IMOTIONS
Unpack Human Behavior

More Data, Better Data: Defining Human Behavior with Biometrics

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#EmotionAISummit

Outline

- Who is iMotions?
- The Biometric/Biosensor Toolbox
- 2 Challenges to Human-Centered AI
  - … and how biometrics can help

“Human-Centered AI”

… assumes an understanding of human behavior

… which humans are still trying to figure out

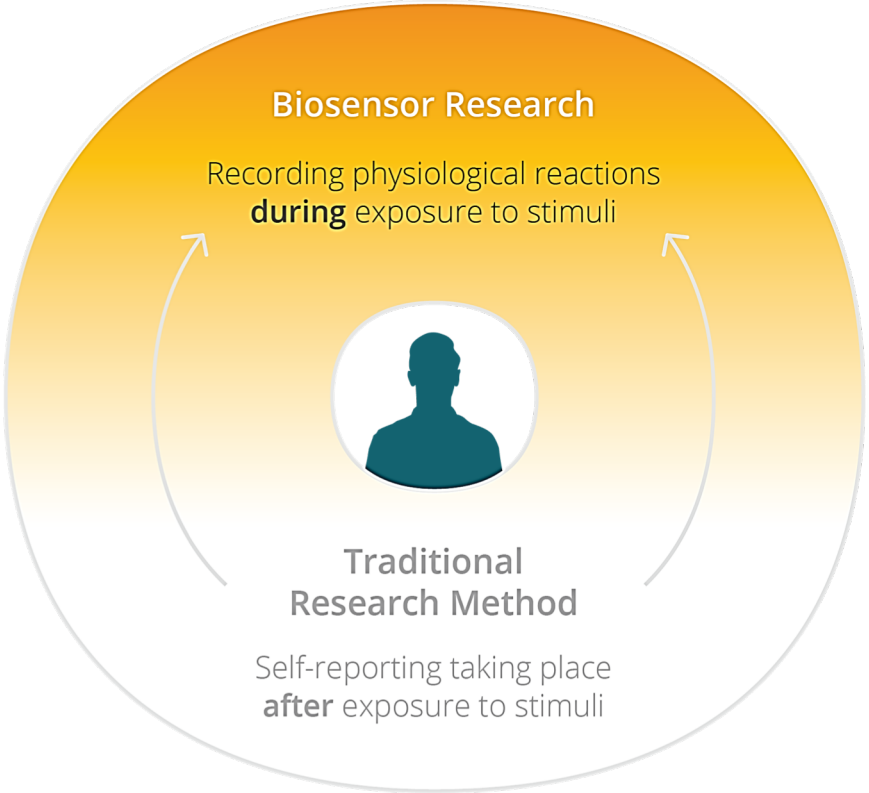
Who is iMotions?

We are a software company specializing in biosensors to study human behavior.

Biosensors for human behavior research

Benefits:

- Extend traditional methods
- Apply best measures to research objectives
- Understand physiological reactions

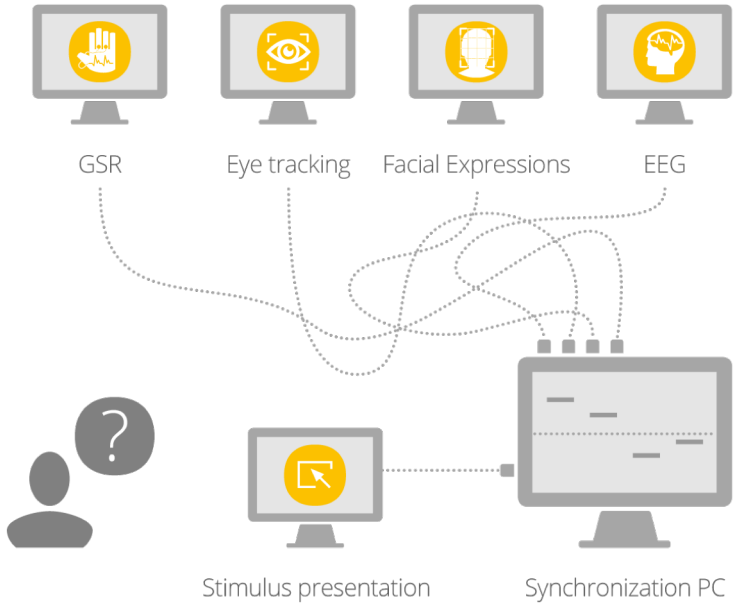


Human behavior research can be complex

The challenge

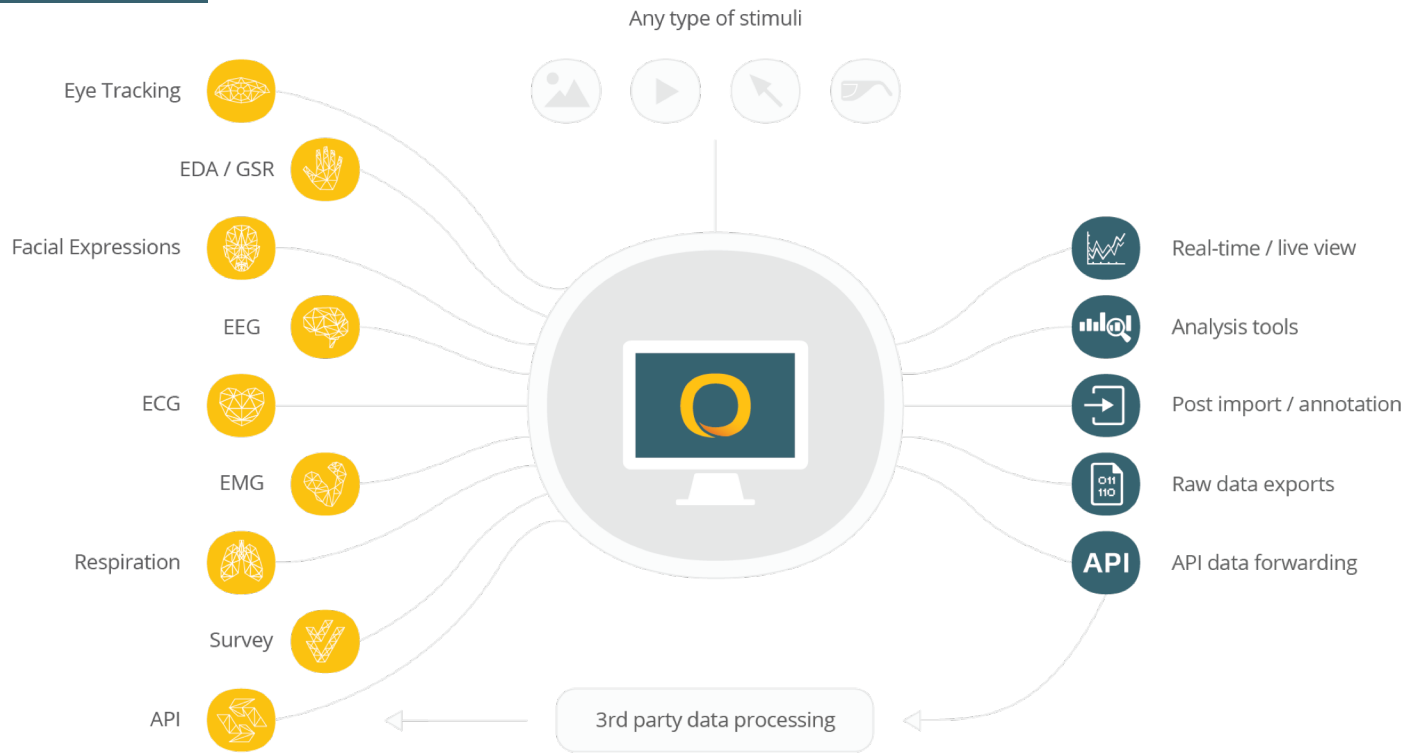
Dealing with:

- Multiple computers, hardware & software tools
- Sensors and stimuli not connected or communicating
- Data collection & analysis are time consuming and prone to manual errors



iMotions simplifies human behavior research

The solution



Powering Academic & Commercial Client Labs

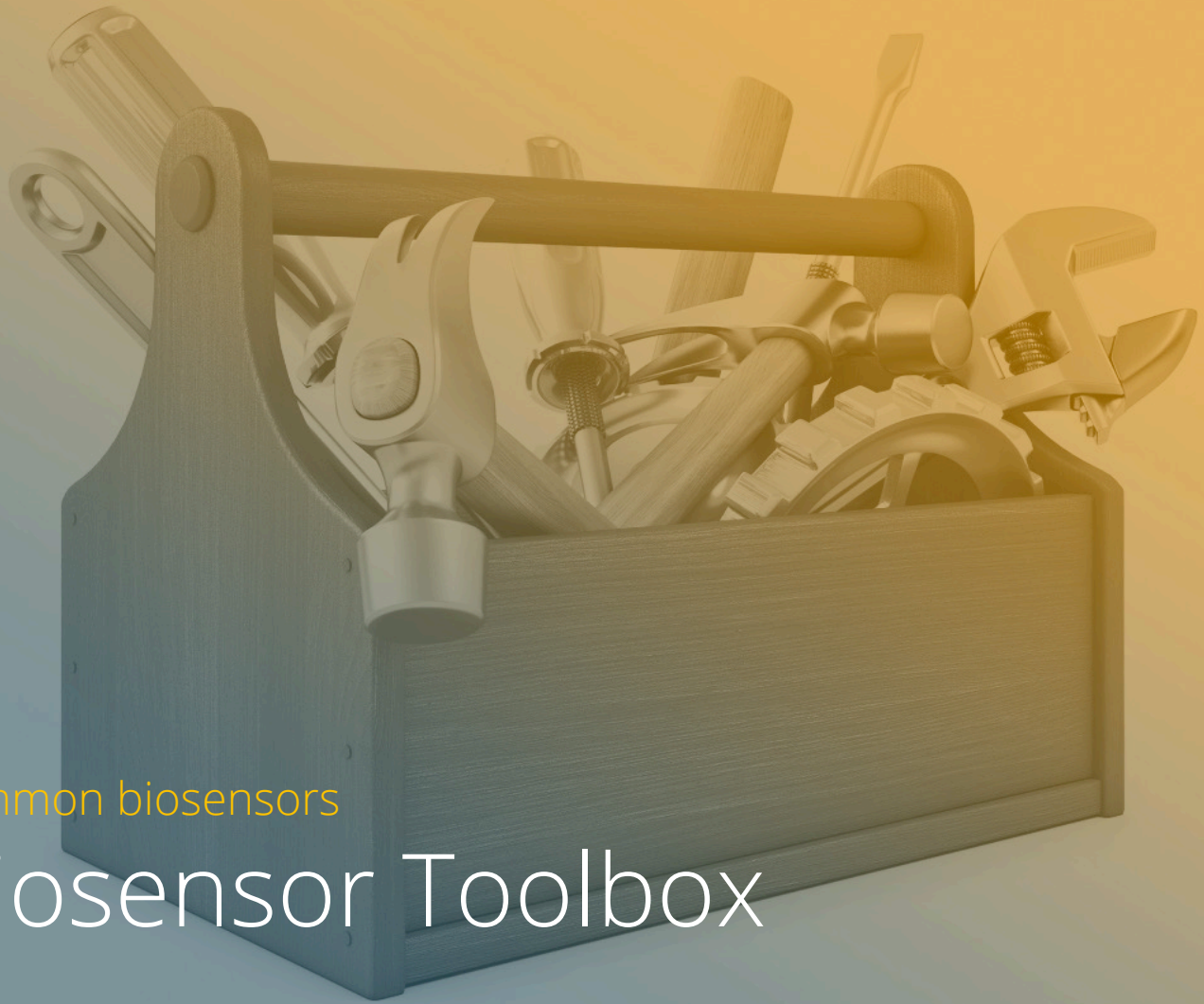
Academic

Commercial

Who is iMotions?

We are a software company specializing in biosensors to study human behavior.

(We think a lot about data.)



The most common biosensors

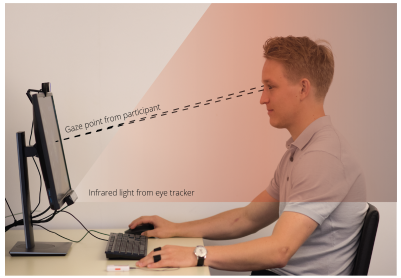
The Biosensor Toolbox

Eye tracking

Screen-based, Glasses, and VR

Eye Tracking Setups for Every Study

Most Stable
Remote/Screen-Based

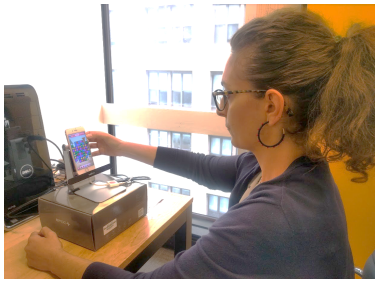


- Respondents can move within the headbox
- Stable systems
- Ideal for any type of screen-based stimulus presentation

Most Natural
Mobile/Glasses-Based

- Participants can stand up and move (almost) naturally
- Glasses make additional video of the environment
- Ideal for real-world stimuli

For Phone/Tablet
Compact Trackers



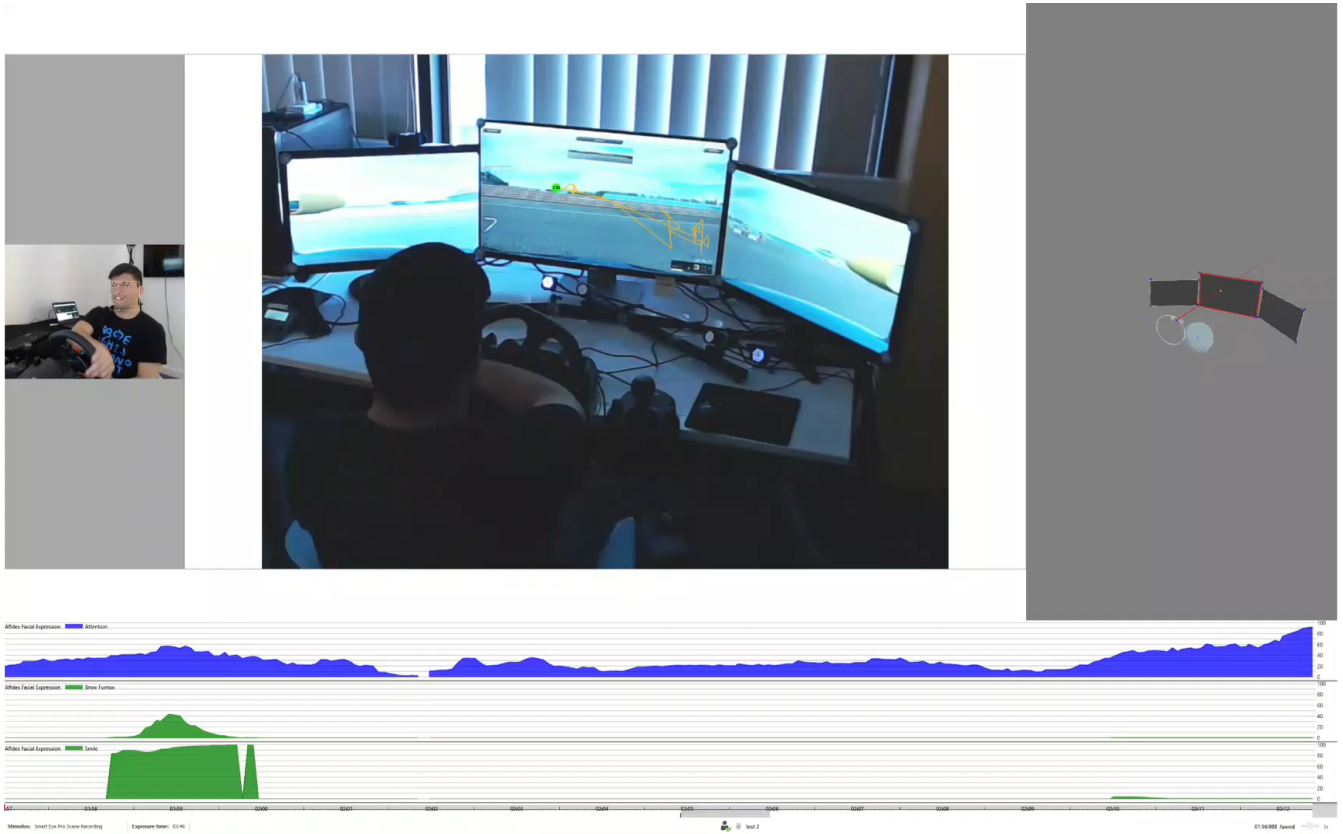
- Mobile stand holds eye-tracker and mobile device
- Extra cameras can be added to monitor the respondent

Virtual Reality
VR-ET Headset

- Virtual reality headset outfitted with eye-tracking hardware
- Made for simulated environments

Eye Tracking setups for every study

Multi-camera setups for driving, cockpit and simulation



Eye Tracking

Measure visual attention

Important metrics:

- AOI (Areas of interest)
  - Time to First Fixation (TTFF)
  - Time Spent
  - Revisits

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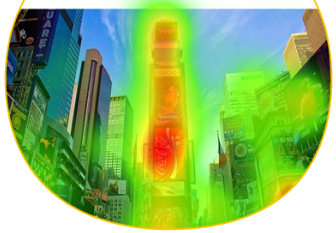
Gaze Replays

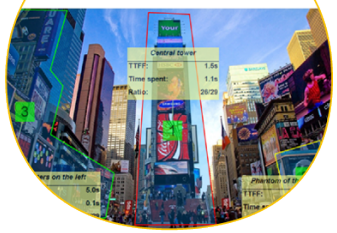
In what order did an **individual** look at things and for how long?

Heatmaps



Where did a **population** focus their visual attention?

Areas of Interest



How did a **population** focus on one element versus another?

Screen-based

Suited for:

- Controlled environments
- Advertisement
- UX
- Academic

Glasses

Suited for:

- In-store testing
- Real-life situations
- Package design
- Automotive

VR

Suited for:

- Simulations
- Military
- UX
- Gaming
- Health

Detect emotional reaction

Facial Expression Analysis

Facial Expression Analysis

Reveal emotional responses

Integrating Affectiva's (AFFDEX) engine:

- Tracked by
  - Webcam
  - Video feed
- 20 facial action units
  - Brow-furrow, Smile, Cheek-raise etc.
- 7 Core emotions
  - Joy, Fear, Contempt, Surprise, Anger, Disgust, Sadness

FEA

- More than **7.7 million faces** analyzed in 87 countries
- Understand **unfiltered responses**
- Combine with eye tracking to **analyze Areas of Interest**

Detect arousal

EDA – Electrodermal Activity

EDA

Detect arousal

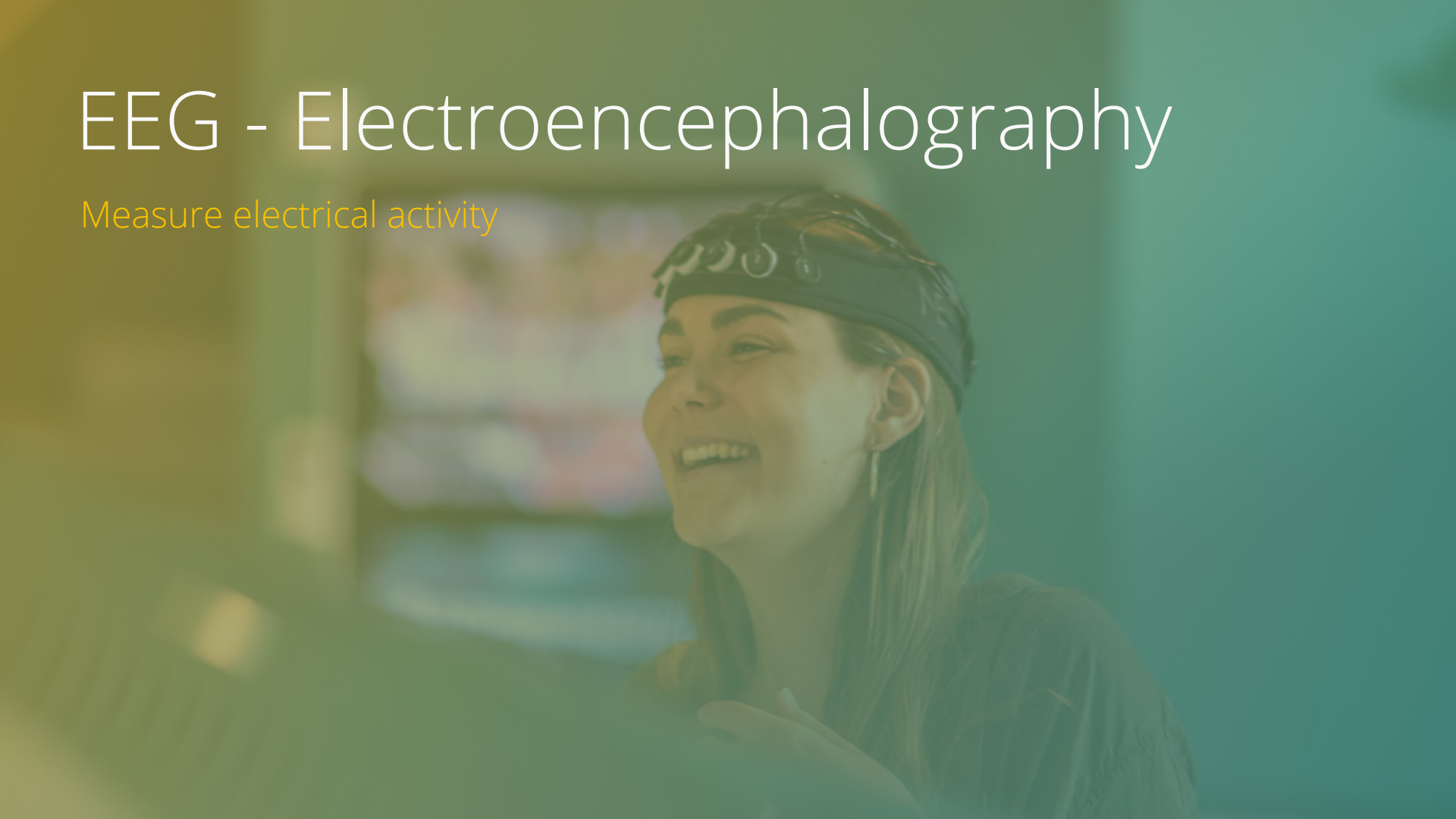
- EDA Peaks
  - Overall intensity
  - Per minute
  - Can be positive or negative
    - Combine with valence
- Easy setup
  - Wired or wireless
  - Placed on hands or feet

EDA (GSR)

- Measure increases in eccrine **sweat gland activity**
- Excellent for **lab and real world** settings
- A **valuable index** of emotional arousal

EEG - Electroencephalography

Measure electrical activity



EEG

Measure electrical activity

- Hardware
  - Electrodes in several options: (8-24 channels)
  - Headband (8 channels)
- Metrics
  - Frequency bands
  - Frontal alpha asymmetry
  - PSD
- Setup
  - Surface of the scalp
  - Wireless

EEG

- Measuring **electrical activity**
- Excellent time resolution
- A **valuable index** of avoid/approach behavior

Putting it all together…

Volunteer, please!

2 Challenges in Human-Centered AI

… and how biosensors can help

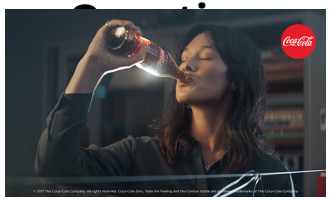
Challenge #1:
Human emotions and behavior can range from simple to complex.

Solution #1:
… Biosensors + machine learning can help characterize difficult problems in human behavior.

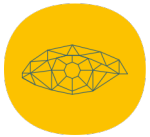
Example 1: Advertising

The more complex and abstract the behavior, the more sources of data you should have.

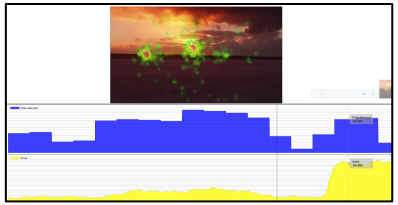
Easy



"Did people notice the branding in my commercial?"



Moderate Question



"How engaging is my commercial to viewers?"

Difficult Question

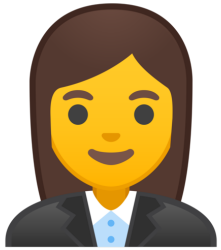
Tasty!

"How does my commercial affect brand identity?"

Example 2: Automotive (Workload)

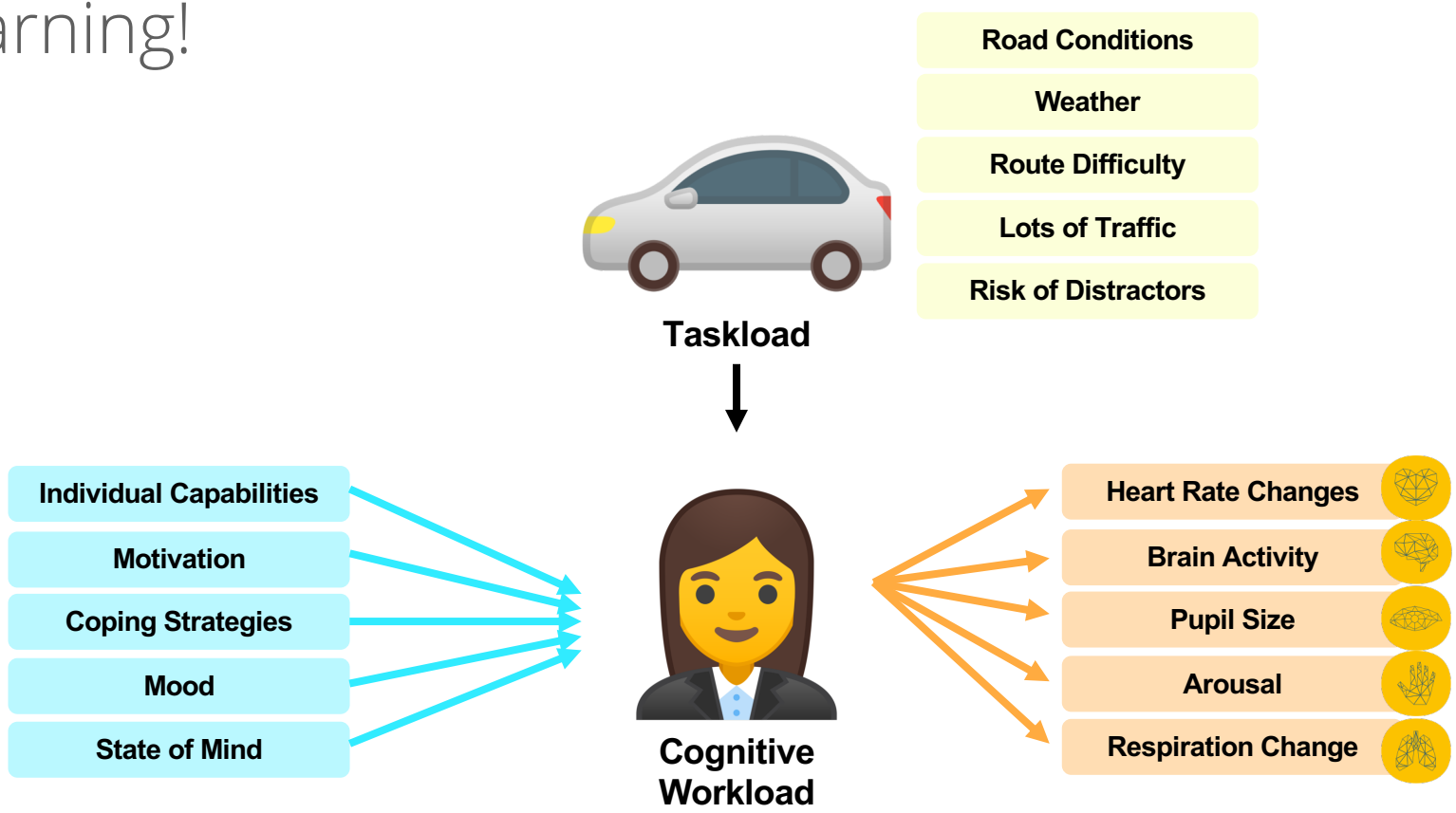
- **Cognitive Workload** is a particularly difficult problem because it's extremely context dependent and incorporates **objective** and **subjective** measures.

Taskload: The objective cognitive effort required to do a task effectively



Workload: The subjective interaction of the person's bandwidth with a given taskload

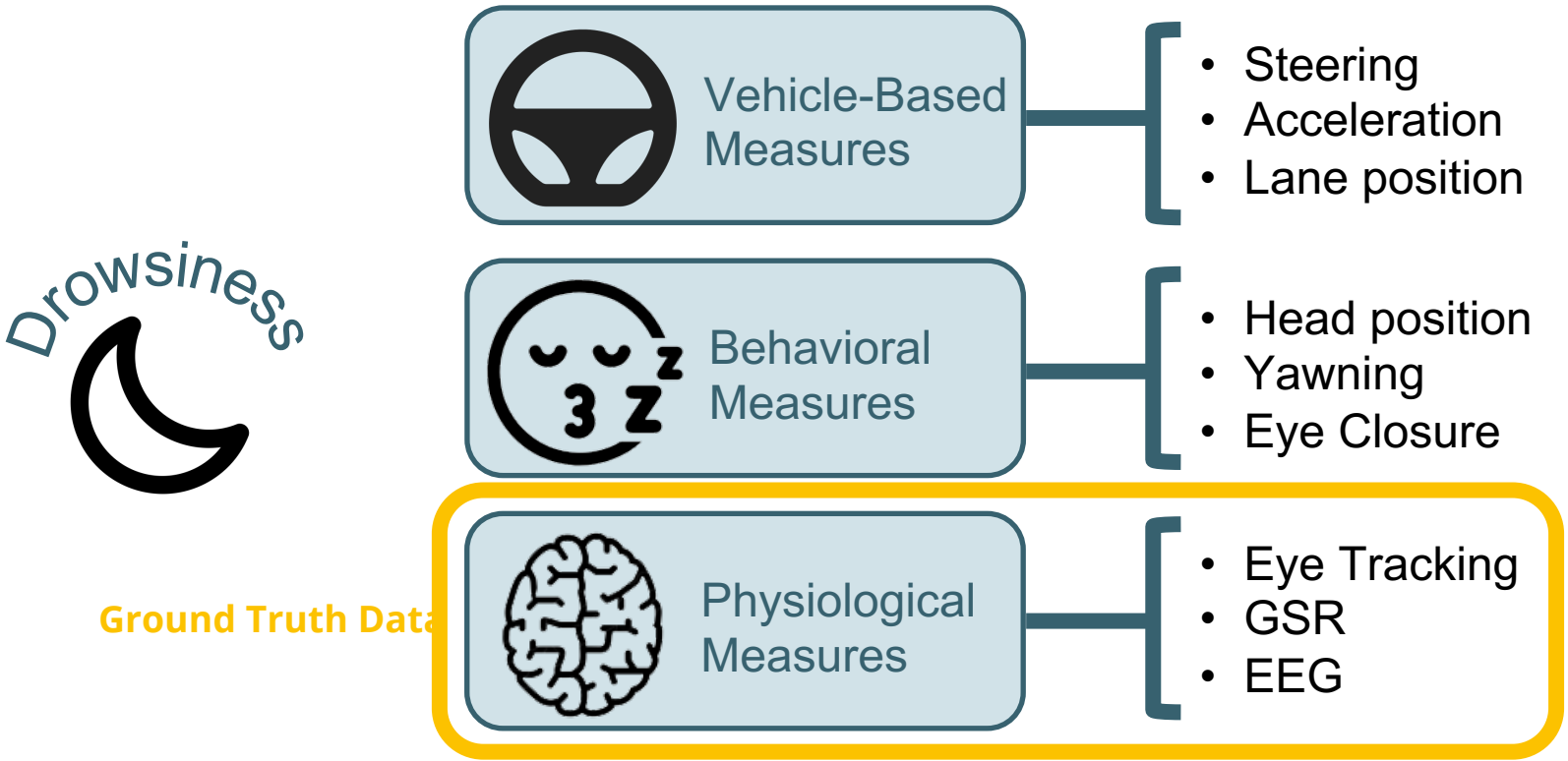
Many Variables = A great problem for machine learning!



Challenge #2:
Human brains are difficult to measure “in real life”. Behavior is often used as a proxy for physiological processes.

Solution #2:
…Biosensors can be employed as Ground Truth Data to validate behavioral algorithms.

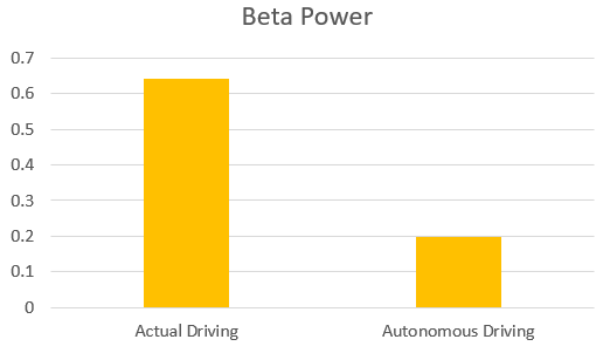
Example: Automotive (Drowsiness)

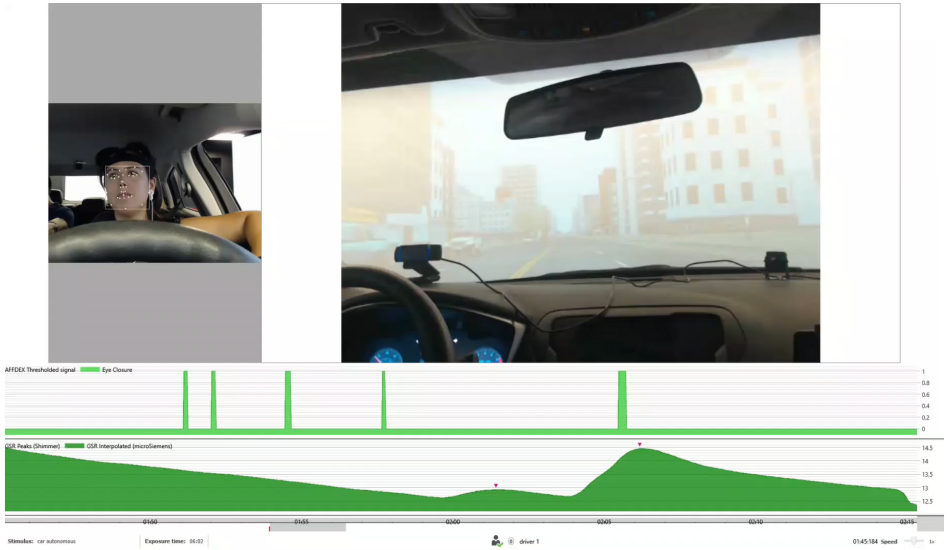


(Sahayadas et al., Sensors, 2012)

Example: Automotive (Drowsiness)

Autonomous versus Regular Driving





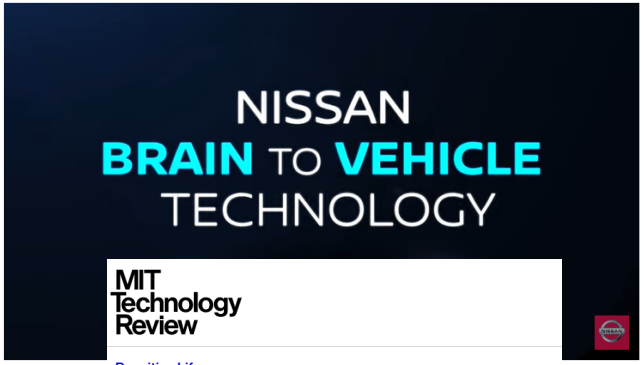
Biometric integration may be sooner than we think…?

Nissan's future cars may read your brain to prevent accidents

The company is working on a 'brain-to-vehicle' system

By Sean O'Kane | @sokane1 | Jan 3, 2018, 11:22am EST

SHARE



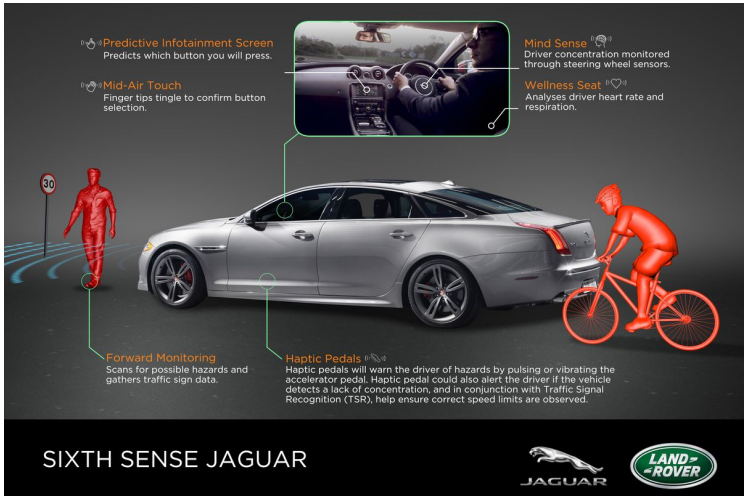
MIT Technology Review

Rewriting Life

Car Could Check Your Heart Rate While You Drive

Researchers think drivers could use their sensor-laden Mini Cooper as an aid to health.

by **Susan Young Rojahn** Oct 3, 2012



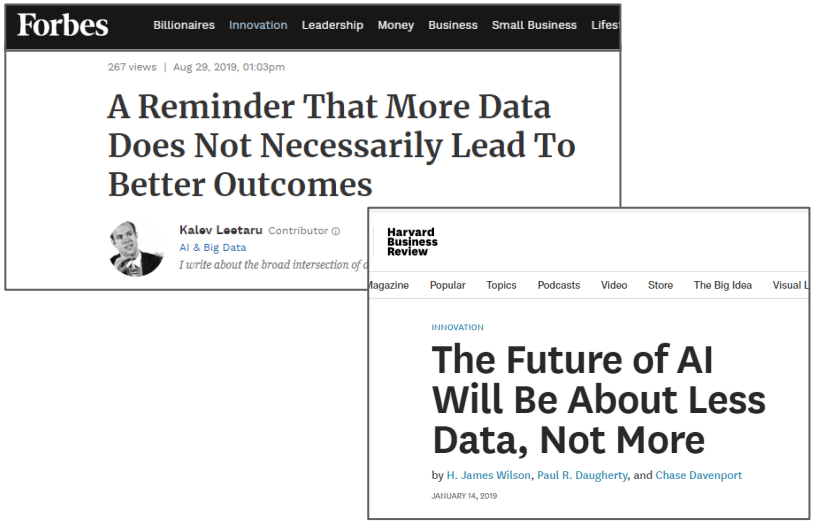
MOTHERBOARD
TECH BY VICE

Making a Car that Won't Let You Sleep

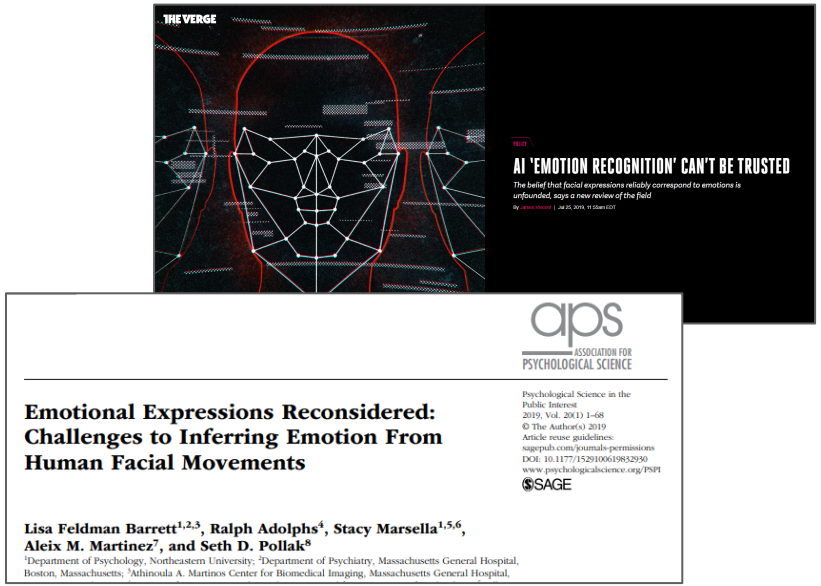
Algorithms, sensors – there's There's even talk of using biometrics and wearables, data derived straight from a driver's body, to determine if a person is too tired to drive.

More or Less Data?

- Crafting human-centric AI is a delicate balance between data **overload**, and not enough data causing dangerous **assumptions or biases**.



Too Much Data



Not Enough Data?

“Human-Centered AI”

The Right Kind of Data - Quantifying how humans interact with stuff

The stimulus, whether an active **task** or a passive **experience**

+

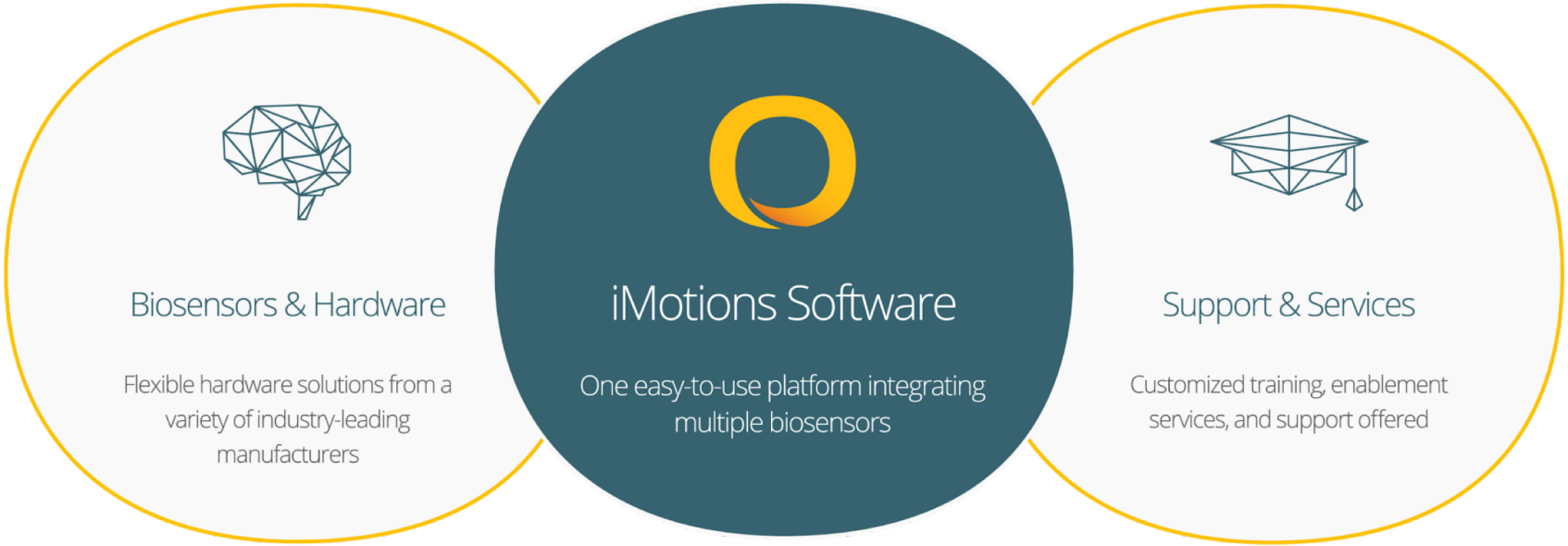
The context, providing **nuance** as well as potential **bias**

+

Human behavior

?

iMotions offerings



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