



**Mon, March 31**

**Porter Hall  
Room B34  
12:30 p.m.**



**XiaoFei Lu**  
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## **Minimum Robust Sensor Placement for Linear Time- Invariant Systems: A Structured Systems Approach**

**Xiaofei Liu** is a PhD student at Electrical and Computer Engineering in Carnegie Mellon University. She received her BSc from Department of Automation at Tsinghua University in 2008. Her research interest include controllability/observability analysis of large scale systems and system design from their structural descriptions.

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### **Minimum Robust Sensor Placement for Linear Time-Invariant Systems: A Structured Systems Approach**

The talk will address the problem of robust sensor placement for linear time-invariant systems with respect to sensor failure. The sensor placement problem consists of choosing a subset of state variables in a system and assigning sensors to each of these variables to make the system observable. A robust sensor placement with respect to sensor failure ensures that the system, under arbitrary failure of any one sensor, is still observable. To solve such problem, we recast this problem as a well-known graph theoretical problem, the set covering problem. Briefly, a subset of state variables are identified as “critical”, therefore a sensor must be assigned to each of these variables. Such assignment corresponds to a cover set (of the critical state variables by the sensors). Consequently, from the analysis and economic point of view, the minimum number of such variables/sets, must be identified. Although the problem of finding the minimum set covering has no known efficient (polynomial in the number of sets) algorithm, several approximation algorithms are known. Consequently, an approximation to the set covering problem is shown to be an approximate solution to the minimum sensor placement that satisfies the aforementioned robustness criteria.

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