Digital Biomarkers

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Luo et al.: Assessment of Fatigue Using Wearables

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Sensor	Parameter	Description	Unit	Downsampling	Daily features
Accelerometer	ActivityClass	Categorical parameter. Type of physical activity: 0 = undefined, 1 = resting, 9 = other, 10 = biking, 11 = running, 12 = walking	I	Mode	Count per category; One-hot encoding
	ActivityCounts	The activity value indicates the intensity of motion (activity)	I	Sum	Mean, SD, Median, Max., Min., Skewness, Kurtosis, 5 th and 95 th percentile, FFT, PSD, Sum
	Steps	Number of steps	I	Sum	Mean, SD, Median, Max., Min., Skewness, Kurtosis, 5 th and 95 th percentile, FFT, PSD, Sum
	EnergyExpenditure	Amount of energy a person uses to complete all regular bodily functions, measured in calories	Calories/s Sum	Sum	Mean, SD, Median, Max., Min., Skewness, Kurtosis, 5 th and 95 th percentile, FFT, PSD, Sum
Photoplethysmography	HR	Heart Rate	mdq	Quality-weighted average	Mean, SD, Median, Max., Min., Skewness, Kurtosis, 5 th and 95 th percentile, FFT, PSD
	HRV	Heart rate variability. Indicates the beat to beat variations.	ms	Quality-weighted average	Mean, SD, Median, Max., Min., Skewness, Kurtosis, 5 th and 95 th percentile, FFT, PSD
	RESP	Respiration rate. Number of breaths a person takes per minute	mdq	Quality-weighted average	Mean, SD, Median, Max., Min., Skewness, Kurtosis, 5 th and 95 th percentile, FFT, PSD
	BloodPerfusion	Blood perfusion can be measured as the percentage change in blood volume in local tissue resulting from a heartbeat	1	Median	Mean, SD, Median, Max., Min., Skewness, Kurtosis, 5 th and 95 th percentile, FFT, PSD
	BloodPulseWave	Blood is ejected generating a pulse wave when the heart contracts	I	Median	Mean, SD, Median, Max., Min., Skewness, Kurtosis, 5 th and 95 th percentile, FFT, PSD
Temperature	SkinTemperature	Skin temperature	J.	Median	Mean, SD, Median, Max., Min., Skewness, Kurtosis, 5 th and 95 th percentile, FFT, PSD
Galvanic Skin Response	GalvanicSkinResponse	Describes changes in the electrical conductivity of the skin. It is a measure of emotional arousal	kOhm	Mean	Mean, SD, Median, Max., Min., Skewness, Kurtosis, 5 th and 95 th percentile, FFT, PSD
Barometer	Barometer	Barometric pressure measures changes of altitude	mbar	Median	Mean, SD, Median, Max., Min., Skewness, Kurtosis, 5 th and 95 th percentile, FFT, PSD

HR, heart rate; HRV, heart rate variability; RESP, respiratory rate; SD, standard deviation; Max, maximum; Min, minimum; FFT, fast Fourier transform (amplitude and frequency of 2nd to 5th peaks).

