

# Decisions and Computations over Wireless Networks

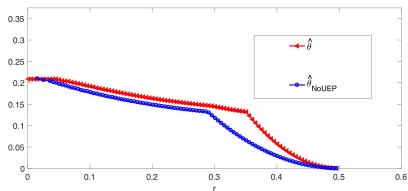
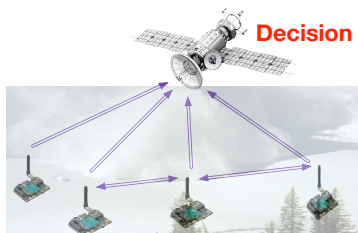
Michèle Wigger, COMELEC, Telecom Paris

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- ▶ Distributed Detection Systems
- ▶ Distributed Computing Systems
- ▶ Networks with Cache Memories
- ▶ Mixed-Delay Traffics

# Distributed Detection Systems

- ▶ CNRS, Hebrew University, Huawei, MIT, Teheran University, Telecom SudParis

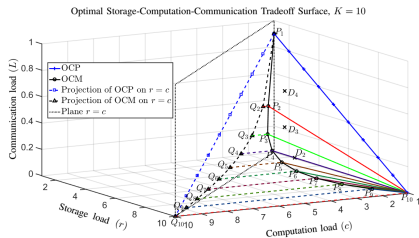
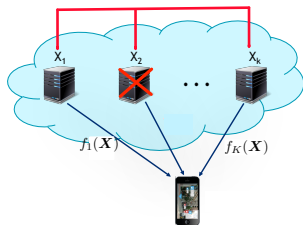


- ▶ Minimize false-alarm exponent given a miss-detection constraint

- ▶ Optimal detection systems based on:
  - ▶ Unequal error protection coding
  - ▶ Unanimous-decision forwarding in multi-hop setups
  - ▶ Opportunistic transmission to mitigate tradeoff in multi-detector setups
  - ▶ Variable-length coding “virtually” boosts transmission rates

# Distributed Computing Systems

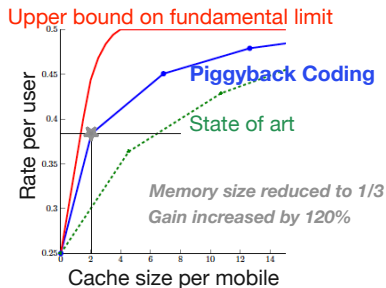
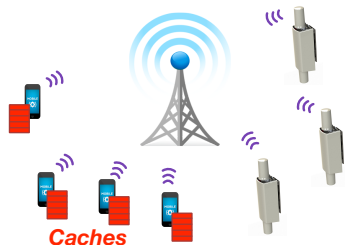
- ▶ Supec, Southwest Jiao Tong University



- ▶ Computation-Communication-Storage Tradeoff in Map-Reduce Systems (Hadoop)
  - ▶ Coded multicast reduces network load
  - ▶ Characterised optimal tradeoff region for general functions
  - ▶ General framework for efficient near-optimal systems
  - ▶ Framework extends to straggling nodes → no need to know the number of stragglers during the Map phase

# Piggyback Coding for Cache-Aided Networks

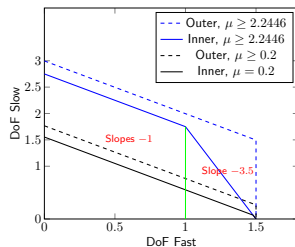
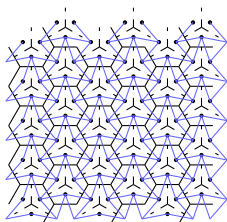
- ▶ CEA, Stanford, Telecom SudParis, TU Munich, University of Pennsylvania



- ▶ Cache contents not only determine **what** to communicate but also **how**
  - ▶ Larger cache memory to weaker users → improved performance
  - ▶ **Piggyback coding** boosts gain of cache allocation
  - ▶ Sometimes secrecy comes for free
  - ▶ Currently running tests on CorTex test bed at INSA Lyon

# Cooperative Networks with Mixed-Delay Traffics

## ► CNRS, Technion



- Cooperation link between neighbouring BSs and users
  - “Slow” data stream can profit from cooperation, “fast” cannot
  - Random arrivals of “fast” messages
- 
- Nested coding scheme  $\rightarrow$  sum-rate preserved for moderate “fast” rates
  - Overall performance not reduced due to coexistence ULLRC / eMBB
  - Intermittent arrivals help mitigating sum-rate penalty