Research Methods in computer science

Spring 2019

Lecture 20

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April 1, 2019

Agenda

HW9 live grading

System Comparison Experiments

Level of Details

HW10

CS Experiments Today

Artifact Comparison Experiments

- Run the new artifact
- Run best-known prior work
- Compare

Simulations + “Real” experiments

Wireless Experiments Today

Protocol Comparison Experiments

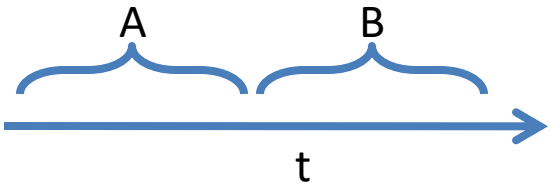
- Run the new protocol
- Run best-known prior work
- Compare

Simulations + Testbed experiments

Serial Experiments

Run one protocol at a time

Compare the results



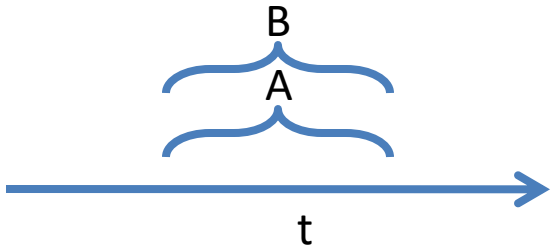
Difficult to distinguish the contribution of these these variables

- Environment
- Protocol mechanisms

Concurrent Experiments

Run multiple protocols concurrently

Compare the results



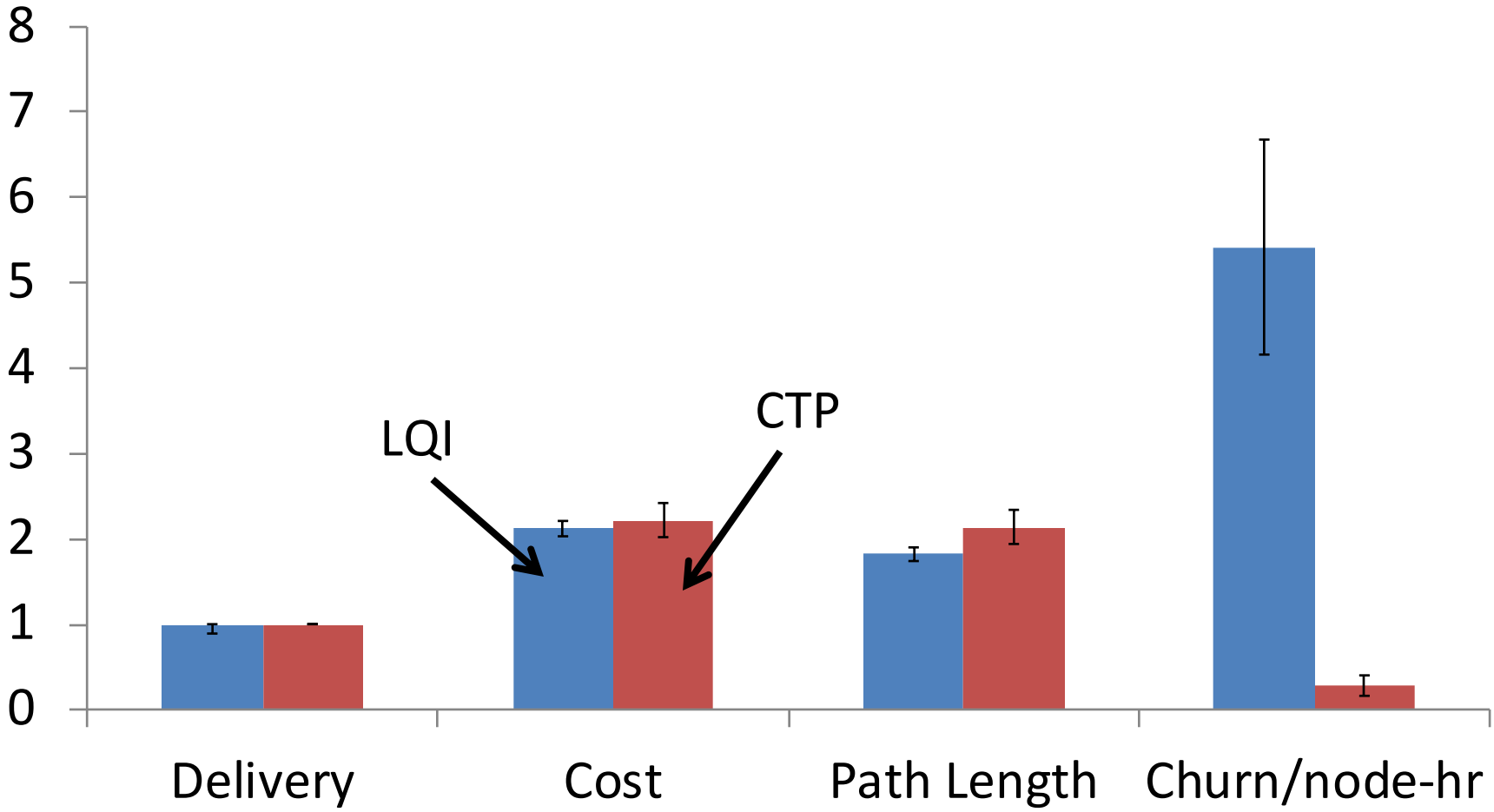
Advantages

- Consistent environment for both the protocols

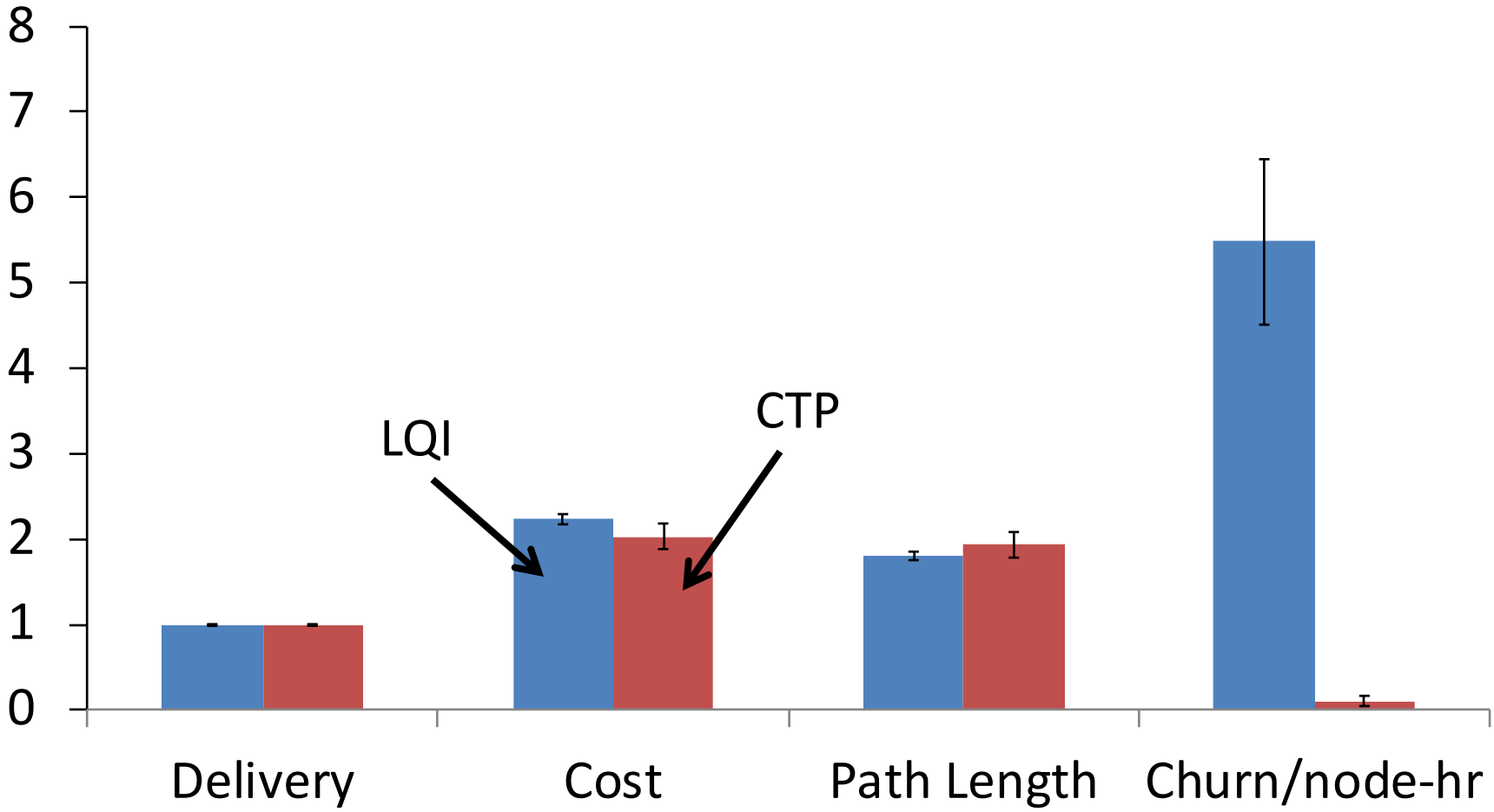
Concerns

- Contention of different types

Results from Serial CTP vs LQI Experiment on Tutornet

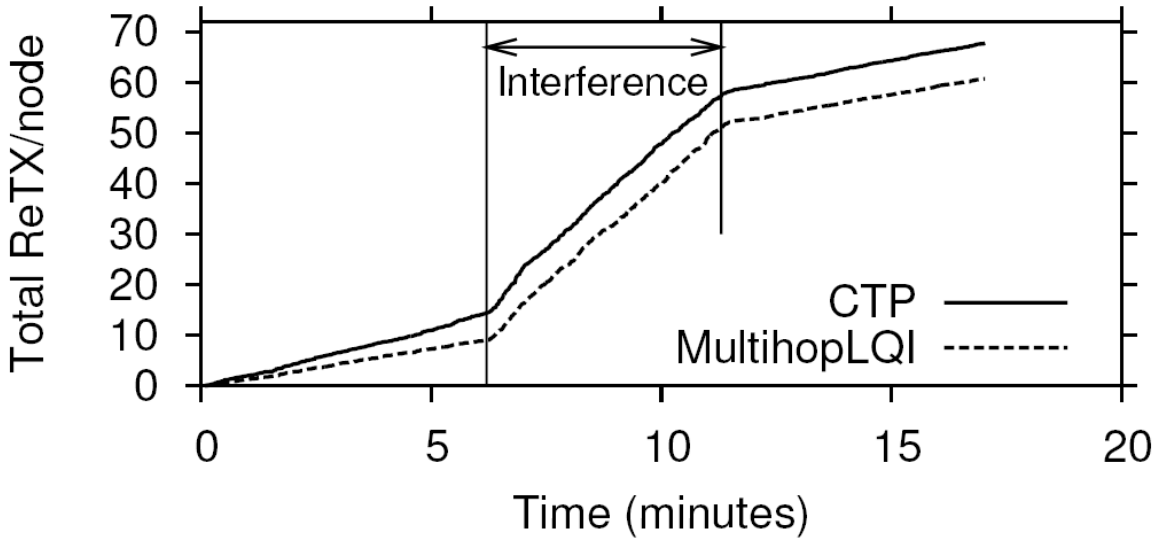


Results from Concurrent CTP vs LQI Experiment on Tutornet



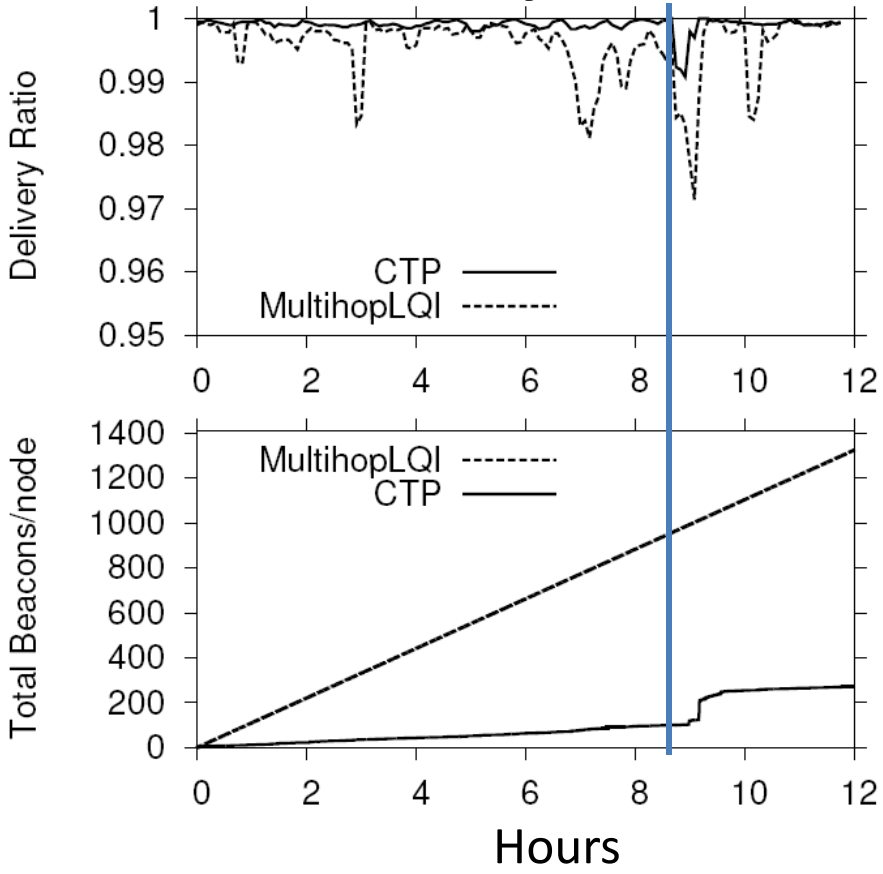
Putting Concurrent Methodology to Use: Expts. with External Interference

Engineered Scenario



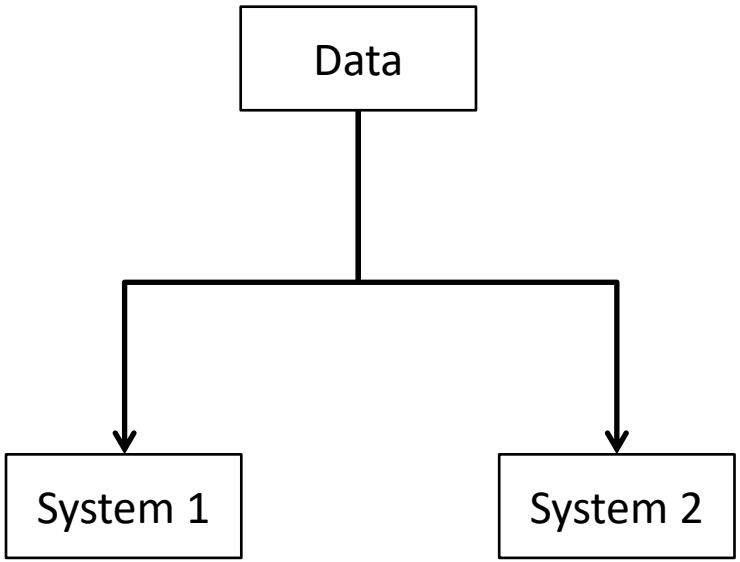
Both protocols *struggle* in the same environment.

Putting Concurrent Methodology to Use: Experiments in a Dynamic Network



CTP and LQI react differently to dynamics.

Uncontrolled environment does not imply we cannot do fair comparisons


Data
System 1
System 2

Level of Details

At What Level of Detail?

- Descriptions
  - System and algorithm
  - Experiments
  - Datasets
  - Results

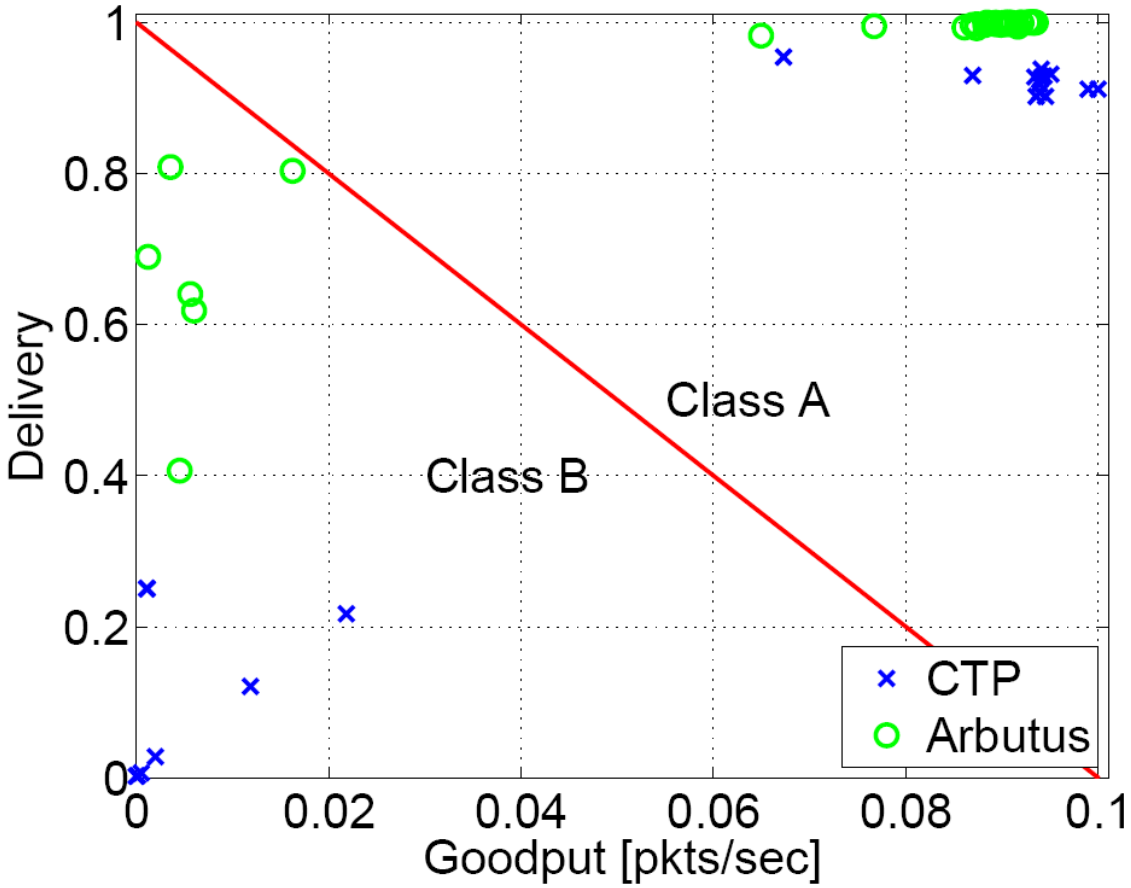
We use all available nodes in every experiment. In some testbeds, this means the set of nodes across experiments is almost but not completely identical, due to backchannel connectivity issues. However, we do not prune problem nodes. In the case of Motelab, this approach greatly affects the computed average performance, as some nodes are barely connected to the rest of the network.

5.1 Methodology

We conducted our experiments on a tiered network testbed with several Stargate nodes and 40 TelosB motes. All nodes are located above the false ceiling across multiple rooms and hallways on a floor of a large office building. The wireless environment above the false ceiling is harsh, with some links experiencing above 30% packet loss rates. All nodes run the Tenet stack modified to support AEM. In most experiments, we use a single Tenet master node. We configured the mote radios to transmit at -8.906 dBm, which results in a tree with 4-hop depth.

Experimental Methodology and Metrics We now compare the performance of Tenet-PEG and mote-PEG. Our experiments are conducted on the testbed shown in Figure 7. This testbed consists of 56 Tmotes and 6 Stargates deployed above the false ceiling of a single floor of a large office building. The Stargate and mote radios are assigned non-interfering channels. This testbed represents a realistic setting for examining network performance as well as for evaluating PEGs. The false ceiling is heavily obstructed, so the wireless communication that we see is representative of harsh environments. The environment is also visually obstructed, and thus resembles say, a building after a disaster, in which a pursuit-evasion sensor network might aid the robotic search for survivors.

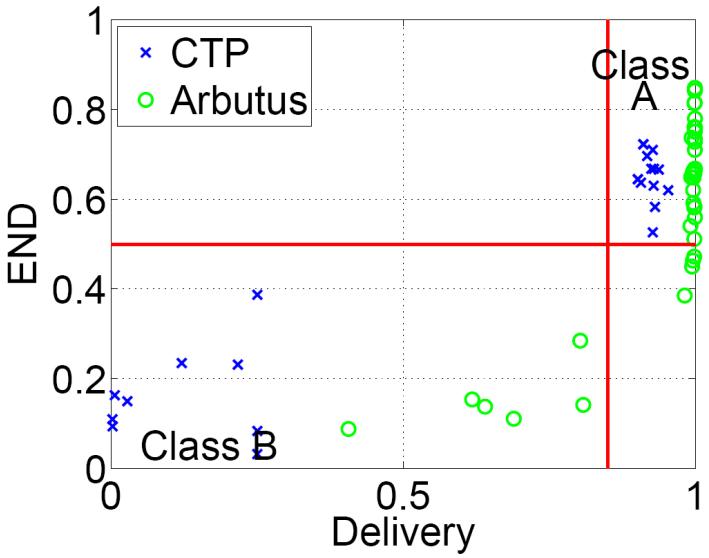
Results from the same Testbed

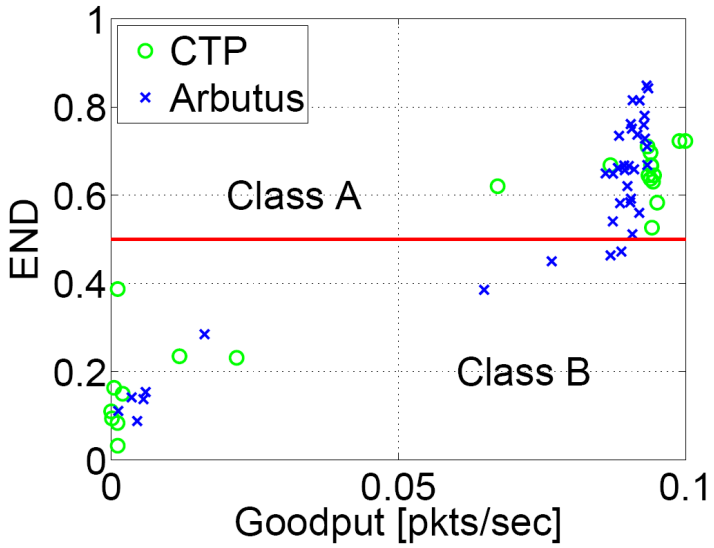


Network Metric

Converting these subjective descriptions to a more quantitative description

END and CTP Performance





DeepFace: Closing the Gap to Human-Level Performance in Face Verification

[Taigman 2014]

The SFC dataset includes 4.4 million labeled faces from 4,030 people each with 800 to 1200 faces, where the most recent 5% of face images of each identity are left out for testing. This is done according to the images' time-stamp in order to simulate continuous identification through aging. The large number of images per person provides a unique opportunity for learning the invariance needed for the core problem of face recognition…

"See the supplementary material for more details about SFC."

Supplementary Material:
DeepFace: Closing the Gap to Human-Level Performance in Face Verification

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“We evaluate the throughput and delay benefits of CQIC using the Google Nexus device to download content from a Google server via a popular cellular network provider. Reflecting a common CDN scenario, this server is located near the network of the mobile carrier such that the cellular channel is the bottleneck link…”

[Lu 2015]

HW10

Describe the results from your research.