Award #: 1943002

CSSI Element: Citizenly: Empowering Communities by Democratizing Data Science

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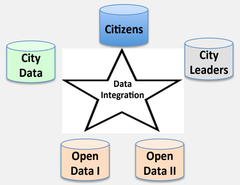
Problem Statement

- **Urban data and data-driven approaches are not effectively used, especially in many midsize cities around United State, to address urban challenges and civic progress.**
- **Use of traditional open data sets have resulted in limited success.**
  - **Computational Complexity:** Access and use of open data requires specialized skills making directly inaccessible to key stakeholders. Enable "all" to participate in data collection and analysis to derive value-added actionable insights.
  - **Community Engagement:** Communities are involved in decision-making throughout the research process, from developing research questions to disseminating research findings
  - **Context:** Open data sets are more suitable for conducting community-level data analysis



Cyberinfrastructure to *democratize data science* and *community engagement* in civic progress

Testbed and Partnerships

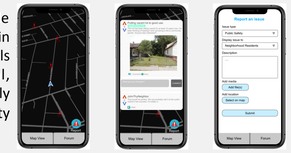
- **Marketview Heights Urban data in the city of Rochester, NY.**
  - **Designated as "pilot neighborhood" by RMAPI (**Rochester-Monroe Anti-Poverty Initiative.
  - Experienced significant disinvestment and are economically segregated and marginalized.
  - Today, the neighborhood has the highest density of poverty, but strong community assets including vacant lots and active and engaged citizens.

RMAPI ROCHESTER-MONROE ANTI-POVERTY INITIATIVE

- Formed a **Community Advisory Board (CAB)** comprising Marketview Heights residents
- **CAB will play a leading role in the Citizenly Project**
  - Identify outcomes most useful to the community
  - Identify data gaps
  - Co-creation of data collection tools and activities
  - Assist with project evaluation

Overarching Objectives

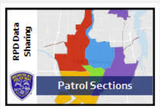
- **Community Data Infrastructure:** realize a cyberinfrastructure to address Citizenly's heterogeneous data sets involved and, at the same time, enable ease of use and accessibility for citizens and civic leaders.
  - **Automate Extract-Transform-Load (ETL):** automate integration of urban data sources using domain-specific modeling approach
  - **Citizen Sensor and Data Collection:** enable collection of neighborhood specific data that, in combination with more macro level data, reveals new understanding of the social, cultural, environmental, and economic conditions, especially neighborhood assets, including existing community connections and interaction



- **Citizen-Centric Programming:** A key tenet of the Citizenly is to create an ecosystem for application development addressing solutions to the urban use cases especially focused on neighborhood issues. In contrast to a generic app ecosystem, Citizenly strives to create an ecosystem where citizens, community leaders, and city administrators can be app developers
  - Intent-based Microservices Composition:
    - Domain-specific Interface
    - QoS-based services composition: we will automate the process of mapping user's intent onto available concrete services set and derive an optimal microservices composition based on the set objectives.

Datasets: Established + Emerging and Key Partnerships

- **Rochester City Data**
  - Zoning Districts. GIS layer with detailed property parcels information, including ownership, tax assessment, photos, and other building-related information.
  - Property sale records (with prices) from the past three years. Recent sales information.
  - City services map: Information about city services, like parks, community centers, fire stations, libraries.
  - Rochester Police Department: Spatio-temporal data.
  - Live snow-plow tracking. Real-time status tracking of the city's snow clearing operations.
  - Recently launched Tolemi Data Portal https://rochester-ny.tolemi.com/



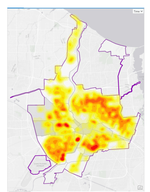
- **Public Health Datasets**
  - Inpatient and Outpatient Claims. Patient level data for each hospital visit
  - Mortality Data
  - Public Safety Data

- **Citizenly Partnerships and Collaborations**
  - City of Rochester Office of Innovation and Strategic Initiatives
  - Common Ground Health of Rochester
  - United Way of Rochester
  - Rochester City Environmental Services

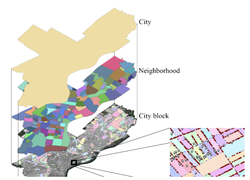
Innovative Approaches

- **Vacant Lot Conversion Decision Tool: Prediction Model**

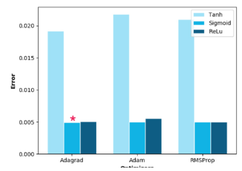
$$\vec{S}_i = \vec{B}_k \frown \vec{C}_j \frown \vec{P}_x \frown \vec{V}_y$$



Kernel Density of Property Parcels



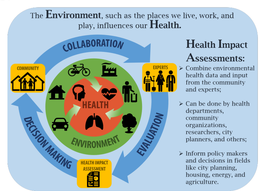
Hierarchical Structure for Vacant Lot Model



Hyperparameter Tuning for Artificial Neural Network

- **Optimal City Resources Deployment**
  - Optimizing the use of (police) resources through efficient (patrol) path planning using crowd-sourced and publicly available datasets.

- **Predictive Health Impact Assessment**
  - Model impact of socio-economic factors on public health outcomes. Help communities, decision makers, and practitioners make choices that improve public health through community design.



Interdisciplinary Research Team

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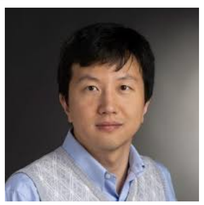

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