Estimating Customer QoE from Network Metrics

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IBM Israel
Celebrating 70 Years of Progress

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QoE – Quality of Experience
Measure of User Satisfaction

- User centric, service specific, context dependent
- Measured with end-user feedback
- An end-to-end metric
  - Network QoS is only part of the story

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Example: SliceNet eHealth Use-Case

- **Use Case:**
  - Paramedic streams live HD video feed from ambulance to hospital
  - Hospital personnel advise paramedics on actions to take

- **QoE:**
  - Quality of video experience
  - May be influenced by:
    - Scenario, e.g., conf call vs. diagnosis
    - Equipment, e.g., size/quality of screen
    - Mobility, weather, eyesight, time-to-live
Why Estimate QoE?

- **Meet SLA**
  - Minimize QoS without degrading QoE (save $)
    - SLA usually defined by QoS

- **Exceed SLA to achieve QoE**
  - Compensate for poor QoS by other components
    - Think Earliest-Due-Date (EDD) scheduling
  - Can be value add, pay-per-use, best-effort

- **Shift blame if something goes wrong**
  - Log proof of QoS (audit) when QoE is poor
  - Collect more info

- **Notify service owner**
  - Throttle / apologize to users / degrade gracefully
  - Change service parameters, mask degradation
Problem Definition: QoS $\rightarrow$ QoE

- **Input**: measured QoS
  - Metrics, any available indicators
  - Partial view

- **Output**: estimated QoE

Follow-up question: where is the problem?

- **Network provider perspective**:
  - Network problem $\rightarrow$ fix
  - Not network problem $\rightarrow$ notify

- **Service provider perspective**:
  - Network problem $\rightarrow$ complain
  - Service problem $\rightarrow$ fix
  - Other $\rightarrow$ notify

Can you guess the QoE?
Solution Outline: Machine Learning Approach

Other approaches apply too

- **Model Training:**
  - Measured QoS
  - QoE labels

- **Output:** QoE Estimator

- **Usage:** apply model on measured QoS
Validation: Actual QoE vs. Estimation

Missed Estimations

QoE Score

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<tr>
<th>Sample #</th>
<th>Actual</th>
<th>Estimate</th>
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Computing as a Service, IBM Research – Haifa
Thank you!

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