Background
- Widespread use of electronic devices
- Devices interact with the environment and generate data
- Can data from these devices be trusted?
- Forensic techniques can be used to uniquely identify each device

Printers
- Cameras
- Scanners
- RF Devices

Goals
- Forensic characterization
- Device authentication
- Detection of data forgery or alterations
- Fingerprint and Trace

Image Source Identification
- Image is captured by a sensor (CCD or CMOS)
- Noise pattern in sensor is correlated to manufacturing defects
- Two types of noise associated with sensor
  - Fixed Pattern Noise (FPN)
  - PhotoResponse NonUniformity (PRNU)
- Estimated sensor noise using a denoising filter (wavelet or LPA-ICI)
- Intrinsic Printer Identification
  - Graylevel co-occurrence texture features estimated from printed regions within individual text characters
  - System works across various font types and sizes, paper types, and consumable age when trained with same font and paper type
  - 90% classification accuracy when training on new data and testing on old data
  - Similar technique is promising for forensic identification of inkjet printers
- Extrinsic Signature Embedding
  - Generate extrinsic signature by modulating laser intensity
  - Ability to synchronize with individual text lines and embed different signals on a per line basis
  - Embedded signature does not affect perceived image/text quality, but is still detectable from the scanned document
  - Ability to embed up to 8 bits per text line with 7% bit error probability (up to 400 bits in a page of 12 point text)

RF Device Identification
- Remotely identify devices in an environment
- Part 15 FCC Regulations
  - A device cannot cause harmful interference
  - A device must accept interference
  - The environment must be probed in order to detect wireless devices
  - Two tone probe signal designed to produce intermodulation distortion (IMD) products in circuitry of device
  - IMD products created throughout the spectrum of the received signal
  - Extract features based on IMD frequency locations

Confusion matrix for Image Source Classification

Confusion matrix for source scanner identification

References available at http://cobweb.ecn.purdue.edu/~prints