Edge Computing for Improving Medical Adherence

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My research

Multimedia
Interaction
Networking and Systems
How to send large amount of data over the network for users to interact with.
• Zoomable Video Streaming
• Networked Virtual Environments
• Games
Edge Computing for Improving Medical Adherence

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“the degree to which patient accurately follows medical advice given by healthcare professionals”
• call the hotline if body temperature goes above 38°C
• wear a mask if you are in a crowded place
• take medication
Medication Adherence

• Medication adherence
  • take the right medication?
  • correct dosage?
  • at the right time?
  • observing food restriction?
• Adherence rate has been low
  • 41% among adolescent HIV patients, need >90% for optimal clinical outcome
  • 27-60% for adolescent cancer patients
Why?

• “I forget”
• “Other priorities”
• ”I didn’t want to”
“Hide meds around friends, don’t want them to know.”
“Having to do it in front of people, them asking questions.”
“Staying the night at a friends’ house and forgetting to pack them.”
‘Medication and school schedules clash.’
• No food two hours before and one hour after the medication
• About the same time every day
• Multiple medications a day (some in order of tens)
• Current method for collecting non-adherence data: self-reporting and interview

• Can we get more insights into why patients do not take their medication?
Smart Phone Reminders

• Research shows 50% -> 68% improvement in using smart phone reminders

• Review of 160 reminders app show simple notification, few appeared to be personalized
• Most remind patients to take the medication only
• Not bring it with them, not to observe food restrictions, etc.
How CS Can Help

- Daily Activity Recognition using Wearable Sensors
  - eating
  - drinking
  - writing
  - typing
  - using smartphones
  - brushing teeth
  - taking transport
  - ambulation (walking, running)
• Do what, where, and when?
• Correlate with medication adherence data

• **Goal 1**: To better understand why patients did not take their pills
 Goal 2: To opportunistically remind the patients to:
- bring the medication
- take the medication
- observe food restriction

e.g., if routine is disrupted

e.g., if traveling in a train
• **Privacy** is a major concern.
• Data should not be sent to the cloud and processed at devices trusted by the users (watch, phone, home PCs)
How to distribute the computation, data, learning model across various devices (depending on the available resources, context, privacy needs)?
Research Issues

• How to adapt frequency of data collection without sacrificing accuracy (rate-accuracy tradeoff)?
• What sorts of programming abstractions are appropriate for building of such systems?
• What to sense?
  • IMU sensors (where else besides a ring?)
  • Audio sensing (without violating privacy?)
  • Location
  • RF-sensing
• Other sources (calendars, social media)?
• HCI perspective
  • persuasive visualization
  • gamification

• Behavioural Economics
THANK YOU

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