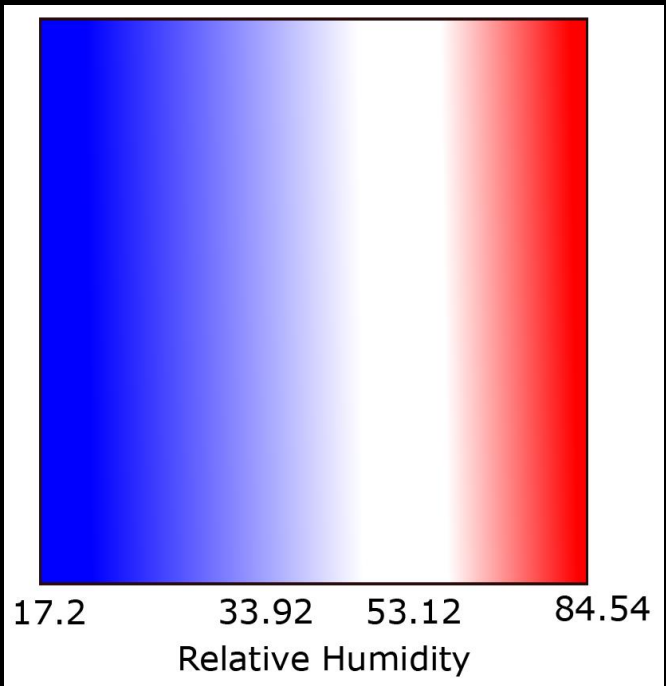
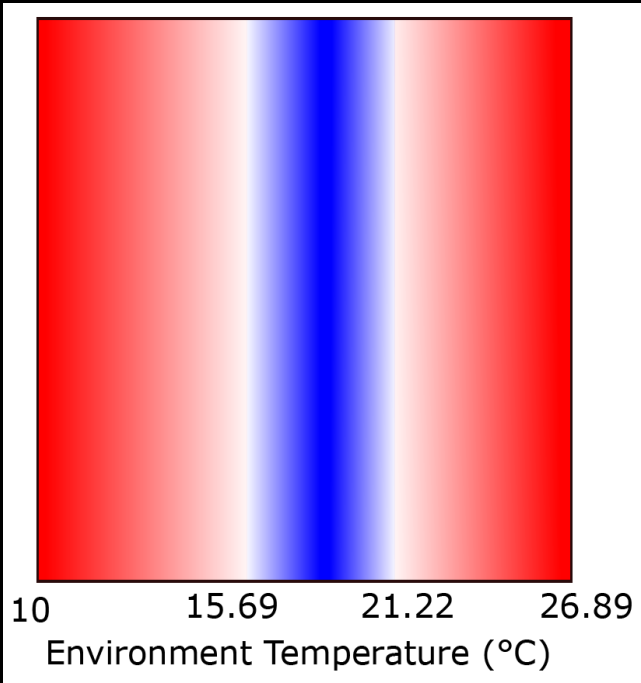


Feature analysis

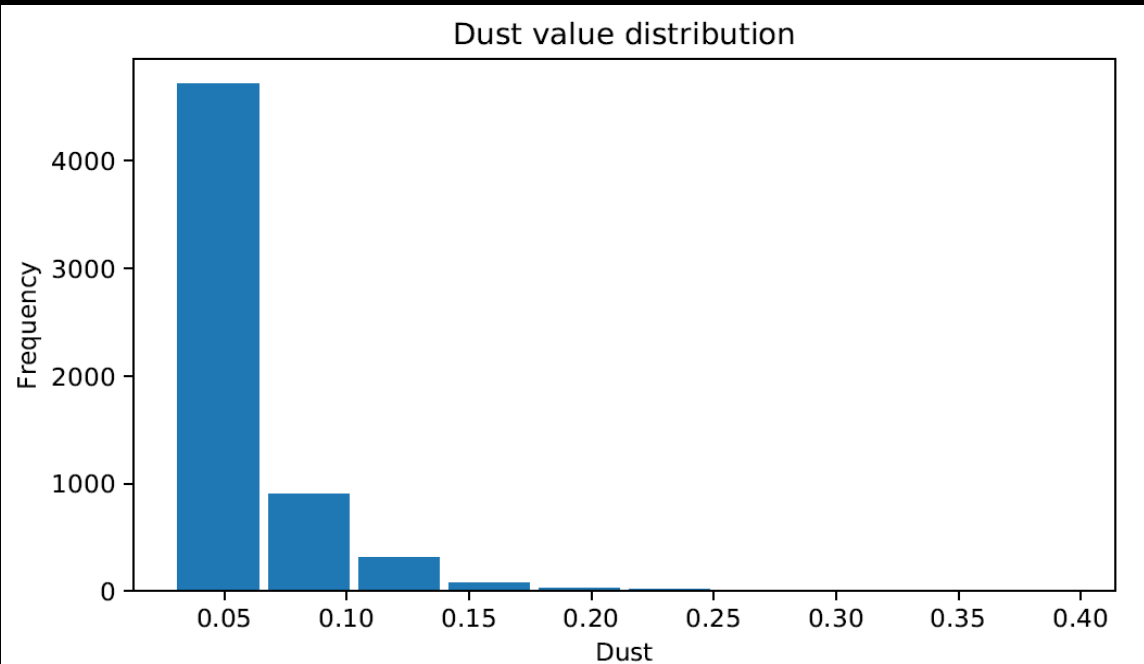
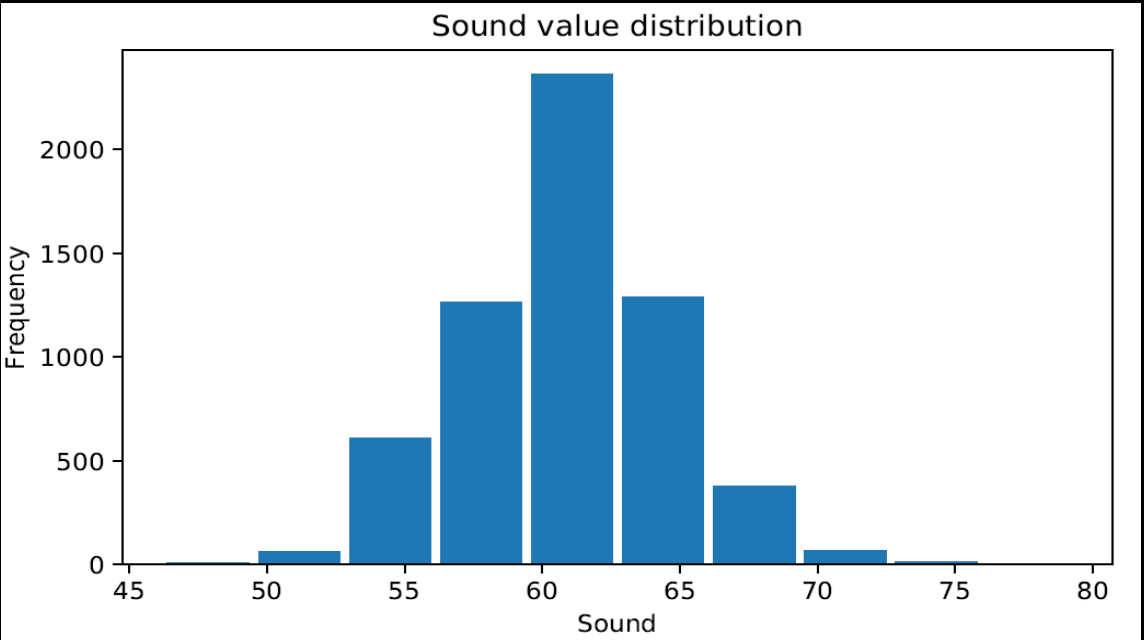
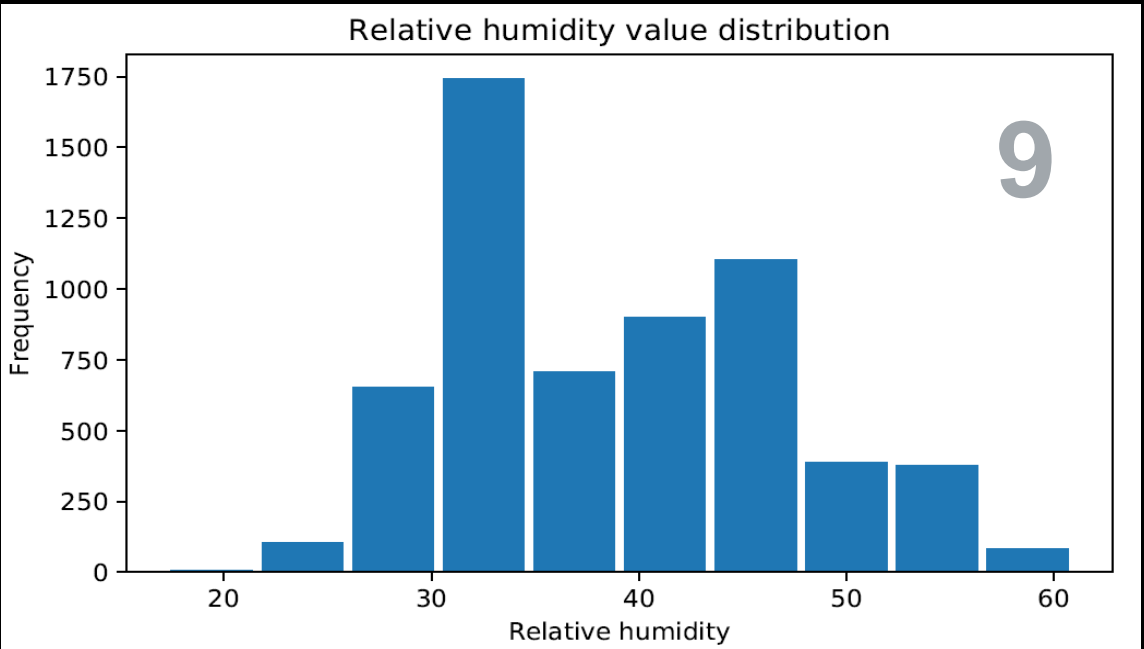
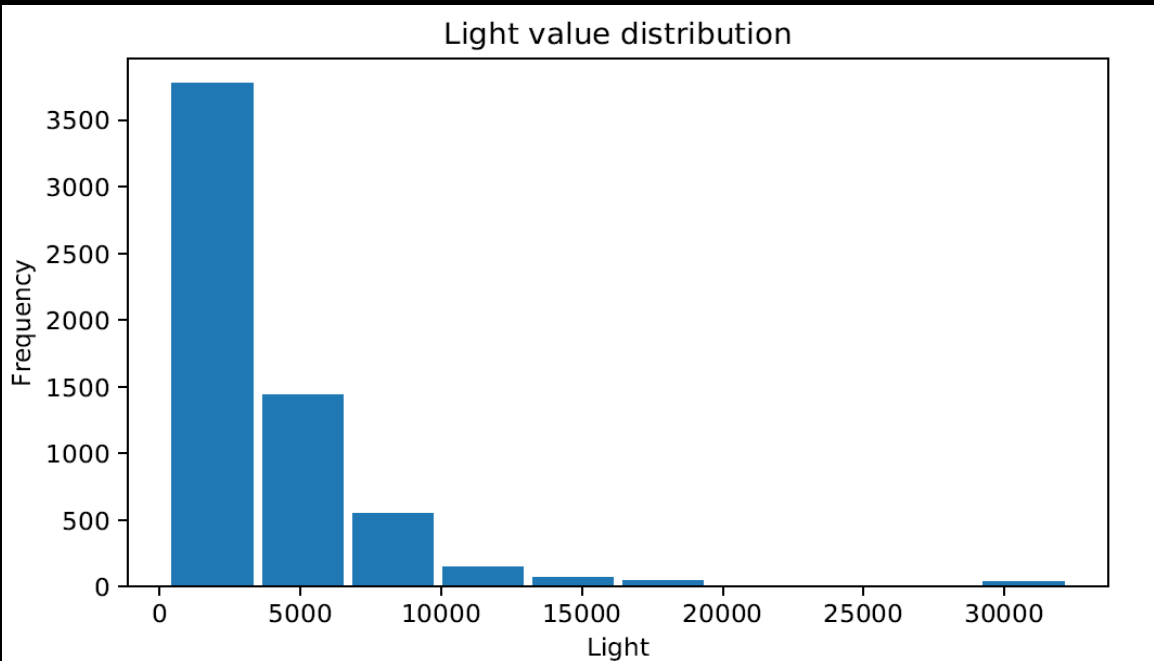
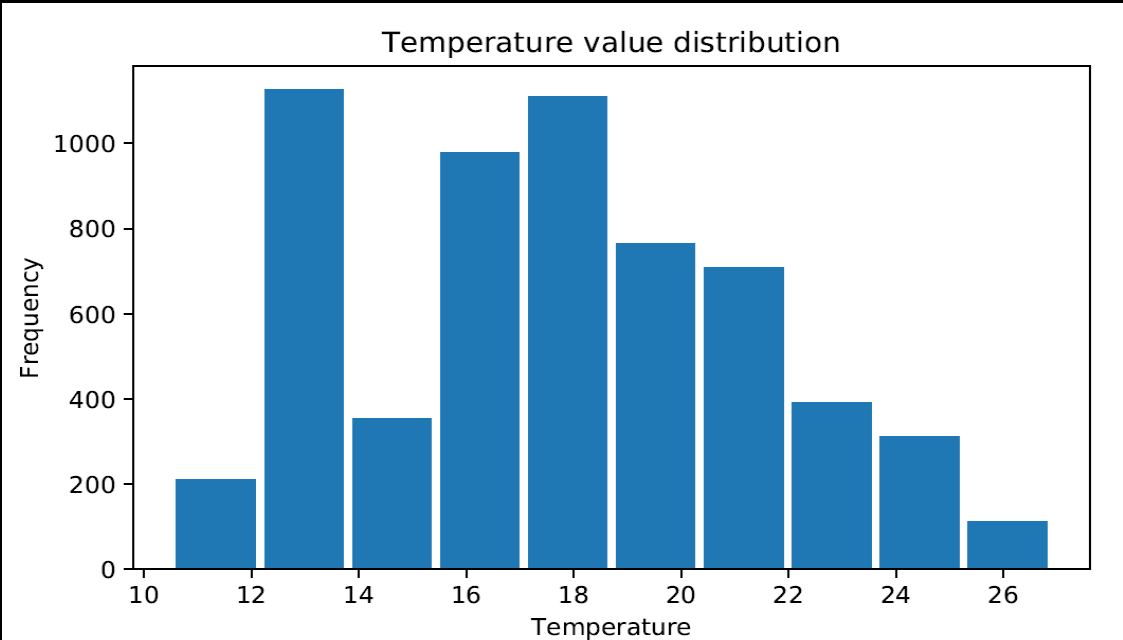


What are the important features?

Inference using fuzzy rule analysis (confidence 60%)

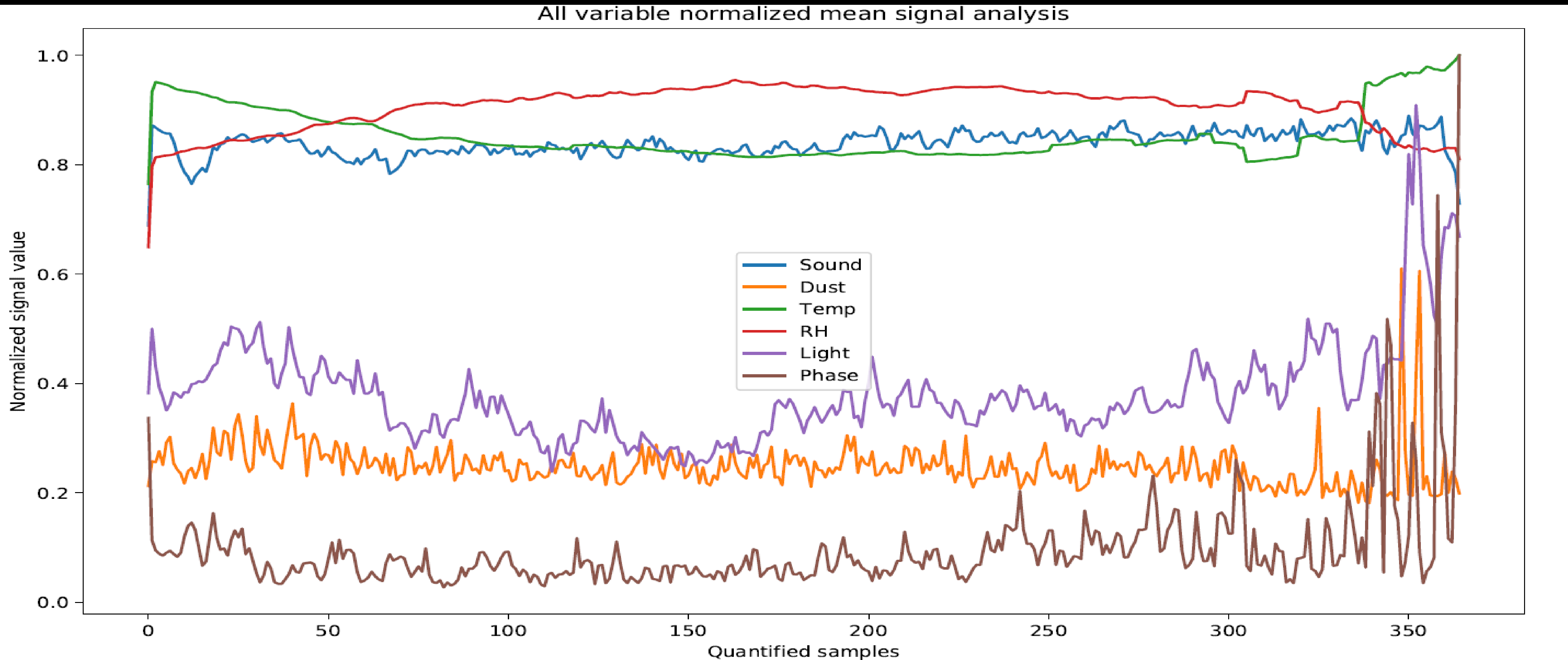


Interpretation:



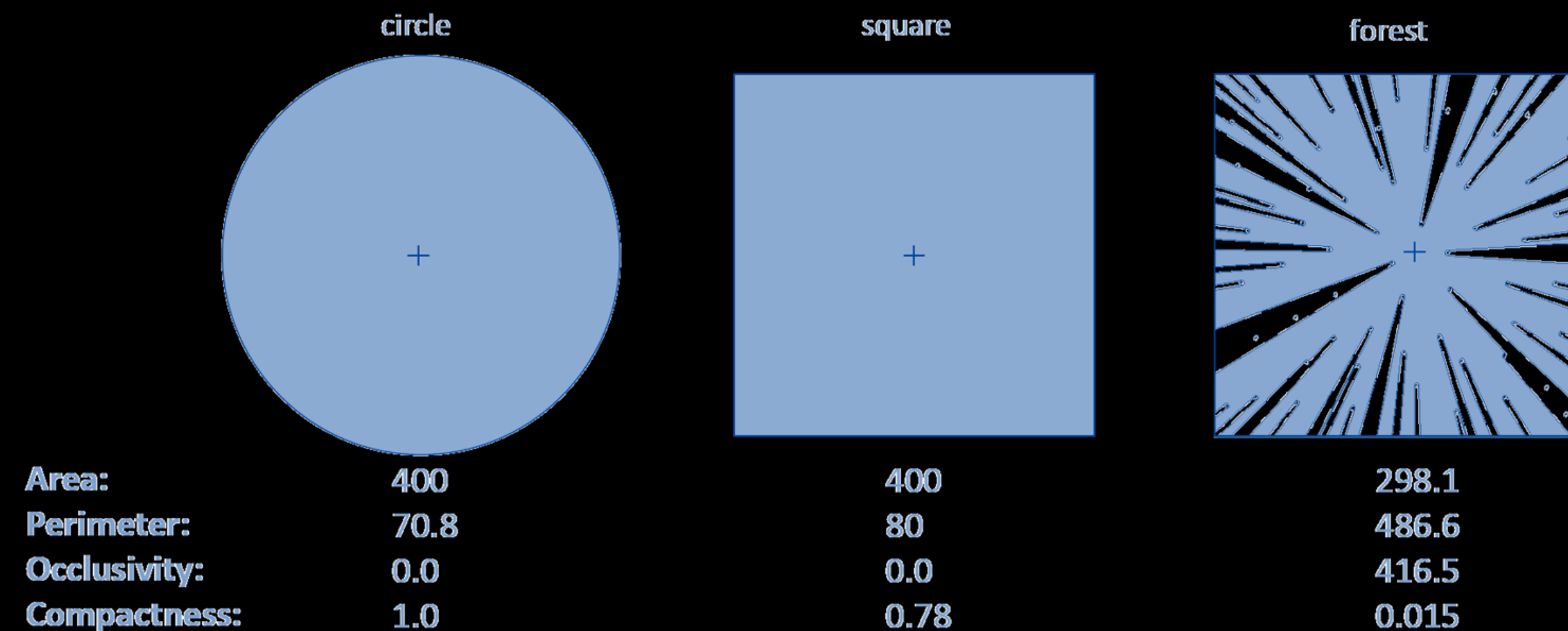
What is the correlation between the features and stress level (EDA phase driver)?

10

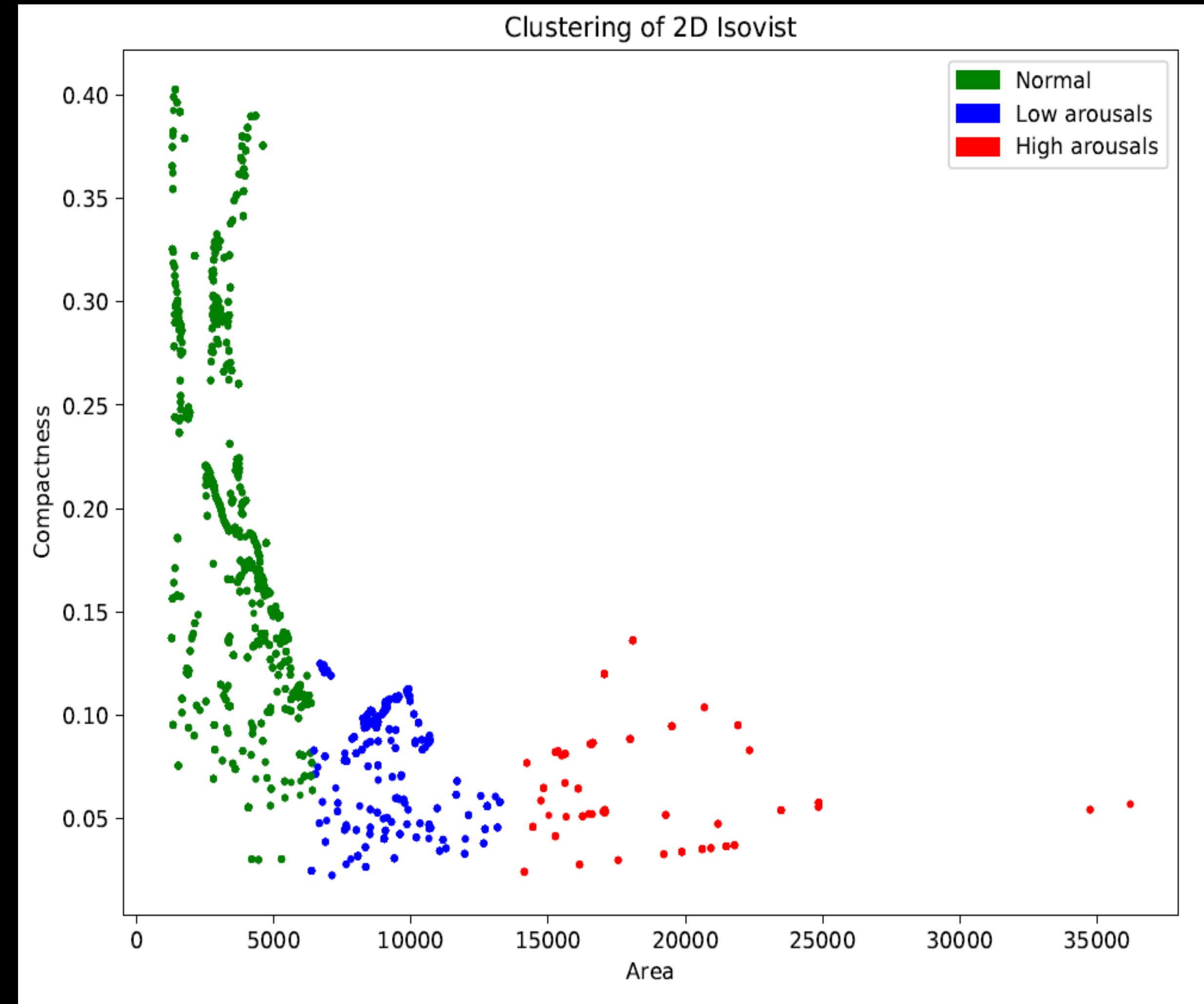


Do morphology have any impact on human perceiving an environment?

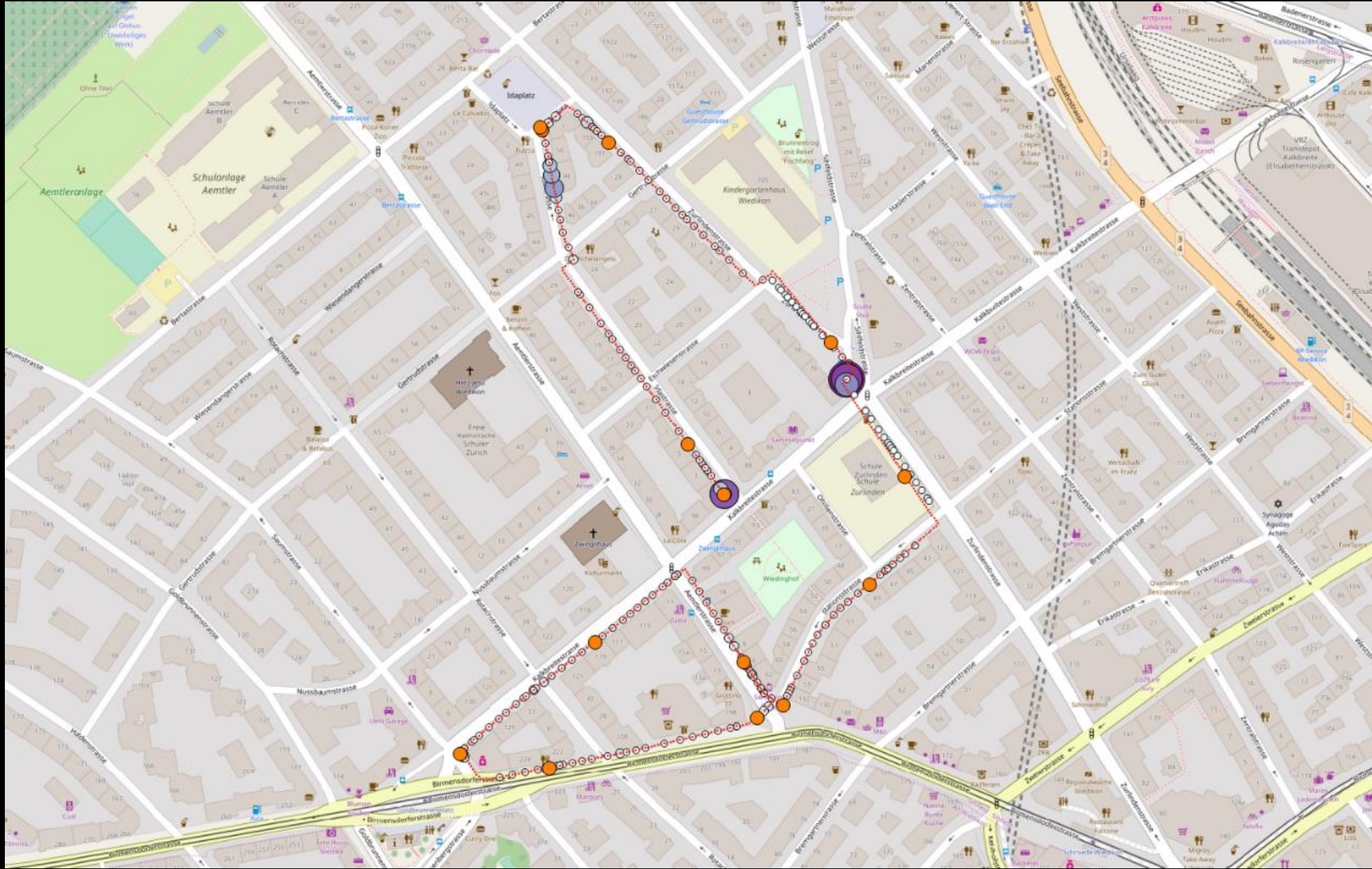
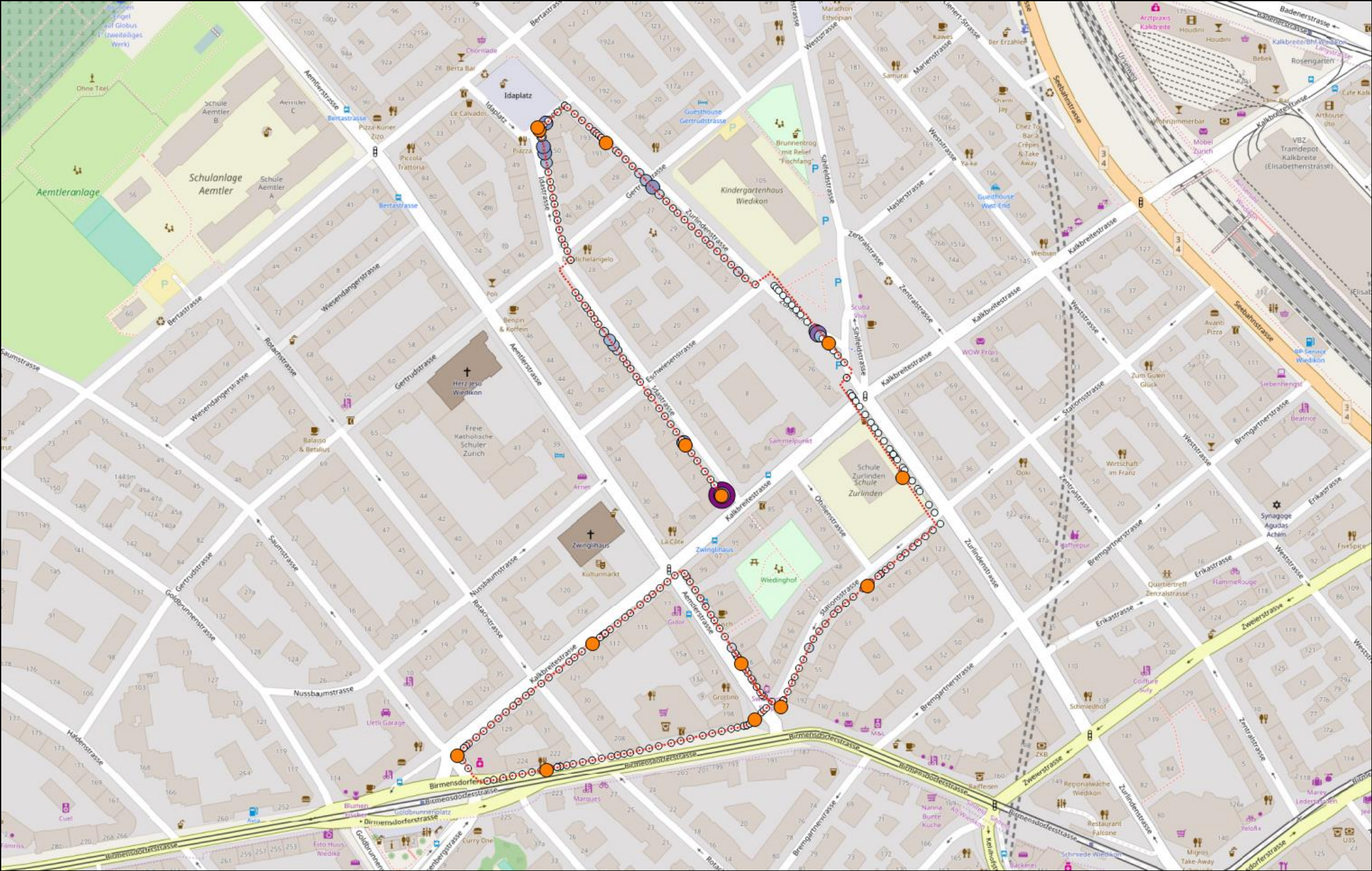
2D Isovist Fundamentals



Significant pattern of morphology



Spot identification



On real time

13

Please wait for exploring a real-time experience 😊

Thank you

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ojha@arch.ethz.ch