

## **UCLA Electrical Engineering ARR 2011**

### **Session 1. New Solutions to Communication Problems North Ridge Room**

#### **9:00-9:25**

"Secure State-Estimation for Dynamical Systems under Active Adversaries"

*Hamza Fawzi, Paulo Tabuada, and Suhas Diggavi*

Abstract:

We consider the problem of state-estimation of a linear dynamical system when some of the sensor measurements are corrupted by an adversarial attacker. The errors injected by the attacker can be arbitrary and do not follow a particular model. We first characterize the maximum number of errors that can be corrected by any decoding algorithm. We then propose a specific computationally feasible decoding algorithm and we characterize the number of errors it can correct. For this, we use ideas from compressed sensing and error correction over the reals. We show using examples that the decoder performs very well in practice.

#### **9:25-9:50**

"On Information Sharing and the Predicament of Privacy"

*Supriyo Chakraborty, Mani B. Srivastava*

The convergence of sensing, computation and communication technologies in the form of mobile smart phones, wearable sensors, and instrumented household devices have enabled unobtrusive acquisition and sharing of personal information. There are two aspects to the problem of sharing personal sensory information. At the data producer, there are privacy concerns, leading to mitigation strategies, such as data obfuscation and falsification. At the consumer, it manifests itself as a problem of deriving utility from possibly obfuscated data. In the first part of this talk, we will look at approaches for quantifying and achieving information privacy without distortion of data utility. In the second part we will look at techniques we employ at the consumer to reason with obfuscated and uncertain data.

#### **9:50-10:15**

"To the New frontier of Multi-User Communications - an

## Approach Based Repeated Games with Intervention" *Yuanzhang Xiao and Mihaela van der Schaar*

### Abstract:

There have been extensive works that modeled communication scenarios with selfish users as one-shot games and proposed incentive schemes to achieve desirable point on the Pareto boundary as equilibrium. However, in many communication scenarios, the Pareto boundary of the one-shot games is inefficient. In this talk, we propose a generalized repeated game model with intervention to enlarge the set of equilibrium payoffs and loosen the conditions under which it can be achieved. We study the protocol design problem of maximizing the social welfare subject to QoS guarantees, and show the huge performance gain (improvements by a factor of up to 3) obtained by using repeated games with intervention. We also derive the minimum intervention capability required to achieve the social optimum, and design equilibrium strategies to achieve it. The generalized repeated game model with intervention applies to a large variety of communication scenarios, including power control, medium access control, and flow control. Importantly, these new game theoretic - design concepts can also be applied to many emerging fields - network security, social networks, energy markets etc.

### **10:15-10:40**

## "Maximizing Profit on User-Generated Content Platforms" *Shaolei Ren and Mihaela van der Schaar*

### Abstract:

In this talk, I present a unified payment scheme that can maximize the profit of a user-generated content platform. First, I study how the content viewers' attention is spread across content available on the platform. Then, by modeling the content producers as self-interested agents making independent production decisions, I analyze the equilibrium state in which no content producers can gain additional benefits by deviating. Next, the optimal payment scheme is derived based on the well-known Dixit-Stiglitz utility function. Discussions regarding whether and when the intermediary should charge or reward the content producers are also provided. The proposed payment scheme can be applied to maximize the profit by online content platforms such as YouTube, Yahoo!, and Facebook.