# **CPS & Big Data Security: Training Innovation**

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## **Big Picture of This Project:**

The objective of this project is to train next-generation cybersecurity workforce with the deep understanding of security and privacy issues in Cyber-Physical Systems and Big Data.

Up to this point, there is very little development of the graduate student training materials on the following critical issues:

- CPS control security;
- Medical device security;
- Big data mining process security;
- Big data sharing and networking security.

#### Big data security

**Big Graph** 



Process monitoring sensor data stream







### **Approaches**

**CPS Security**:

- Linear/Nonlinear Control security;
- Medical device access control;
- Radio Fingerprint identifications;
- Sensor & actuator interaction security;
- Power system pattern anomaly detection.

#### **Big Data Security:**

- Big graph decomposition security;
- Big table integrity and access control;
- Big stream on-line anomaly detection;
- Big data sharing security in clouds;
- Machine learning security; etc.



#### Medical Device Security:

IMD (pacemaker) power charging

Pacemaker Inductor



#### Enhanced Graduate Education:

Developed two graduate student courses: (1) Advanced CPS Security; (2) Big Data Security.

http://feihu.eng.ua.edu/NSF CPS/year2/year2.html

http://feihu.eng.ua.edu/bigdata/bigdata.html

security.

- Using Chaos theory to adjust the capacitors.



Oscillator

Wireless IMD Power charge

#### Trained multiple PhD students in Big Data:

- Integration of Big Data and Wireless Transmission (data decomposition);
- Integration of Big Data and Attribution Encryption as well as Machine Learning Security (prevent matrix eigenvector release).

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