



CPS: Small: Human-in-the-Loop Learning of Complex Events in Uncontrolled Environments

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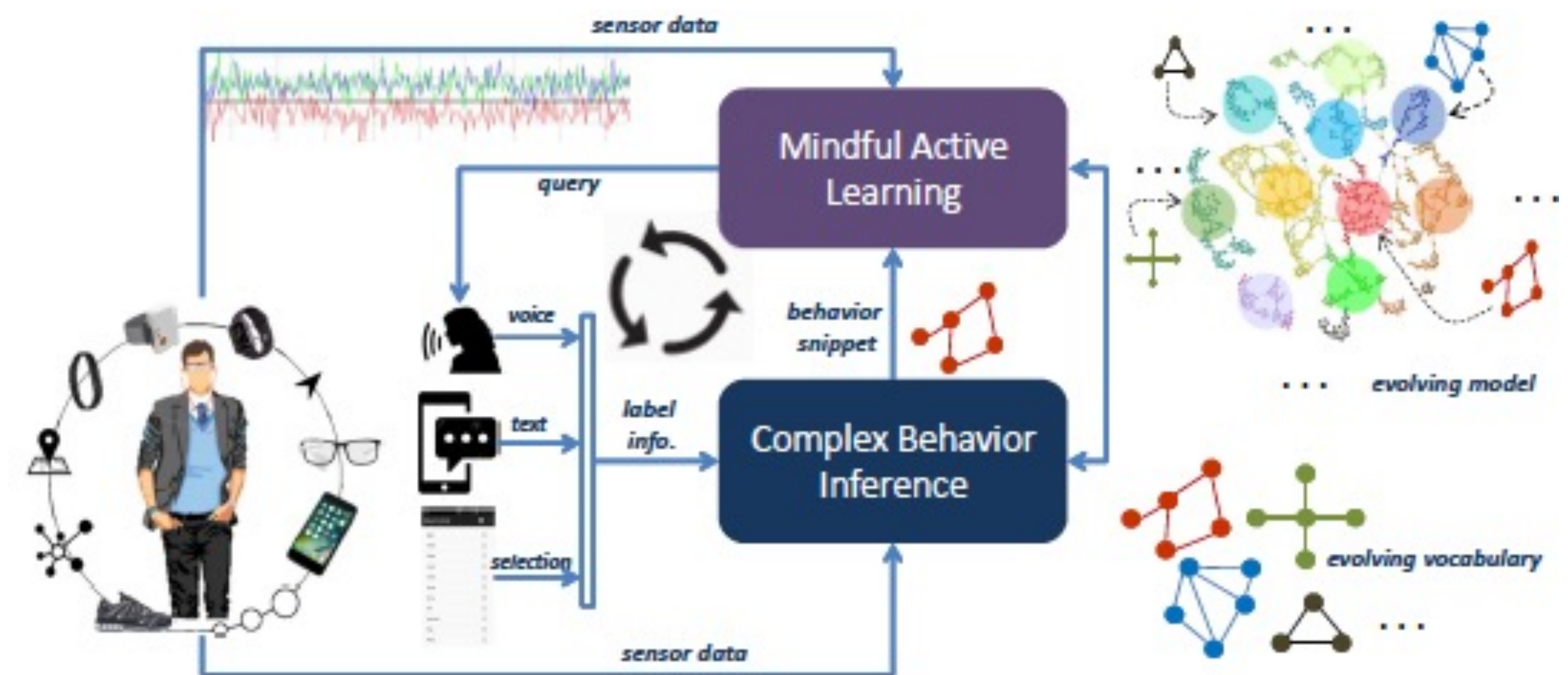
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Problem & Challenge:

- Design a cyber physical system for human health monitoring and behavioral intervention using wearable sensors
- How to gather and label sensor data in uncontrolled settings?
- How to use the gathered data to detect complex events such as human behavior?
- How to close the loop by providing adaptive clinical interventions?

Solution:

- Active learning algorithms to minimize burden of data labeling
- Multitask learning algorithms to enhance efficiency of the underlying machine learning models
- Human behavior modeling using graph networks
- Predictive models to forecast health events such as treatment adherence, hyperglycemia, and stress
- Sequential decision-making algorithms for real-time, data-driven adaptive clinical interventions



Scientific Impact:

- Advancing knowledge of machine learning design for CPS
- Mixed initiatives that balance human input and algorithm performance
- Closed-loop systems with physiological sensing, health assessment, and real-time feedback



Broader Impact:

- 6 in 10 American adults live with a chronic condition
- Promoting chronic disease management and prevention through
 - Diet management
 - Glycemic control
 - Promoting physical exercise
- More than 75% of all health care costs are due to chronic conditions in the US
- Potential to reduce costs and improve physical and mental health outcomes
- It is projected that wearables will prosper a global cost savings of \$200 billion in the next 25 years
- Improving healthcare quality and access
- Involving undergraduate students such as REU students in research
- Holding webinars for community college students
- Visiting community colleges in the greater Phoenix area
- Mentoring high school students through ASU Science and Engineering Experience program (SCENE)

