Collaborative Collision: Smart Cities

Presented by the Office of Proposal Development

Laura Arpan
School of Communication

Research Agenda:
- Understanding risk perceptions, human motivation & responses to environmental and health-related interventions; related technologies.
  - Avoid information deficit assumption: lack of knowledge rarely the only problem.
  - Motivation and risk perception problems
    - Not all care or perceive health/environmental risk
    - Some perceive few benefits and unsubstantiated risk of new technologies
    - Not all who care act or inadvertently undermine interventions
- Testing theory-based messages to encourage health & pro-environmental behaviors, policy acceptance;
  - use of messages: user-generated videos, entertainment programs, promotional messages, or
  - information technologies (educational video games, apps, smart meters)

Potential Project Roles :
- Survey research to predict citizen and/or organizational risk perceptions, needs and motivation to participate in smart city initiatives and services;
- Theory-based message and incentive strategies to encourage citizen and organizational participation (outreach and awareness building);
- Analysis of smart city citizen/organizational participation and satisfaction.

Recent, related work:

Role of values, norms, group identity, & risk perceptions in predicting behaviors, message response, policy acceptance.

- Moral motivations for renewable energy for home use.
  - Responses to promotional messages emphasizing caring, justice, loyalty, or authority and willingness to pay more for green energy.

- Motivations and risk perceptions associated with use and acceptance of smart meters in the United States.

- Saving money vs. the environment? Short-term vs. long-term gains?
  - Responses to messages promoting reduced residential energy use.

- The role of values, moral norms, and descriptive norms in building occupant responses to an energy-efficiency pilot program and to framing (norms vs. personal responsibility) of related messages.

- Motivating the skeptical and unconcerned: Considering values and norms when planning messages encouraging energy conservation and efficiency behaviors.

Shayok Chakraborty

Assistant Professor

Computer Science

shayok@cs.fsu.edu

My Research Background

Research Interests: **Machine Learning, Computer Vision, Artificial Intelligence**

2017 – Present: Assistant Professor, FSU
2015 – 2017: Assistant Research Professor, ASU
  Associate Director, Center for Cognitive Ubiquitous Computing (CUbiC)
2014 – 2015: Postdoc, CMU
2013 – 2014: Postdoc, Intel Labs
01/2012 – 04/2012: Research Intern, MSR Redmond
2007 – 2013: PhD, ASU

How I'd Like to be Involved in a Smart Cities Project

Eagerly looking to collaborate on:
❑ Grant Proposals
❑ Research Publications

Smart Stadium for Smarter Living Project

Projects
- **Wait Time and Queue Estimation**
- **Emotion Detection to Enrich Fan Experience**
- **Crowd Behavior Analysis**
- **Pitch Monitoring**

Research Publications
- S. Panchanathan, **S. Chakraborty**, T. McDaniel *et al.*, "Enriching the Fan Experience in a Smart Stadium Using Internet of Things Technologies", International Journal of Semantic Computing (**IJSC**), 2017 (**Special Issue on Best of IEEE ISM 2016**)
- S. Panchanathan, **S. Chakraborty**, T. McDaniel *et al.* "Smart Stadium for Smart Living: Enriching the Fan Experience", IEEE International Symposium on Multimedia (**ISM**), 2016 (**Invited Paper**)

David C. Folch
Geography

- Motivations:
  - Geography, economics, computer science → Geographic data science
  - Cities → Identifying neighborhoods: change, segregation, amenities

- My Research Background:
  - NSF Census Research Network (NCRN) – Spatial Sciences Node
  - Environmental Influences on Child Health Outcomes – Family Life Project
  - Neighborhood Influences on the Quality of Child Care Centers in N.C.
  - Measuring Social Vulnerability – Reducing Uncert. and Validating Indicators
  - Residential Segregation Measures and Their Spatial Properties – DDRI
  - Urban Analytics – Textbook

- How I'd Like to be Involved in a Smart Cities Project:
  - Smart Cities (GEO 5934) course in Spring 2018
  - Federal Statistical Research Data Center
  - Uses of new ("big") urban data
  - Leveraging spatial data
  - Neighborhoods, context, indicators
  - Urban data science

URBAN ANALYTICS
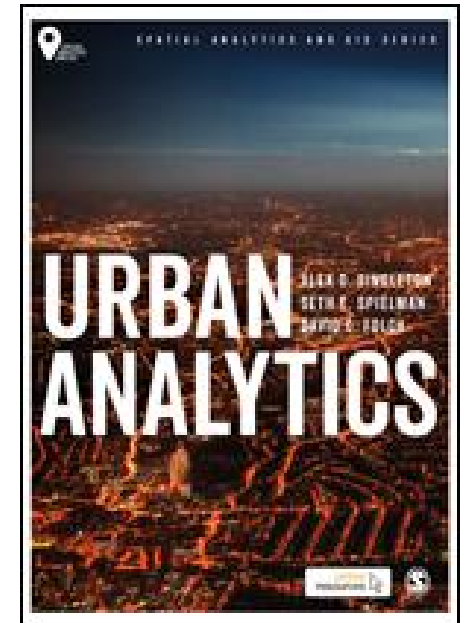
Iris Junglas

Business Analytics,
Information Systems,
and Supply Chain

- My Research Background:
  - Technology innovation; more specifically, my background is focused on the emergence of new technologies and their impact on individuals, organizations, and society as a whole
  - Over the years, I have looked at a variety of technologies and related phenomena, including electronic commerce, wikis, social media, virtual worlds, mobile healthcare systems, IT consumerization, business analytics, and the Internet of Things
  - I'm currently chairing a special issue on the "Internet of Things" for one of our premier journals in the discipline
  - I have submitted a proposal for a research project titled "The Internet of Things and its Business Models: A Data and IT Governance Perspective" that I plan to execute with an Irish university if approved (Dublin is currently on its way to becoming one of the world's first Internet of Things (IoT) cities. Spearheaded by Intel, Dublin's streets, parks and rivers will soon be linked with IoT sensors that are able to gather a slew of environmental and energy information.)

- How I'd Like to be Involved in a Smart Cities Project:
  - Looking for collaboration among FSU faculty

Vasu Misra

Earth, Ocean and Atmospheric Science

Florida Climate Institute

- **My Research Background**: Climate scientist, worked extensively on global and regional climate (especially of Florida)
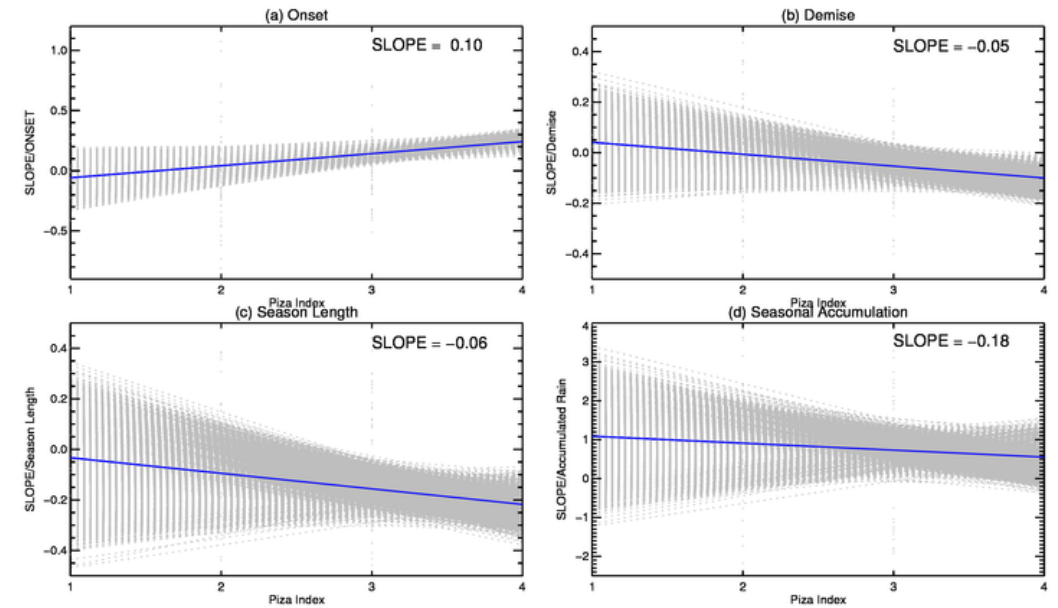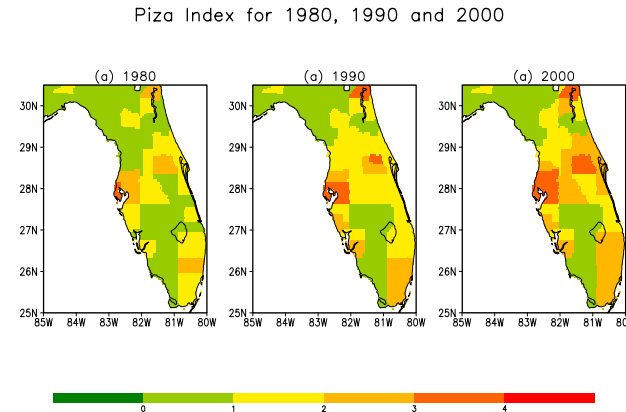
- **How I'd Like to be Involved in a Smart Cities Project**: There is significant changes in the observed climate over Florida from land cover and land use changes. We could model this sensitivity of the regional climate to land cover and land use change. Further, also assess the impact on the regional climate from other potential Engineering solutions in building Smart Cities.

Publications

1. **The Potential role of land cover on secular changes of the hydroclimate of Peninsular Florida** (in embargo)

2. **Characterizing the rainy season of Peninsular Florida** (http://coaps.fsu.edu/~vmisra/rainyFL.pdf)

3. **The oceanic influence on the rainy season of Peninsular Florida** (http://coaps.fsu.edu/~vmisra/rainyseason.pdf)

Piza Index for 1980, 1990 and 2000

1. Florida urban areas are displaying a trend of later onset, earlier demise and resulting shorter length of the wet season compared to the rural areas.

2. The differences in the trends of the wet season rainfall accumulation between Florida's rural and urban areas are however insignificant. This suggests that there is a trend for summer rains to be stronger in urban areas relative to rural regions.

Andy Opel
Communication

aopel@fsu.edu

- **My Research Background:** I have been working in the area of environmental communication for almost 20 years. My work includes documentary filmmaking, advocacy video production, news analysis of environmental issues, and interdisciplinary team collaborations around environmental messaging. Samples of my work are available at www.andyopel.net

- **How I'd Like to be Involved in a Smart Cities Project:** Smart cities are more than an assemblage of new technologies. They also require a set of cultural and social practices to accompany material changes to the built environment. *HOW* changes are introduced often matter more than *WHAT* those changes/technologies are.

- Communication, visual narratives, social media, and public outreach are critical components of successful shifts to "smart" cities. Concepts such as a Just Transiton are essential, linking environmental justice to a sustainable future.

A JUST TRANSITION

Climate *impacts:*
- "Hit first and worst on those who do the least to cause it and are the most vulnerable to the consequences."[1]
- Rebuilding for *Sustainable, Shared Prosperity*

Example of what happens when community engagement fails:

The Tallahassee Solar Farm

A STRATEGY FRAMEWORK FOR JUST TRANSITION
RESIST — RETHINK — RESTRUCTURE

Facebook comments:

Dallas Loughmiller Sounds good but it takes up way to much land for the return. How many trees were taken down for this? Did we wast one natural resource for another?
Like · Reply · 1 · December 30, 2017 at 1:59pm

Bek Jones Very excited about getting my solar energy!
Like · Reply · 2 · December 30, 2017 at 4:44pm

Michael Ferrell How much bribe money did our Commissioners get from this foreign Company?
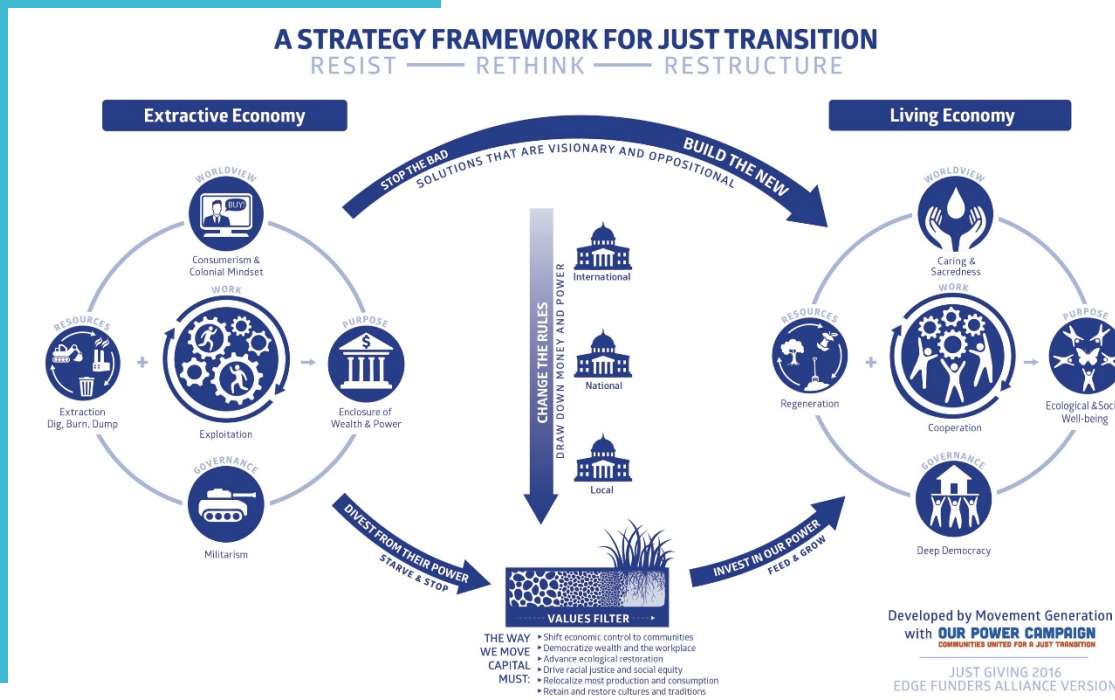Like · Reply · December 31, 2017 at 8:25am

William Payne Crazy how much land is needed to put up solar panels for that small percentage of Tallahassee
Like · Reply · 1 · December 30, 2017 at 11:31am

Bradley Jenkins That's why they're charging them more.
Like · Reply · 1 · December 30, 2017 at 12:02pm

William Payne Could you imagine how much land it would take to power the whole county? Obviously wouldn't happen but just a thought.... crazy
Like · Reply · December 30, 2017 at 12:17pm

Write a reply...

Tally Foreman Would have been nice to see this money go towards fixing the run off problem from the Tram water facility. It's killing more than just our springs here in Wakulla County.
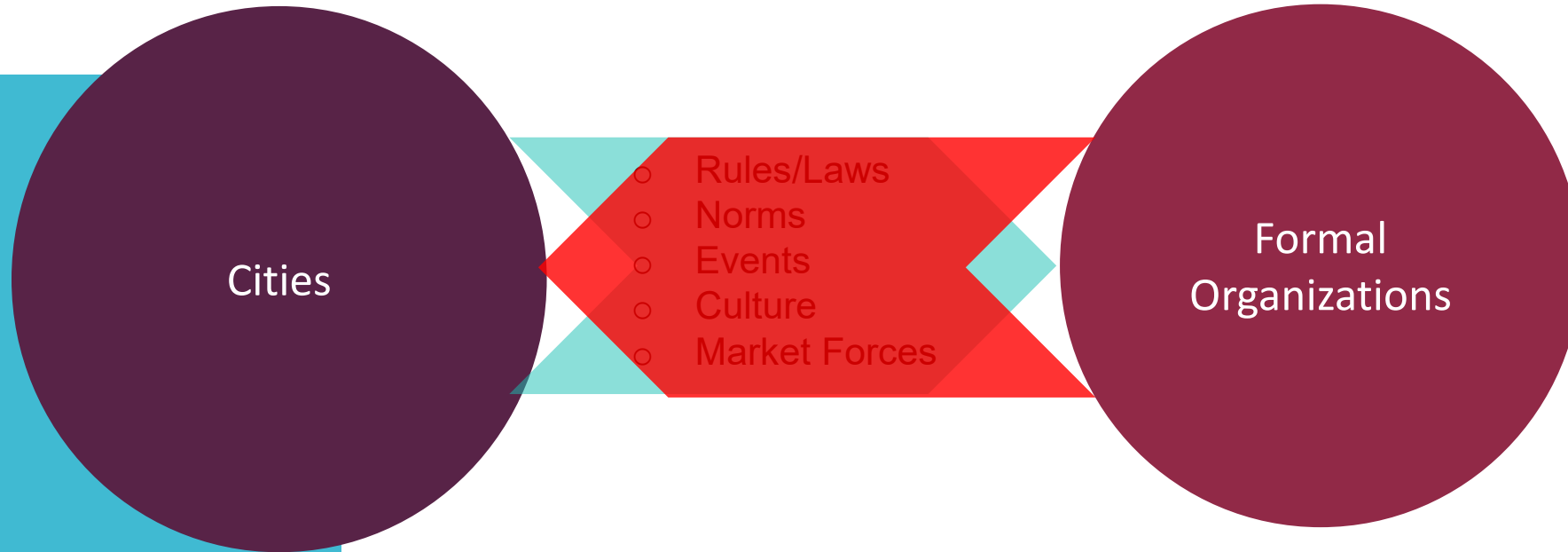Like · Reply · December 31, 2017 at 9:06am

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1 https://www.climatesolutions.org/programs/just-transition

Horacio E. Rousseau

Management

- My Research Background:
  - Ph.D. Management, IESE Business School (2017)
    M.Sc. Management Research, IESE Business School (2014)
    B.A., Business Administration, University of Buenos Aires (2006)

- I'm interested in studying two related processes:
  1. Uncovering how organizations such as nonprofits, corporations and community banks can shape the social and environmental dimensions of the urban communities on which they operate.
  2. Understanding how cities shape the strategic actions of different types of organizations

- How I'd Like to be Involved in a Smart Cities Project:
  1. Bringing the "organizational" into the smart cities equation.
  2. Data collection and analysis.
  3. Develop theory that brings Smart Cities into mainstream management research.

Cities

Formal Organizations

- Rules/Laws
- Norms
- Events
- Culture
- Market Forces

Studies have shown the influence of communities on:

Many other issues are still unknown of

1. City features that affect decision-making, especially on social and environmental issues (Brief, Umphress and Dietz, 2005)
2. Organizational Conflict (Brief, Umphress and Dietz, 2005)
3. Corporate Philanthropy (Tilcsik and Marquis, 2015)
   - Cities influence organizational behavior and performance.
   - Local banks behave differently than corporate banks both in times of low and high performance.
4. Entrepreneurial Outcomes (Saxenian, 1996; Almandoz, 2012)
5. Industry Concentration and Location (Sorenson and Audia, 2000)
   - Banking profits are incredibly high in cities with low levels of social infrastructure.

Daniel Schwartz

Computer Science

- My Research Background:

  - Mathematics and Computer Science
  - Formal and Fuzzy Logics
  - Artificial Intelligence
  - 90+ refereed publications

- How I'd Like to be Involved in a Smart Cities Project:

  - Real Time Dynamic Waypoint Navigation for Autonomous Vehicles

A theory of event possibility with application to vehicle waypoint navigation, in P. Melin, et al. (eds.), *Fuzzy Logic in Intelligent System Design: Theory and Applications*, Advances in Intelligent Systems and Computing 648, Springer, 2017.

[*Proceedings of the 36th North American Fuzzy Information Processing Society Annual Conference, NAFIPS 2017*, Cancun, Mexico, October 16--18, 2017.]
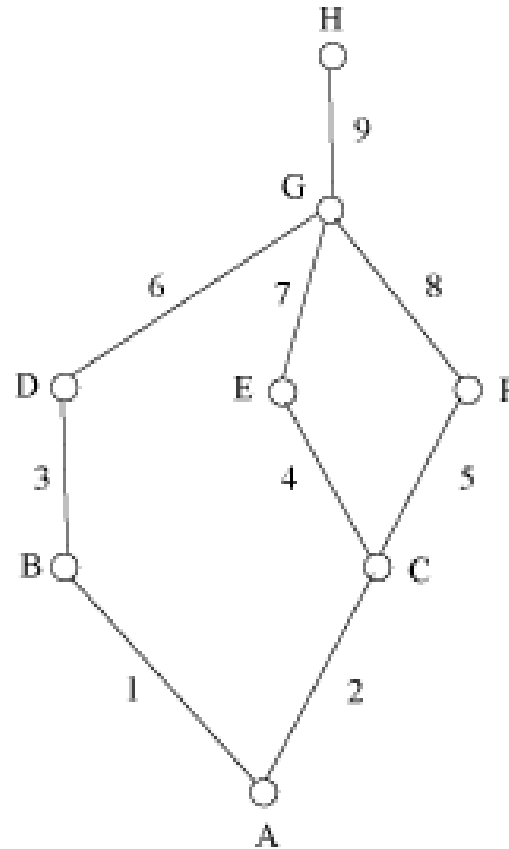
Real time monitoring and replanning due to changing traffic conditions:

- Rush hour
- Accident
- Road construction
- Weather (snow, ice, etc.)
- Fallen tree
- Etc.

Dynamic rerouting using Google maps.

Civil and Environmental Engineering

Lisa Spainhour, Professor and Interim Chair

spainhour@eng.famu.fsu.edu

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Eren Ozguven
Civil and Environmental Engineering

- **My Research Background:**

  - ❖ Transportation Safety and Accessibility
  - ❖ Emergency Transportation Operations
  - ❖ Intelligent Transportation Systems
  - ❖ Smart Cities and Urban Mobility

- Two NSF-funded projects from the Smart Cities and Communities Directorate

  - ❖ CNS-1737483, "One Bridge at a Time: Bridging the Digital Divide for the Well-Being of Aging Populations in Smart and Connected Communities"
  - ❖ CNS-1640587, "UHDNetCity: User-centered Heterogeneous Data Fusion for Multi-networked City Mobility"

- **How I'd Like to be Involved in a Smart Cities Project:**

  - ❖ Participating in multi-disciplinary projects engaging engineering, social sciences and policy researchers and academicians

CNS-1737483, NSF Smart and Connected Communities (SCC) Program

One Bridge at a Time: Bridging the Digital Divide for the Well-Being of Aging Populations in Smart and Connected Communities (SCC)

Eren Ozguven and Walter Boot (FSU PIs)

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Motivation

- **Insufficient or inadequate internet access** in low density areas can be bottleneck to implementing smart solutions.
- A transit traveler information system can be a crucial S&CC tool for the mobility of an **urban community**, but not a **suburban community**.
- **Rideshare phone applications**, such as Lyft, indicate promising results; however the aging population lags other segments of the population in **smartphone use** with only 42% of those age 65+ owning a smartphone in 2016.

Frameworking Workshop (April, 19-20, 2018 Stony Brook University): An international 2-day kick-off workshop will be held at Stony Brook University in order to bring the RCN members together within the first year of the start date.

In-Progress Workshop (University of Michigan): Within the late second or early third year of the project, a workshop will be held covering all RCN themes.

Synthesis Workshop (FSU): Towards the end of the 4 year period, the most up-to-date RCN (with international participants) will present on ongoing and completed research, to discuss and assess the success of RCN activities, and to identify future actions to maintain the momentum of the RCN.

Objectives

Bringing multiple academic disciplines and community organizations together to exchange ideas, to develop problem statements, to identify research needs and to share findings of completed and in-progress research.

Identifying venues to publish and showcase S&CC research, organizing conference sessions and journal special issues, and disseminating information about the RCN activities and research findings.

Supporting educational activities such as thesis and dissertation topics on S&CC, as well as short courses for professional development opportunities.

Fostering collaborations to pursue identified funding opportunities.

Expanding the RCN by recruiting new members and identifying parallel research directions for other disadvantaged population segments.

Research Coordination Network (RCN) for Aging Population

https://you.stonybrook.edu/agingpopulationrcn/

UHDNetCity: User-centered Heterogeneous Data Fusion for Multi-networked City Mobility

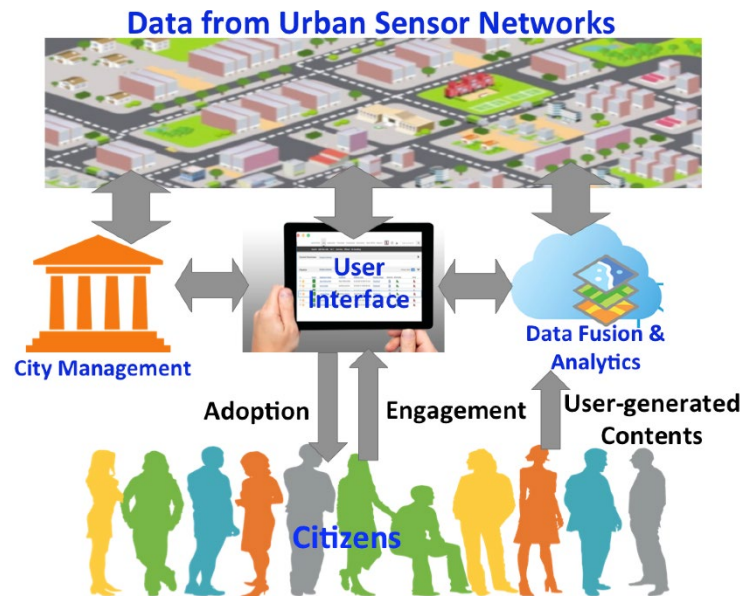Reza Arghandeh, Eren Ozguven and Jinghui Hou

CITY OF TALLAHASSEE

Motivation

The study of mobility should go beyond transportation systems and **merge** with other infrastructure systems and information **networks**.

There are no indices to measure the urban mobility concept from **a sociotechnical perspective**, which considers **interdependency and interconnectivity** among different infrastructure and **citizens**.

The UHDNetCity project aims to provide a mathematical and analytical framework for **citizen centric multi-network system** such as Urban Cyber-Physical Systems that involve very large volume of heterogeneous data from different layers of the city.

Data from Urban Sensor Networks

User Interface

City Management
Data Fusion & Analytics

Adoption   Engagement   User-generated Contents

Citizens

Objectives and Impact

The UHDNetCity is a novel approach for characterizing and quantifying mobility in a **sociotechnical urban system**. This approach highlights interdependency and interconnectivity between infrastructure networks.

The UHDNetCity also presents a framework for **heterogeneous urban data fusion**.

The UHDNetCity employs a user-centered design approach to promote **city residents' adoption of the urban technology platforms**, and encourage their engagement with the social platforms.

The UHDNetCity will be able to bring **measurable mobility benefits** and improve Tallahassee residents' experience in terms of lowering energy consumption, reducing congestion, crashes and traveler frustration, and providing a more streamlined and cost-effective system to operate and maintain the city.

CI2
Collaborative Intelligent Infrastructure Lab

Other Faculty
Civil and Environmental Engineering

- **Ren Moses and Eren Ozguven (Transportation)**

  - ❖ Smart infrastructure and connected vehicles
  - ❖ Connected Vehicles Testbed consists of 22 signalized intersections on Mahan Drive here in Tallahassee
  - ❖ Awarded $200k by FDOT and City of Tallahassee to evaluate Roadside Units (RSUs) and Onboard Units (OBUs) currently being installed, which will enable vehicle-to-infrastructure (V2I) communication. This is a Phase I project to last one year with the potential for substantial additional funding in Phase II.

- **John Sobanjo (Transportation and Construction)**

  - ❖ Director of Transportation Center on Accessibility and Safety of an Aging Population (ASAP)
  - ❖ Recently completed study which used driving simulator to capture the driver behavior at the merge locations into a freeway with mixed autonomous/conventional traffic
  - ❖ Network-level bridge and pavement deterioration models that inform safety and fiscal decisions by state and local municipalities

Other Faculty
Civil and Environmental Engineering

- **Maxim Dulebenets (Transportation) and Wenrui Huang (Hydrology)**

  ❖ Multi-disciplinary effort to predict and mitigate the effects of natural and man-made hazards on critical infrastructure (including electricity networks, ports, airports, nuclear plants, roads, and bridges), especially in the North Florida and panhandle regions, with a focus on coastal events .

- **Yassir Abdelrazig (Construction)**

  ❖ Coordinator of college's strategic initiative on sustainable and resilient infrastructure, which aims to plan, design, build, operate and dispose of systems that are environmentally responsible, can withstand disruptions, adapt to changing conditions, perform effectively, and recover rapidly
  ❖ Currently researching sustainable building design and construction models for school buildings

- **Sungmoon Jung (Structures and Energy)**

  ❖ Modeling wind energy resource, especially in Florida; response of high-rise buildings and wind turbines subjected to hurricane-force winds.

Other Faculty

Civil and Environmental Engineering

- **Clayton Clark (Environmental)**

  ❖ Teaches and performs research in area of STEM and Public Policy to encourage and facilitate communication between STEM professionals and policy makers, which is critical to sound policy decisions on topics affecting urban regions, including water quality, climate issues, food safety and security, etc..

- **Youneng Tang and Gang Chen (Environmental)**

  ❖ Reduction and sequestration of greenhouse gas emissions
  ❖ Environmentally friendly biological treatments for drinking-water
  ❖ In place bioremediation of contaminated soil and groundwater
  ❖ Electromagnetic wave-induced methods for removing heavy metals from sewage

- **Tarek Abichou (Geotechnical)**

  ❖ Landfill covers that reduce both greenhouse gas emissions and groundwater pollution

Georgianna Strode

Florida **R**esources & **E**nvironmental **A**nalysis **C**enter (FREAC)

- My Research Background:

  Our organization works with Geographic Information Systems (GIS).
  I started as a computer programmer and along the way became a geographer.

  Words I can relate to:
  - Maps
  - Data science
  - Visual analytics

- How I'd Like to be Involved in a Smart Cities Project:

  Our organization is an applied research group.

  We provide **technical support** for campus organizations, local and state governments, private agencies, and non-profits.

  We have developed **high-resolution population data** by mixing census data with the Florida Department of Revenue's property tax database. The result is an estimated population for all of Florida's 9 million land parcels.

Population Estimate for Every Land Parcel in Florida

Census Data Combined with Property Appraiser Data

Dots represent estimated population per land parcel
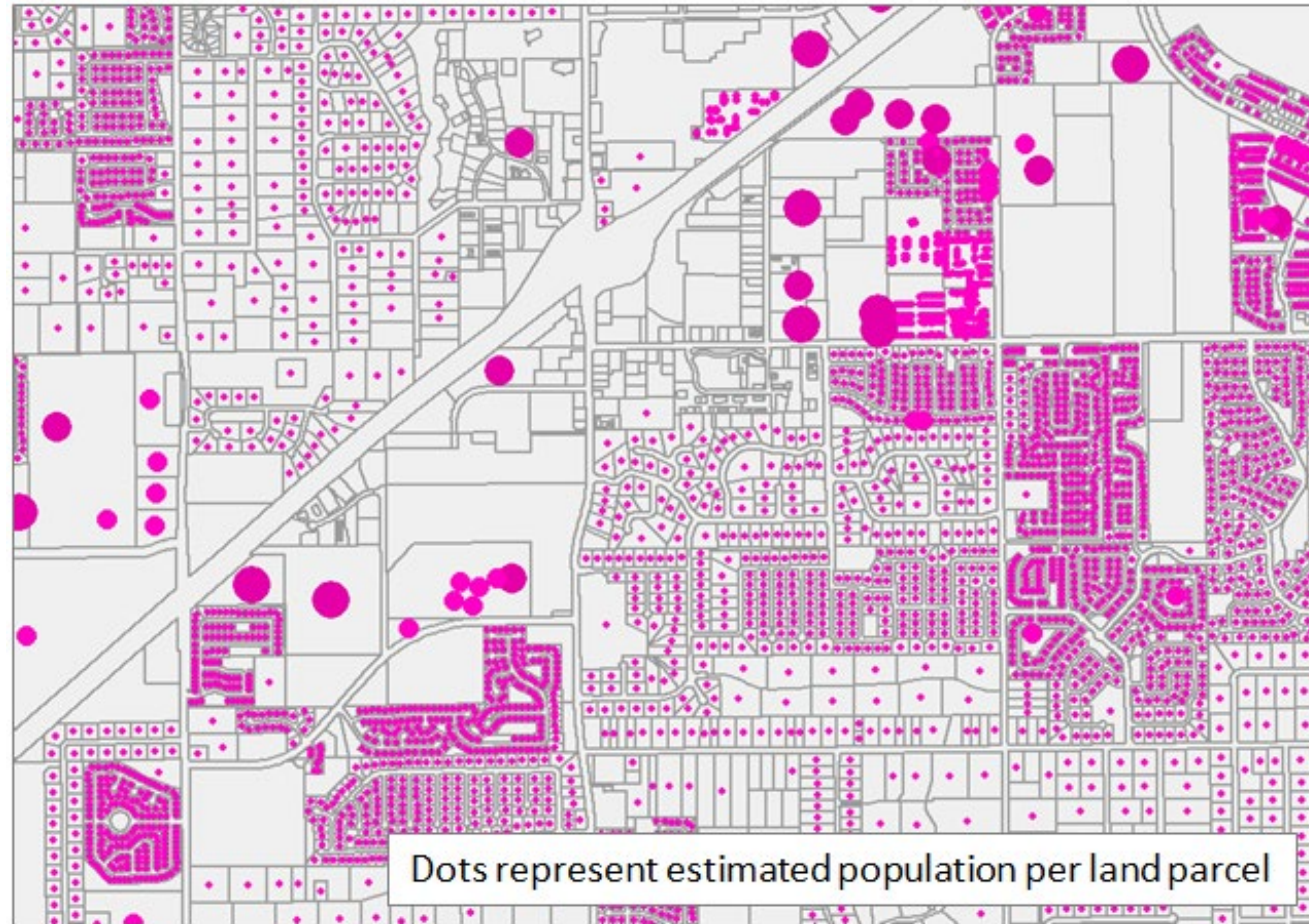
Two Ways to Calculate Population

Traditional Population Methods Can Result in an *Undercount !!*

Census Block Group Data

Population is assumed to be spread evenly across an area. Calculating the number of people at risk in an event is done through a ratio of the size of the risk area and the size of the census area (e.g. 20% of the land area and area assumes 20% of population).

Population at Risk
In this example: 3,688

KEY
○ Area at Risk
▢ Population ↓
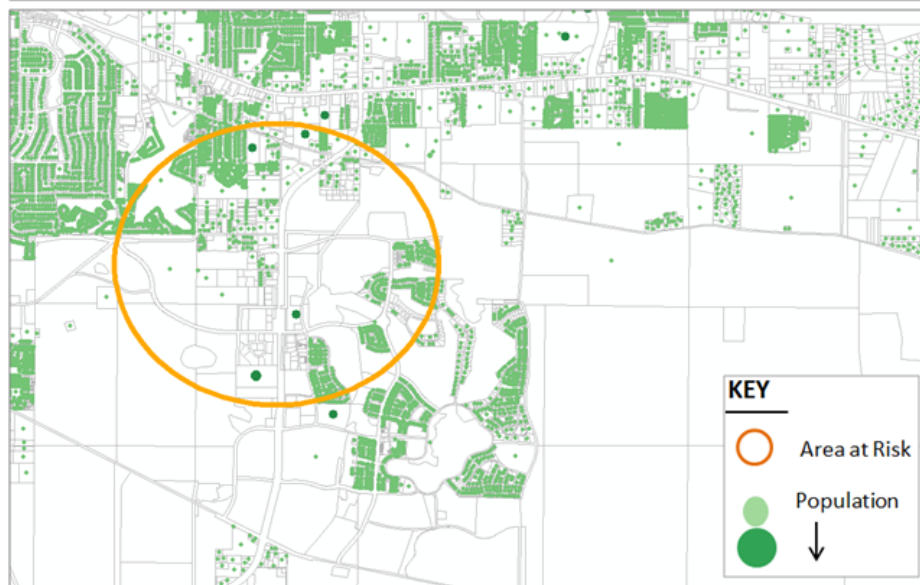
Dasymetric Parcel-based Estimations

Population is estimated for each land property parcel. Calculating the number of people at risk in an event is done by summing the estimates for all parcels within the area at risk.

Population at Risk
In this example: 5,267

KEY
○ Area at Risk
● Population ↓

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U.S. National Grid (USNG)

Cadastral

Larger circles indicate higher populations.

Irregular data impedes analysis. Visualization is difficult when zoomed out.

Grid

Darker colors indicate higher populations.

Grid format preserves density. Improves visualizations and analysis.
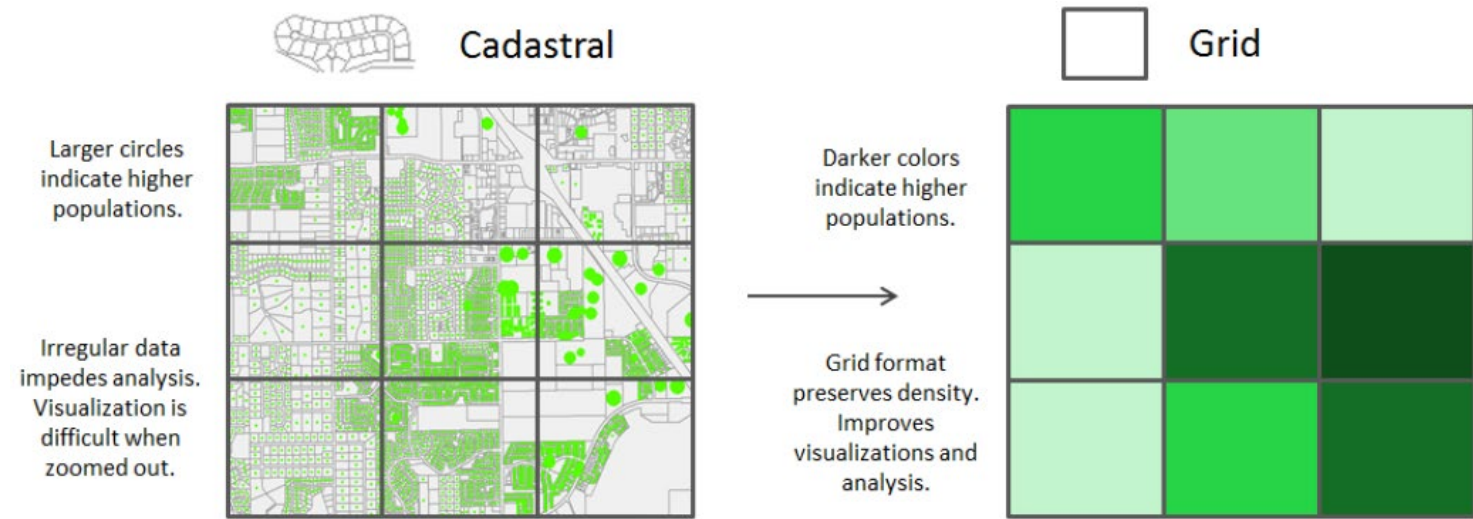
- Preserve data density
- Important features are prominent
- Facilitates statistics and analysis
- Does not mask data patterns
- Perfect for data archival
- USNG is a national standard used
    By FEMA, US Park Service, and more

2010 population using a 1-km US National Grid cell
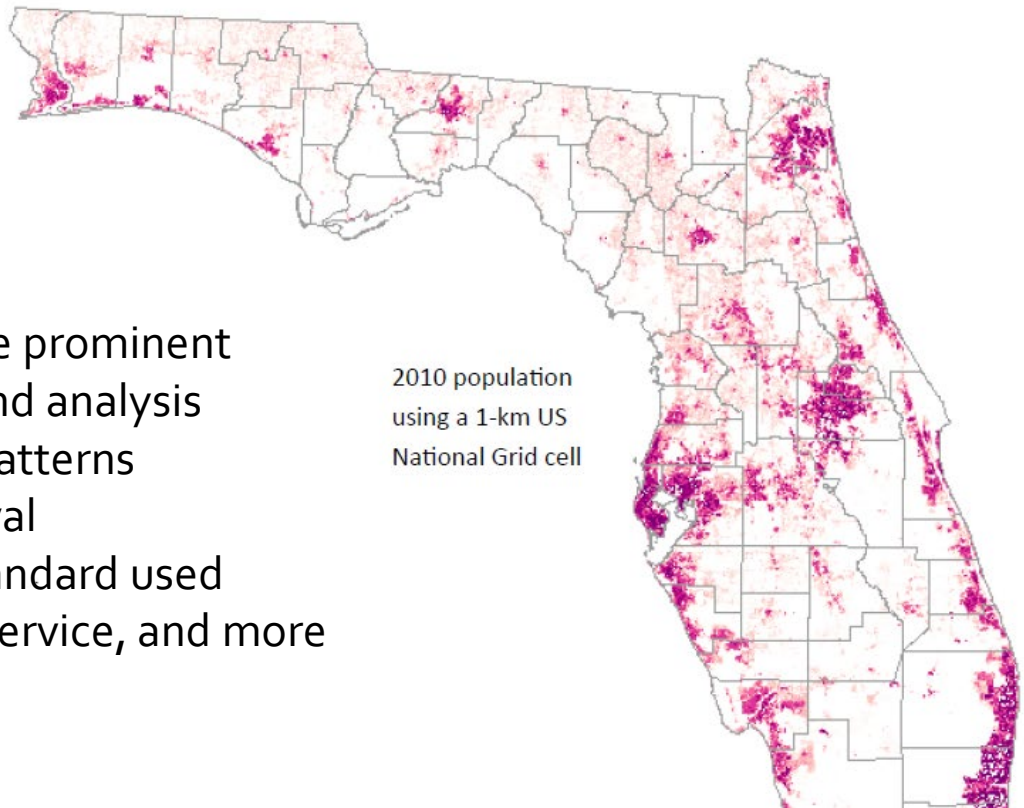
Sample Using Land Use and Land Cover Data

Land Cover

Land Use

Collaborative Collision: Smart Cities 2018
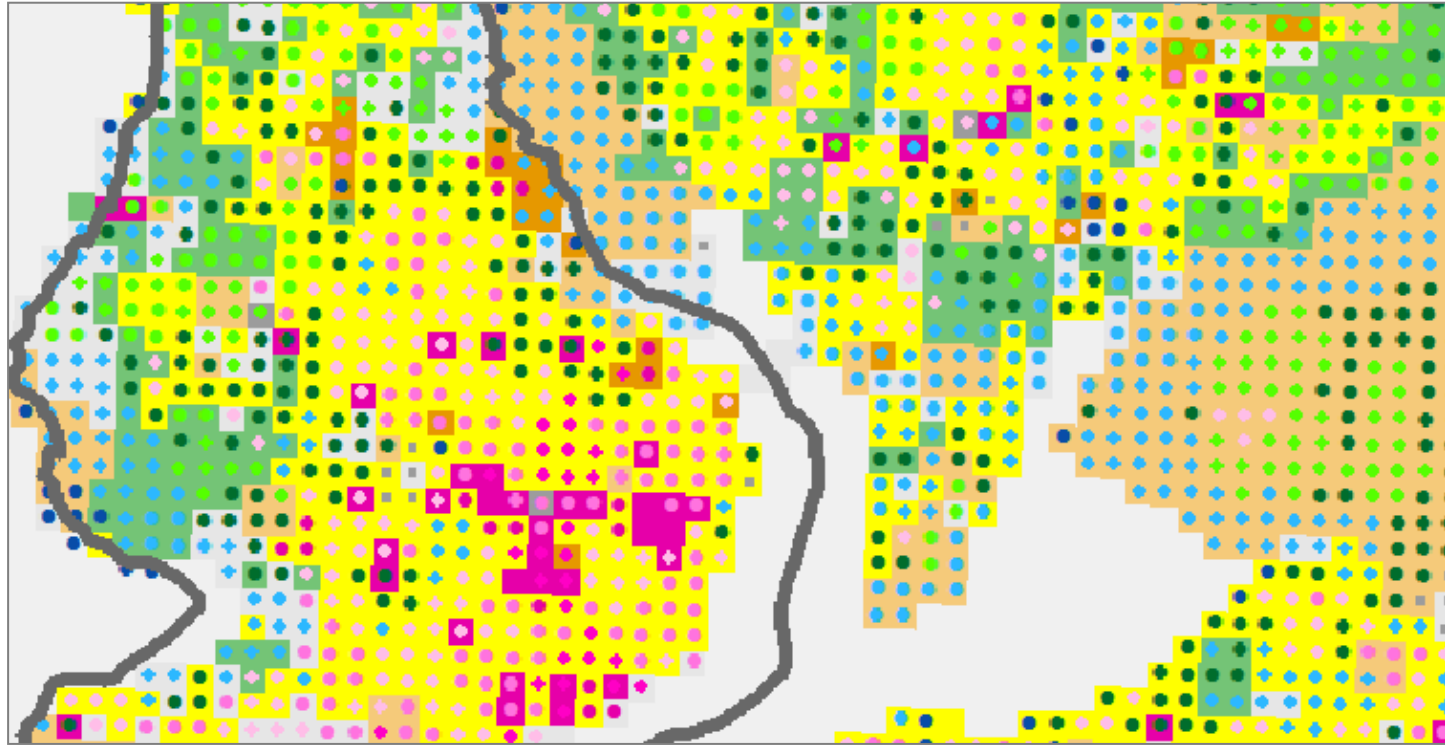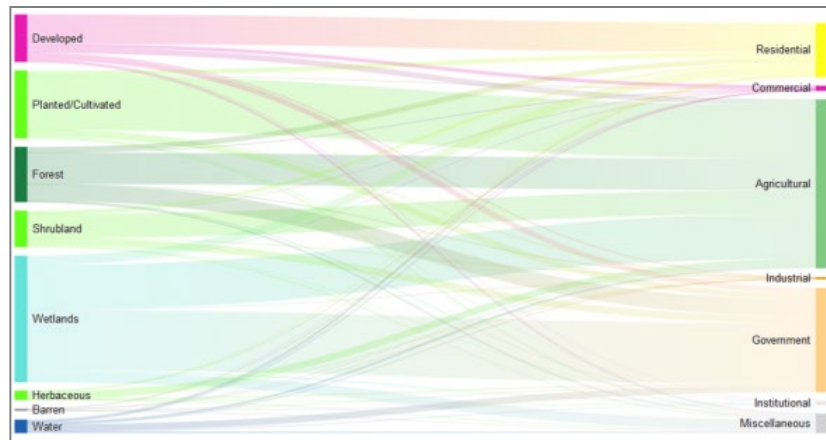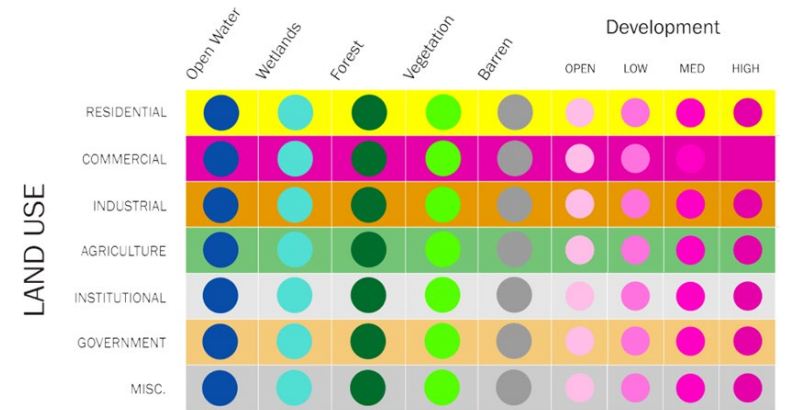
Population Using Public & Private
Drinking & Wastewater Infrastructures

Georgianna Strode
Florida Resources and
Environmental Analysis
Center (FREAC)

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644-5886

freac.fsu.edu
fl-usng-gis.org

For More Information
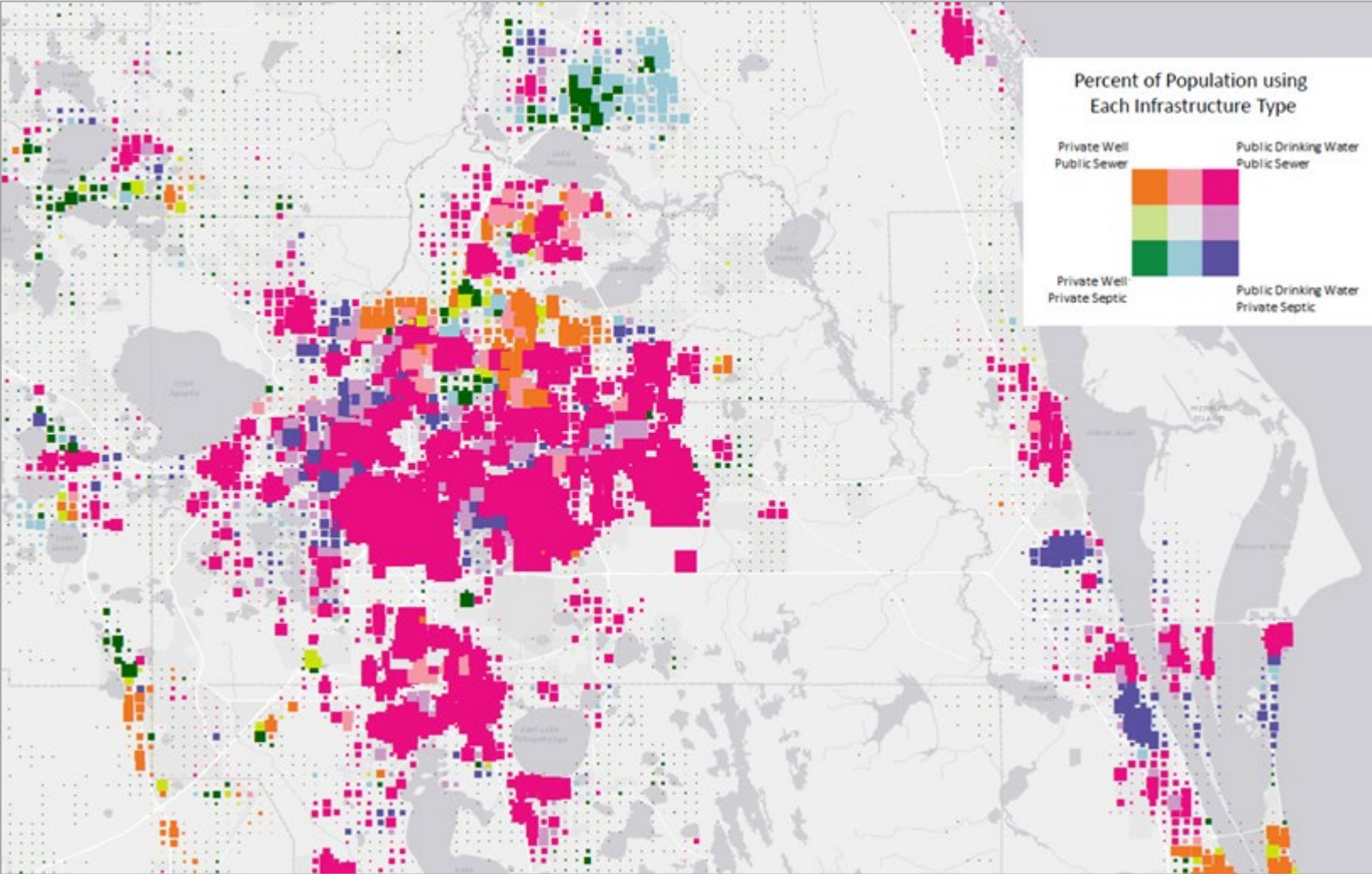
Percent of Population using
Each Infrastructure Type

Private Well
Public Sewer

Public Drinking Water
Public Sewer

Private Well
Private Septic

Public Drinking Water
Private Septic

Collaborative Collision: Smart Cities 2018

Tian Tang

Askew School of Public Administration and Policy

- **My Research Background:**
- Technology policy, environmental and energy policy, public management

- Technology innovation, Public sector innovation, use of information communication technologies in public service delivery (e-government & e-governance）

- **How I'd Like to be Involved in a Smart Cities Project:**
- What social, economic & political factors drive/hinder the adoption and diffusion of smart city technologies across cities

- How the use of emerging smart city technologies affects policymaking, implementation, and more broad social outcomes (i.e. urban sustainability, city resilience etc.）

Tian Tang

Askew School of Public Administration and Policy

Recent Works (Under Review):

- **Design and Adoption of DigiTally (smart city mobile apps in Tallahassee)**

- **Tang, T.**, Fay, D, Hou, J., and Annis, C., Revisit the Drivers and Barriers to E-governance in the Mobile Age: A Case Study on the Adoption of Smart City Mobile Apps

- Hou, J., **Tang, T.**, Annis, C., Wu, Y., Arghandeh, R., Ozguven, E., The Road toward Smart Cities: A Focus Group Study on Citizens' Perceptions and Use of Mobile Applications for City Management.

- **Adoption of "Internet of Things" across US cities**

- **Tang, T.**, & Ho, A., A Path-Dependence Perspective on the Adoption of Internet of Things: Evidence from Early Adopters of Smart and Connected Sensors in the United States.

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Maribel Trejo
Family and Child Sciences

- My Research Background:

    We've been doing research for about 20 years in the Latino community. So, we've done a lot of community engagement in that hard-to-reach population, especially in rural areas in NC, OK, FL, and GA. During that time, we've done research on occupational health and safety, and in education. Right now, we're working on a project called PISCA (Pesticides and Heat Stress Prevention that is Culturally Appropriate) that focuses on preventing pesticide exposure and heat stress among agricultural workers in Southern Georgia and North Florida. Our work is essentially focused on eliminating social injustices.

- How I'd Like to be Involved in a Smart Cities Project:

    Due to all the experience we've accumulated doing research in hard-to-reach populations, we'd like to bring our expertise in community engagement to help with the Smart Cities Project.

Break

10 Minutes

Christopher S. Edrington, PhD, PE

Energy Conversion and Integration Thrust

Electrical and Computer Engineering/Center for Advanced Power Systems

- **We bring expertise in:**
  - Distributed control for power and energy management
  - Fault tolerant control via advanced methodologies from the actuator to system
  - Advanced methodologies to seamlessly incorporate multiphysics objectives into overall system control
  - tem level
  - Evidence theory approaches to incorporate higher-level functionality to system control for consideration of equipment failure and vulnerability
  - Advanced system monitoring methodologies
    - Real-time Complexity analysis
    - Real-time Stability analysis
  - Sensor placement
    - Analysis on where sensors should be placed and associated computational burdens
    - Awareness in the system to applications such as system reconfiguration, resiliency, and immunity to faults
  - Experience in development of real-time multiphysics models of systems
    - Generators, motors, electrolyzers, wind, PV, fuel cells, power architectures, power electronics, and thermal systems
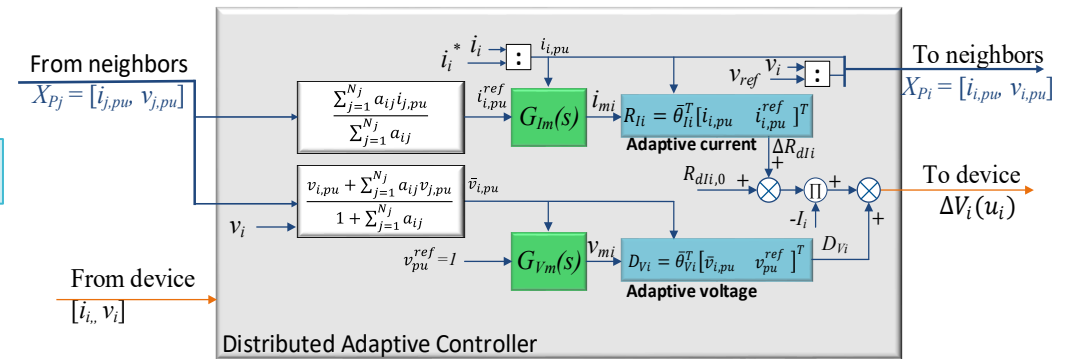
Christopher S. Edrington, PhD, PE

Energy Conversion and Integration Thrust

Electrical and Computer Engineering/Center for Advanced Power Systems

- **We bring expertise in:**
  - Coding for real-time control on the following platforms:
    - Texas Instrument DSPs, Altera FPGAs, NI RIO
  - Data acquisition via National Instruments Labview-based systems
  - Real-time modeling via:
    - OPAL-RT, Typhoon, RTDS, and Matlab/Simulink
  - Experience in:
    - Processor in the Loop, Controller Hardware in the Loop, Power Hardware in the Loop based studies
  - Experience in developing Hybrid AC/DC Microgrids and conduction of studies in management of such systems
  - Application of advanced optimization techniques:
    - Crow Search Algorithms (CSA), Particle Swarm Optimization (PSO), Dynamic Programming, and Alternating Direction Method of Multipliers (ADMM)

Christopher S. Edrington, PhD, PE

Energy Conversion and Integration Thrust

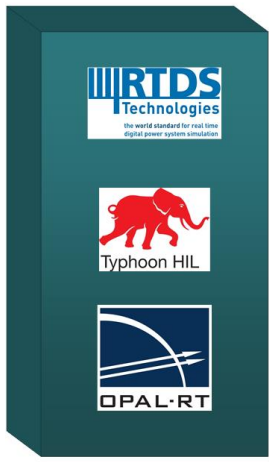## Electrical and Computer Engineering/Center for Advanced Power Systems

- **How I'd Like to be Involved in a Smart Cities Project:**
  - Energy and power management, systems awareness, sensor placement, multiphysics system modeling are all directly applicable to instantiation, integration and development of Smart Cities
    - Controls, communications, cyber-physical systems security
    - Reduced Scale Advanced Demonstrators (RSAD)
  - Would like to work synergistically with researchers who are thinking holistically about passive and active systems and their integration and design cycles
  - Would like to work with researchers who are considering integration of:
    - Local and mass transportation
    - Industrial, residential and commercial complexes
    - Medical systems
    - Novel energy systems

Christopher S. Edrington, PhD, PE

Energy Conversion and Integration Thrust

Electrical and Computer Engineering/Center for Advanced Power Systems
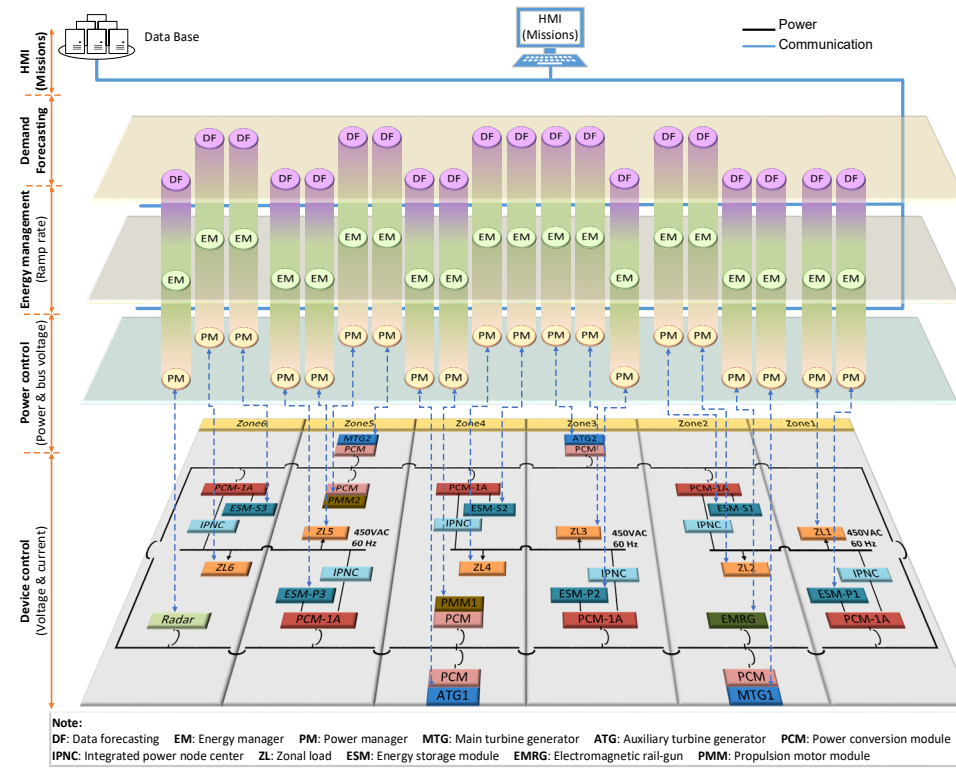
System level controls and architecture

Detailed control implementation

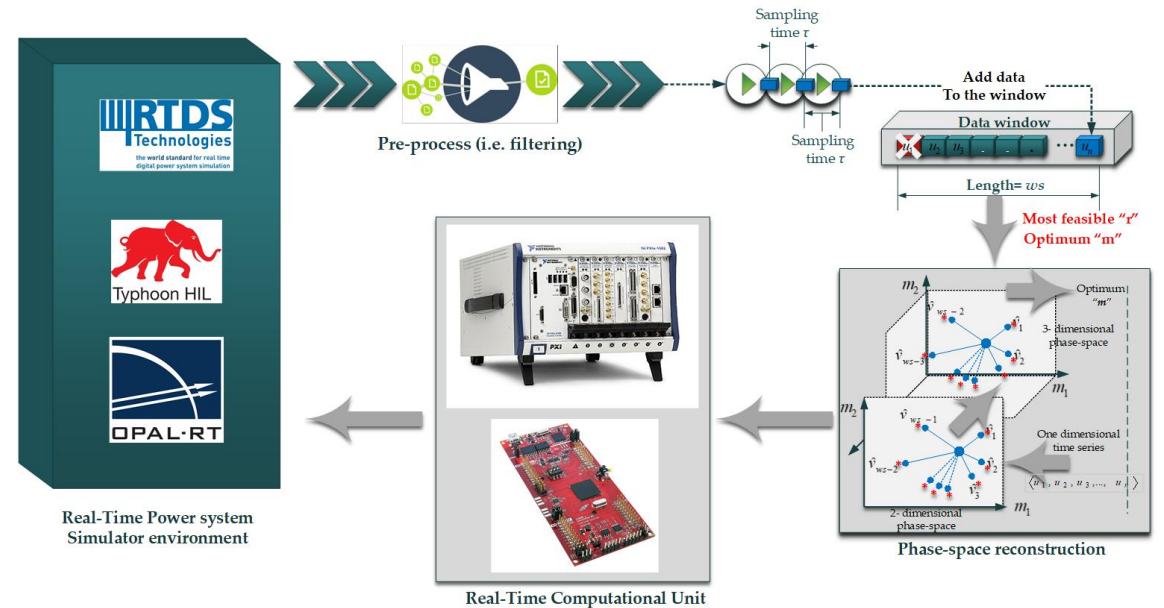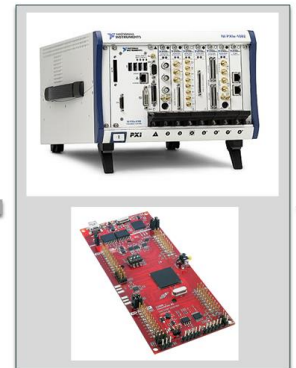# Christopher S. Edrington, PhD, PE

Energy Conversion and Integration Thrust

Electrical and Computer Engineering/Center for Advanced Power Systems
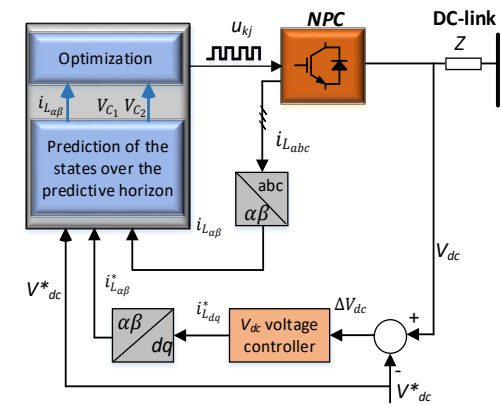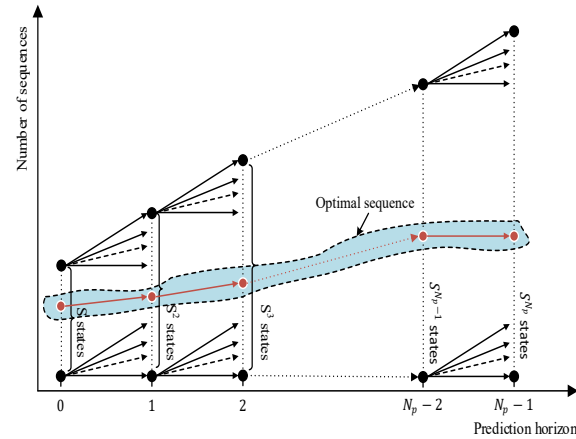
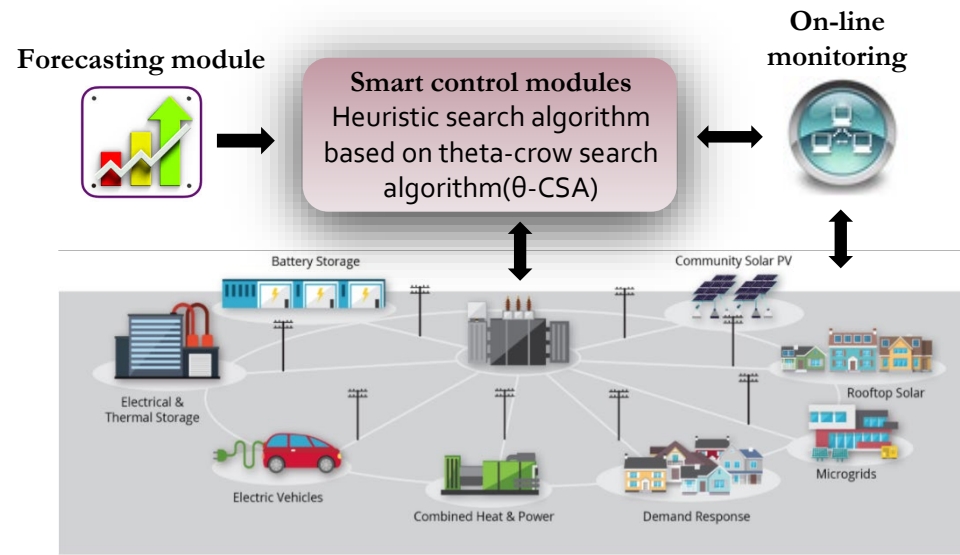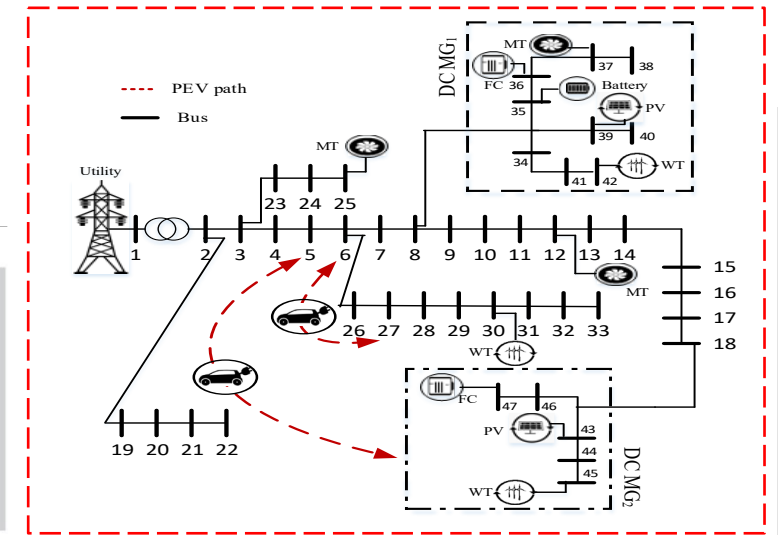Sequenced-based controls and architecture

System Awareness

Christopher S. Edrington, PhD, PE

Energy Conversion and Integration Thrust

Electrical and Computer Engineering/Center for Advanced Power Systems

Forecasting module

On-line monitoring

Smart control modules
Heuristic search algorithm based on theta-crow search algorithm(θ-CSA)

Energy Management

Hybrid Microgrids
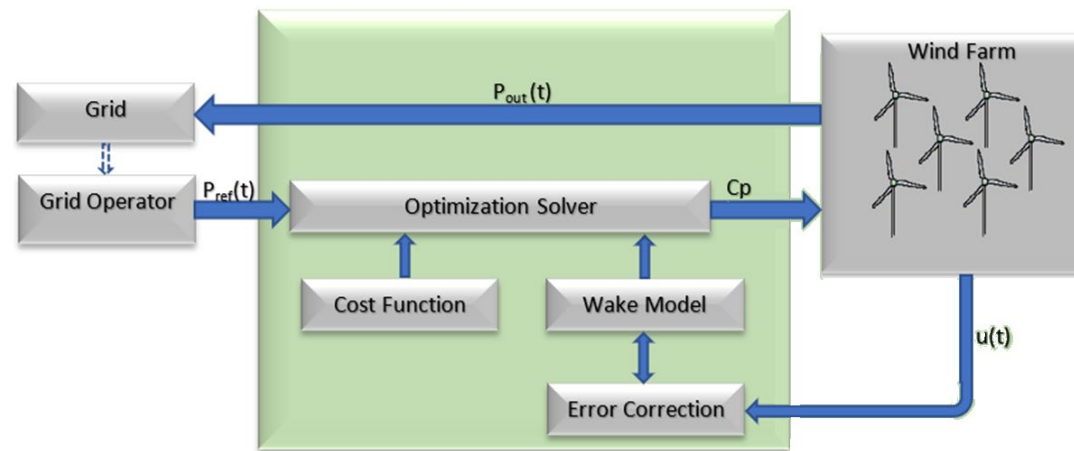
Christopher S. Edrington, PhD, PE

Energy Conversion and Integration Thrust

Electrical and Computer Engineering/Center for Advanced Power Systems

- **Team:**
  - Dr. Tuyen Vu, Research Faculty I
  - Dr. Hesan Vahedi, Postdoctor
  - Mr. David Gonsoulin, PhD student
  - Mr. Dallas Perkins, PhD student
  - Mr. Huawei Yang, PhD student
  - Mr. Gokan Ozkan, PhD student
  - Ms. Behnaz Papari, PhD student
  - Dr. Jim Stright, PhD student

- **Relevant Grants:**
  - NSF FREEDM
  - NSF CREDENCE
  - ONR Distributed Controls
    - 6.1 and 6.2 efforts
  - ONR Electric Ship Development Consortium
    - 6.2 efforts

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Energy Conversion and Integration Thrust

Electrical and Computer Engineering/Center for Advanced Power Systems

- **Relevant Publications:**

F. Diaz, T. Vu, D. Gonsoulin, H. Vahedi, **C. S. Edrington**, Enhanced Performance of PV Power Control using Model Predictive Control, *Solar Energy (accepted for publication).*

B. Papari, **C. S. Edrington**, (2017), Effective Energy Management of Hybrid AC-DC Microgrids with Storage Devices, *IEEE Transactions on Smart Grid, (IEEE Early Access).*

B. Papari, **C. S. Edrington**, and F. Kavousi-Fard, (2017), An Effective Fuzzy Feature Selection and Prediction Method for Modeling Tidal Current: A Case of Persian Gulf, *IEEE Transactions on Geoscience and Remote Sensing, (IEEE Early Access).*

F. Ferdowsi, H. Vahedi, **C. S. Edrington**, and T. El-Mezyani, (2017), Dynamic Behavioral Observation in Power Systems using Real-time Complexity Computation, *IEEE Transactions on Smart Grid, (IEEE Early Access).*

T. Vu, D. Gonsoulin, F. Diaz, **C. S. Edrington**, and T. El-Mezyani, (2017), Predictive Control for Energy Management for Ship Power Systems under High-power Ramp Rate Loads, *IEEE Transactions on Energy Conversion, vol. 32, no. 2, pp. 788 – 797.*

T. Vu, D. Perkins, F. Diaz, D. Gonsoulin, **C. S. Edrington**, and T. El-Mezyani (2017), Robust Adaptive Droop Control for DC Microgrids, *Electric Power Systems Research, vol. 146, pp. 95 – 106.*

T. Vu, F. Diaz, S. Paran, T. El-Mezyani, and **C. S. Edrington** (2017), An Alternative Distributed Control Architecture for Improvement in the Transient Response of DC Microgrids, *IEEE Transactions on Industrial Electronics, vol. 64, no. 1, pp. 574 – 584.*

A. Salmani and **C. S. Edrington** (2015), Small-signal Stability Assessment of a Single-phase Solid State Transformer through PHIL Experiment, *International Journal of Power Electronics, vol. 7, no. 3/4.*

M. Cupelli, F. Ponci, G. Sulligoi, Andrea Vicenzutti, **C. S. Edrington**, T. El-Mezyani, A. Monti (2016), Power Flow Control and Network Stability in and All Electric Ship, *Proceedings of the IEEE, vol. 103, no. 12, pp. 2355 – 2380.*

A. Salmani, N. Asr, **C. S. Edrington** and M. Chow (2015). Online and Offline Stability Analysis Methods for the Power Electronic-based Components in Design and Operational Stages, *IEEE*

Chiwoo Park

Industrial and Manufacturing Engineering

chiwoo.park@eng.famu.fsu.edu

- **My Research Background**:

  Machine Learning and Big Data

  Mainly Applied for Industrial Systems Analysis such as Manufacturing Systems and Service Systems

  Some specializations:
  1. Sensing, Monitoring and Control of Dynamic Processes
  2. Spatial-Temporal Data Analysis (Kriging)
  3. Imagery / Remote-Sensing Data Analysis

- **How I'd Like to be Involved in a Smart Cities Project**:

  Like to work with domain experts in Smart Cities to identify and solve many unique big data issues existing in Smart Cities.

  Interested in participating or building a research team to write research proposals in Smart Cities

Chiwoo Park

Industrial and Manufacturing Engineering

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eng.famu.fsu.edu/~chiwoo.park

Related proposal opportunities I can lead:
- NSF Big Data (Innovative Applications)
- AFOSR DDDAS (Dynamic Data Driven Application Systems)
- NSF CDS&E

Interested in participating in a big team for
- NSF Smart and Connected Communities (S&CC)
  Letter of Intent Due (January 30, 2018)
  Full Proposal Deadline (February 28, 2018)

Current Grants: NSF, AFOSR, Oak Ridge NL, Brookhaven National Lab; Mostly Related to Imagery Data Analysis for Manufacturing Systems Analysis

Recent Publications: Many top journal publications in Analytics, J. of Machine Learning Research (4)
IEEE TPAMI (2)
Annals of Applied Statistics (1)
Technometrics (2)
Pattern Recognition (one forthcoming)
Operations Research, IIE (3)

Gary VanLandingham

Askew School of Public Administration and Policy

My Research Background:
- Evidence-based policymaking, program evaluation, performance management, use of data in governance

How I'd Like to be Involved in a Smart Cities Project:
- Depends on the scope; ideally assessing cities' current use of evidence to inform their policy choices (particularly in social services) and their policies that influence evidence use
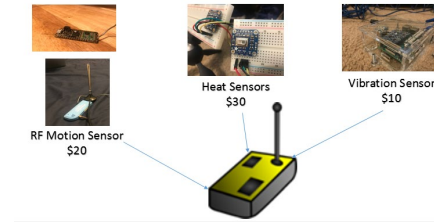
Zhenghao Zhang

Computer Science

- My Research Background:
  - Wireless communication networks
    - Network protocol design, implementation, and testing
    - Network scheduling algorithm design and optimization
  - Sensors and applications
    - Fall detection
  - Data analysis
- How I'd Like to be Involved in a Smart Cities Project:
  - Working on a collaborative project with colleagues, can contribute on
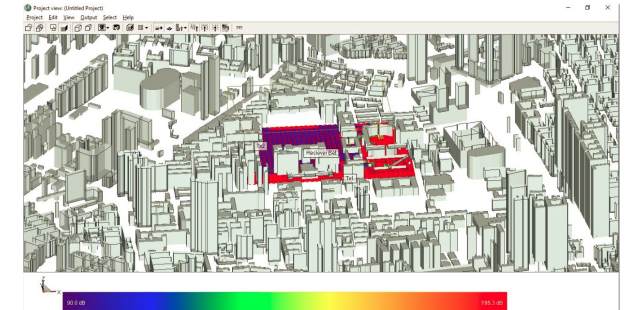   - Wireless communication system
    - Sensor network design and testing
    - Big data analysis

Recent work and grants
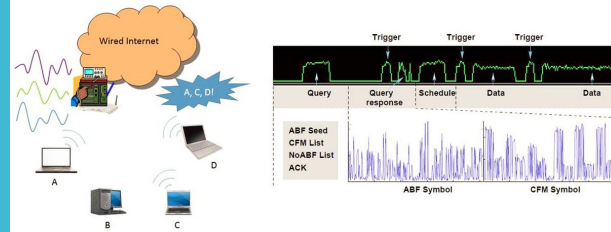
Analog Bloom Filter for 5G Networks

Wearable-Free Fall Detection

City LTE Big Data Analysis

- Recent NSF grants:
    - **Zhang, Zhenghao (PI). (Aug 2016–Jul 2019).** *NeTS: Small: Sparse Approximation of the Channel State Information For Wi-Fi Networks*. Funded by National Science Foundation. (1618358). Total award $360,751.
    - **Zhang, Zhenghao (PI). (Sep 2012–Aug 2017).** *CAREER: Addressing Fundamental Challenges for Wireless Coverage Service in the TV White Space*. Funded by National Science Foundation. (1149344). Total award $450,883.

Mariya Letdin

Department of Risk Management/Insurance, Real Estate, and Legal Studies
College of Business

- My Research Background:

  - House Prices
  - Residential Mortgages
  - City decentralization
  - Commute Times
  - Housing Location Choice
  - School Quality

- How I'd Like to be Involved in a Smart Cities Project:

  I'd like to study current and optimal:

  - Commute Times, Traffic and Transportation
  - House Prices
  - Housing Development
  - Location of Amenities
  - Decentralized City

Collaborative Collision: Smart Cities 2018

Relevant Work

In 2018 I will serve as co-organizer and guest editor at the **Endogenous Amenities and Cities Symposium** organized jointly with the DeVoe L. Moore Center (College of Social Sciences) and the Real Estate Center (College Of Business) at Florida State University with a special issue of *Journal of Regional Science*
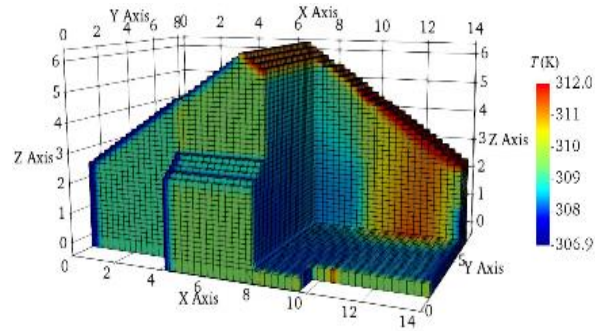
My recent relevant work:
"Non-monocentric Household Location" by Mariya Letdin and Hyoung Suk Shim

Work I am inspired by:
J. K. Brueckner, J.-F. Thisse, and Y. Zenou. Why is central Paris rich and downtown Detroit poor?: An amenity-based theory. *European economic review*, 43(1):91–107, 1999

Juan C. Ordonez

Mechanical Engineering

- **My Research Background:** Thermodynamics and Heat Transfer- Modeling and Optimization of Energy Systems
- **How I'd Like to be Involved in a Smart Cities Project:** Providing Thermal Models for Model Predictive Control Intelligent Systems & through the OGZEB as platform to test smart systems at residential level.
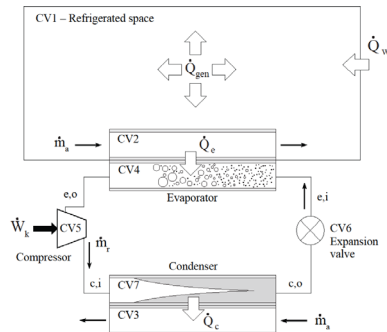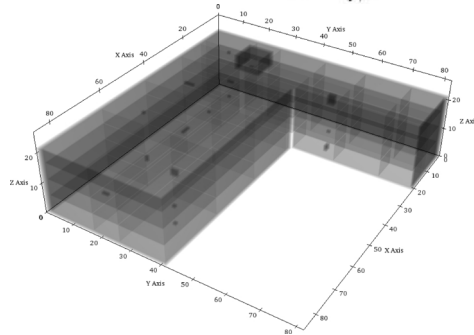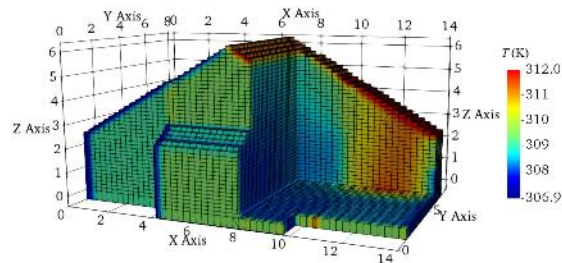
Facility - OGZEB
- Offers as a research, development, and testing site for building-related systems.
- Ability to retrofit to facilitate the testing of new devices and/or systems.
- Progression towards building science-related courses, major/minor, and/or department.

vemBUILDING

Juan C. Ordonez

Mechanical Engineering

PRESENT
- Intermediate model – 3D, dynamic, and fast.
- Versatile – component-level –> system-level – HVAC, building, etc.
- Any building geometry can be imported.
- Experimentally validated.

FUTURE
- Model enhancement – lighting, incorporation of more building components, etc.
- Model calibration and validation.
- Uncertainty quantification and optimization.
- Adapt for urban-scale modeling and simulation by coupling with GIS.
- Online platform for real-time energy monitoring and simulation.

John Sobanjo, Ph.D., P.E., Fellow A.S.C.E.

Director, Center for Accessibility and Safety for an Aging Population (ASAP)

FAMU-FSU COE Phase II Research Leadership Theme: Augmenting mobility in urban environments

Interconnected Smart Transportation Systems: Research and Education Capacity Building
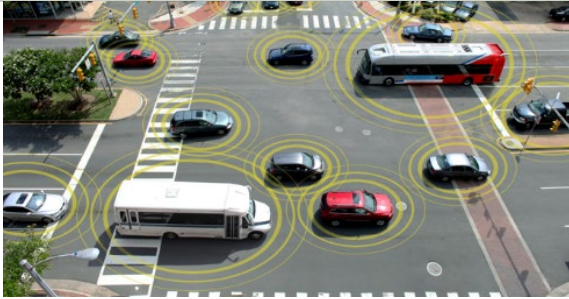
Toward SMART CITIES, A Plan for America's Infrastructure

Urban Mobility & Technology

Promoting Successful Longevity: A Transportation-Focused Effort to Improve Safety and Accessibility

- NSF ERC Proposal: Theme of multidisciplinary research and outreach programs – includes smart city.
- Focus on technology and aging population.
- Identify resource needs: faculty, facility, etc.
- Smart city is a "hot" competitive research area: MIT, Carnegie Mellon, UCF, etc.
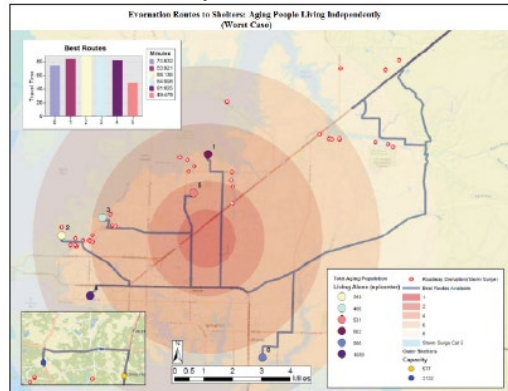
Center for Accessibility and Safety for an Aging Population

Florida State University
in Partnership with Florida A&M University
and University of North Florida

Tier I University Transportation Center (UTC) Funded by the U.S. Department of Transportation (USDOT)

Multi-modal emergency transportation
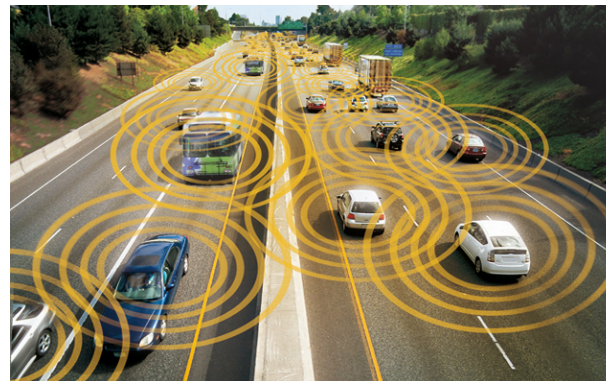

Evacuation of seniors in Panama City

3-D transportation safety models

Biomechanics of older drivers in crashes

older drivers at roundabouts

older drivers and connected/automated vehicles

Distracted driving performance