



On Clustering RSS *Fingerprints* for Improving Scalability of Performance Prediction of Indoor Positioning Systems

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Paper's goals

- Enhance the model⁺ for analyzing Wi-Fi location fingerprinting-based system using a proximity graph
- Study characteristics of fingerprint clusters and applying it to the performance modeling

⁺ IEEE PerCom 2008's paper

Research Questions

- Can we reduce computational effort and make the model more scalable ?
- How much is its impact to the prediction of precision performance ?

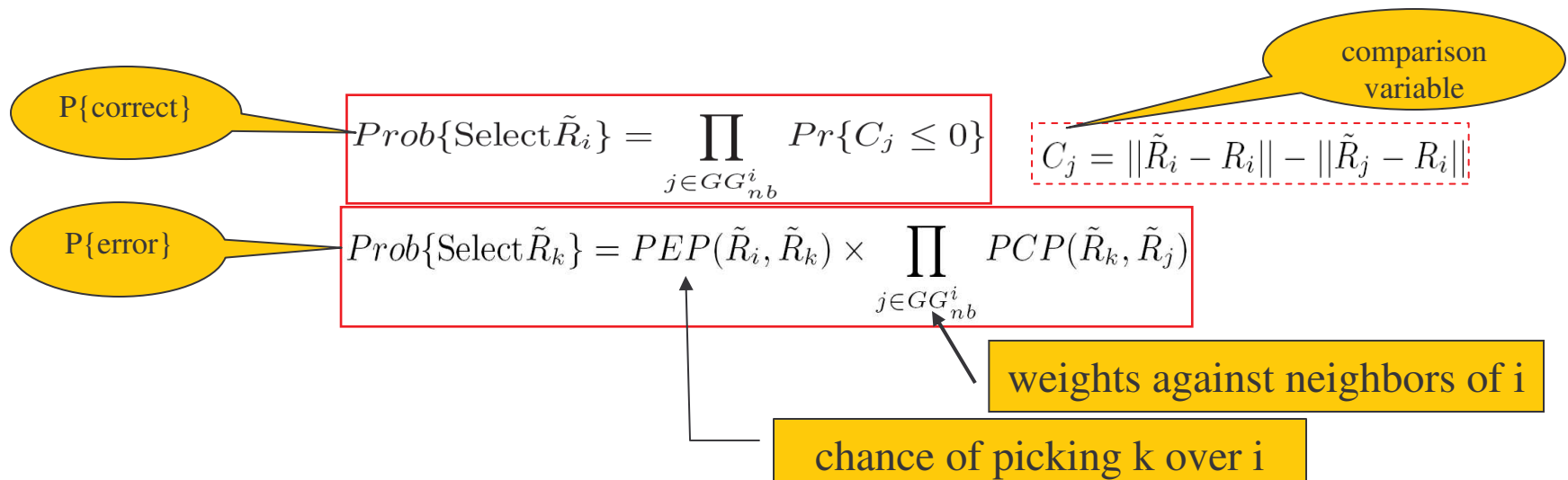
Clustering Methodology

- Different clustering methods:
 - median and K-mean
- Model each cluster separately
- Use measurement data in an office building environment



Analytical Model: Precision as Probability

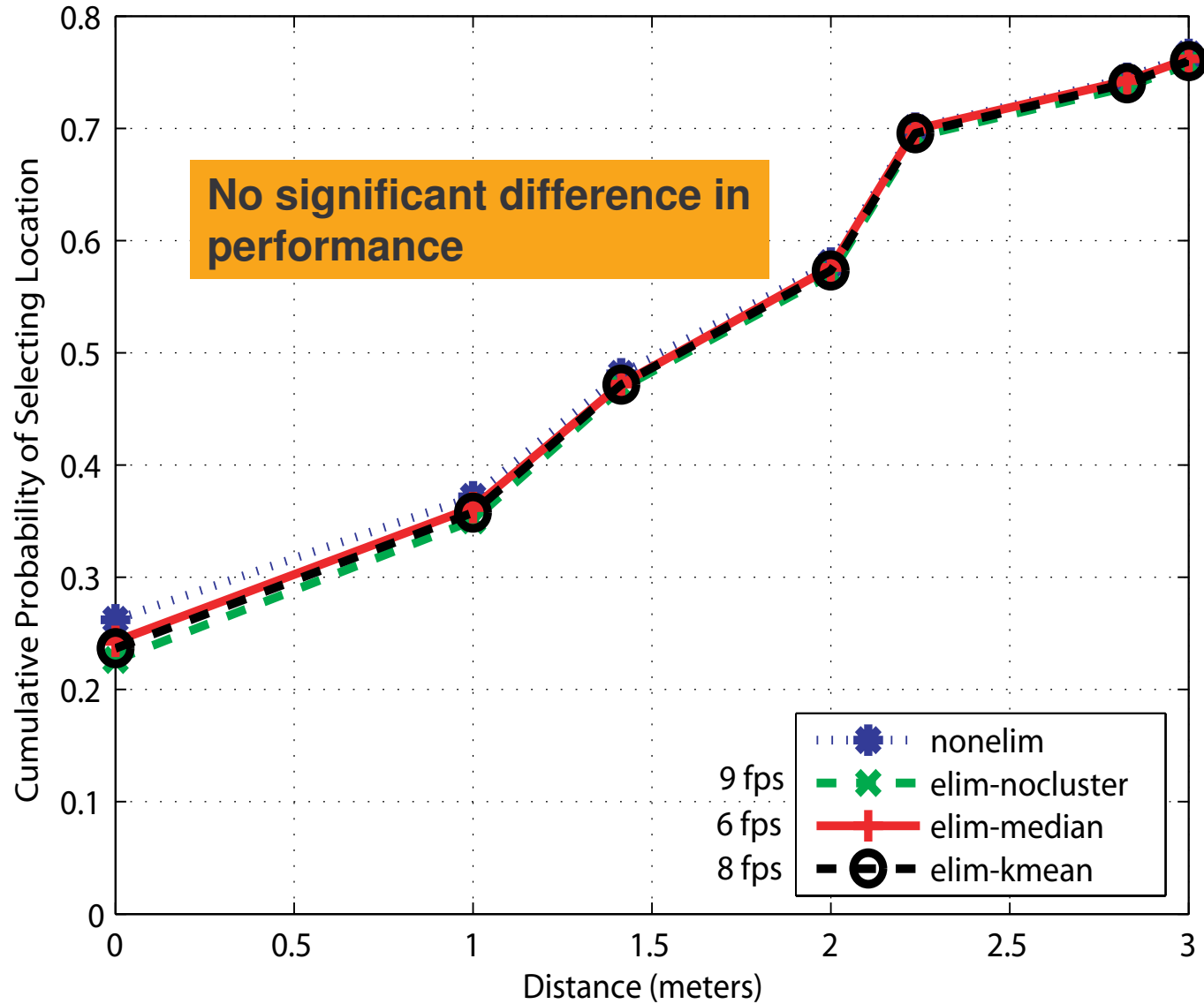
- Multi-location system: computing exact probability requires complex jointed probabilities and becomes prohibitive
 - Solution: approximate prob. Given a MS at the i -th grid point, the prob. of selecting each fingerprint is derived





Fingerprint Clustering Example

Average Error Distance Distribution of 25 Locations





No. of Operations Comparison

	Phase	Clustering		No Clustering
		Median	K-Mean	
Scenario1	Offline	8,284	10,789	31,875
	Online	27	29	50
Scenario2	Offline	38,147	42,230	149,940
	Online	44	46	84



Conclusion

- ✓ Empirical study shows the model with fingerprint clustering maintain good performance
 - No difference in the CDF of error distance curve

- ✓ With Clustering, the model becomes more scalable
 - Save many operations required from the model without clustering
 - Reduce # operations during both the offline and online phases



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Thank you

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