CONSIDERATIONS FOR DESIGNING PRIVATE AND INEXPENSIVE SMART CITIES

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JASMINE DEHART

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OU DATA LAB

https://oudalab.github.io/

Event Extraction	Mining domain agnostic events in large data corpora
Speed Labeling	Interfaces and recommendation systems for accelerating data labeling
Smart Cities	Mitigating cost and privacy within social networks and communities
Fairness Forensics	Critical data exploration tools focused on bias and fairness

NETWORK RECONNAISSANCE LAB

NET RECON LAB

https://www.cs.uky.edu/~baker/research/

Pragmatic Applications of Delay Tolerant Networks	Secure delay tolerant social network for Apple iOS devices
Smart Homes and the Internet of Things	Opportunistic wireless communication to enable Smart Homes to flourish
Low-Cost Smart Cities	Mitigating cost and privacy within social networks and communities

MOTIVATION

Cost

Transforming into a smart city is expensive (e.g., between $30 Million and $40 Billion)

Privacy

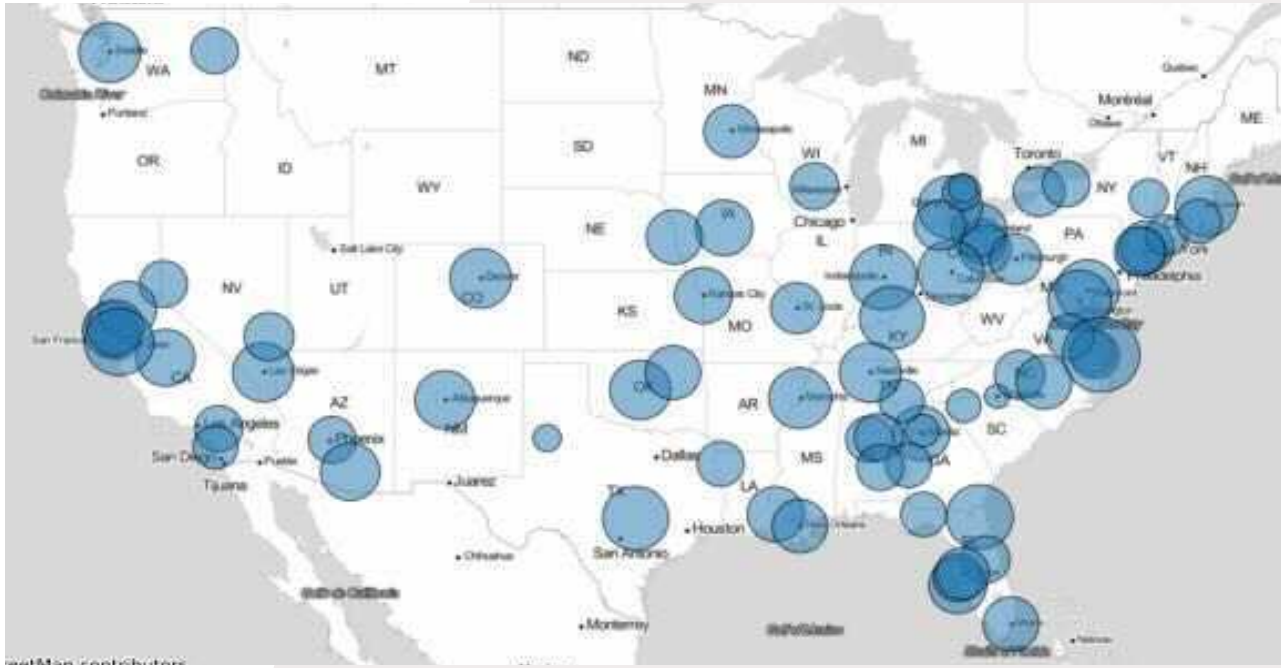
Data collection and surveillance of smart city technology

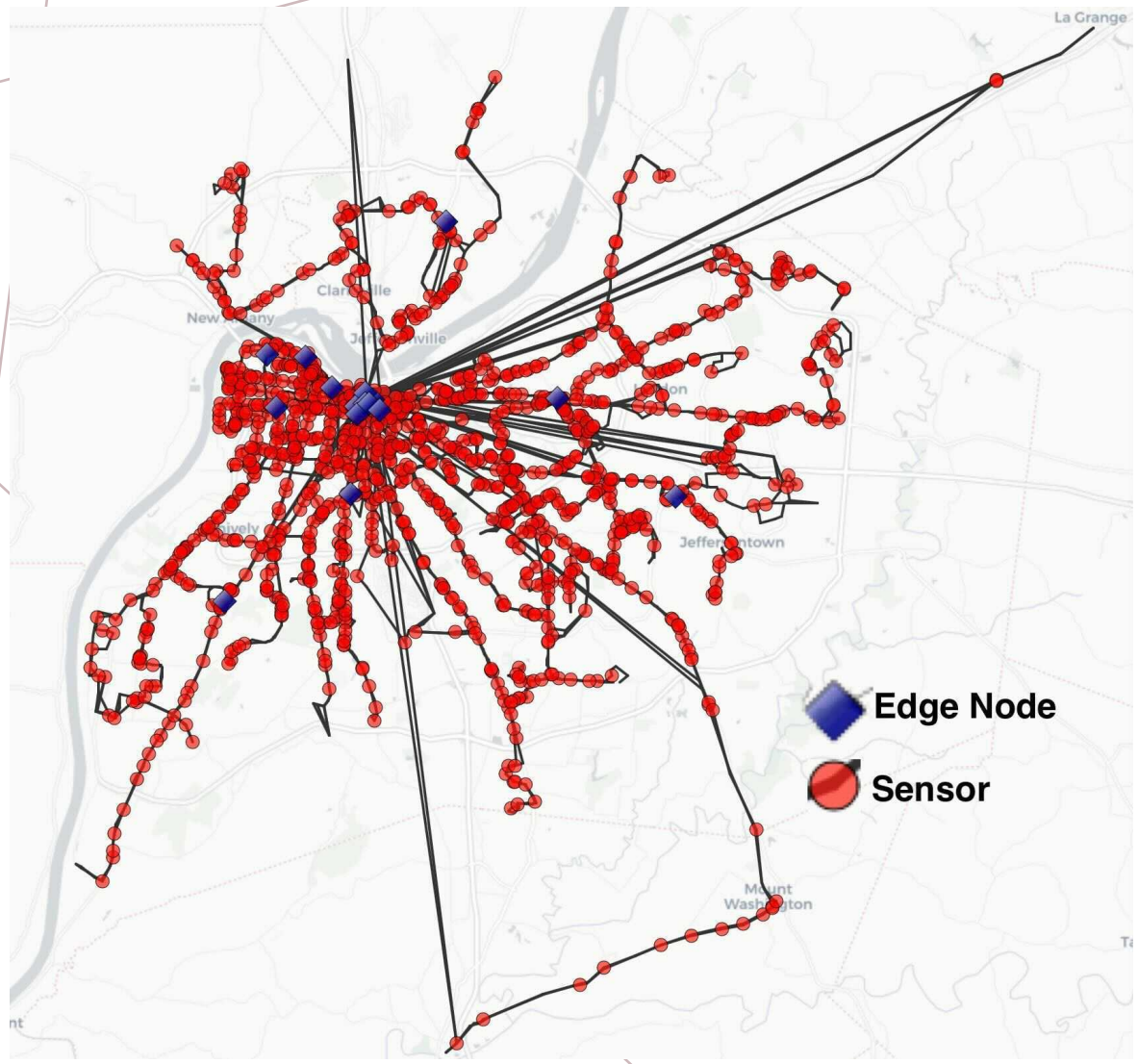
https://thenounproject.com/term/smart-city/1870004/

HOW TO BECOME "SMART"?

U.S. Department of Transportation **SMART CITY CHALLENGE**

- Electric vehicle charging stations
- Electric/autonomous public transportation vehicles
- Connected vehicles using a smart grid
- User mobile applications
- Traffic signaling priority





LOW-COST SMART CITIES

- Cost of deploying and maintaining the IoT devices themselves, a significant portion of the expense is a result of providing Internet connectivity via 5G or WiFi to those devices.
- Delay Tolerant Networks (DTNs) as a backbone for Smart City communication to facilitate data that does not have real-time Quality of Service (QoS) constraints.

City	Data Sharing
Columbus, OH	Poor
Austin, TX	Poor
Denver, CO	Poor
Kansas City, MO	Poor
Pittsburgh, PA	Poor
Portland, OR	Average
San Francisco, CA	Poor

PRIVACY-ENABLED SMART CITIES

Data Sharing answers (1) what information is shared, (2) who can see this data, and (3) how much information will be collected by the city.

City	Individual Privacy
Columbus, OH	Poor
Austin, TX	Poor
Denver, CO	Poor
Kansas City, MO	Average
Pittsburgh, PA	Poor
Portland, OR	Poor
San Francisco, CA	Poor

PRIVACY-ENABLED SMART CITIES

Individual Privacy is the management and protection of personally identifying information (PII).

City	System Security
Columbus, OH	Poor
Austin, TX	Excellent
Denver, CO	Poor
Kansas City, MO	Excellent
Pittsburgh, PA	Poor
Portland, OR	Poor
San Francisco, CA	Poor

PRIVACY-ENABLED SMART CITIES

System Security addresses concerns of hacking, data breaching, cryptographic settings, and comprehensive system design.

PRIVACY- ENABLED SMART CITIES

Data Privacy ensures all data in and data out of the Smart City system is properly protected.

City	Data Privacy
Columbus, OH	Poor
Austin, TX	Excellent
Denver, CO	Average
Kansas City, MO	Poor
Pittsburgh, PA	Average
Portland, OR	Average
San Francisco, CA	Poor

VIPERLIB

From this analysis, we proposed a library of privacy mitigation techniques that includes:

- Visual mitigation
- Various stages of deployment
- Active engagement strategies
- Open Source
- Privacy first

CONCLUSION

Smart cities have the capability to be both private and inexpensive in deployment and for long term sustainability.

- Officials and citizens should consider the high cost and privacy concerns associated
- Extends from the protection of PII to anonymity and protect of minors
- Use of DTNs to lower the cost and allow citizens assist in the transmission of data

FUTURE WORK

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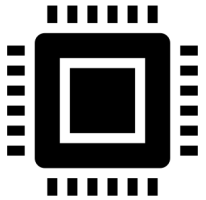

Research potential effects of security for cyber-physical systems in real IoT deployments

Collaborate with Louisville, Kentucky to discuss future strategies

Development and deployment for **ViperLib**

Study African and European Smart Cities

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Questions?

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