Unlocking the Power of Edge Computing for CPS November 16, 2018

Workshop Organizers

Kishore Ramachandran, Georgia Tech

&

Anish Arora, OSU

Unlocking the Power or Edge Computing for CPS

- Three sessions (10:25 to 12:20)
  - A: Three talks (8 min each) followed by panel (15 min): Chair: Anish Arora
    - Bob Iannucci, CMU-Silicon Valley, “Network Edge Considered Harmful”
    - Mung Chiang, Purdue/Princeton, “Fog/Edge and Dispersive AI”
    - Mahadev Satyanarayanan, CMU, “Research Challenges in IoT”
  - I: Three talks (8 mins each) followed by panel (15 min): Chair: Bob Iannucci
    - Prashant Shenoy, UMass, “Edge-enabled Utility-preserving Privacy for Data-driven CPS Systems”
    - Bharath Balasubramanian, AT&T, “State Management for Telco’s Edge”
    - Vladimir Kolesnikov, Georgia Tech, “Efficient Crypto Techniques for the Edge”
  - 1: Two talks (8 min each) followed by panel (10 min): Chair: Kishore Ramachandran
    - Aakanksha Chowdhery, Google Brain, “From Cloud to Edge: Advances in Mobile AI”
    - Sanjiv Doshi, CISCO, “Practical approaches to managing, orchestrating and securing cyber-physical systems”
- Breaks between sessions (5 min)
  - Stretch
  - Yoga
- Wrap up panel (12:20 to 12:45)
  - All speakers

Themes: system architecture

- Tiers in the architecture:
  - Three? Two?
- Software centricity => App model for CPS
  - High level programming model that absorbs the details of the tiers
  - Exemplar of Smart city app
    - Connected vehicles
- Edge system services
  - Giving clear semantics for consistency, failures, latency, execution
  - => need for exposing the network behavior/quality
  - => need to know resource constraints
- Many open challenges in functional decomposition across the tiers
  - New CAP theorem for the edge?

Theme: programming emergent behavior

- Dealing with uncertainty
  - System
  - Environment
  - Assurance for criticality and safety
  - => Ability to ask “what if”” questions in decision making

Theme: Ensuring privacy and security

- Are crypto techniques (MPC, ZK) edge ready?
- Suppress private information embedded in data but reveal non-private information

Theme: Analytics at the edge

- Training in the cloud and inferencing at the edge
  - Enabler:
    - model optimization
    - High level ML programming
  - How does training evolve to use the edge?
  - How to use inferencing from other edge nodes in local decision making?

Economics of Edge CPS

- IT vs. OT
- What services at the edge will be economic drivers?
- Economic incentive vs. privacy