# CAREER: MINDWATCH: Multimodal Intelligent Noninvasive brain state Decoders for Wearable AdapTive Closed-loop arcHitectures (Award#: 1942585)

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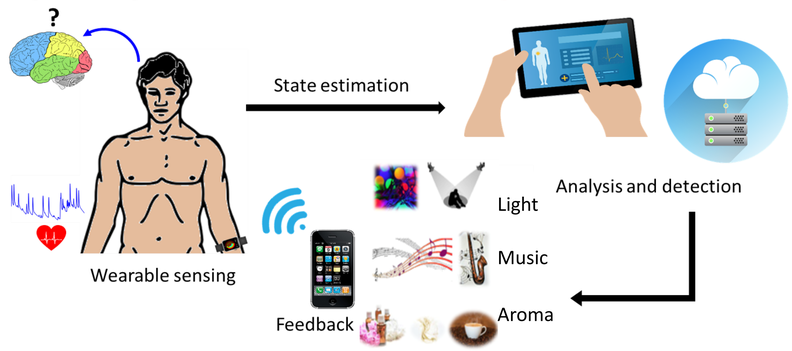
## Challenge:

- What if our smartwatches could track our brain States?
  - Current gold standard – direct brain activity monitoring (e.g., EEG)
  - **Wearable device** to infer brain activity from **peripheral** physiological signals in real world settings




## Solution and Scientific Impact:

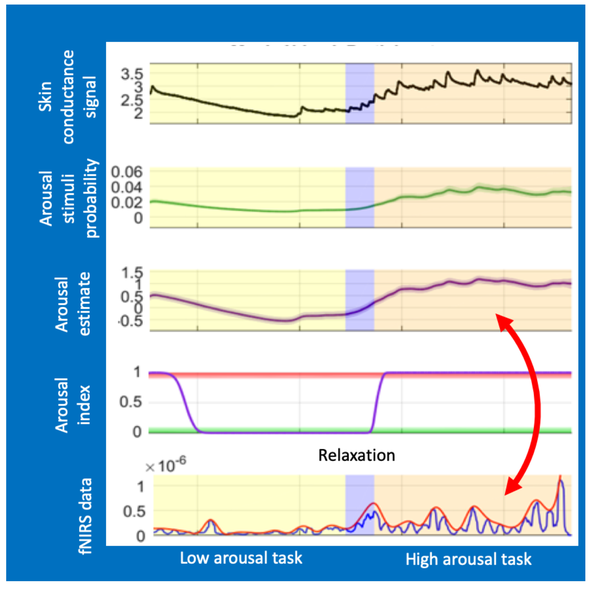
A transformative system-theoretic and computational toolset for:

- Multimodal system identification and brain activity recovery
- Interpretable adaptive tracking of neurobehavioral states
- Personalized closed-loop control design for reliable actuation

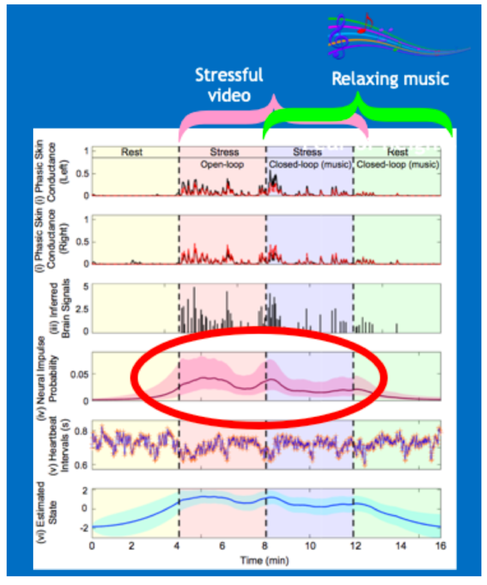
### Project Applicability


## Findings:

- Ability to recover brain activity
  - Arousal estimates from skin conductance match functional near-infrared spectroscopy **(fNIRS) blood flow (brain imaging)**



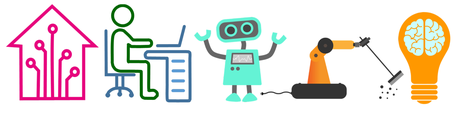

- Empirical demonstration of the viability of regulating arousal via music based on observations from skin conductance and cardiac activity



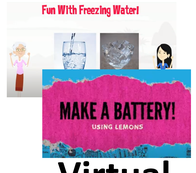

## Broader Impact: Since the start of this grant in 2020,

- **2** published Journal papers
- **14** educational videos
- **3** senior design teams (**11** students)
- **2** Undergraduate Research Projects
- Selected to MIT Technology Review's 2020 Innovators Under 35

**Online Learning**



**Human Computer Interaction in Smart Home and Smart Workplaces**




**Virtual Outreach**

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