



# EdgeDroid

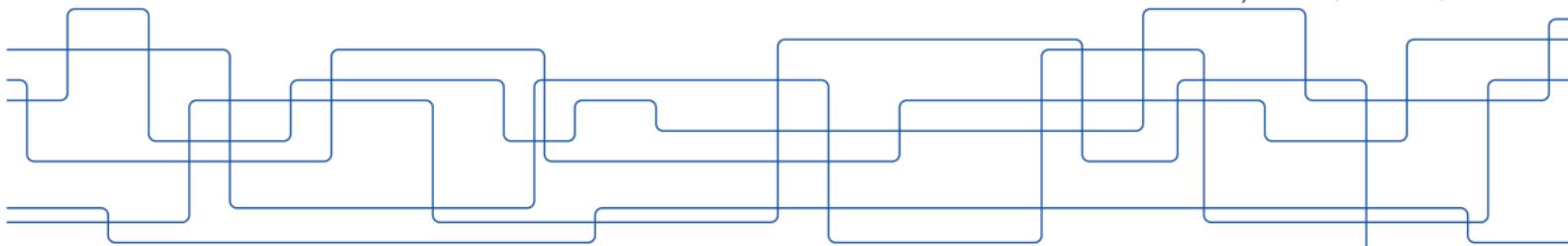
*An Experimental Approach to Benchmarking Human-in-the-Loop Applications*

M. Olguín Muñoz<sup>†</sup>, J. Wang<sup>‡</sup>, M. Satyanarayanan<sup>‡</sup> and J. Gross<sup>†</sup>

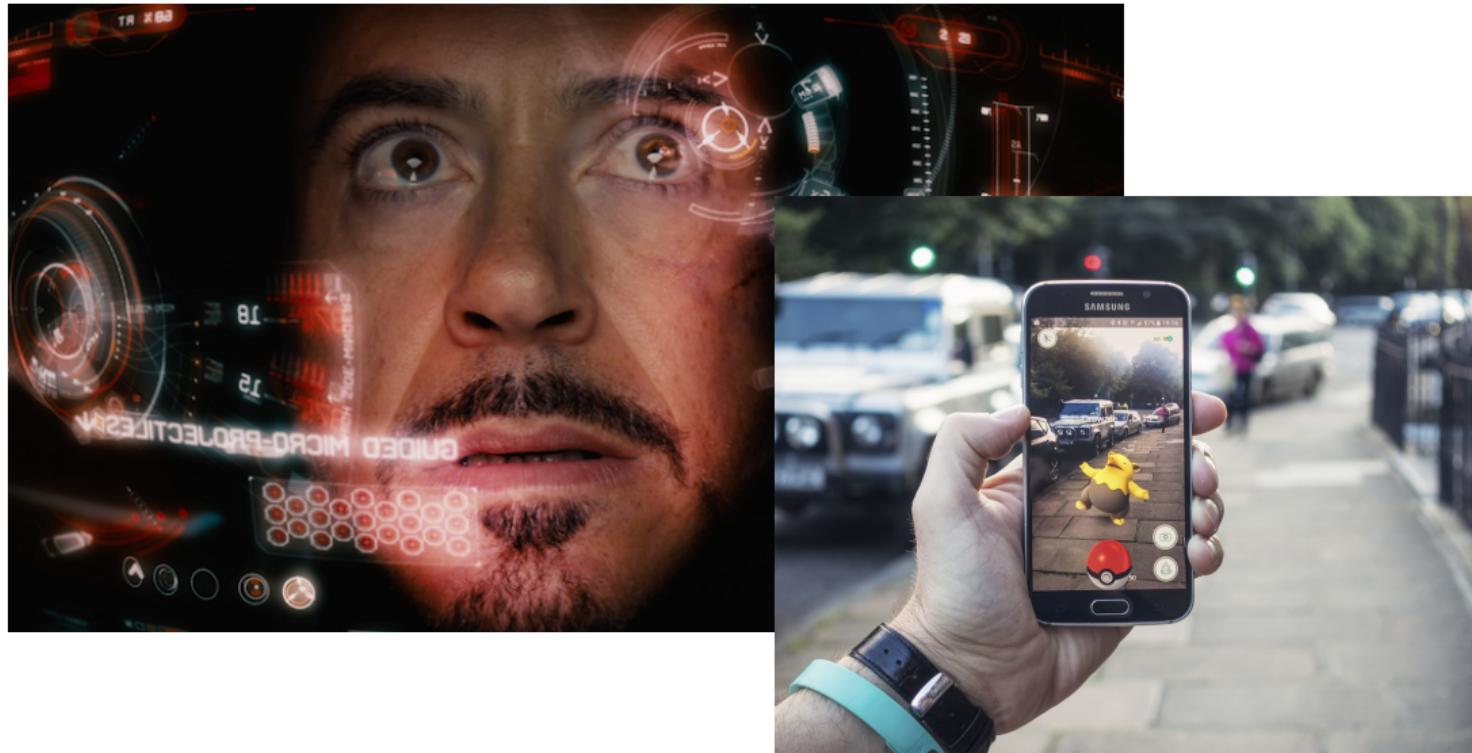
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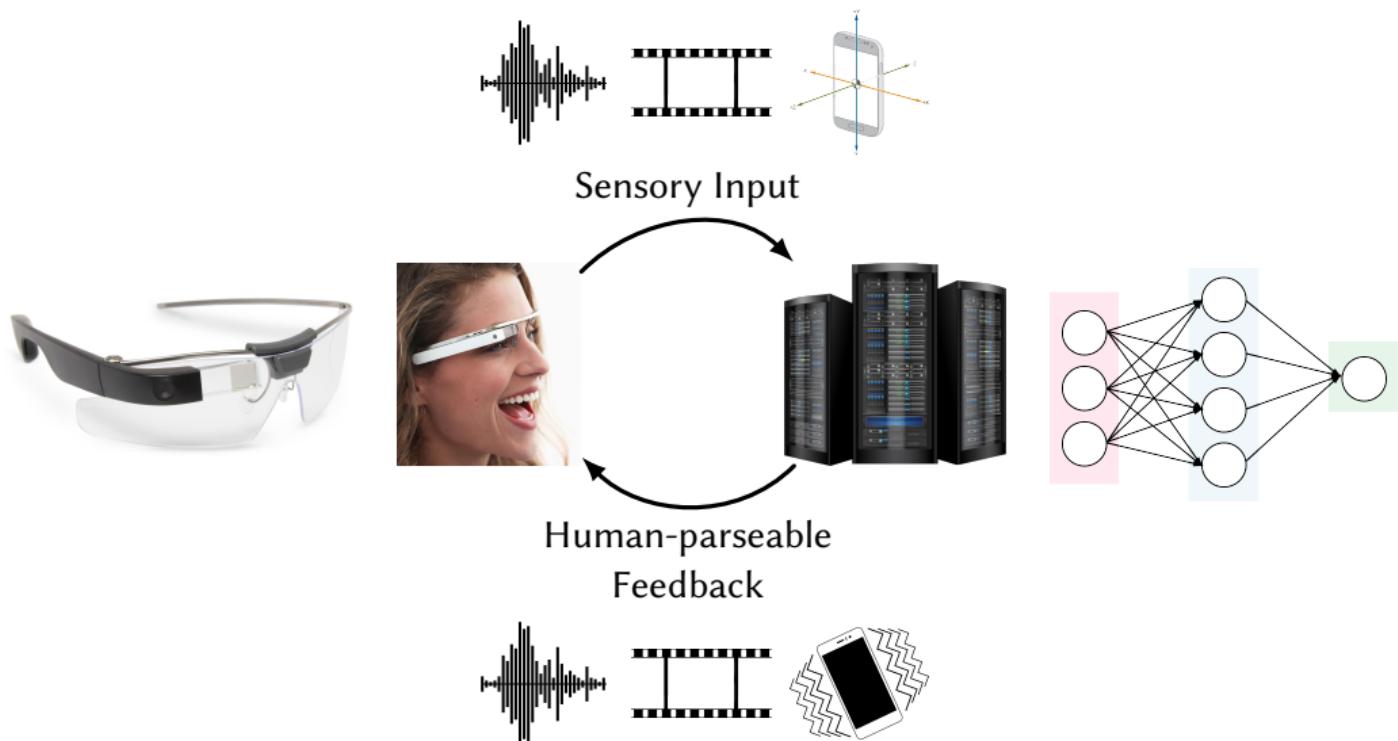
*HotMobile'19 Session 5: February 28<sup>th</sup> 2019, Santa Cruz, CA*



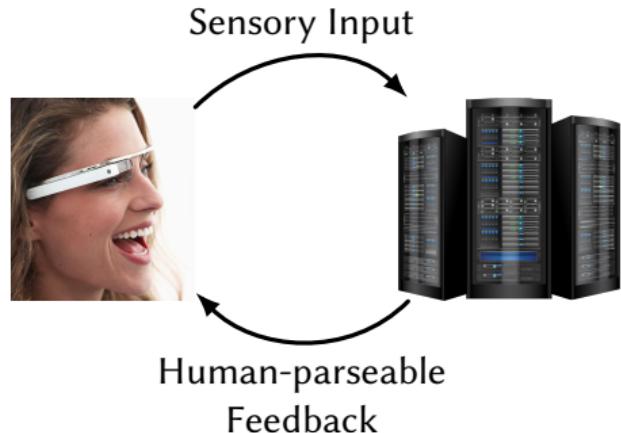
# Human-in-the-Loop Applications



# Cognitive Assistance



# Scaling



No solution yet?

# Our Contributions

## Our Contributions

- ▶ A methodology for benchmarking human-in-the-loop applications.

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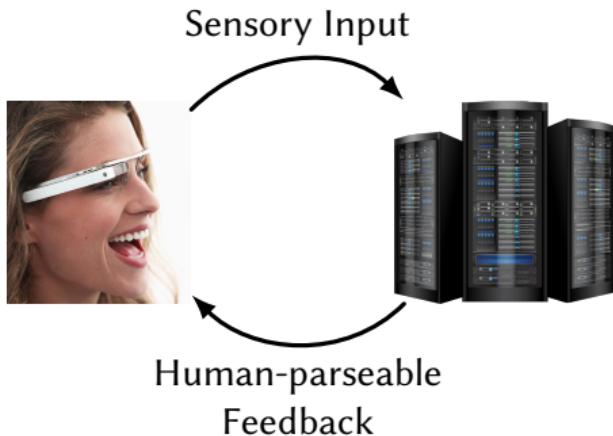
- ▶ A methodology for benchmarking human-in-the-loop applications.
- ▶ EdgeDroid: A benchmarking tool-suite.
- ▶ A set of experiments and measurements which show the effectiveness of the approach.

# Outline

- Introduction
- **Background**
  - Previous & Related Work
  - Motivation
- EdgeDroid: Experimentally Benchmarking Human-in-the-Loop
- Conclusions

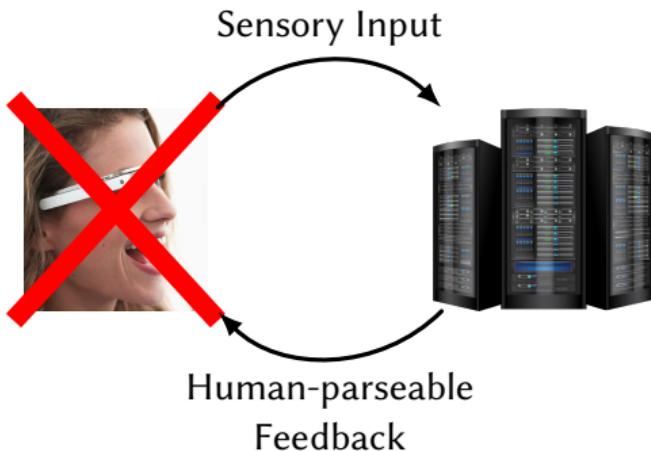
## Previous & Related Work

# Motivation



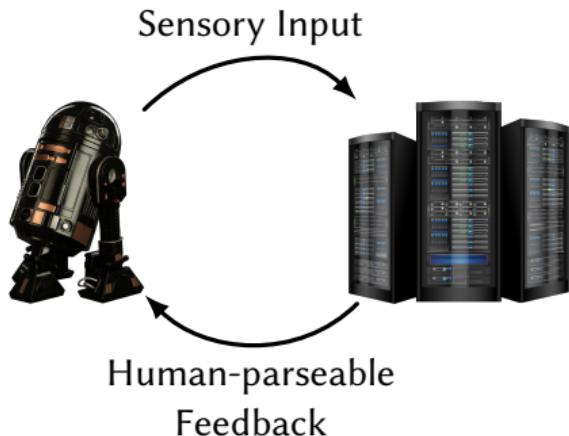
Benchmarking human-in-the-loop applications is HARD!

# Motivation



What if we could do away with the human users?

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What if we could do away with the human users?

# Outline

- Introduction
- Background
- **EdgeDroid: Experimentally Benchmarking Human-in-the-Loop**
  - Requirements
  - Implementation
  - Evaluation
- Conclusions

# Requirements

- ▶ Generate realistic, real-time inputs.
- ▶ Correctly react to feedback.

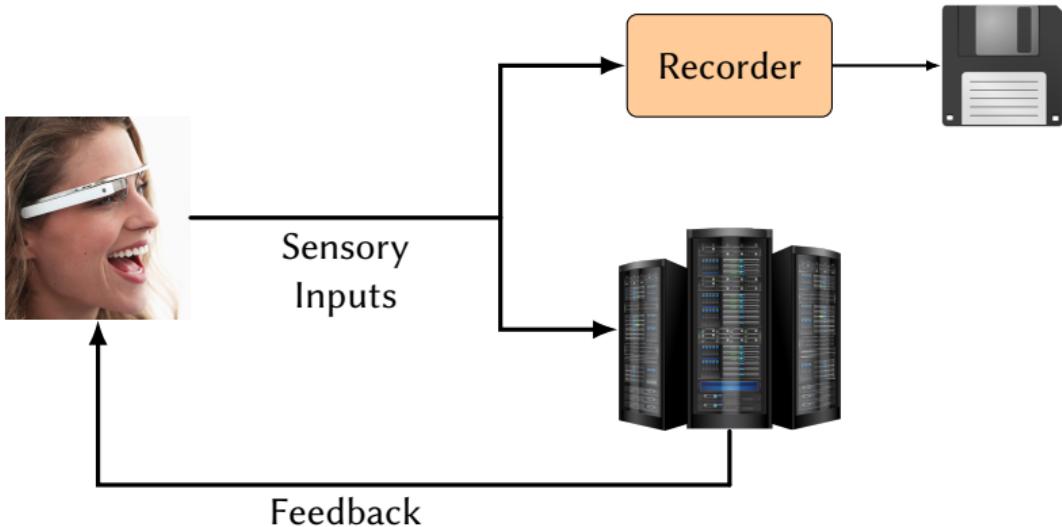


# Requirements

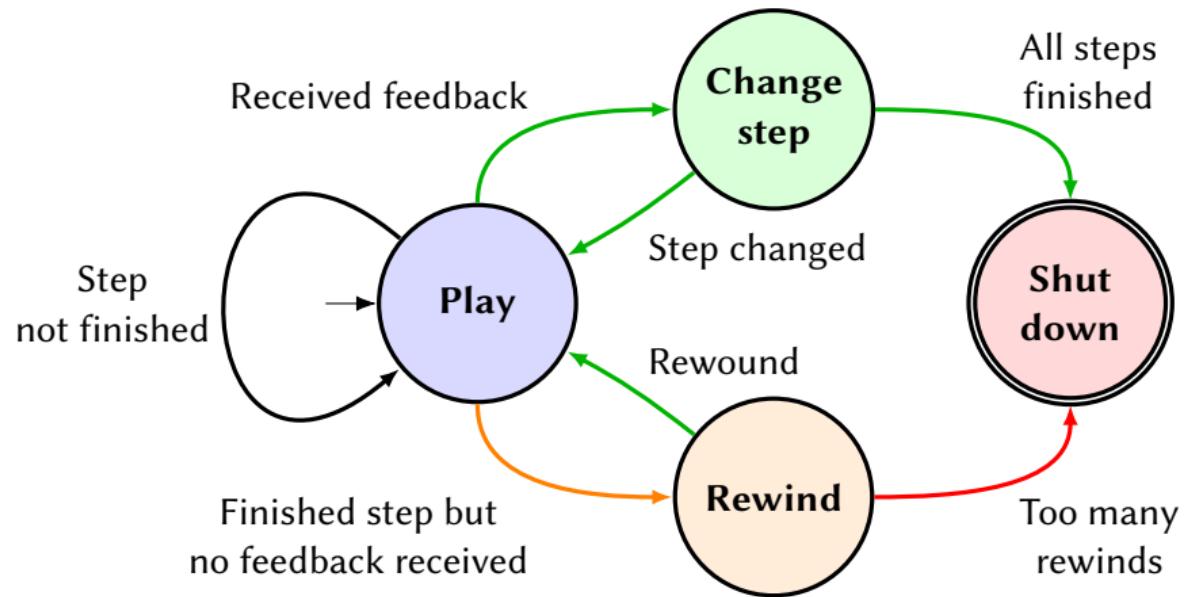
- ▶ Generate realistic, real-time inputs.
  - ▶ Trace of human-generated inputs.
  
- ▶ Correctly react to feedback.
  - ▶ Model of human interaction.



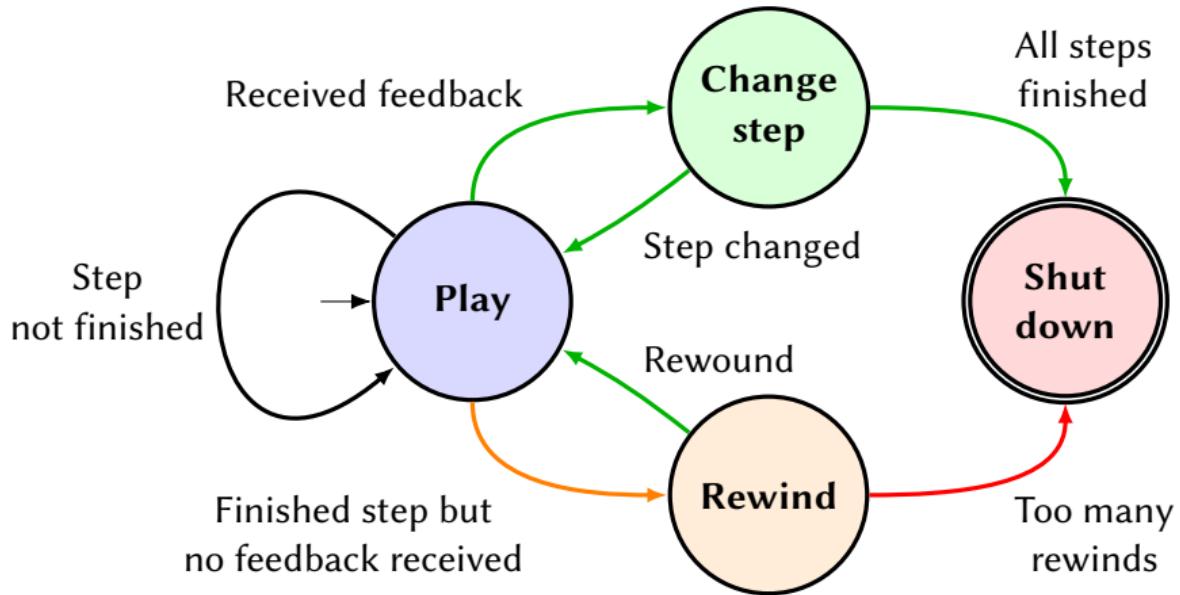
# Tracing



# User Model

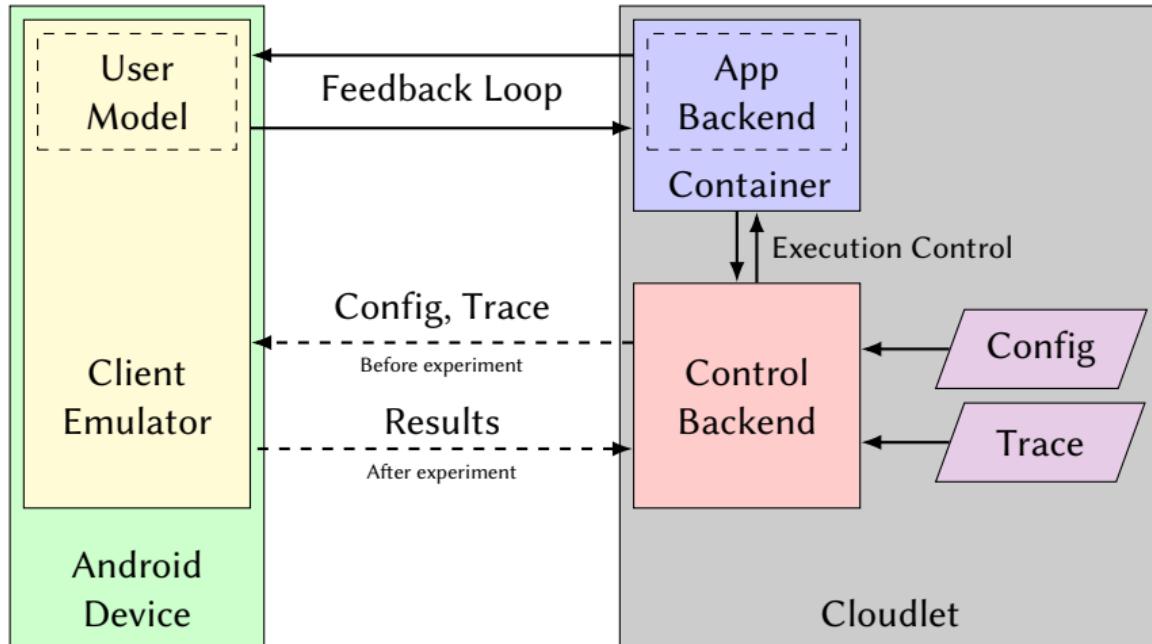


# User Model

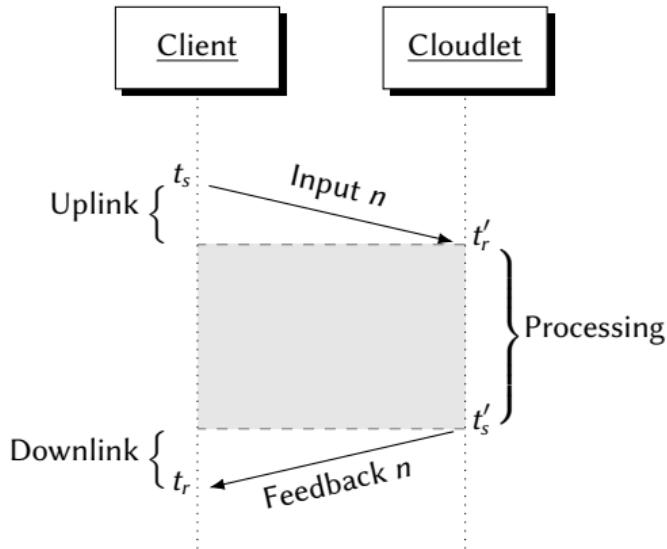


Currently working on a more thorough characterization of human behavior.

# Implementation



# Timestamping



Clocks are synchronized previous to the experiment.

Timestamps at key points to obtain:

$$\Delta T_{\text{up}} = t_r' - t_s \quad (1)$$

$$\Delta T_{\text{proc}} = t_s' - t_r' \quad (2)$$

$$\Delta T_{\text{down}} = t_r - t_s' \quad (3)$$

$$\Delta T_{\text{total}} = \Delta T_{\text{up}} + \Delta T_{\text{proc}} + \Delta T_{\text{down}} = t_r - t_s \quad (4)$$

# Evaluation

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- **Conclusions**
  - Future Work
  - Closing remarks

## Future Work

## Closing remarks