

# Research Methods in computer science

Spring 2023

Lecture 16

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# Agenda

Conference Updates

System Comparison Experiments

Level of Details

HW8

# 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

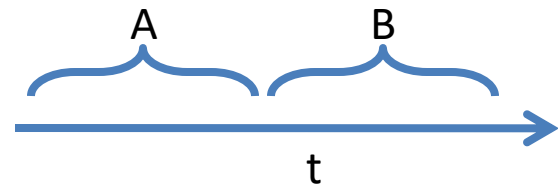
- Compare

Simulations + Testbed experiments

# Serial Experiments

Run one protocol at a time

Compare the results



Difficult to distinguish the contribution of these these variables

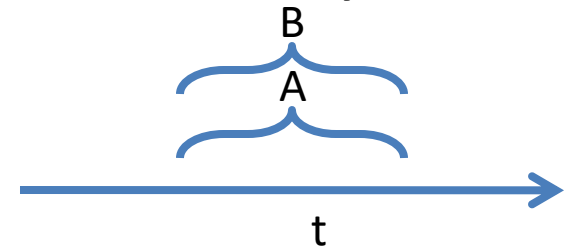
Environment

Protocol mechanisms

# Concurrent Experiments

Run multiple protocols concurrently

Compare the results



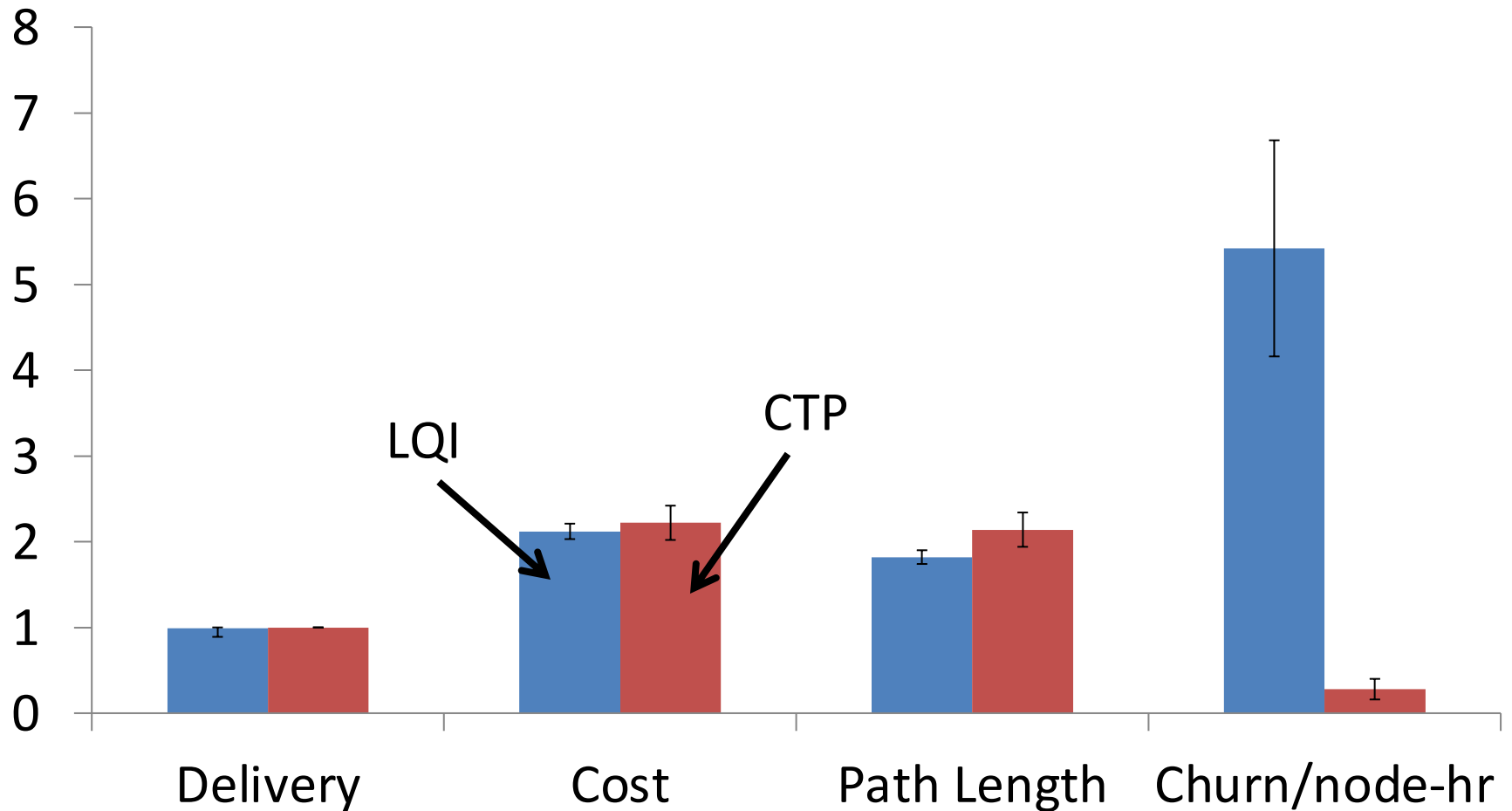
## Advantages

Consistent environment for both the protocols

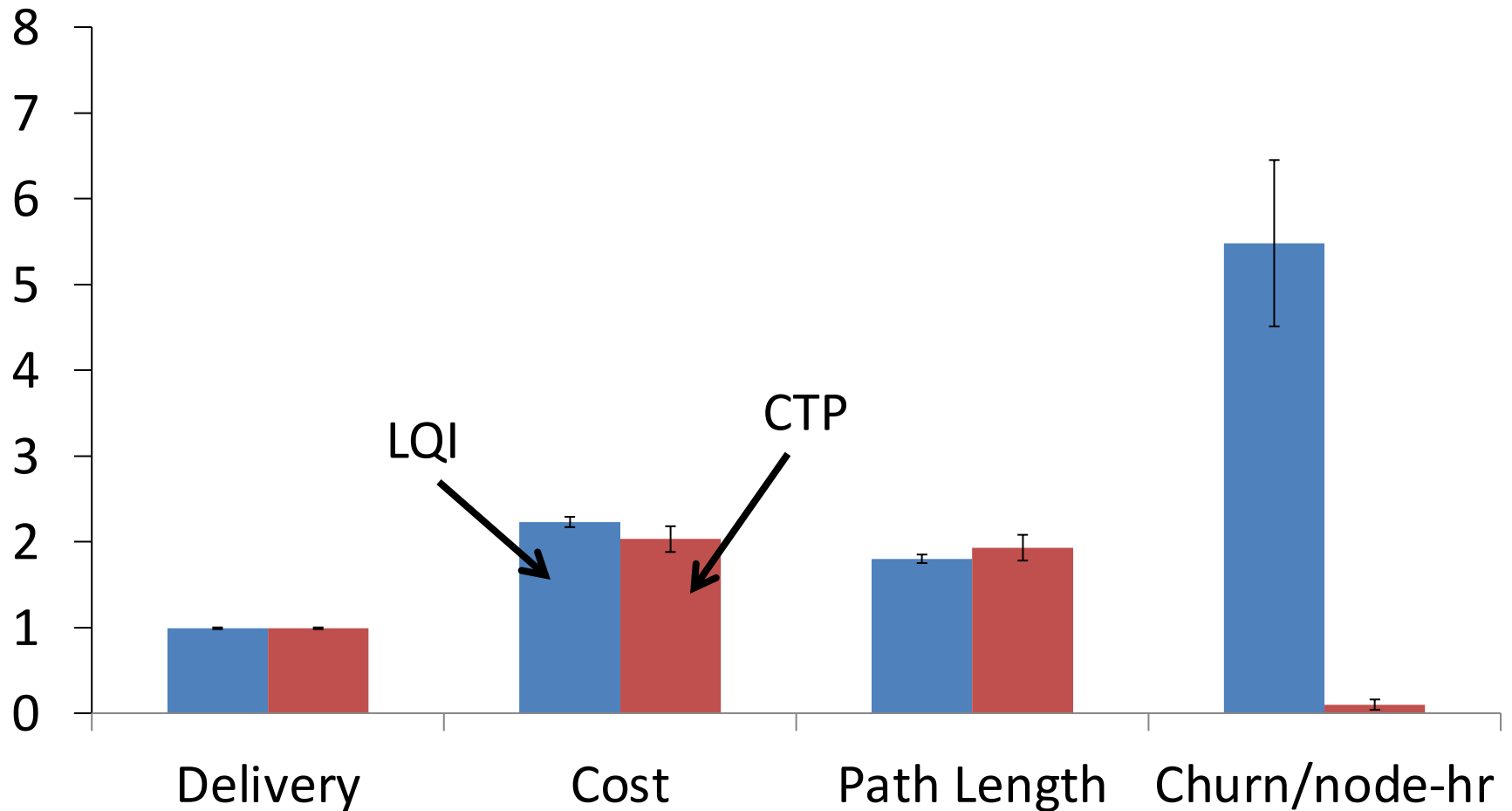
## Concerns

Contention of different types

# Results from Serial CTP vs LQI Experiment on Tutornet



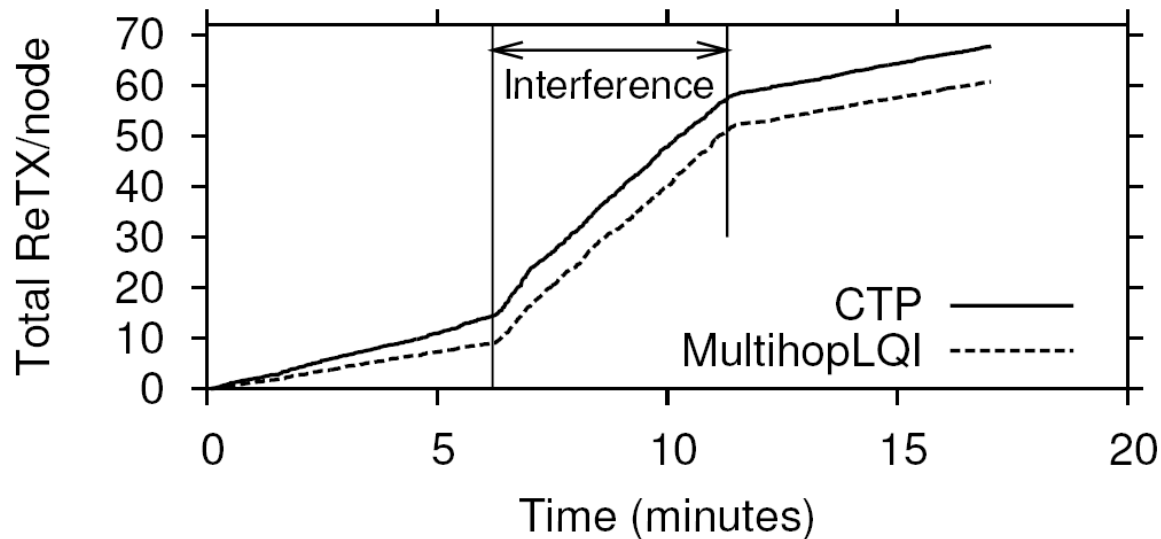
# Results from Concurrent CTP vs LQI Experiment on Tutornet





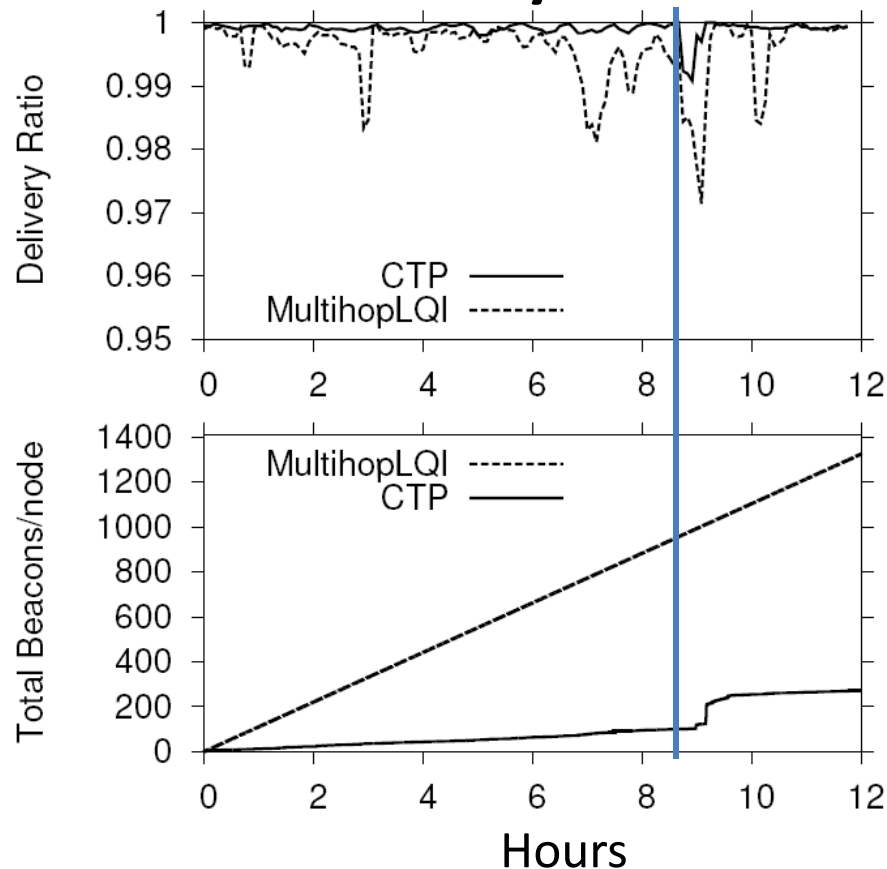
# Putting Concurrent Methodology to Use: Expts. with External Interference

## Engineered Scenario



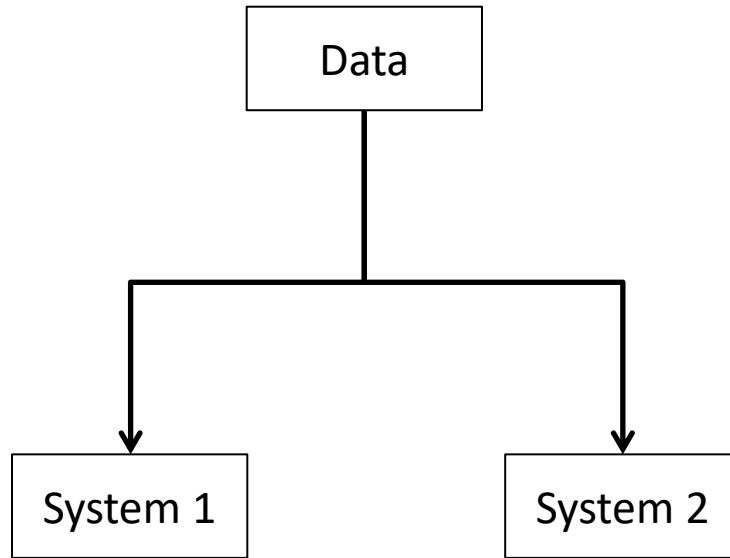
Both protocols *struggle* in the same environment.

# 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



# 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.

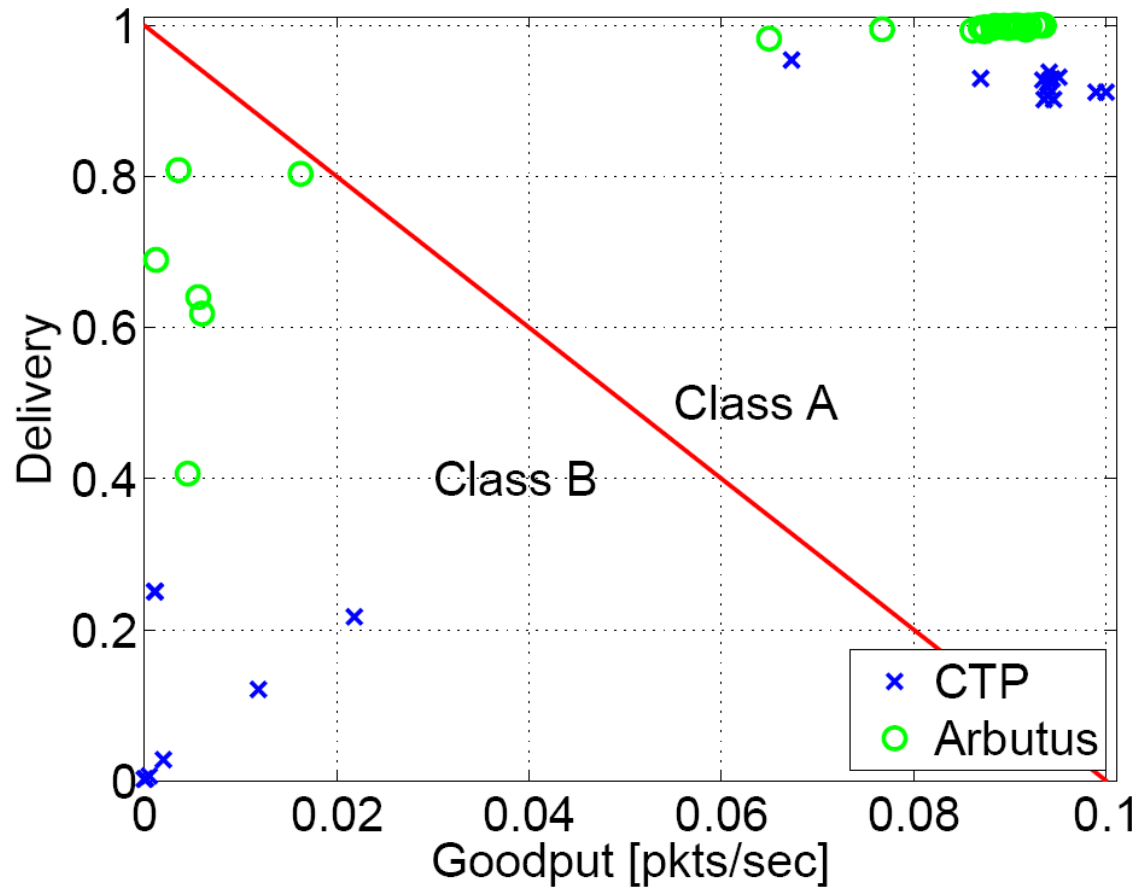
## 5.1 Methodology

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.

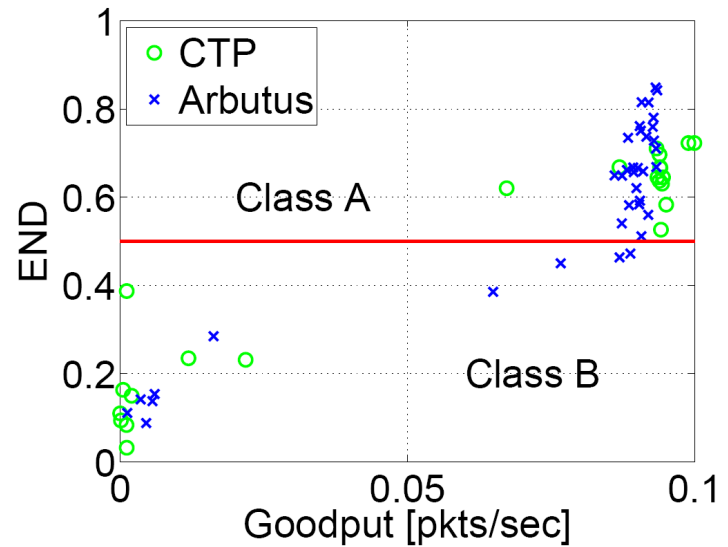
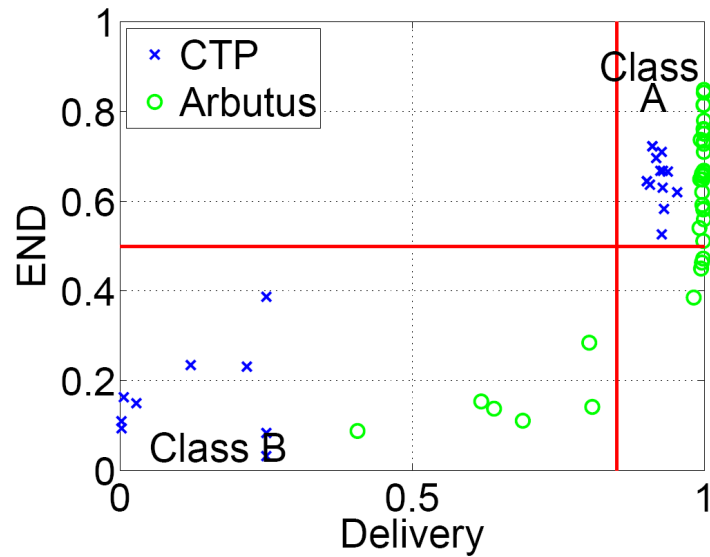
# Results from the same Testbed



# 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]

# HW8

## System (Design)

Describe your system or approach in about one page.