

Evaluating Location Estimation Systems in Wireless Networks



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Methods

Trilateration:

Offline: Create mapping between RSSI and distance per sniffer

Online: Map RSSI to distance
Trilaterate to find final location

Probabilistic Models:

Offline: Collect fingerprint database

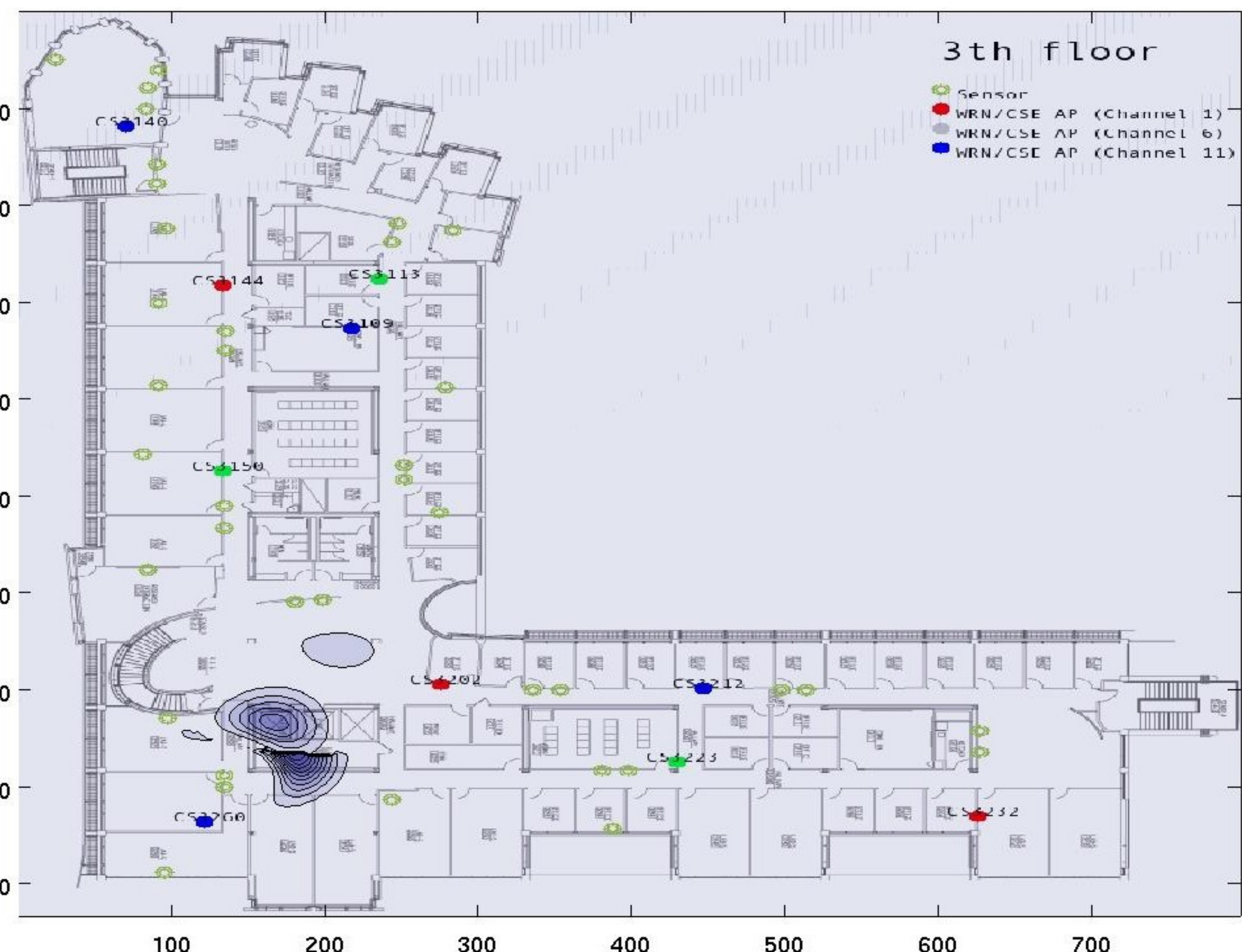
Online: Create one heat map per sniffer

Combine to find final location

Probabilistic Model Failure

Probabilistic models suffer from similar problems as trilateration. But, are less susceptible because

- Ignore RSSIs too dissimilar to training data
- Less likely to use bad training data
- Use more than three observations at a time



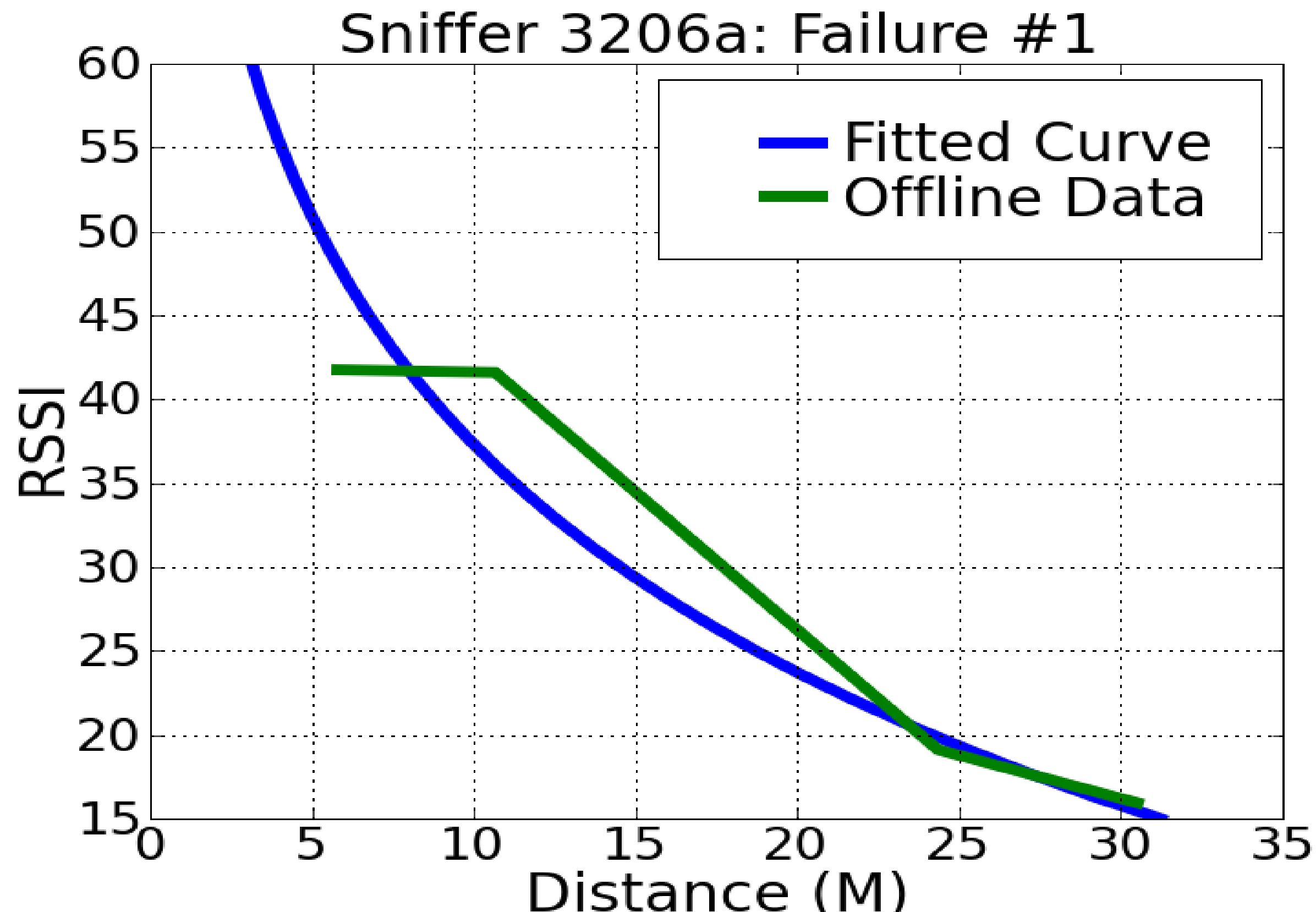
Background and Goals

- Many wireless estimation systems in the literature
- No evaluation of systems in the same environment
- We are uniquely suited to perform such a study
- **Goals:**
 - Evaluate each system
 - Identify unique problems of each system
 - Identify systematic failures that have no solutions.

Trilateration Failure

Four common failures when fitting an exponential curve to the offline data:

1. Two APs have similar RSSIs but different distances
2. Two APs have similar distances but different RSSIs
3. Strongest observed RSSI is too weak
4. AP furthest away from sniffer has overly weak RSSI



Results

Expected: Reported from papers

	Mean	Max
Nearest (Meters)	6	15
Trilateration	5	6
Probabilistic	1.8	3.6
Finger Printing	1.3	10

Actual: From our experiments

	Min	Mean	Max
Nearest	0.9	6.5	12
Trilateration	3.9	8.8	44.6
Probabilistic	0.5	5.7	15

Structural Issues: Height

- Sniffers and APs are all at ceiling height
- Typical usage occurs as 4 feet
- Accuracy degradation is non-uniform across locations

	Floor	4 feet	Ceiling
Nearest	6.7	6.7	4.8
Trilateration	16.8	11.6	11.2
Probabilistic	6.6	3.37	2.65