

Measuring Self-Esteem with Passive Sensing

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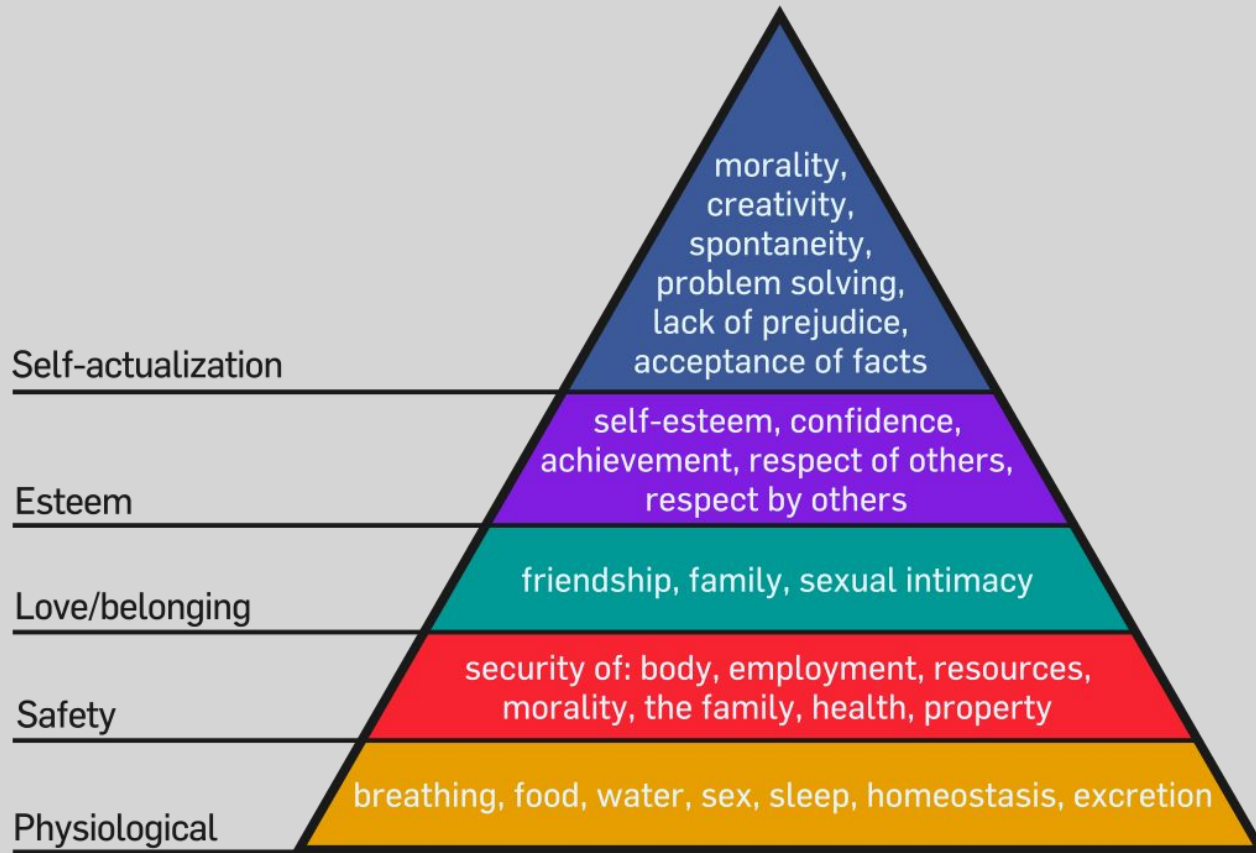


Figure: Maslow's Hierarchy of Needs

Sensors Everywhere

The average smartphone has at least 10 sensors.
Here are the most common.

Camera
What would you do without your selfies?

Pedometer
More and more phones are including a fitness element. Experts recommend 10,000 steps a day.

Light Sensor
Have you ever turned your phone on in the dark and had it been too bright? Your light sensor may have been malfunctioning.

Thermometer
If you've ever left your phone out in the sun you've most likely seen it turn off due to heat. The thermometer is useful to monitor internal operating temperature.

Fingerprint Sensor
The new fingerprint sensor adds an extra layer of security to your phone.



Proximity Sensor
This is what keeps you from accidentally pressing buttons with your cheek during calls!

Magnetometer
The magnetometer measures the strength of the magnetic field around the device to determine what direction it is moving.

Accelerometer
Have you ever wondered how your phone knows which way you are holding it to display vertically vs. horizontally? The accelerometer is the answer!

Gyroscope
If you like taking non-blurry photos you have the gyroscope to thank. It helps to correct for camera shake.

Microphone
The oldest sensor on any phone. Microphones make it possible for others to hear what you are saying.

Research Question

Can we automatically and scalably predict self-esteem using passive sensing modalities available on commodity devices?

Study and Dataset



Study and Dataset

CampusLife



By leveraging passive sensors, this study aims at predicting well-being of students



Smartphone



Social Media



Surveys

Prediction Methodology

Ground-truth

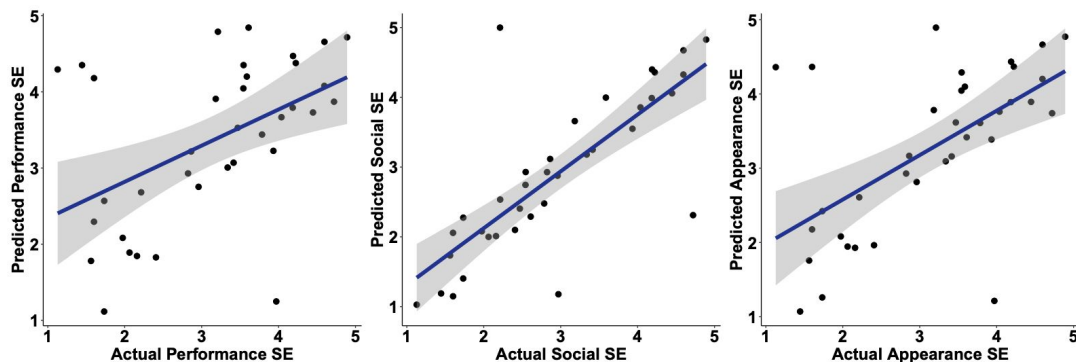
- EMA-based surveys of self-esteem
- Physical, Social, and Appearance self-esteem

Statistical Modeling

- Features: Passive sensing data (calls, text, conversational frequencies, physical activities)
- Regression

Results

Model	Performance			Social			Appearance		
	R^2	r	SMAPE	R^2	r	SMAPE	R^2	r	SMAPE
GBR	0.46	0.42**	8.61	0.83	0.77***	5.64	0.79	0.59***	7.53



Feature Importance





SIEMENS



Takeaways

- Passively sensed data can measure self-esteem.
- Wellbeing in situated communities

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