

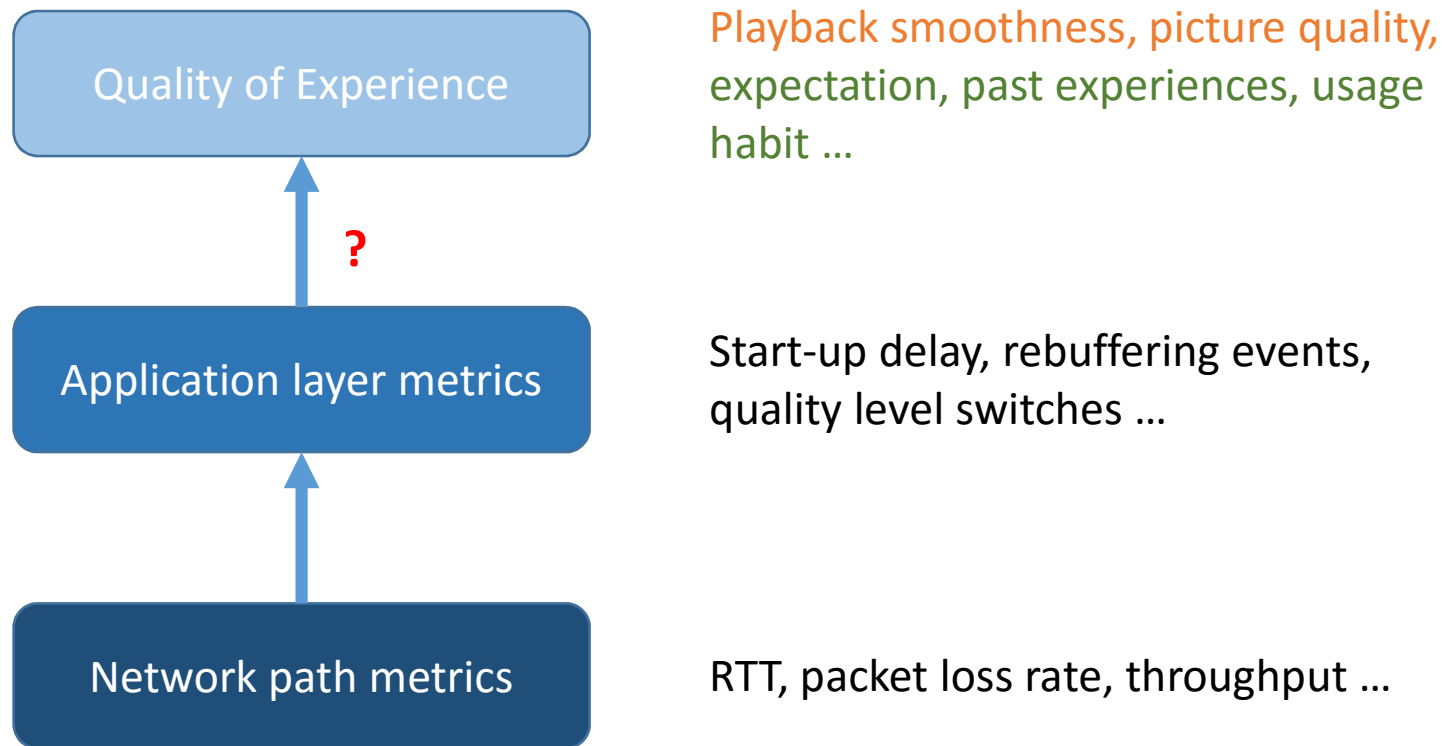
User-behavior analytics for video streaming QoE assessment

Ricky K. P. Mok

The Hong Kong Polytechnic University

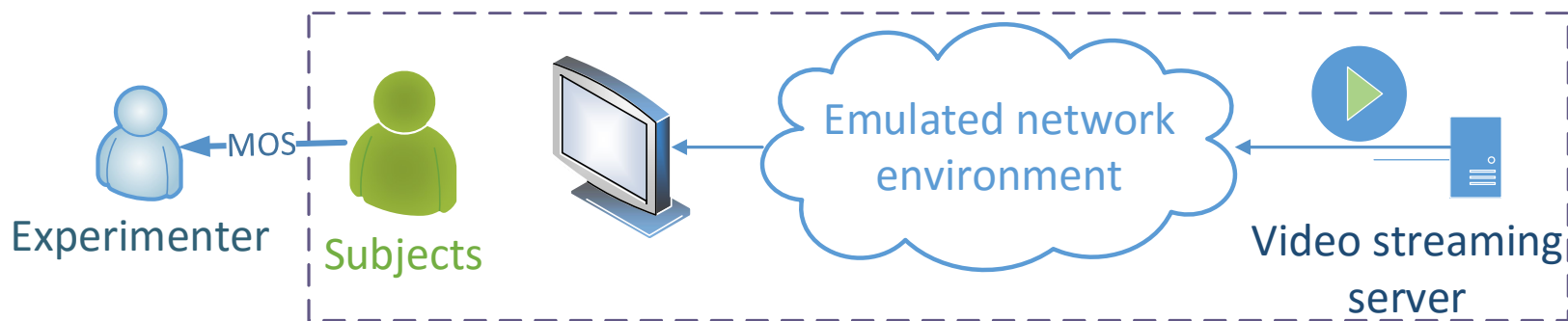
Measuring the QoE is
hard!

A simple QoE model

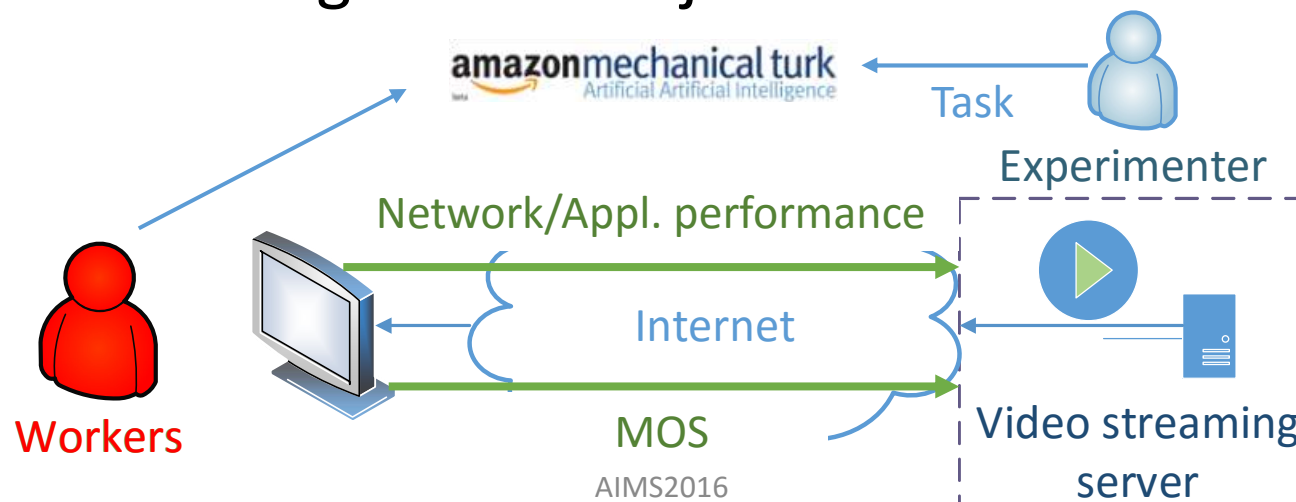


QoE Crowdtesting

- Lab-based subjective assessment



- Crowdsourcing-based subjective assessment



User behavior analytics

- User behavior reflects cognitive processes
 - Generated by users
- User-viewing activities
 - Improve QoE inference
- Worker behavior
 - Detect low-quality workers in QoE crowdtesting



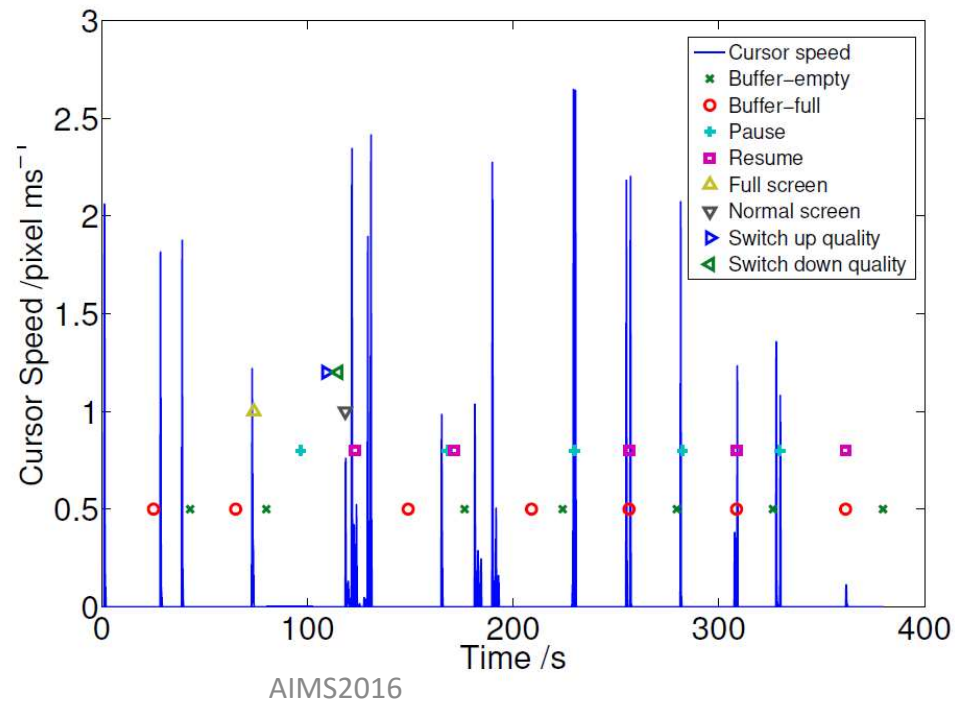
QoE inference

- User-viewing activities can be triggered by the reaction to impairment events.



QoE inference

- User-viewing activities
 - Pause/Resume
 - Change of player sizes
 - Reload
 - ...



QoE inference

- Correlate the occurrence of the activities with perceivable impairments
- Quantify the activities into metrics
- Model the QoE using application layer metrics and the user-viewing activities

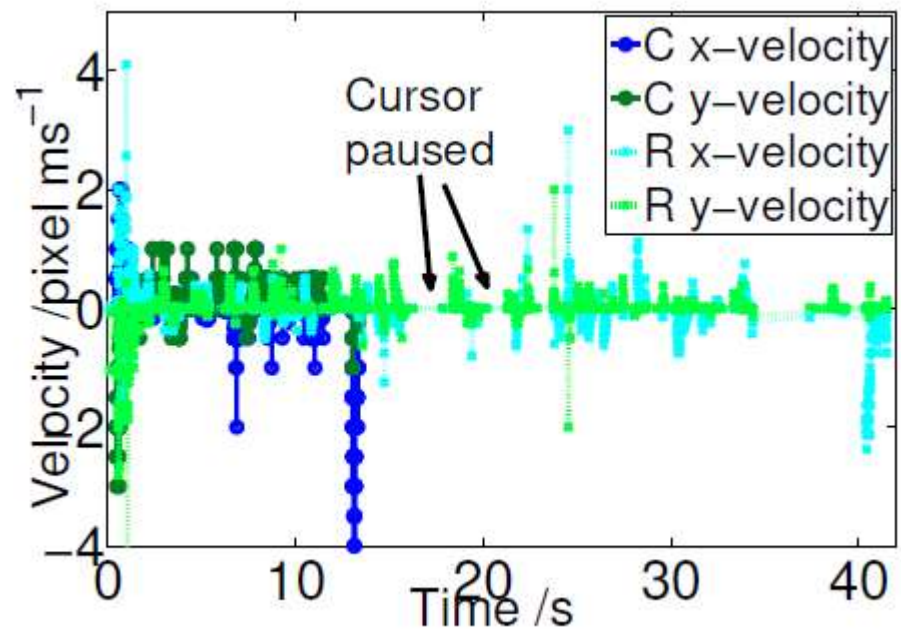
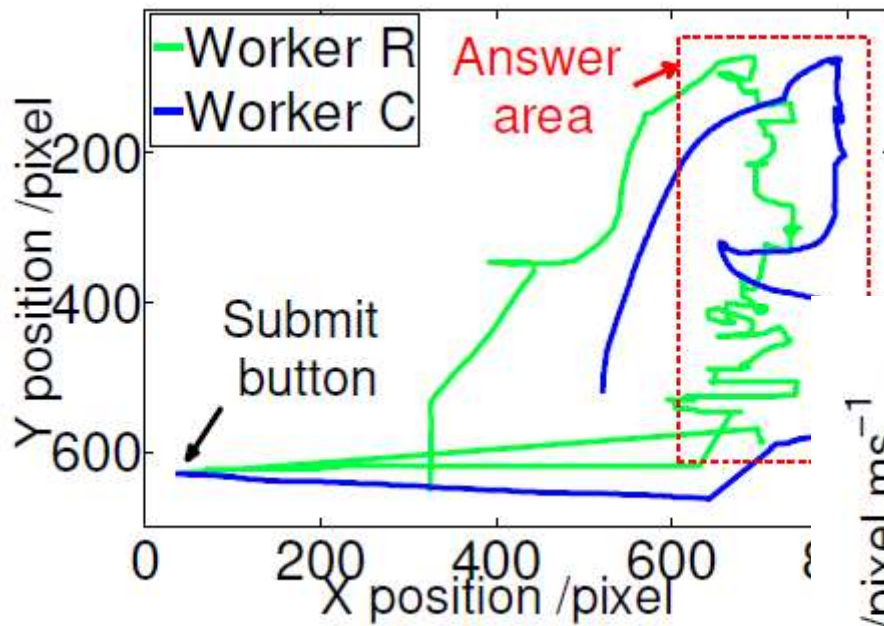
Findings

- An event can be triggered within few seconds after some application events.
 - Pause
 - Reduce the screen size
- Compare two models
 1. Start-up delay, Rebuffering frequency, and Rebuffering duration
 2. Model 1 + No. of Pause, and reduce the screen size
- The explanatory power is significantly increased by 8%.

Detecting low-quality workers

- Worker-behaviour on the question page
 - Clicks
 - Time delay between two question
 - Mouse cursor movement
 - Trajectory
 - Speed/Acceleration
- Low-quality workers behave differently normal workers
- A model can be trained to filter the workers who cheat the system

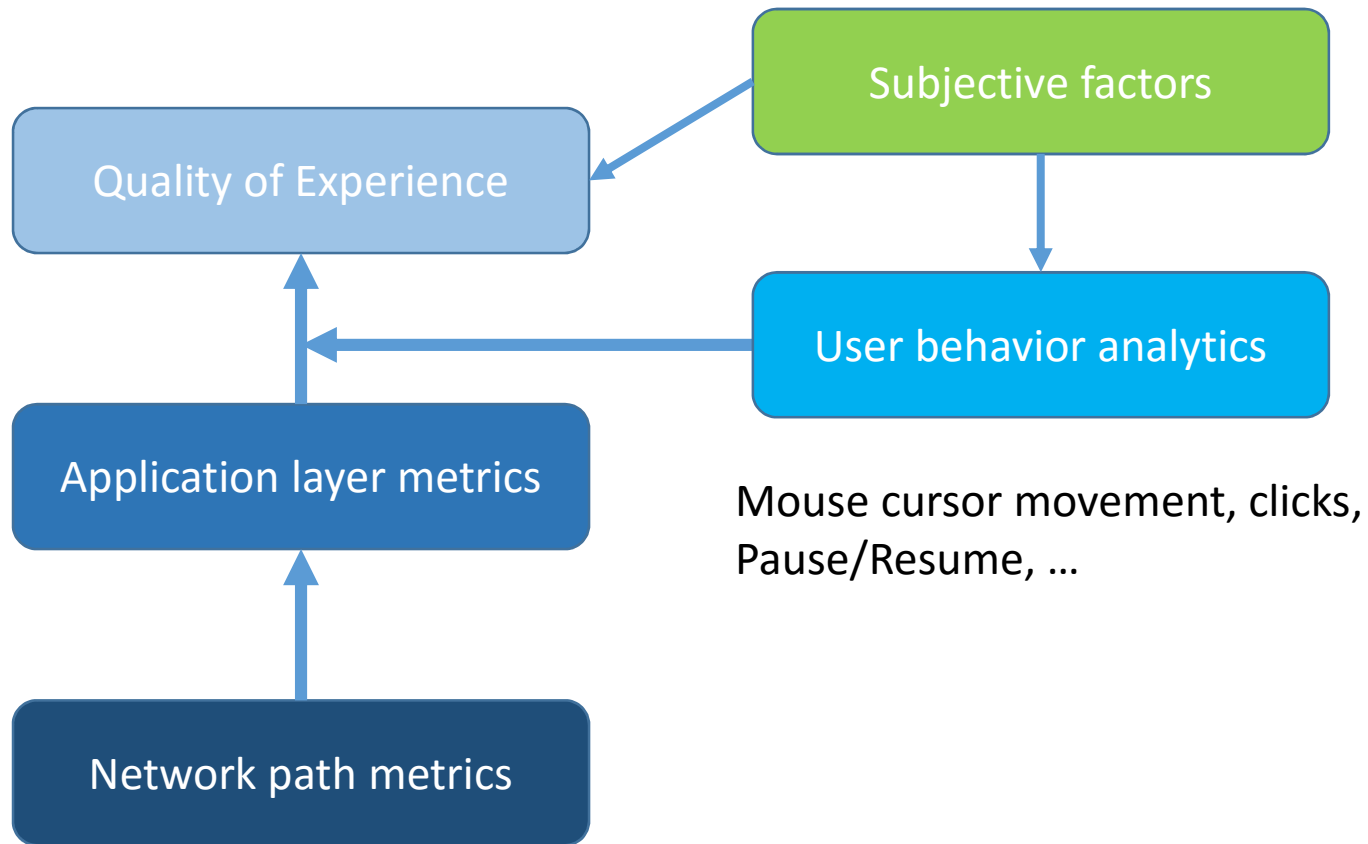
An example



Findings

- Ten worker behavior metrics are designed
- 80% of low-quality worker can be detected
- Comparing to CrowdMOS, our method has
 - Lower false positives and false negatives
- Our method is independent of the ratings
 - More suitable for measuring the QoE

A new model



Challenges

- How can user behavior be incorporated into measurement infrastructures?
 - The user behavior can be application-specific and platform-specific (desktop vs. mobile)
 - Collaboration from either service providers or users is required to collect the user behavior
- Privacy issue?

Thanks

oneprobe.org

cs.rickymok@connect.polyu.hk