

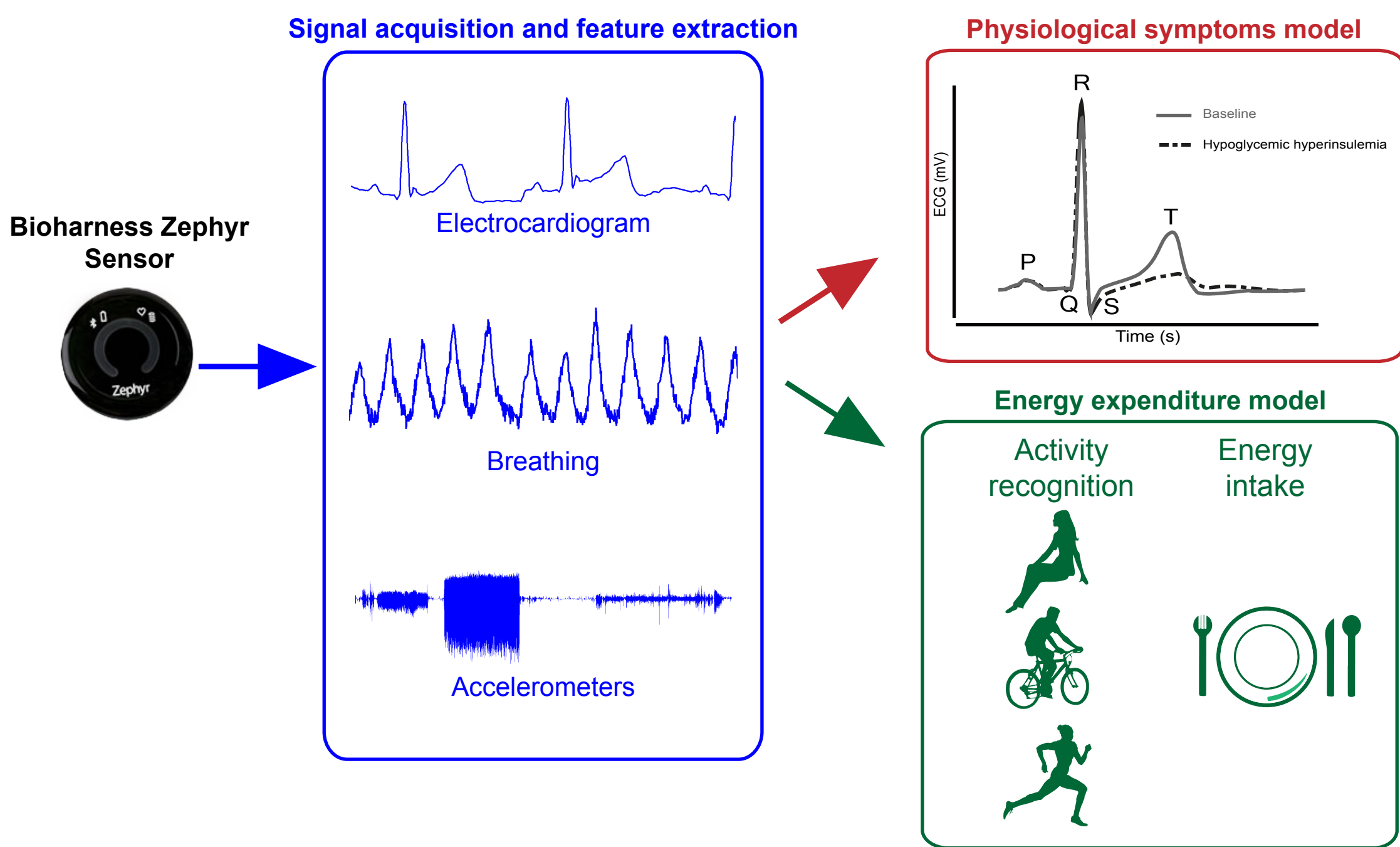
Glycemic events inference from wearable sensor

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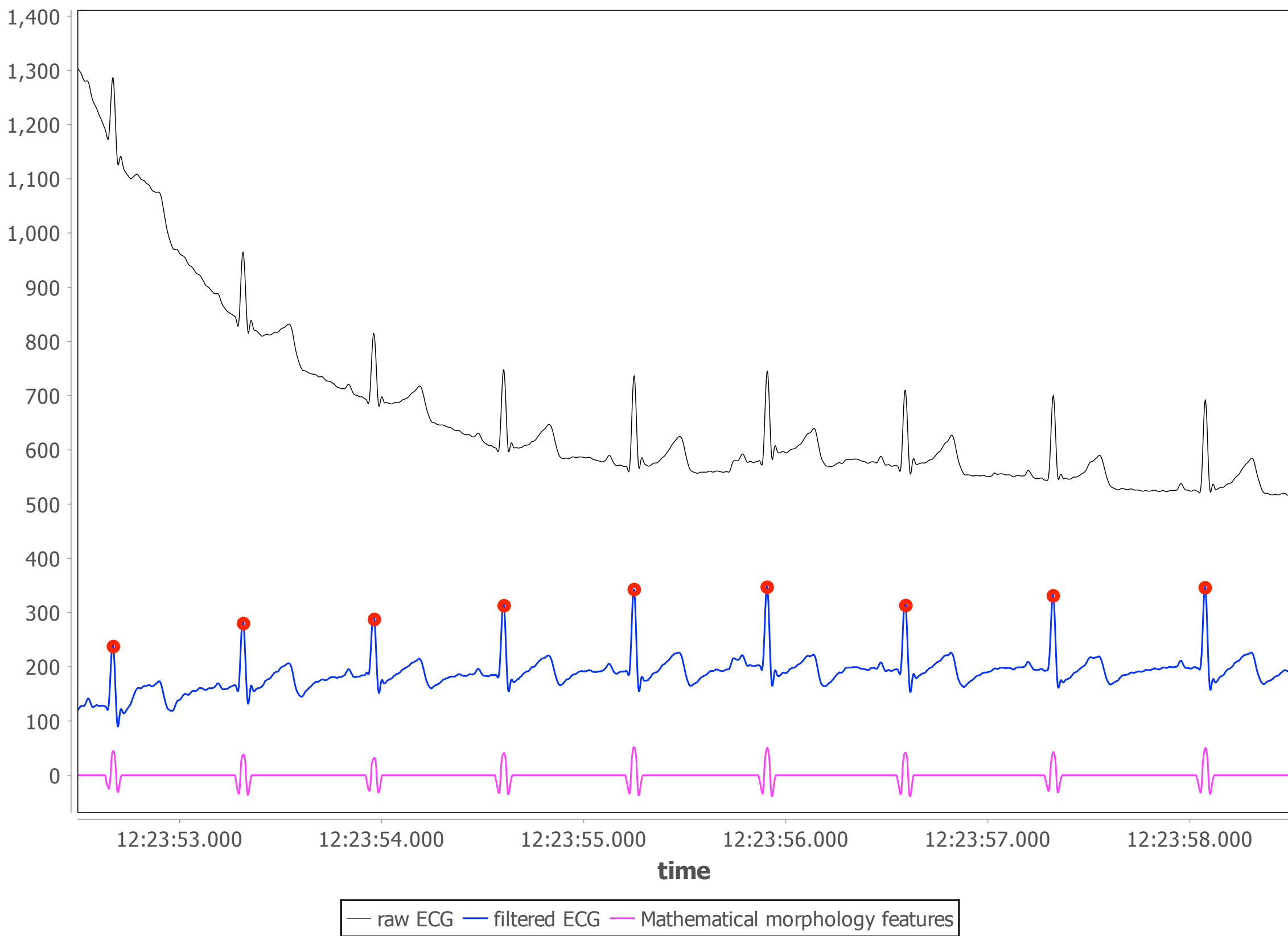
Glucose concentration level is usually measured using a drop of blood, and allow for detection and mitigation of glycemic events (hypoglycemia, hyperglycemia). **Is it possible to accurately infer these glycemic events solely based on non invasive, off the shelves sensors?** D1namo proposes to **fuse multiple sensors** from a wearable belt to build coherent representation of the user’s state in order to detect glycemic events.

Glycemic events detection



ECG analysis

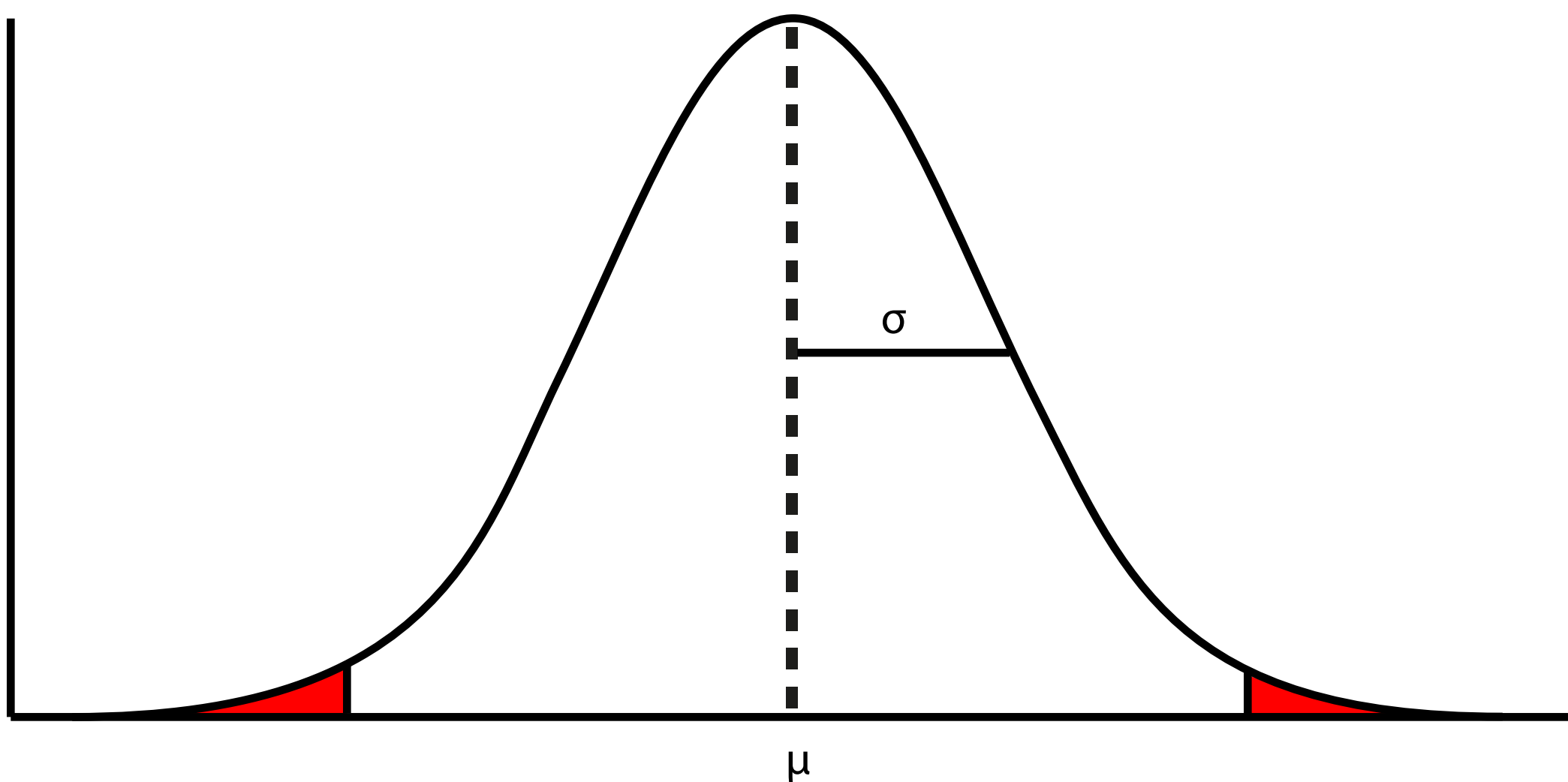
Laitinen et al. showed that the **ECG is altered during glycemic events**. We collect the ECG data provided by the chest belt to infer the glycemia of the patient using **signal processing analysis**. However, movements add **high amount of noise** in the ECG signal necessiting preprocessing: **Adaptive filtering** and **QRS complexes detection** (Sasan et al. '14)



Detection of QRS complexes

Fusion of the features and detection of glycemic events

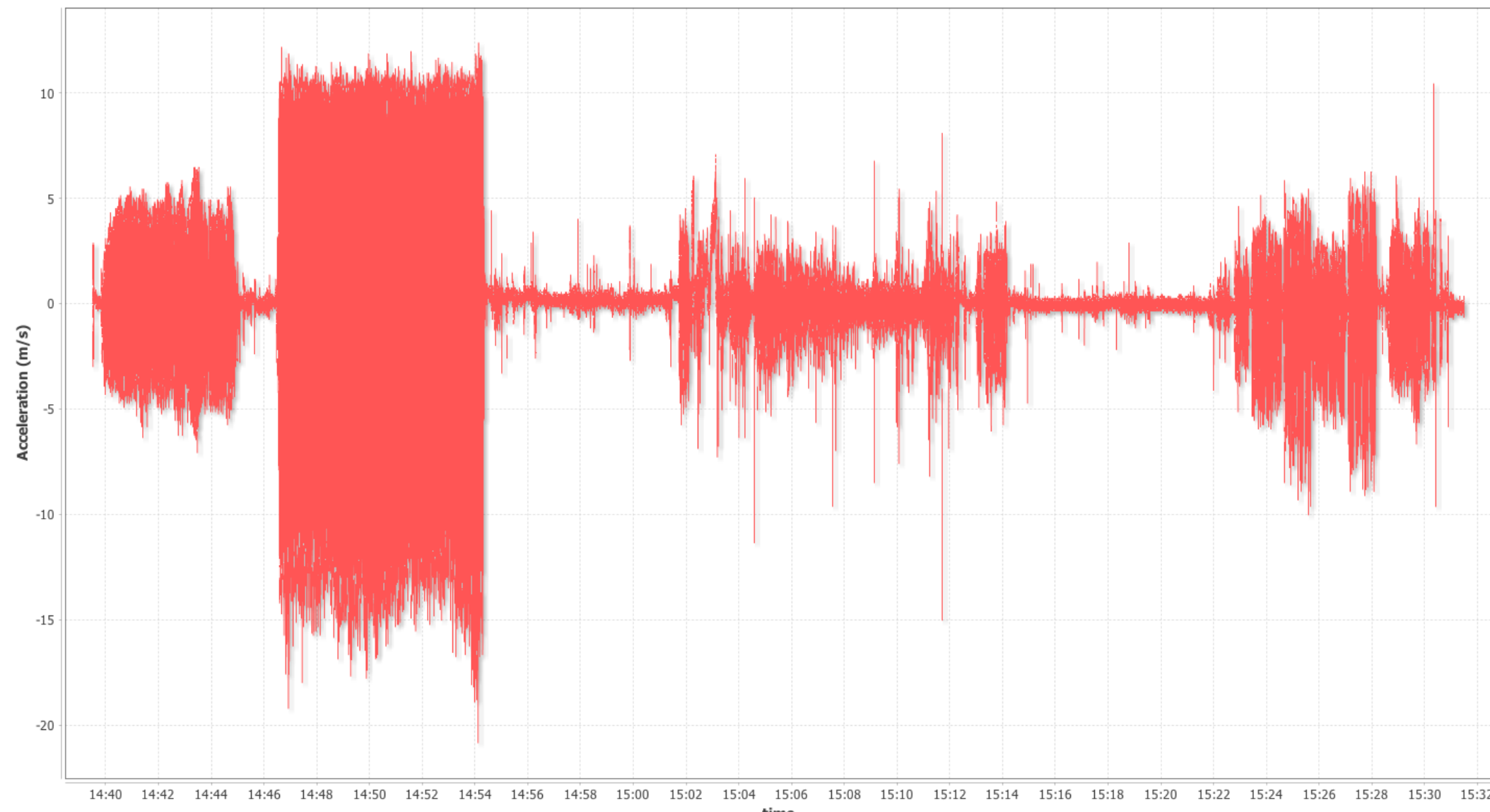
Anomaly detection is first used to counter balance the **overwhelming amount of data collected in absence of glycemic events**. It helps detecting glycemic events which can then be **classified into hypo and hyper-glycemia** based on their ECG features and activity level defined above.



Anomaly detection to balance the different classes

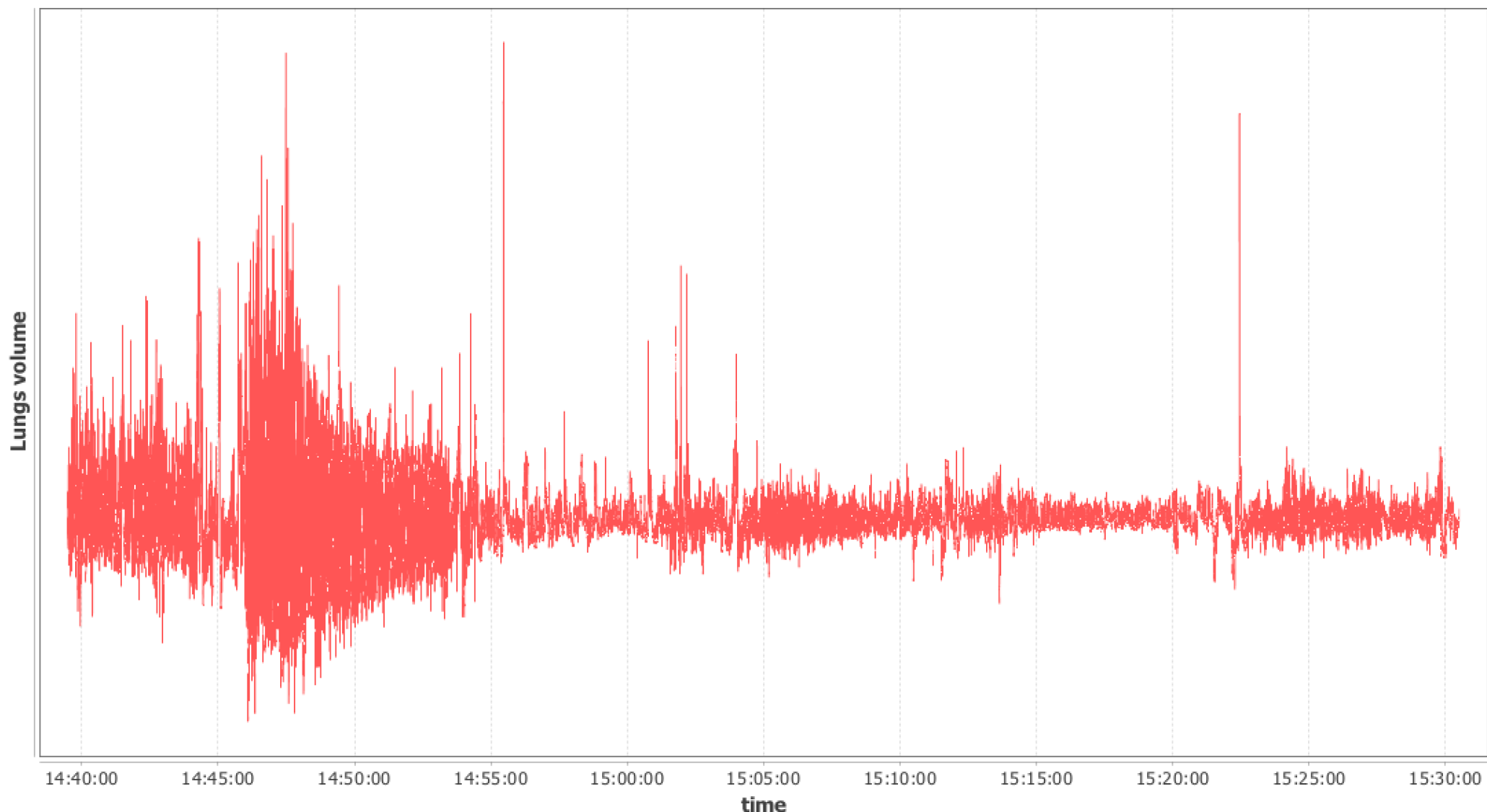
Activity level recognition

Glucose level is highly dependent on the **food income** and **energy expenditure**. We use 3-axis accelerometer, breathing and heart rate data provided by the chest belt **to determine an activity level** which can be translated into energy expenditure of the patient. The **food intake is manually logged** using a third party food database of the patient.



Accelerometer

walk	jogging	standing	biking	sitting	steps
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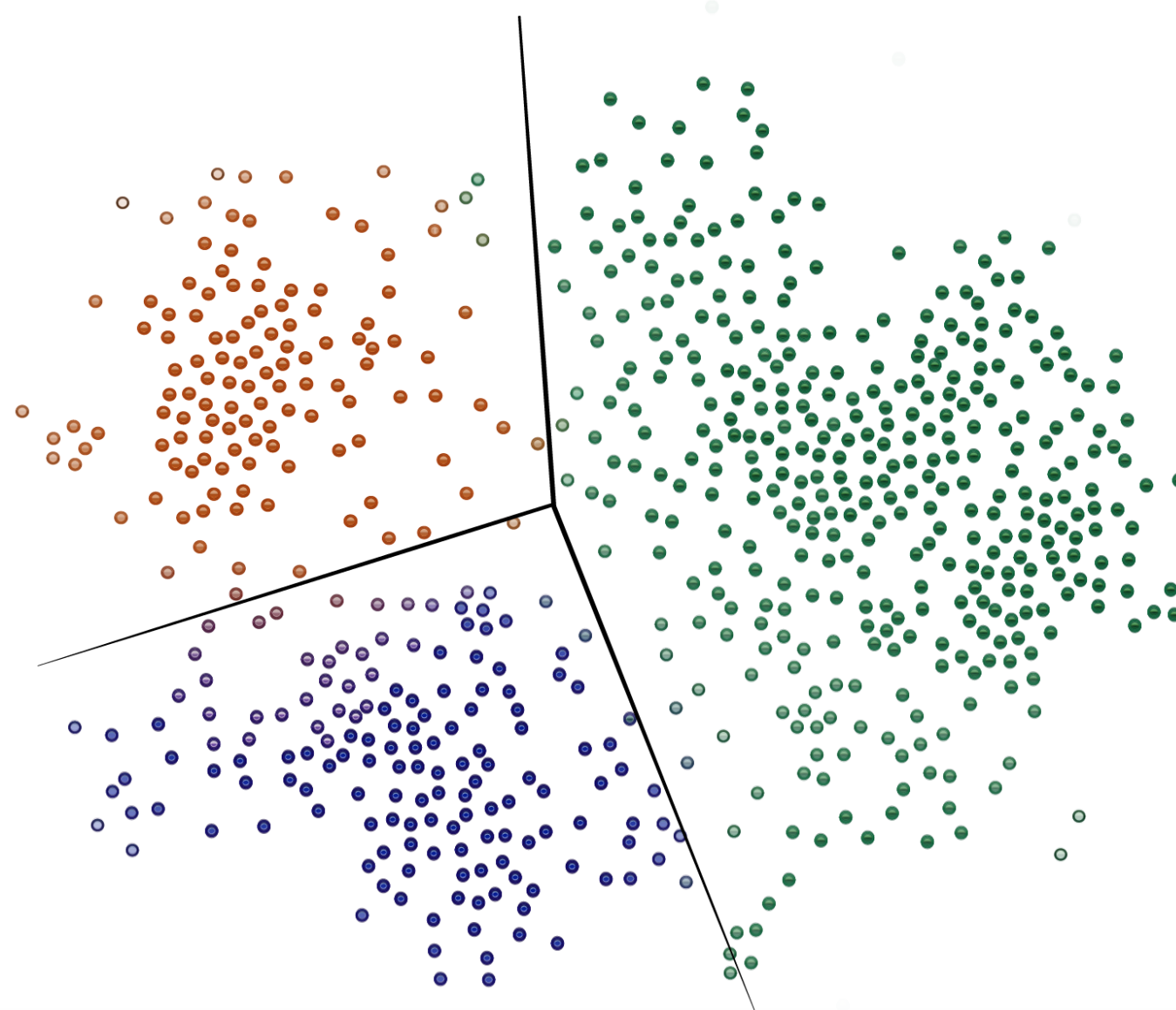
Breathing rate

Lunch

Add a note

Food	Amount	Cals	Fat	Fiber	Carbs	Sodium	Prot	Fav
Boeuf Bourguignon	1 portion (183 g)	254	8.8	0.9	7.5	93	27.2	★

Food intake



Discrimination of glycemic events using machine learning