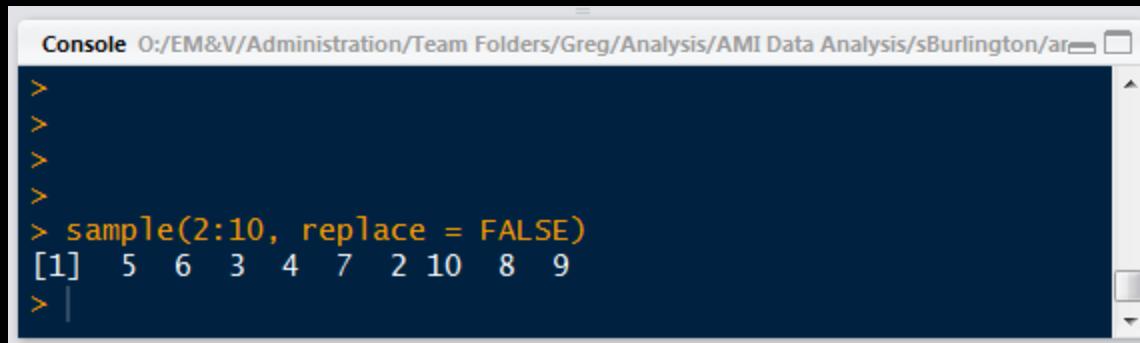


- **Andy Reagan**: "Measuring Social Data"
- **Colin Riggs**: "Training Navigational Systems for ROVs"
- **Uwe Heiss**: "A Startup: Big Data Analytical Services for Healthcare Organizations"
- **Ben Littenberg**: "Obesity and the Built Environment"
- **Ahmed Hamed**: "K-H Networks in Action and applications"
- **Abe Collins**: "Landscape Feedback Systems"
- **Kristian Omland**: "Traditional R Graphics for Sparklines and Logos"
- **Robin Weber**: "An Intro to Criminal Justice Data in VT"
- **Greg Fanslow**: "Dynamic Time Warping"
- **Clayton Miller**: "Data Driven Buildings"



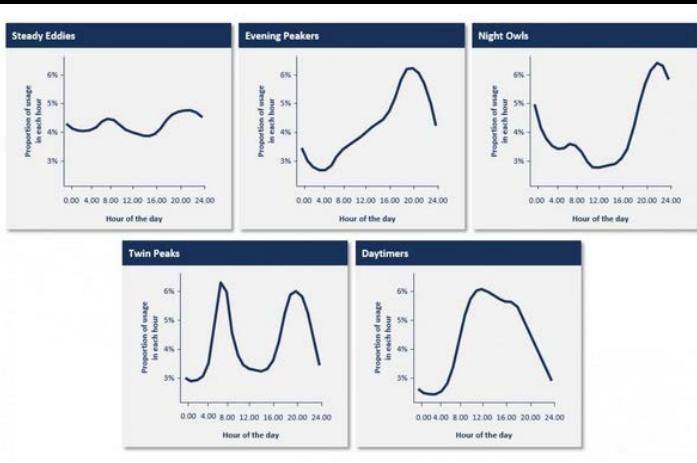
The image shows a screenshot of an R console window. The title bar reads "Console O:/EM&V/Administration/Team Folders/Greg/Analysis/AMI Data Analysis/sBurlington/ar". The console area displays the following R session:

```
>
>
>
>
> sample(2:10, replace = FALSE)
[1] 5 6 3 4 7 2 10 8 9
> |
```

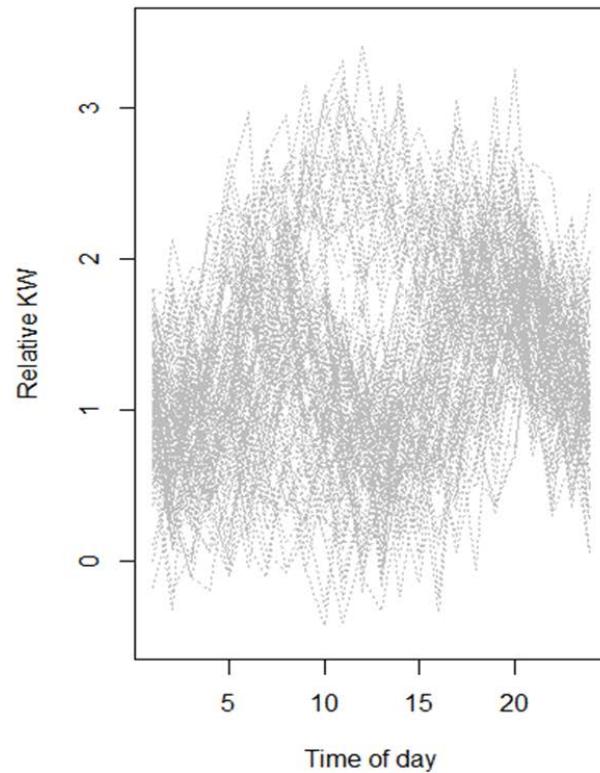
1. **Greg Fanslow:** "Dynamic Time Warping"
2. **Abe Collins:** "Landscape Feedback Systems"
3. **Uwe Heiss:** "A Startup: Big Data Analytical Services for Healthcare Organizations"
4. **Ben Littenberg:** "Obesity and the Built Environment"
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8. **Robin Weber:** "An Intro to Criminal Justice Data in VT"
9. **Clayton Miller:** "Data Driven Buildings"
10. **Kristian Omland:** "Traditional R Graphics for Sparklines and Logos"

# Let's Do the Dynamic Time Warp...

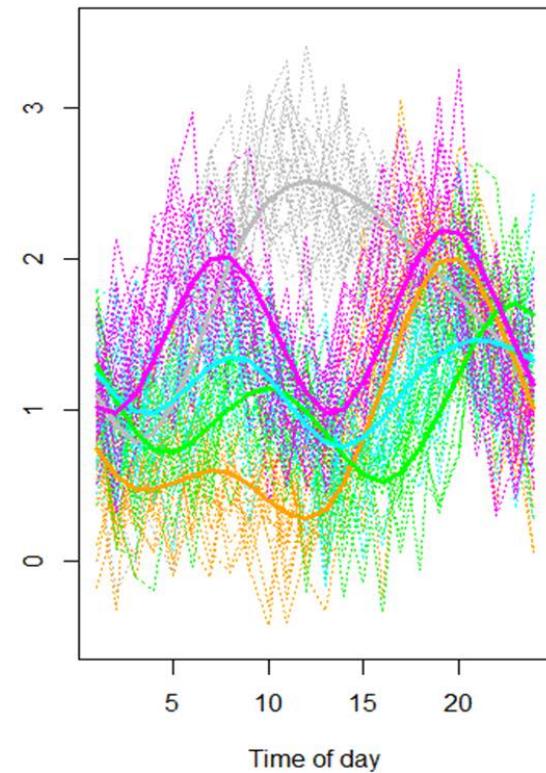
Greg Fanslow  
VEIC / #BTVdatasci



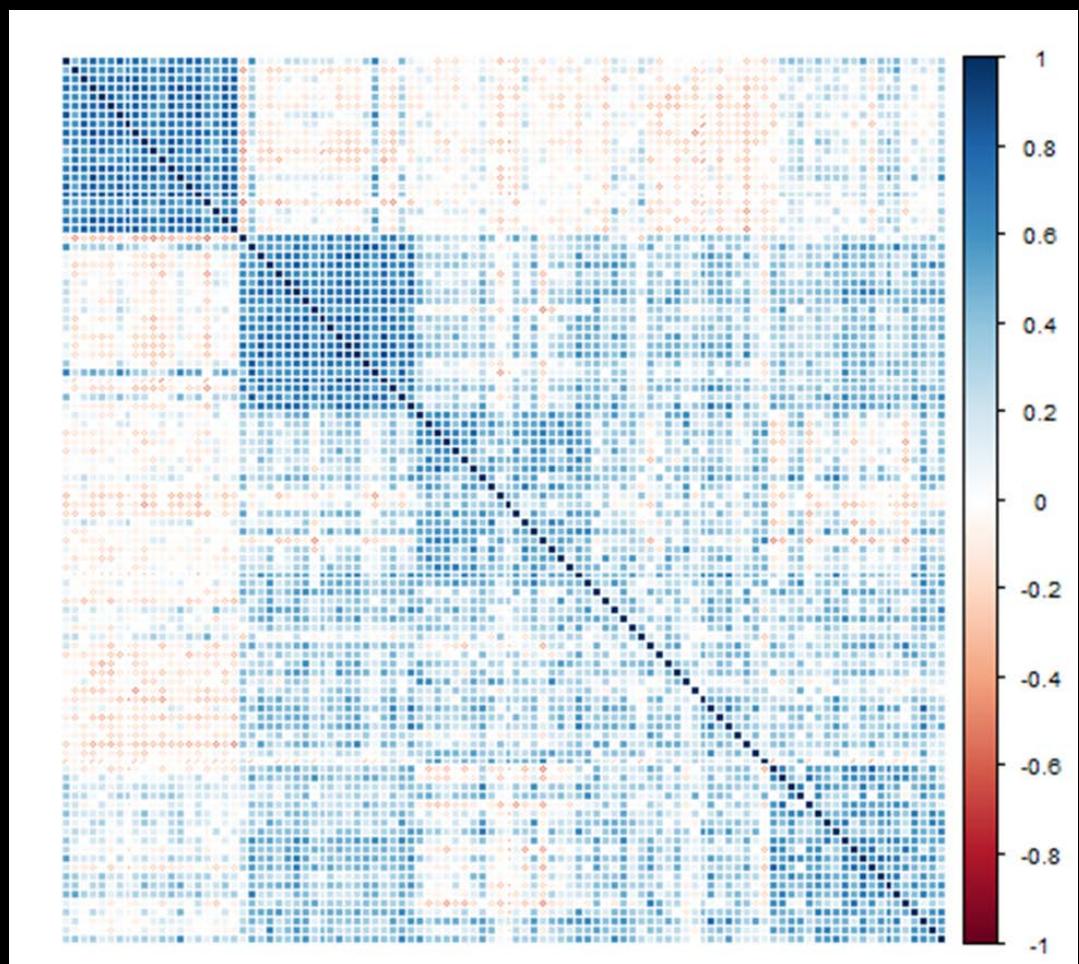
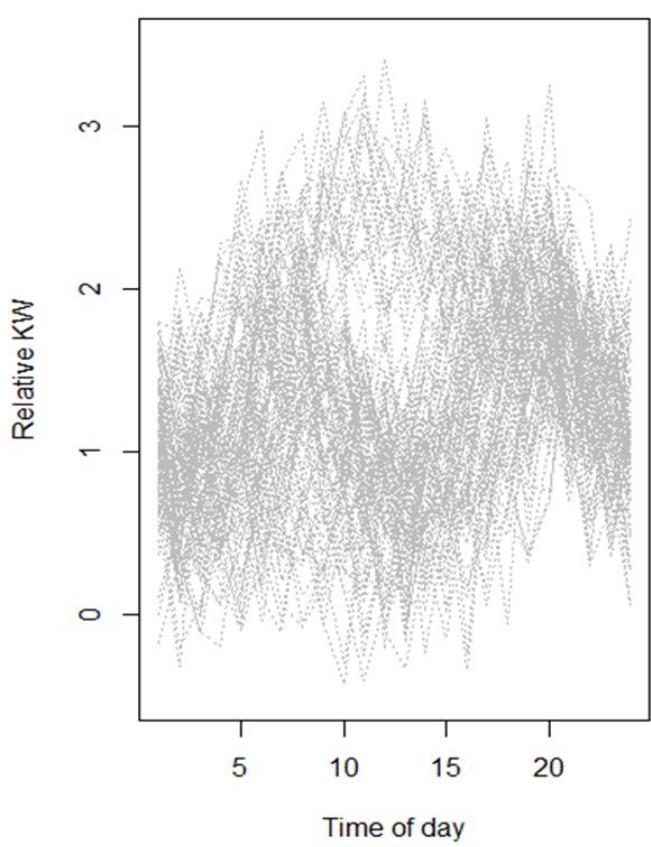
Loadshapes...

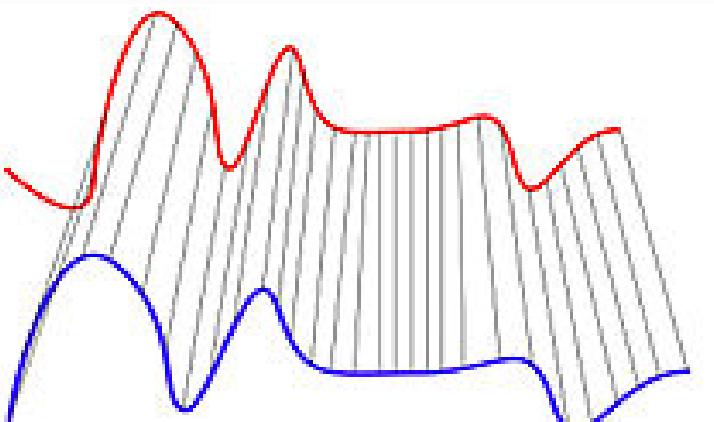
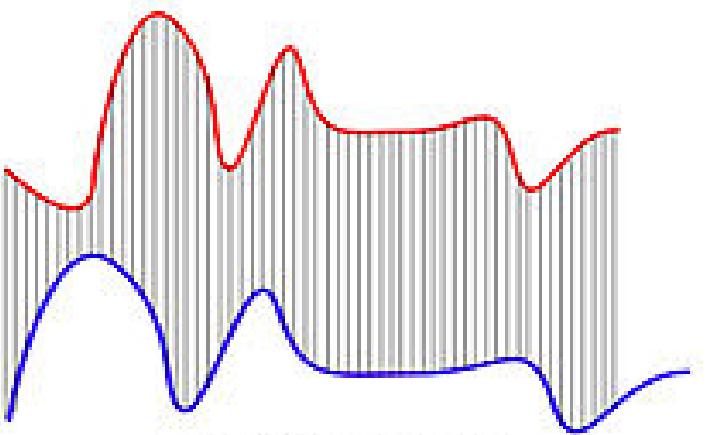


Loadshape Discovery



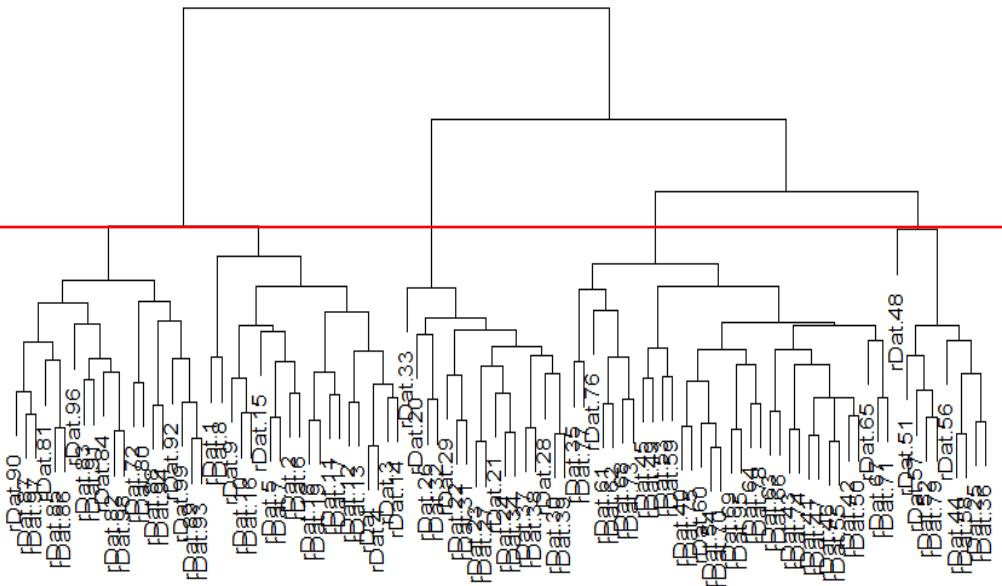
## Loadshapes...





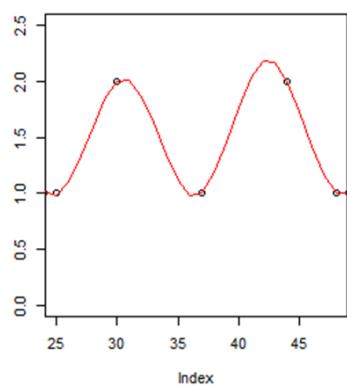
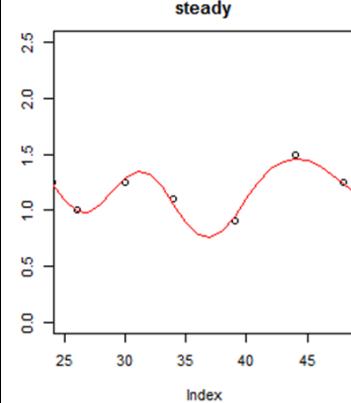
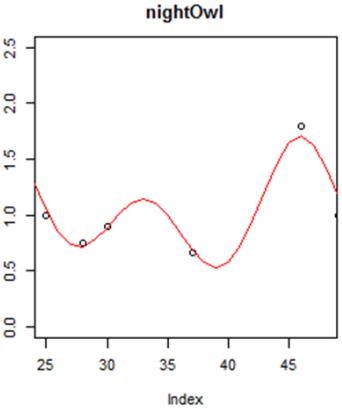
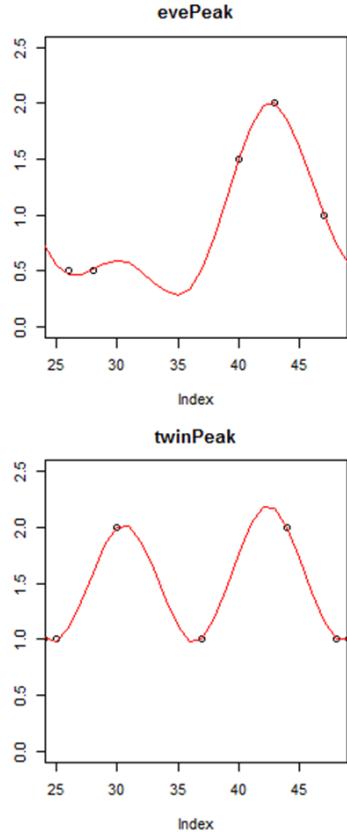
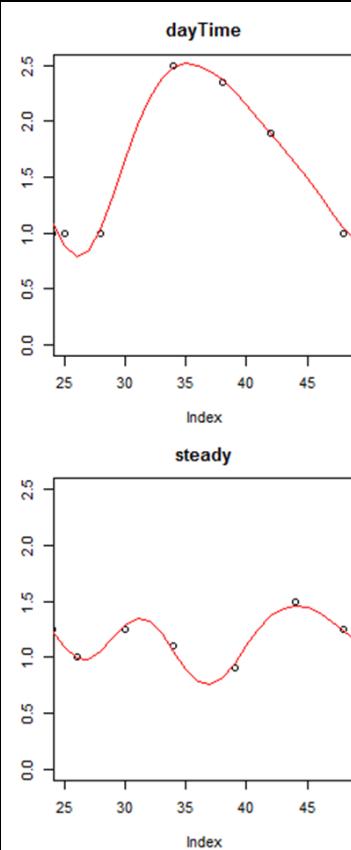
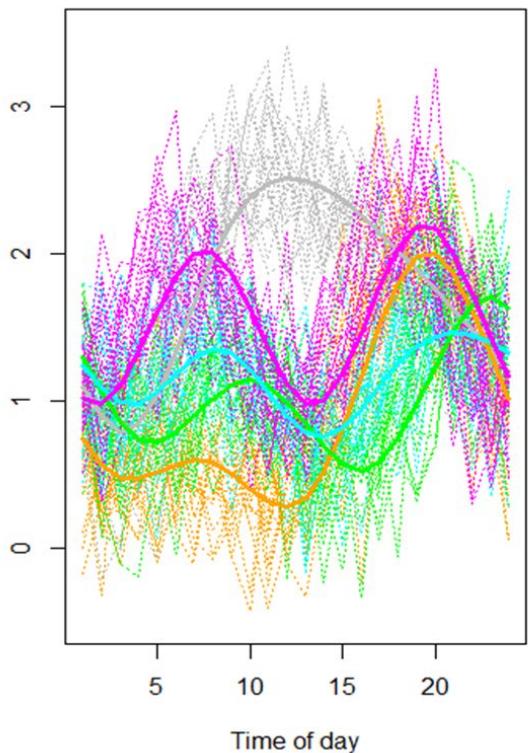
Wikipedia.org

Cluster Dendrogram

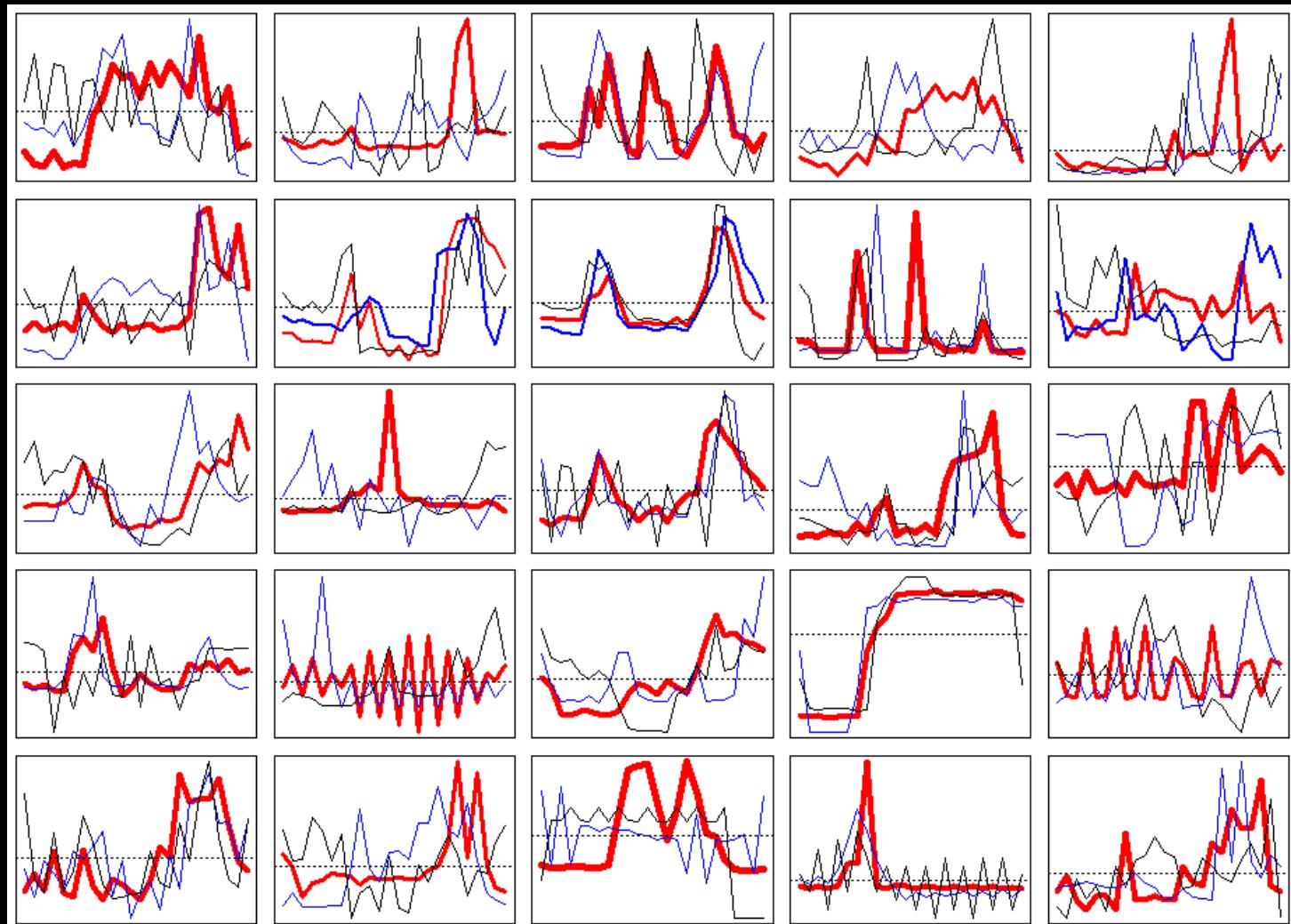


```
> table(predicted = calls, actual = realClasses)
      actual
predicted 1 2 3 4 5
          1 20 0 0 0 0
          2 0 20 1 0 0
          3 0 0 17 5 0
          4 0 0 2 11 0
          5 0 0 0 4 20
> mean(calls == realClasses)
[1] 0.88
>
```

### Loadshape Discovery



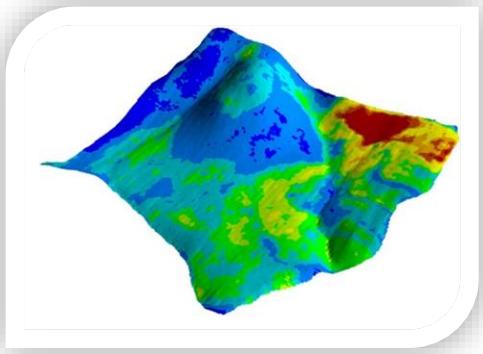
# Time Warping in the Wild...





---

## Growing Deep-Topsoil Watersheds: Landscape Feedback Infrastructure to Grow Clean Water



Abe Collins  
LandStream

(802) 782-1883 abenewsoil@gmail.com

# Windmill Vanes for Agriculture, Communities and Governments

---

- **Goal:** Distributed landscape feedback infrastructure as a Best Management Practice for achieving soil-formation and watershed health.

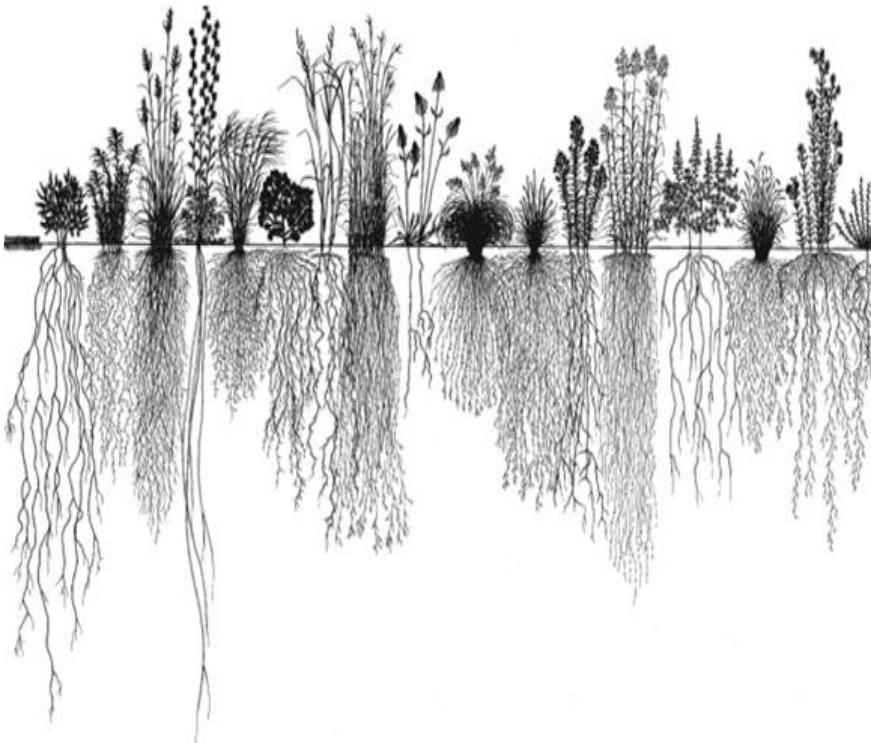
## Hypothesis:

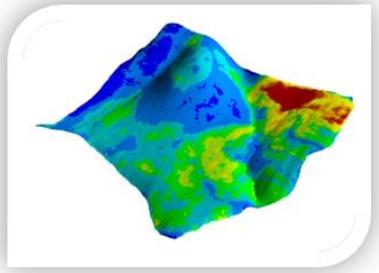
- Farmers with real-time landscape feedback can adaptively manage for:
  - “Harder-working land” - Increased average annual photosynthesis and soil aggregate formation
  - Improved water quality leaving the farm
  - Increased infiltration → reduced flooding
  - More economically efficient production
  - Clean, regulated water as a crop.



# Infiltrate, Hold, Purify, Slowly Release

---





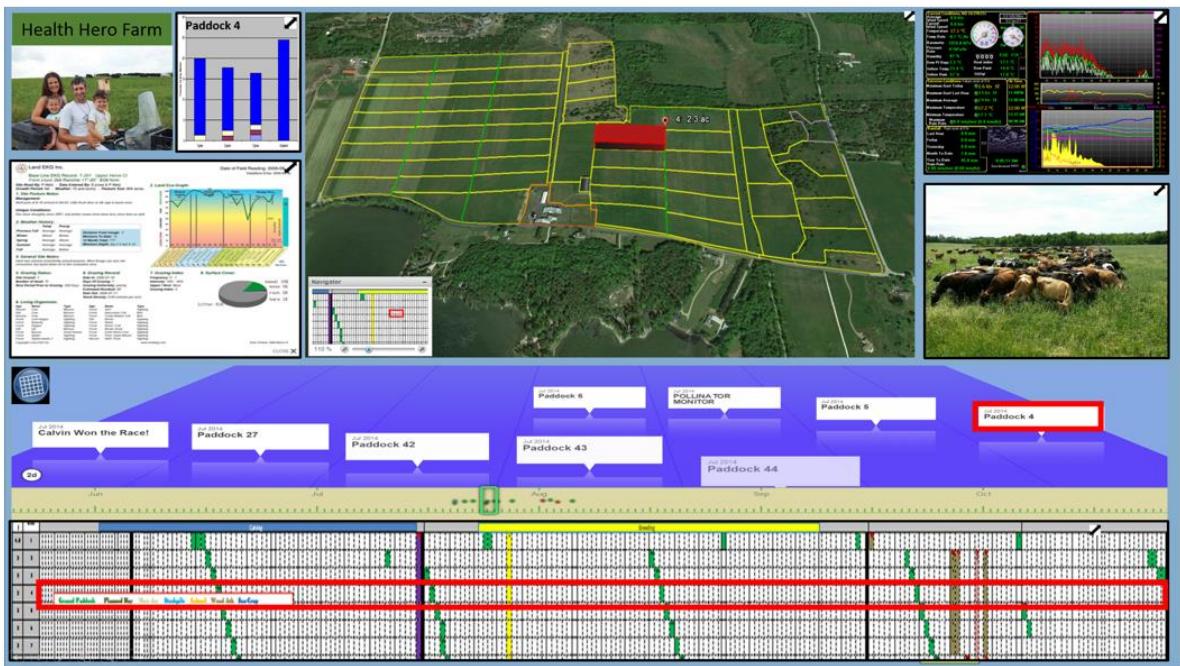
All Soil Properties mapped to 4'



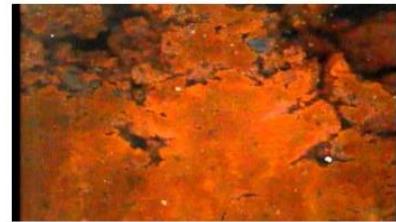
Weather



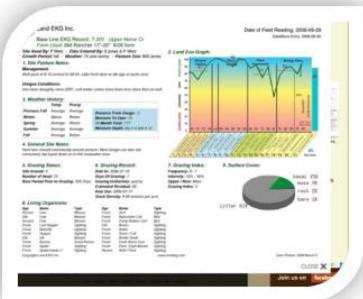
Water Flow and Quality



Ag Yield



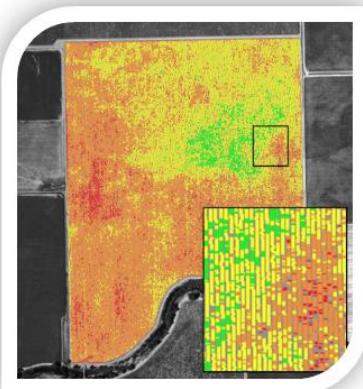
Aggregate Characterization



Soil Surface, Biodiversity, Forage



Soil/Water



Solar energy flow

# Watershed Metrics

Reading Monthly-Yearly Photosynthesis (Energy flow to power working watersheds) and Soil Capacity to Infiltrate, Purify and Slowly Release Water

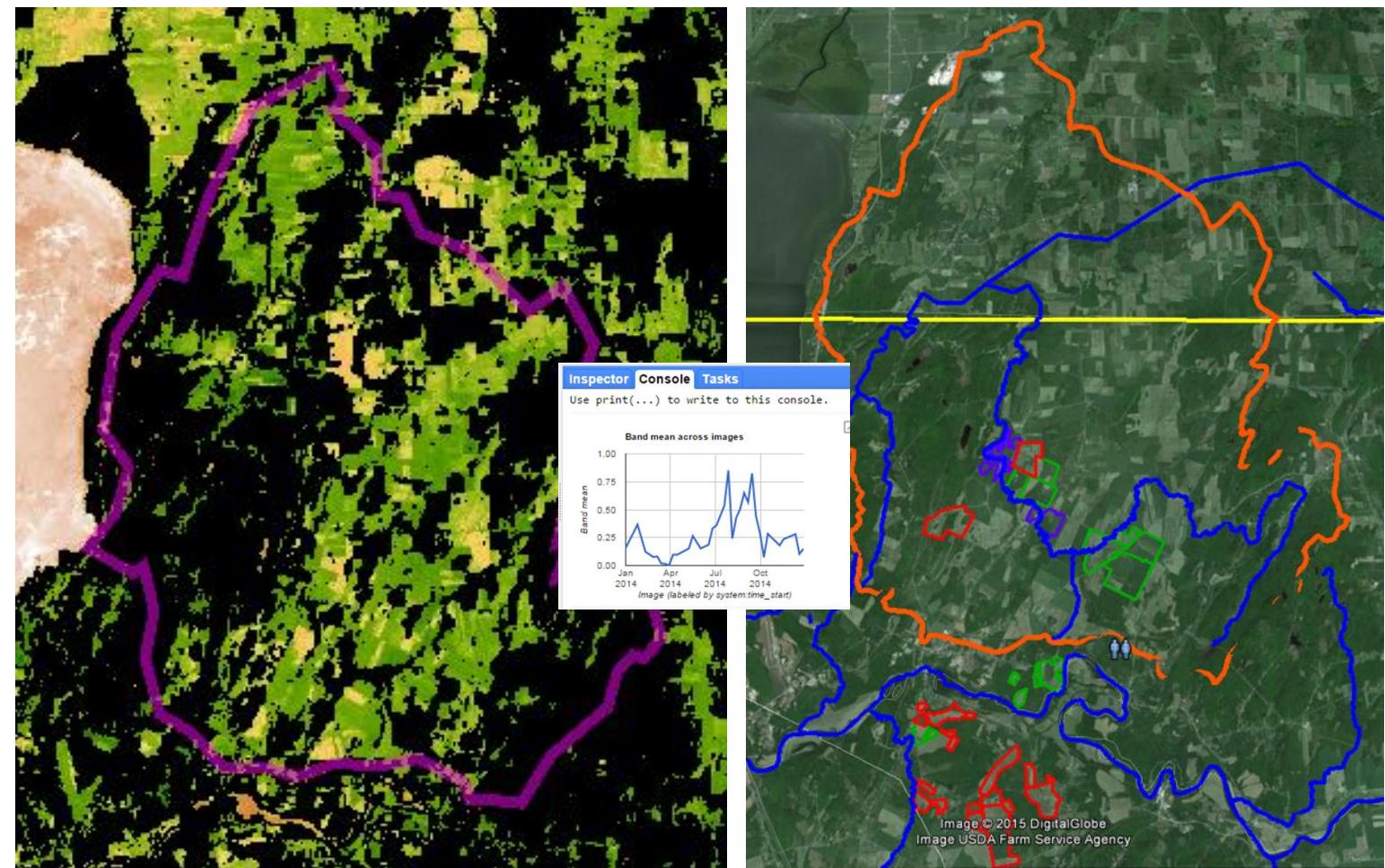
Correlate Energy Flow, Farmer Dashboards and Stream Monitoring

---

Rock River Watershed

Landsat 8 imagery: Median Normalized Difference Vegetation Index for Calendar Year 2014:

Proxy for average photosynthesis over 2014.



# Startup: Big Data Analytical Services for Healthcare Organizations

- The tremendous problem with healthcare
- Why healthcare insiders cannot fix it
- How to fix it
- Our startup
- What's next?

The tremendous  
problem with healthcare

Flying blind

# Why healthcare insiders cannot fix it

The Prisoners' Dilemma

External Cost

Prioritization

# How to fix it

Do the right thing

# Our startup

1. We do the right thing (no compromise)
2. Find problems to solve
3. Create win/win proposals
4. Solve problems at arm's length without immediate disruption to organizations
5. Find backers and collaborators

# What's next

1. Propose problems to solve
2. Develop proposals with us
3. Contact: [uweheiss@gmail.com](mailto:uweheiss@gmail.com)

Join us!

# Obesity and the built environment in Vermont and beyond

**Ben Littenberg**, MD,  
Burlington, VT

**Levi N. Bonnell**, MPH,  
Denver, CO

**Ahmed Hamed**, PhD, Cairo,  
Egypt

**Ayodelle LeBruin**, MD,  
Roseau, Dominica

**Derek Lubetkin**, BA,  
Montreal, Quebec

**Charles MacLean**, MDCM,  
Burlington, VT

**Katie Strauss**, RN, Durham,  
NC

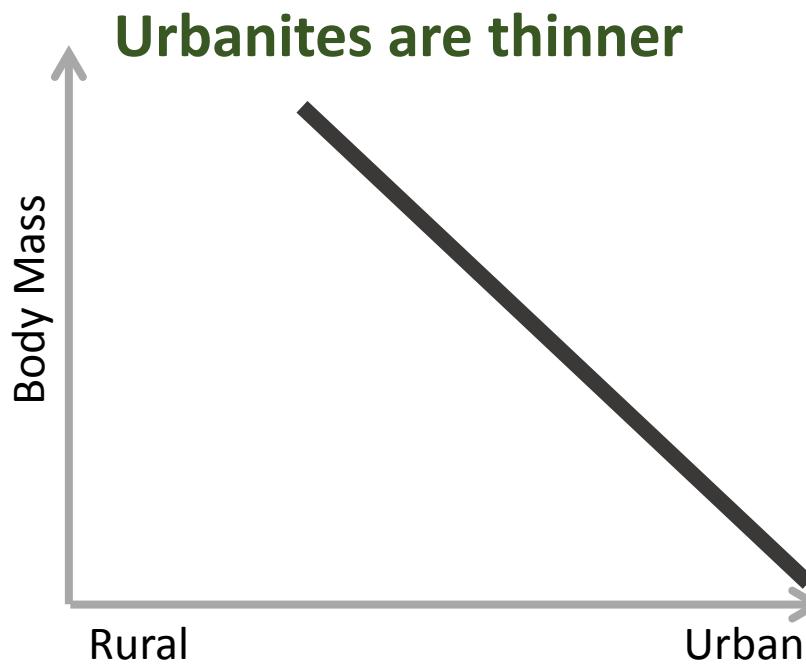
**Austin R. Troy**, PhD, Denver,  
CO

**Asim Zia**, PhD, Lahore,  
Pakistan

## Suburban Sprawl



## Commercial Density

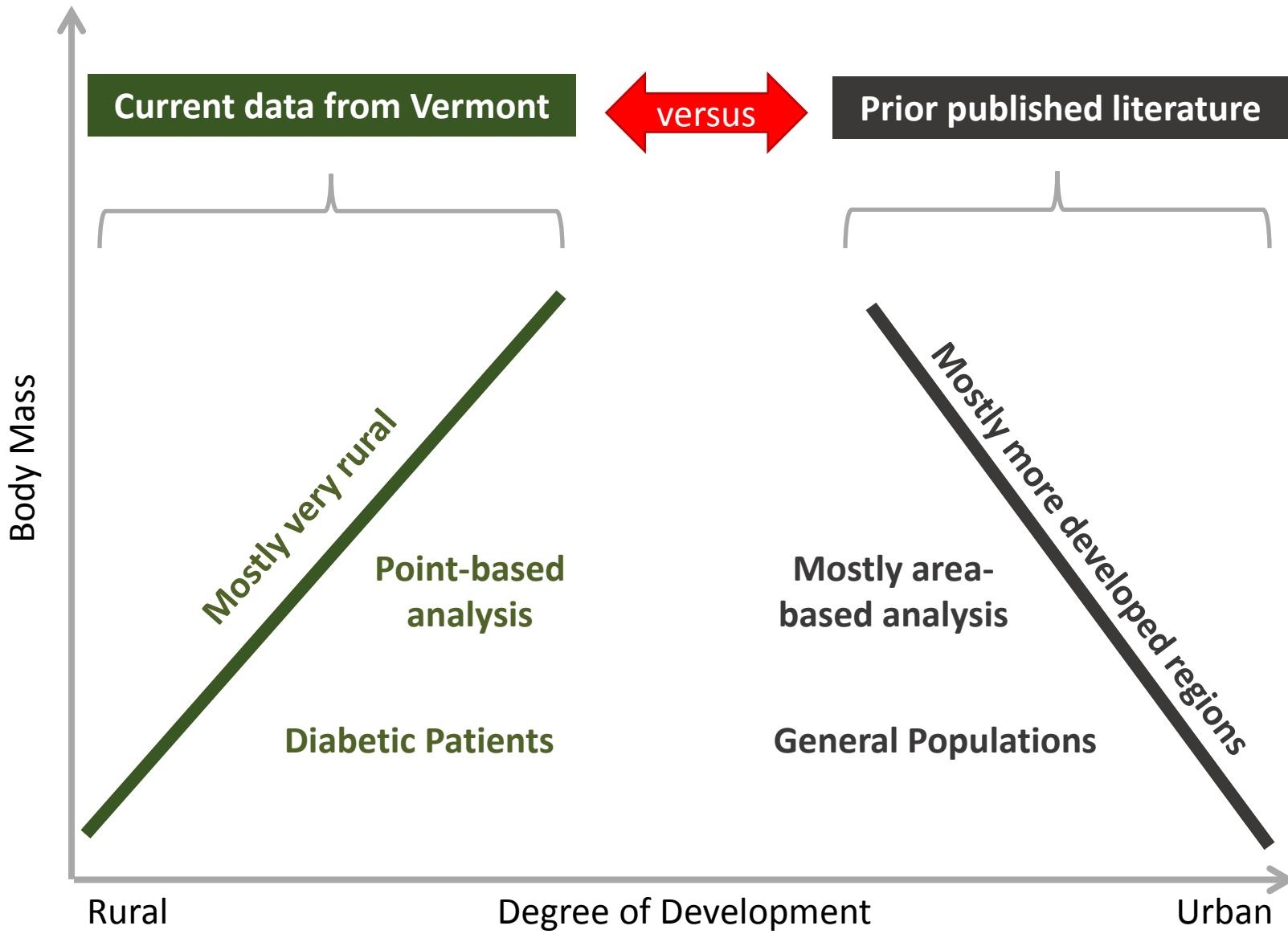


# Vermont Diabetes Information System

- 7,414 adults with diabetes recruited from primary care
- 559 home interviews
- Home address geocoded
- Slope is positive!

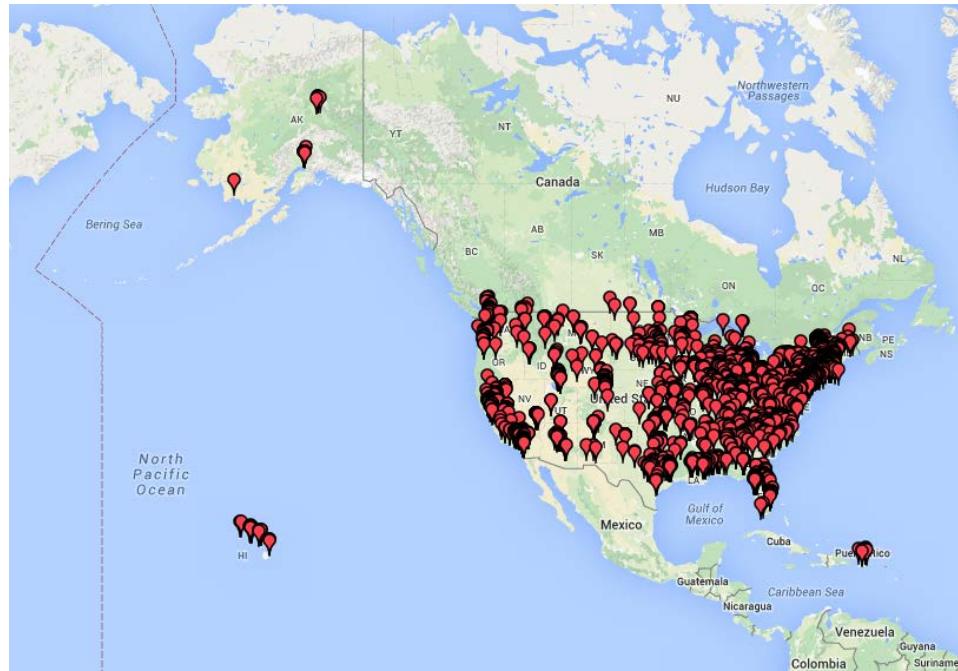
Variable	Coefficient	P
Commercial density ( $\text{ha}^{-1}$ )	+0.785	.020
Age (years)	0.685	<0.001
Age <sup>2</sup>	-0.007	<0.001
Male	1.821	0.001
Drinker	-1.360	.002
Blood pressure (mm Hg)	0.119	<0.001
A1C (%)	0.592	.002
Diet (% of days)	-0.017	.022
Exercise (% of days)	-0.031	<0.001
Smoker	-1.935	0.007
Number of daily medications	0.185	0.002
Low income	1.649	0.005

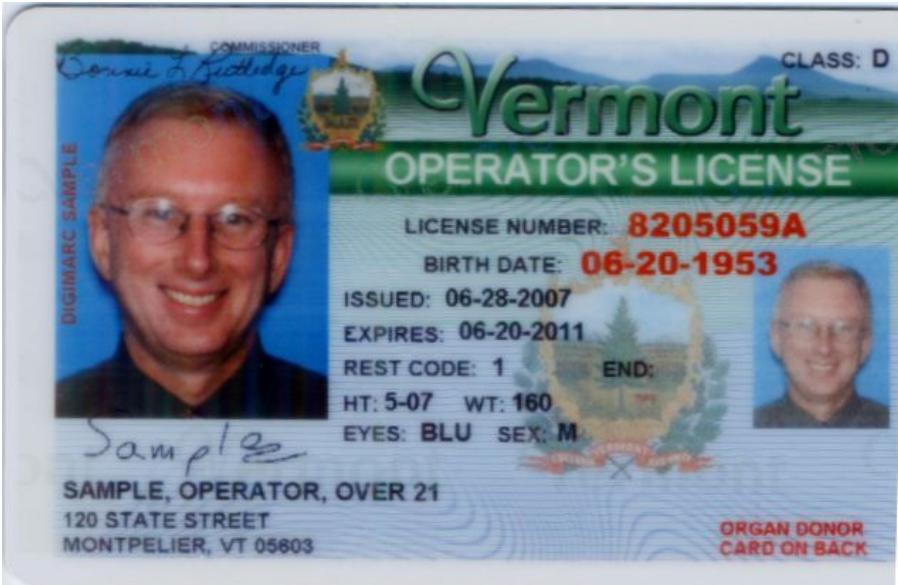
# Urbanites are thinner – except in Vermont



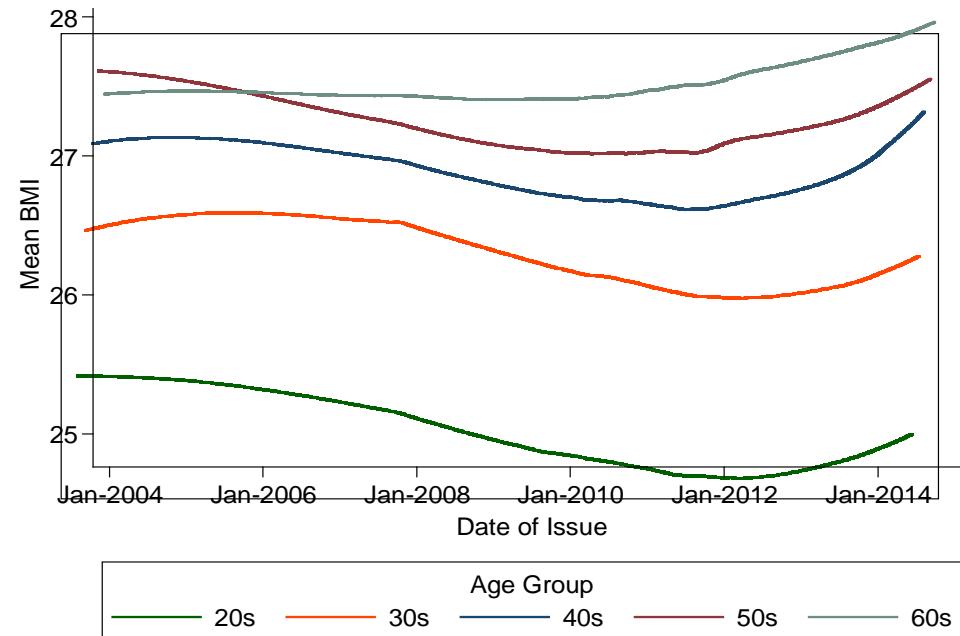
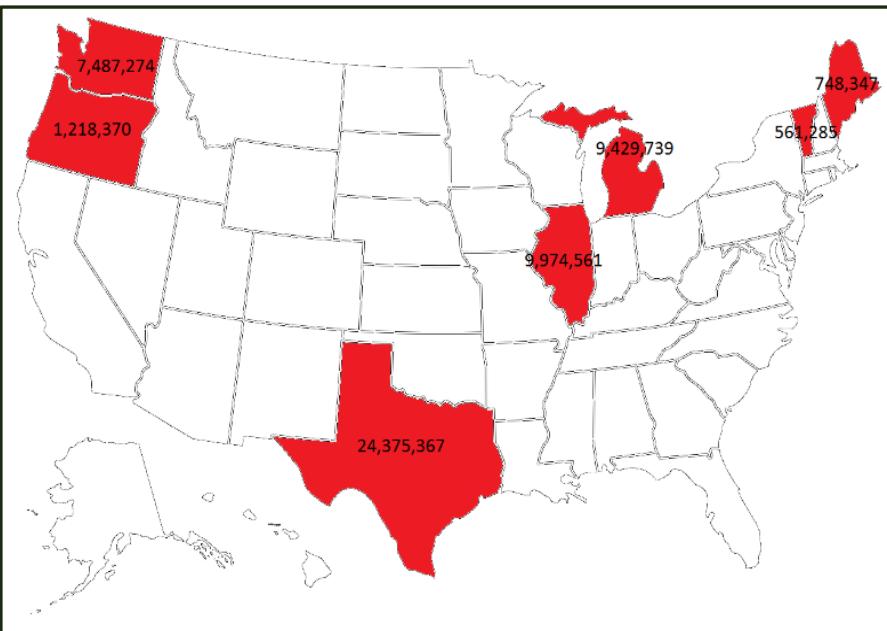
# Survey Data

- Web survey
- Feb 2014-Feb 2015
- Secure online portal
- 3,645 usable responses
- Age, gender, education, race, ethnicity, general health, exercise capacity, height, weight, home address
- Survey: <https://go.uvm.edu/geomed>



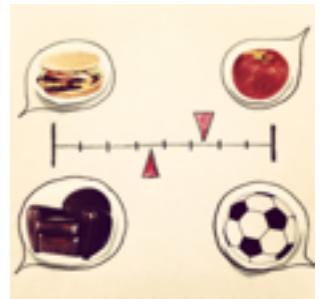
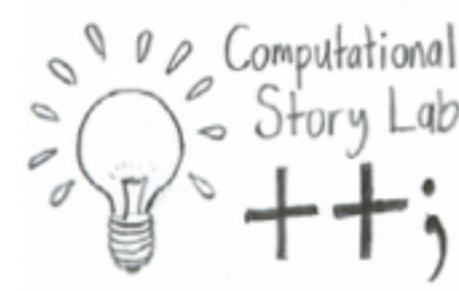
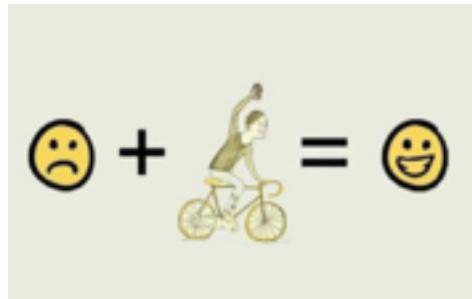


# 53,794,943 DMV Records from 7 states



# Social Panometering

Introducing the **lexicocalorimeter**



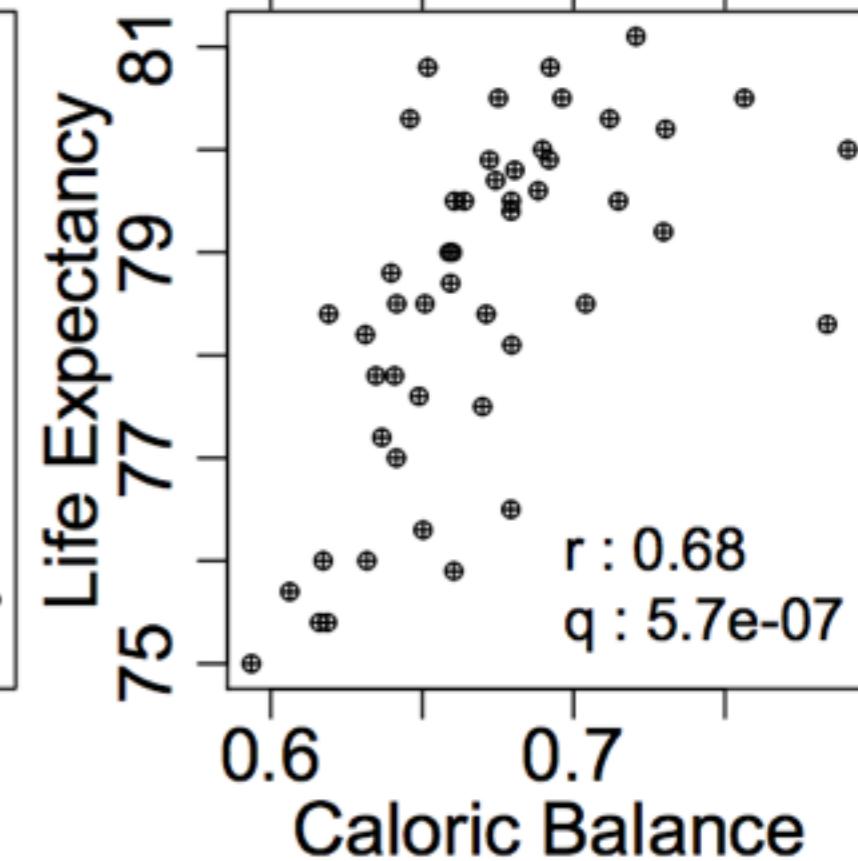
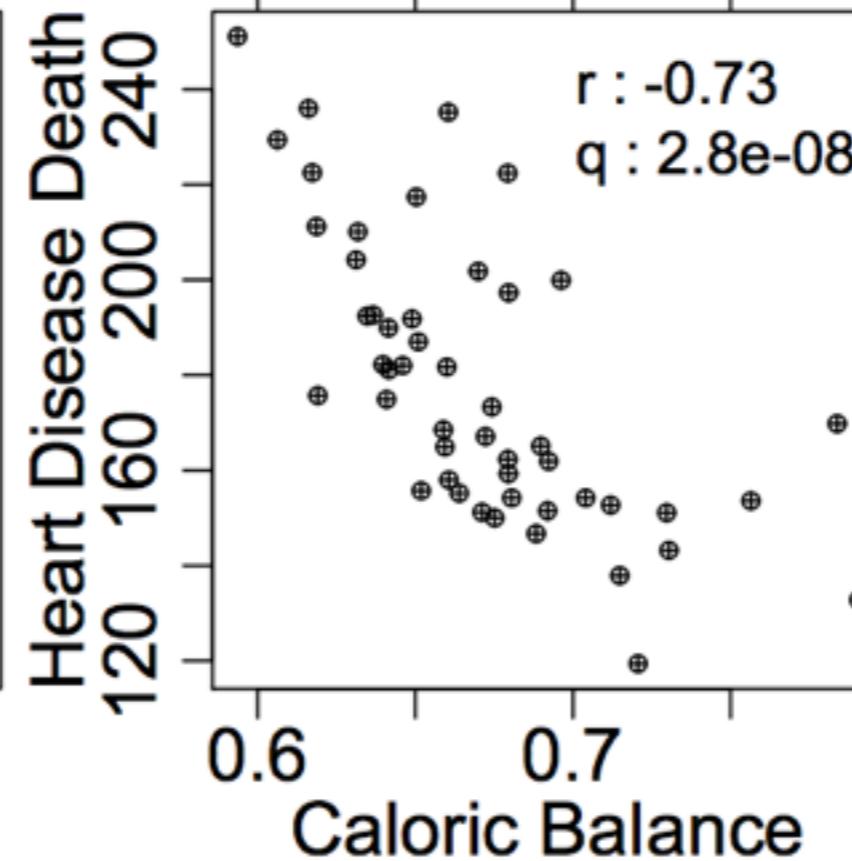
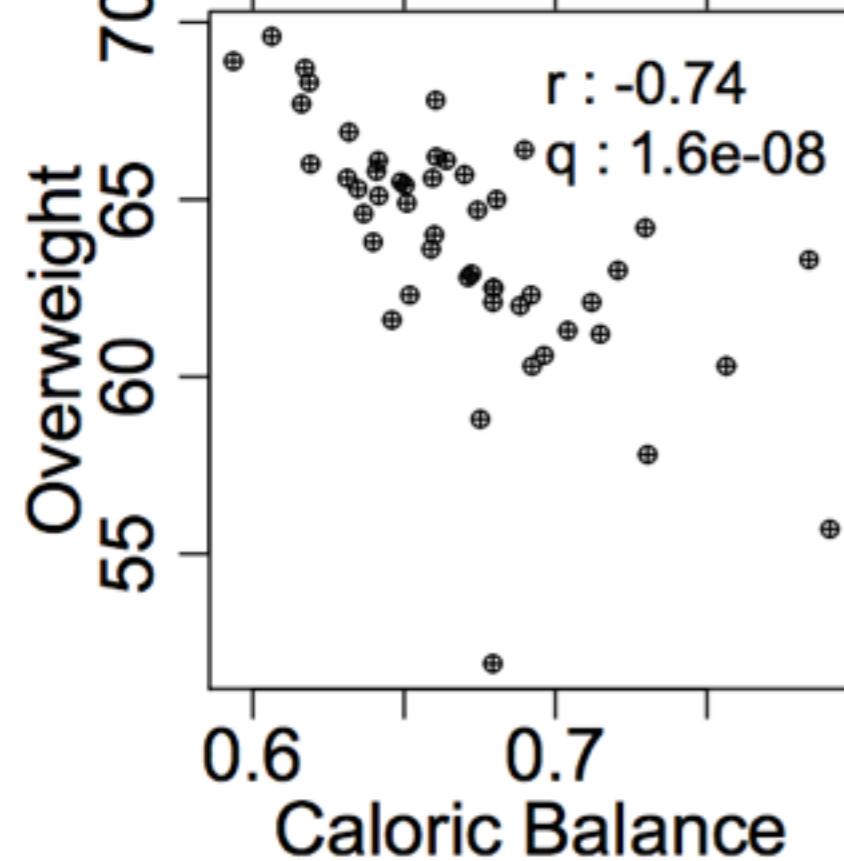
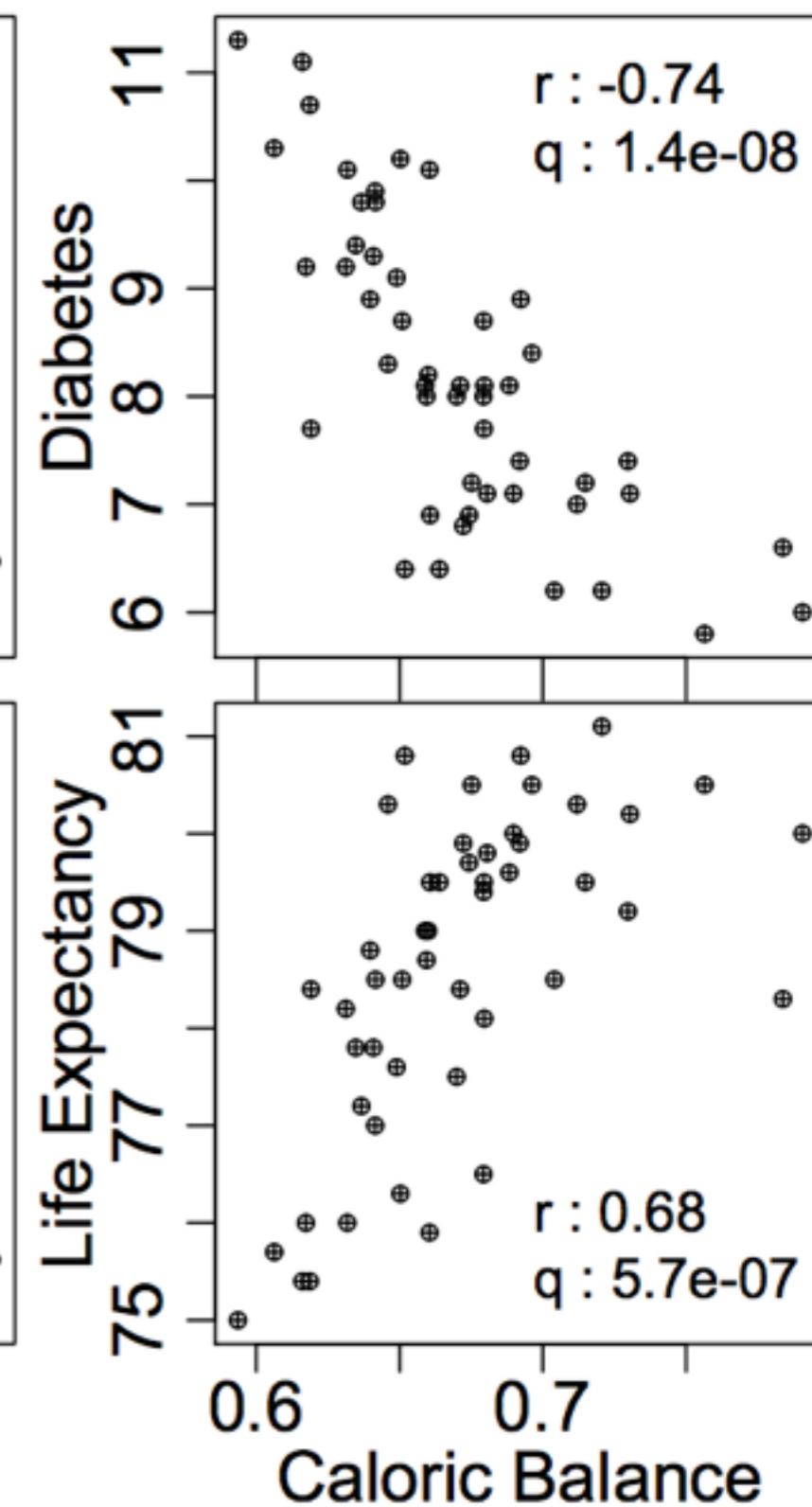
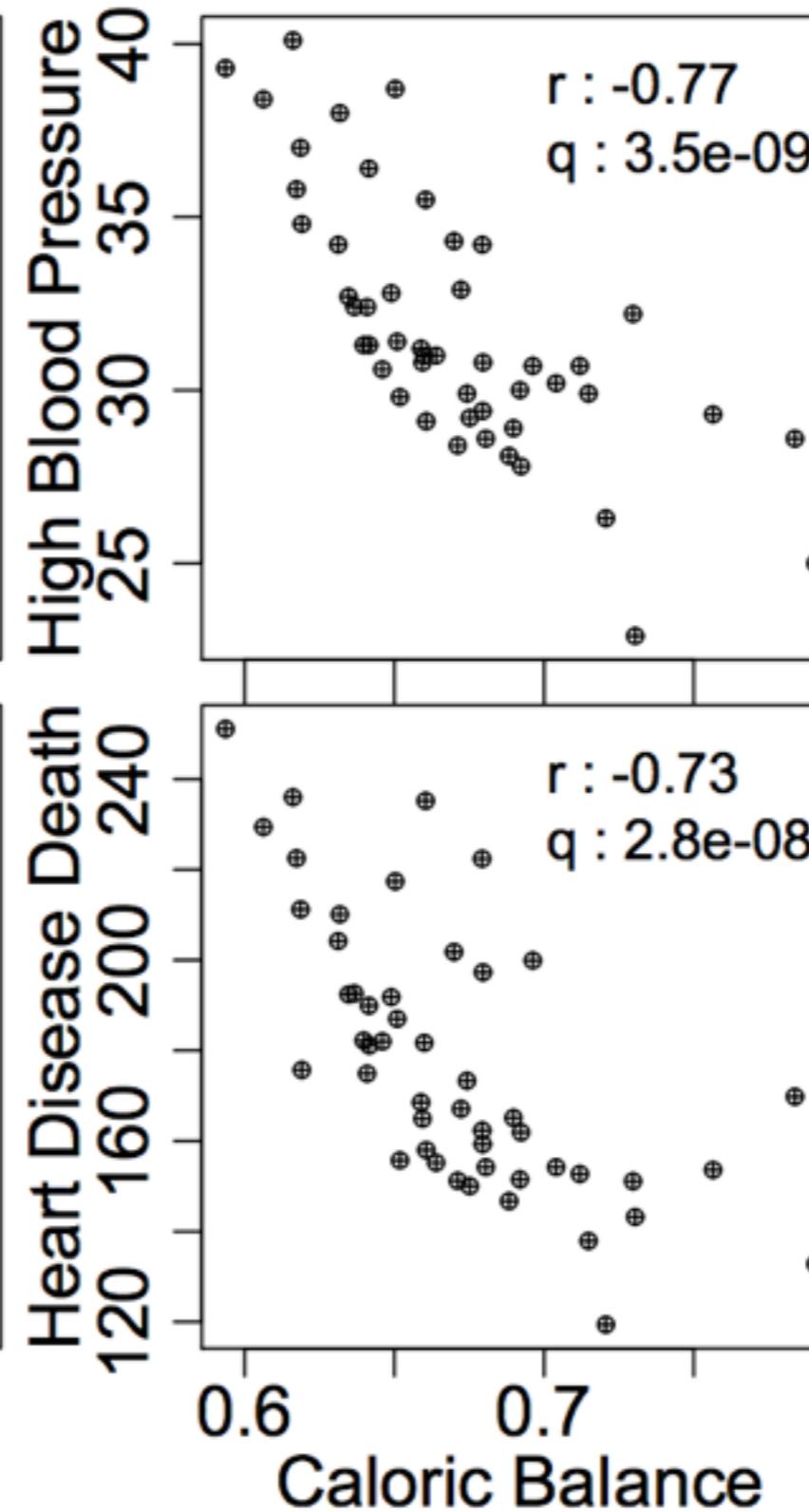
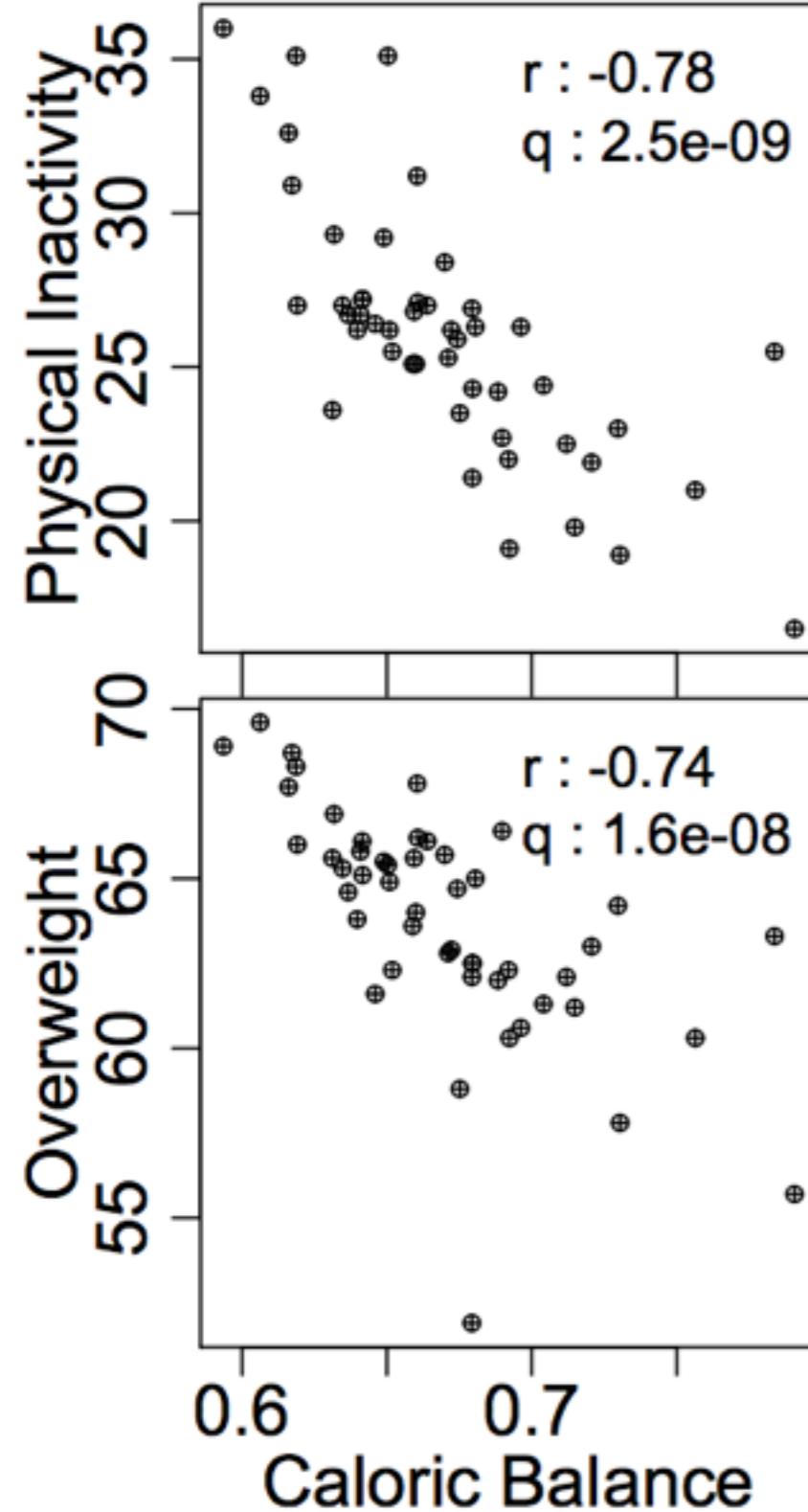
# Goal: measure everything



$$C_{\text{out}} = \sum \text{I LOVE BACON!} + \text{SNICKERS} + \text{Maruchan Ramen} + \text{Broccoli}$$

$$C_{\text{in}} = \sum \text{runner} + \text{skiier} + \text{Homer Simpson}$$

$$C_{\text{bal}} = \frac{C_{\text{out}}}{C_{\text{in}}}$$



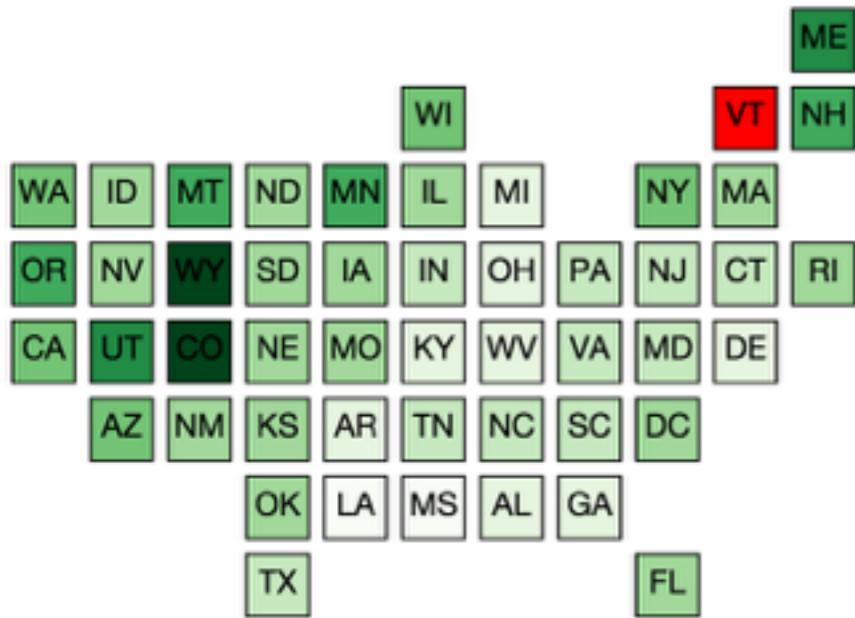


A: Calories in



B: Calories out

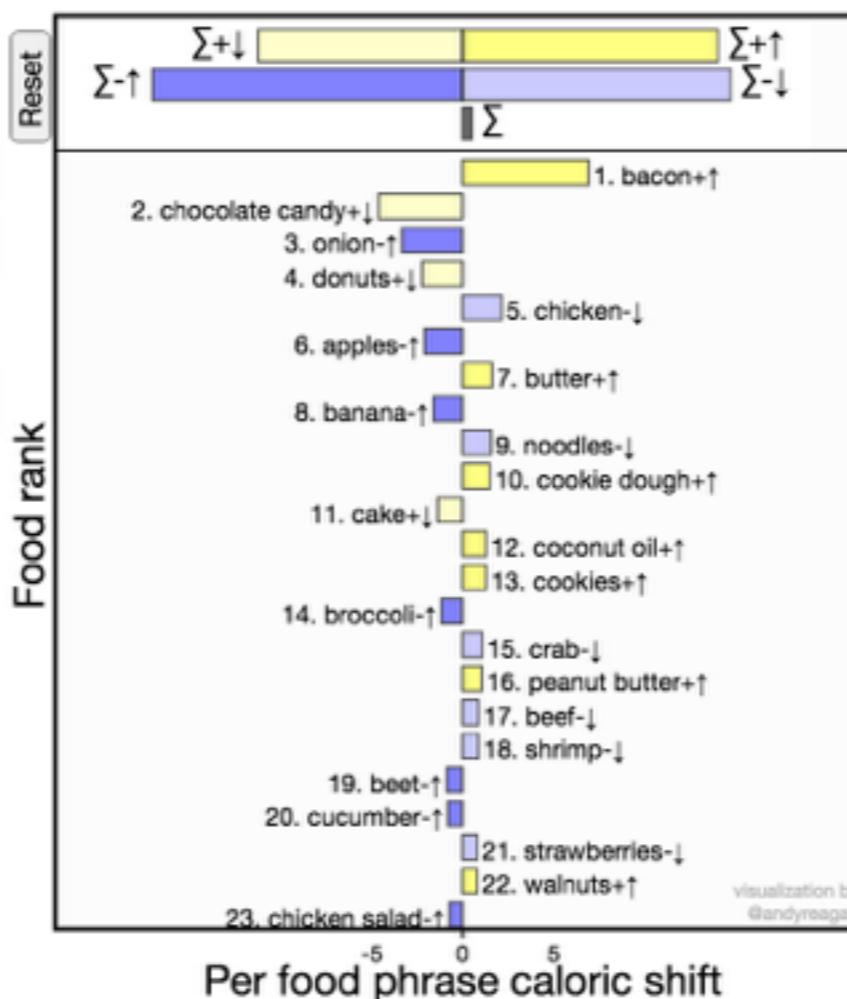
## Caloric Balance



### Why Vermont consumes more calories on average:

Average US calories = 267.92

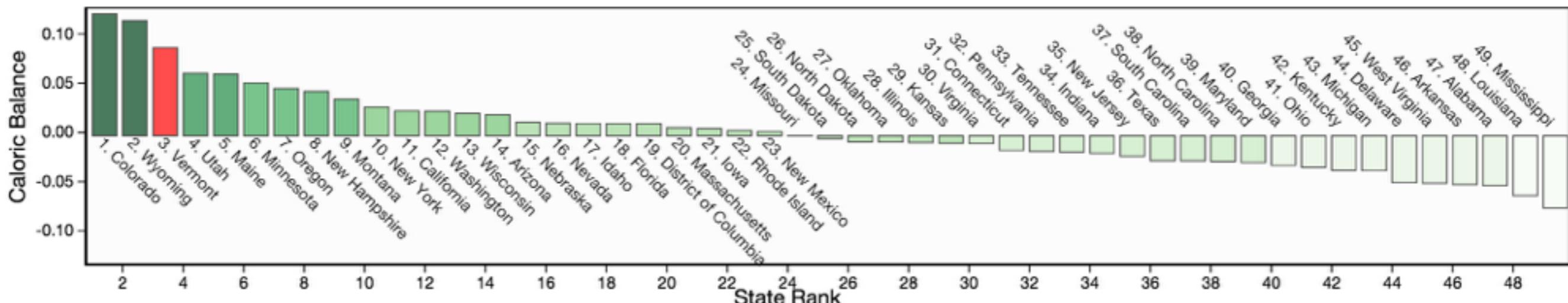
Vermont calories = 268.66 (Rank 29 out of 49)



### Why Vermont expends more calories on average:

Average US caloric expenditure = 176.60

Vermont caloric expenditure = 203.22 (Rank 3 out of 49)





**GREENSEA**  
Creative Unmanned Technologies

# Genetic Algorithms: Applications in Underwater Robotics



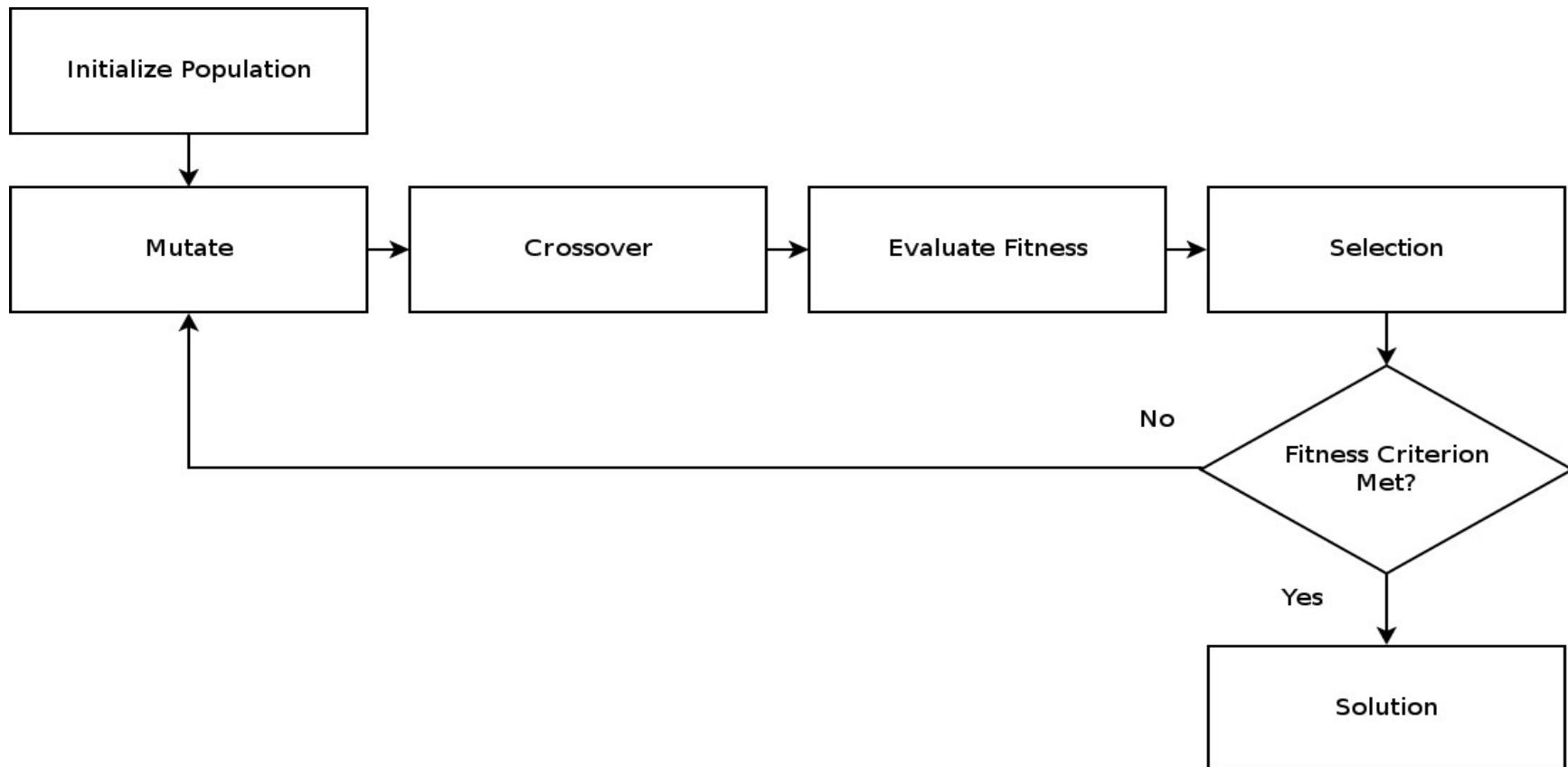
Colin Riggs

[greenseainc.com](http://greenseainc.com)

1.802.434.6080

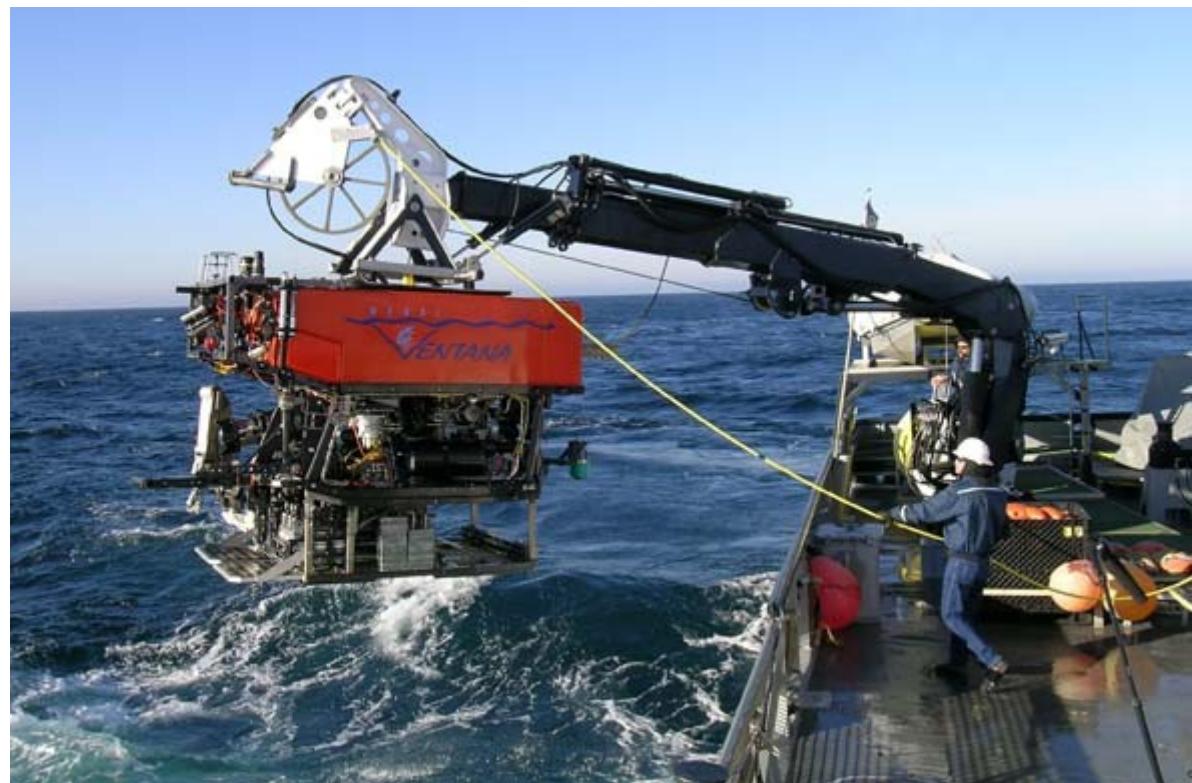
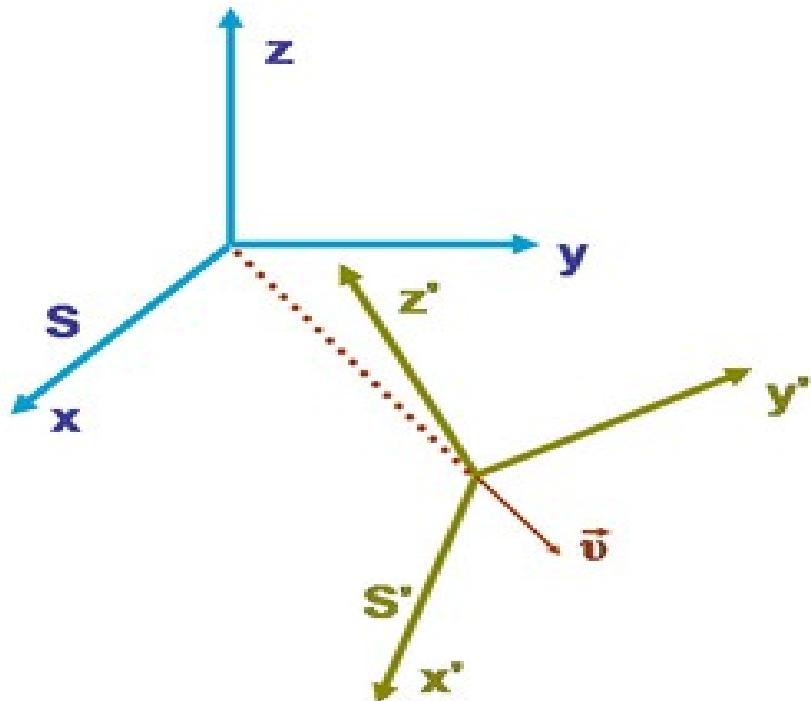
# Genetic Algorithms

Searching for solutions to large state space equations.



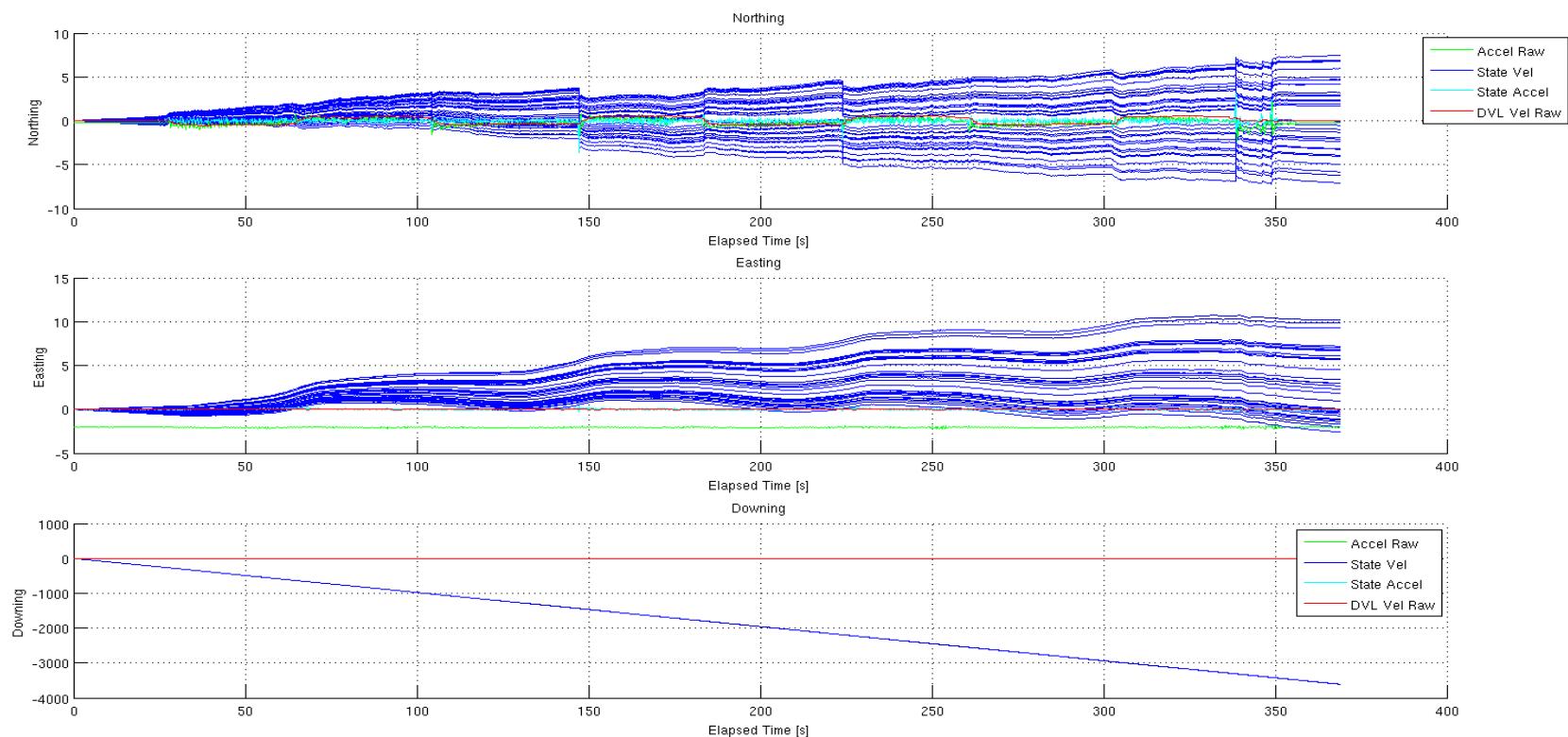
# Inertial Navigation

Searching for sensor to body frame rotation and bias parameters.



# Inertial Navigation

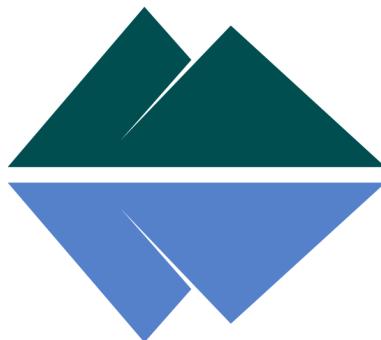
- Search Results.





# Control Modeling





**GREENSEA**  
Creative Unmanned Technologies

**Greensea Systems, Inc.**  
**10 East Main Street**  
**PO Box 959**  
**Richmond, Vermont 05465**  
**United States of America**  
**[info@greenseainc.com](mailto:info@greenseainc.com)**

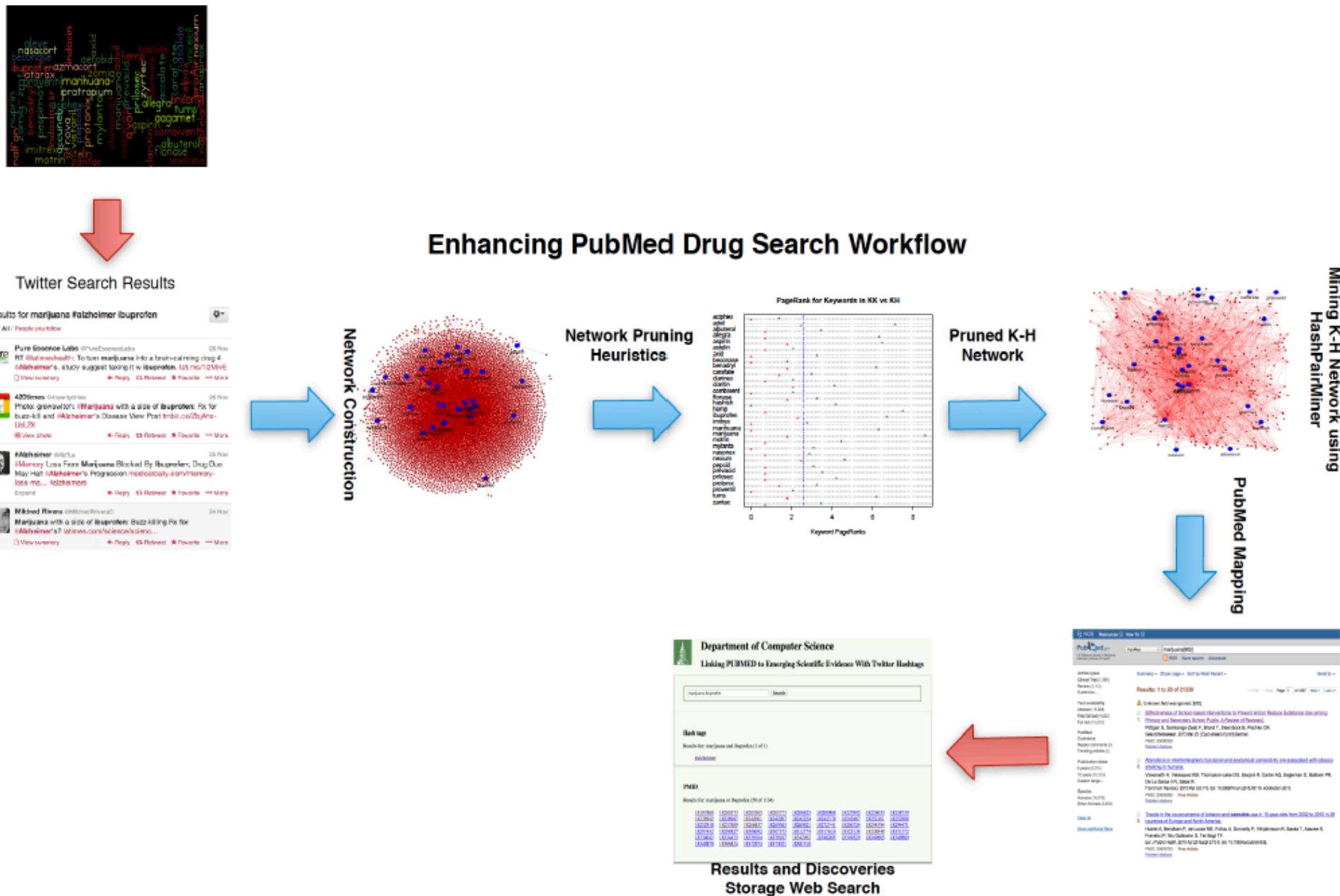
# K-H Networks in Action

## Drug Interaction Application

Ahmed Abdeen Hamed, Ph.D

Assistant Professor

EPSCoR/SEGS VT





## Twitter K-H networks in action: Advancing biomedical literature for drug search

Ahmed Abdeen Hamed<sup>a</sup>, , Xindong Wu<sup>b</sup>, , Robert Erickson<sup>b</sup>, , Tamer Fandy<sup>c</sup>,

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doi:10.1016/j.jbi.2015.05.015

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### Abstract

The importance of searching biomedical literature for drug interaction and side-effects is apparent. Current digital libraries (e.g., PubMed) suffer infrequent tagging and metadata annotation updates. Such limitations cause absence of linking literature to new scientific evidence. This demonstrates a great deal of challenges that stand in the way of scientists when searching biomedical repositories. In this paper, we present a network mining

# New role for Twitter: Early warning system for bad drug interactions

Date: June 29, 2015

Source: University of Vermont

Summary: A new technique for discovering potentially dangerous drug interactions--before they show up in medical databases like PubMed-- has been developed by researchers. It includes the searching millions of tweets on Twitter.

Share:

f 33

t 113

g+ 1

in 35

Total shares: 182

## RELATED TOPICS

### Health & Medicine

- > [Pharmacology](#)
- > [Pharmaceuticals](#)
- > [Controlled Substances](#)

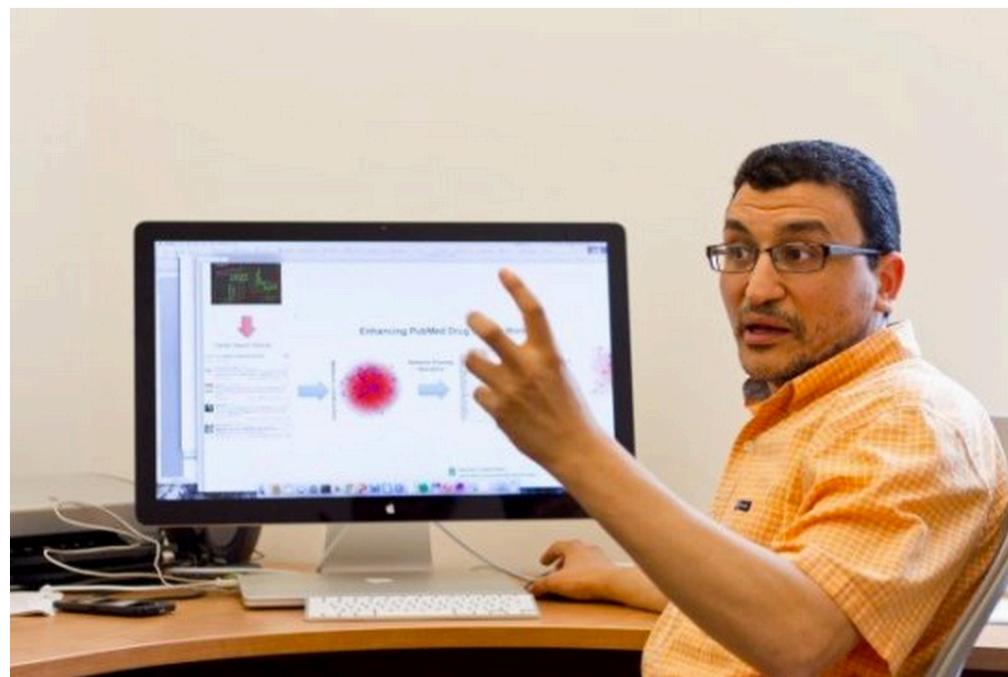
### Computers & Math

- > [Computers and Internet](#)
- > [Computer Modeling](#)
- > [Computer Programming](#)

## RELATED TERMS

- > [Data mining](#)
- > [Pharmacology](#)
- > [Stem cell treatments](#)
- > [Alternative medicine](#)

## FULL STORY



"I'm not a medical scientist. I work with Big Data," says Ahmed Abdeen Hamed, an interdisciplinary computer scientist who works in the University of Vermont's Social-Ecological Gaming and Simulation Lab. But he and the small team he's building want the tool to be useful to doctors.

# Questions and connecting

- Email: [ahamed@uvm.edu](mailto:ahamed@uvm.edu)
- Web: [www.uvm.edu/~ahamed](http://www.uvm.edu/~ahamed)
- Twitter: @ahmedelmasri
- LinkedIn:  
[https://www.linkedin.com/in/  
ahmedabdeenhamed](https://www.linkedin.com/in/ahmedabdeenhamed)
- ResearchGate:  
[https://www.researchgate.net/profile/  
Ahmed Hamed Phd](https://www.researchgate.net/profile/Ahmed_Hamed_PhD)

# CRIME DATA IN VERMONT

Robin Weber, JD PhD  
Director of Research  
Crime Research Group, Inc.



[www.crgvt.org](http://www.crgvt.org)

# State Statistical Analysis Centers

- [www.jrsa.org](http://www.jrsa.org)
- [www.bjs.gov](http://www.bjs.gov)
- [www.crgvt.org](http://www.crgvt.org)



[www.crgvt.org](http://www.crgvt.org)

# Police Data

- NIBRS
- Incident level data
- Victim, arrestee, circumstances of crime, geo codes
- Some governance, data quality issues



[www.crgvt.org](http://www.crgvt.org)

# Court Data

- Disposition and filing information
- Can match to incident number from police data
- Over 20 years worth of data from all criminal prosecutions in VT state courts
- Our MOU with the courts allows us to provide data extracts, including docket numbers.



# DOC Data

- Unified System
- Historical data of time served for 2000-2014 that can be matched to individuals via court and then backwards to the police incident.
- New RMS, will be working with researchers on needs



# Other Data

- Criminal Histories-VT
- Triple-I
- Data Store
- Costs of CJ



[www.crgvt.org](http://www.crgvt.org)

# SUAT

Architecture & Sustainable Building Technologies  
Prof. Dr. Arno Schlüter

## Data-driven Buildings

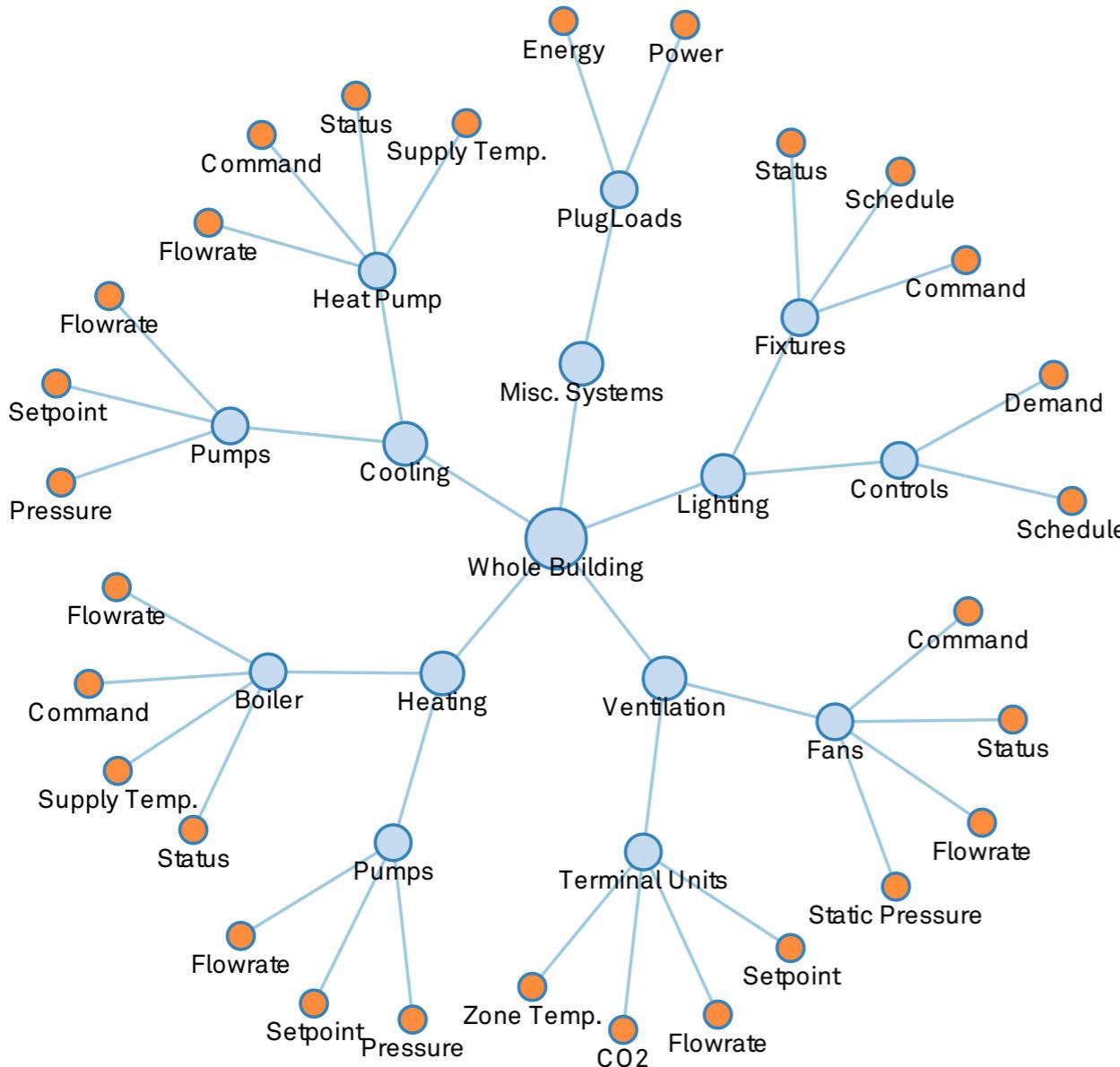
Clayton Miller

/ ITA  
Institute of Technology in Architecture  
Faculty of Architecture / ETH Zurich

**ETH**

Eidgenössische Technische Hochschule Zürich  
Swiss Federal Institute of Technology Zurich

# Conventional Bottom-up Analysis



## **Commissioning techniques**

(Milesi-Ferretti & Choiniere  
2012; Mills 2009; Bynum et al.  
2008)

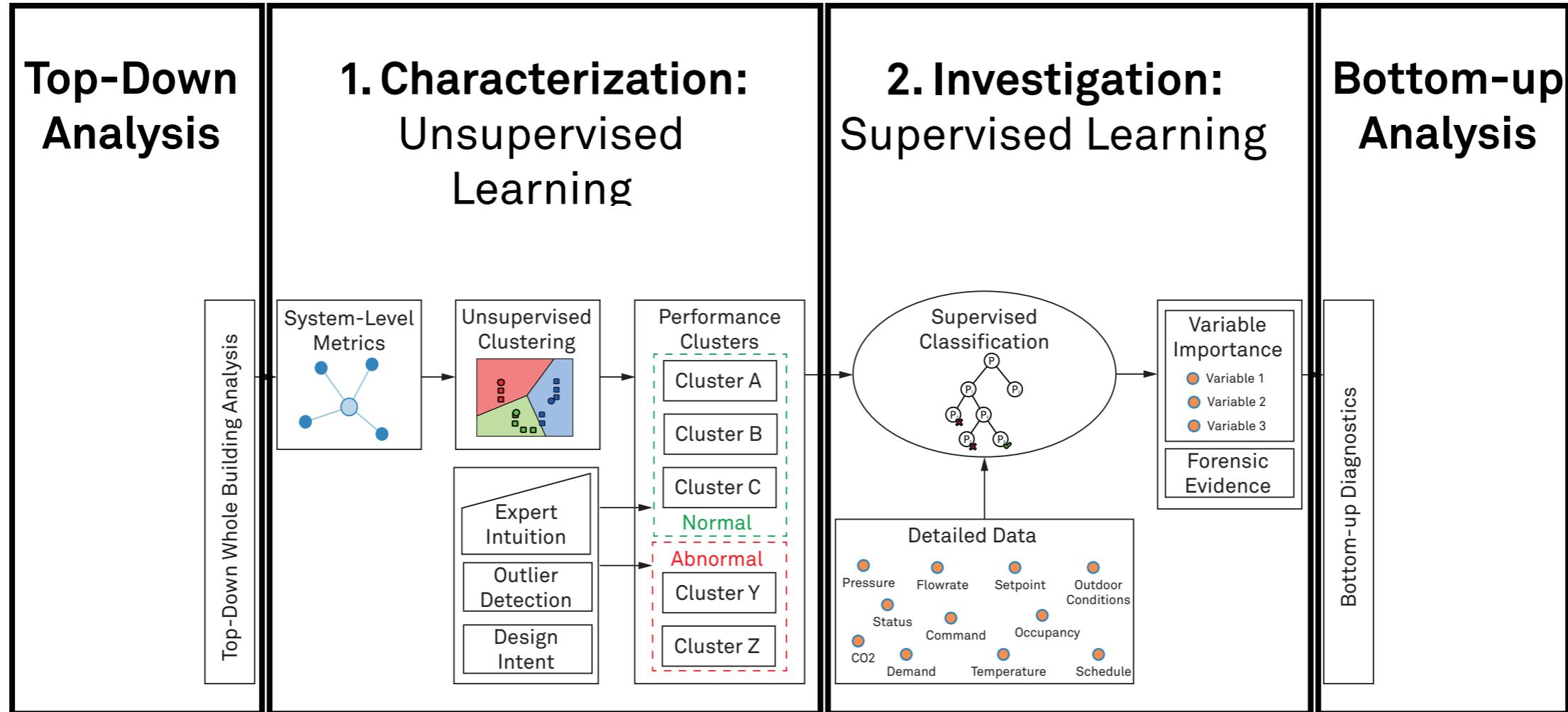
# Fault Detection and Diagnostics

(Samouhos 2010; Katipamula & Brambley 2005)

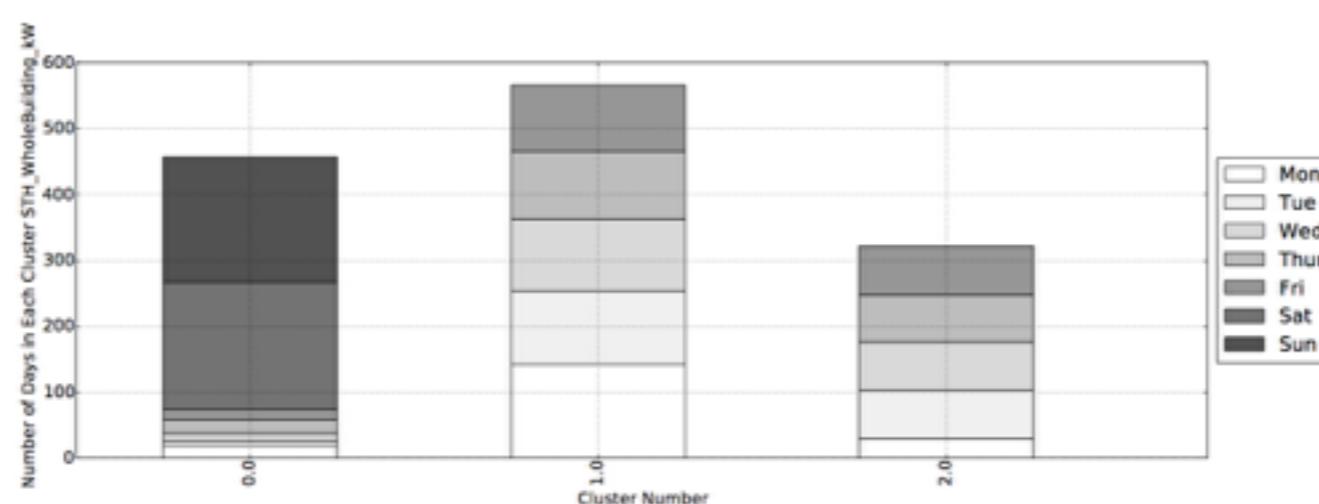
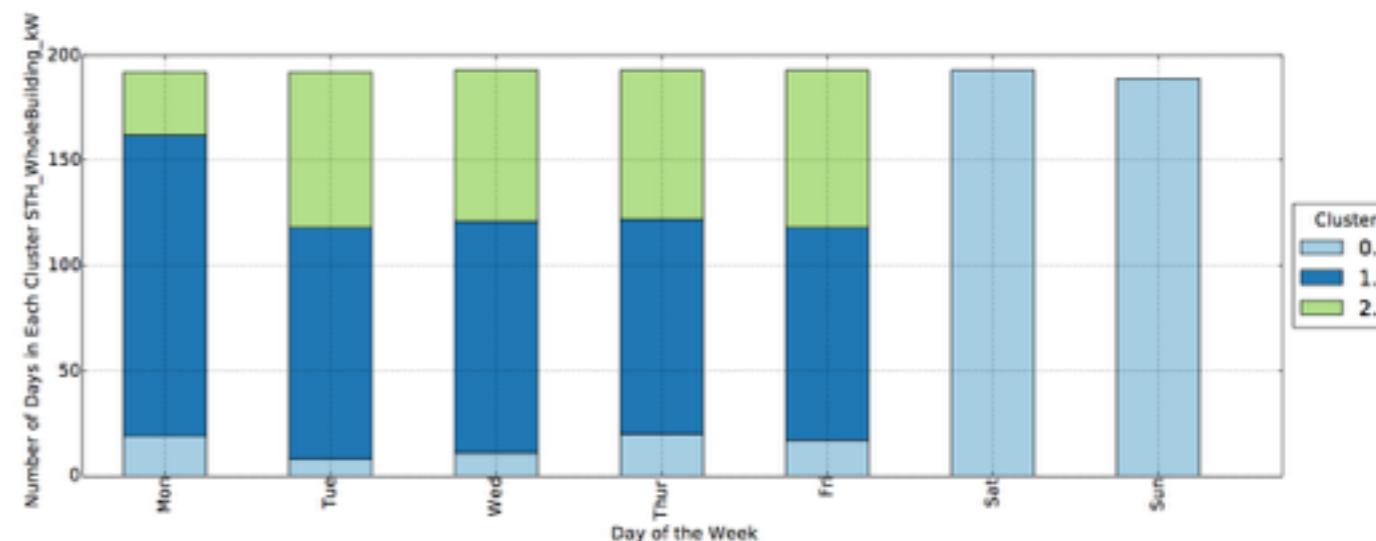
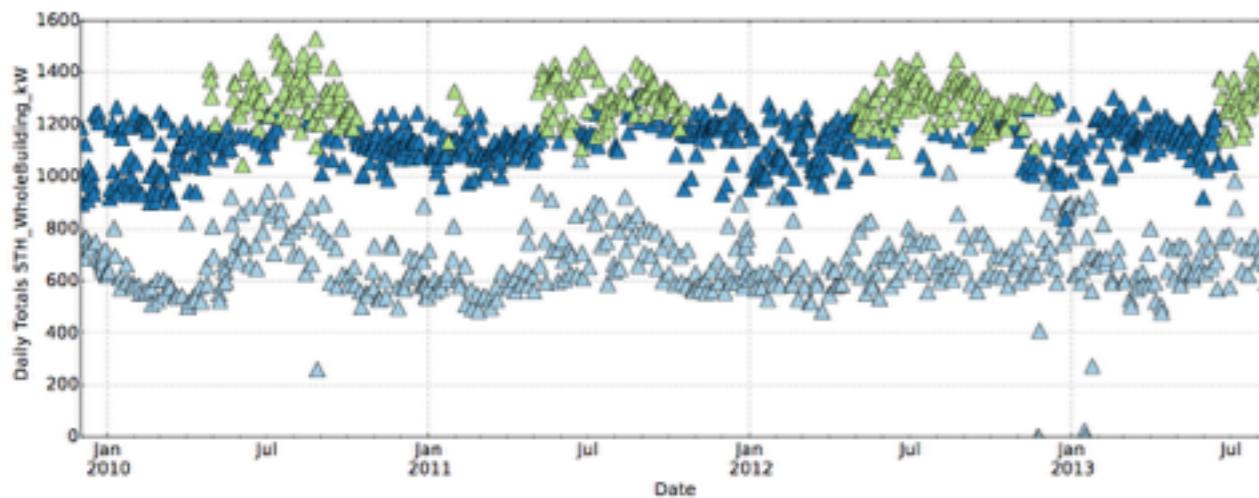
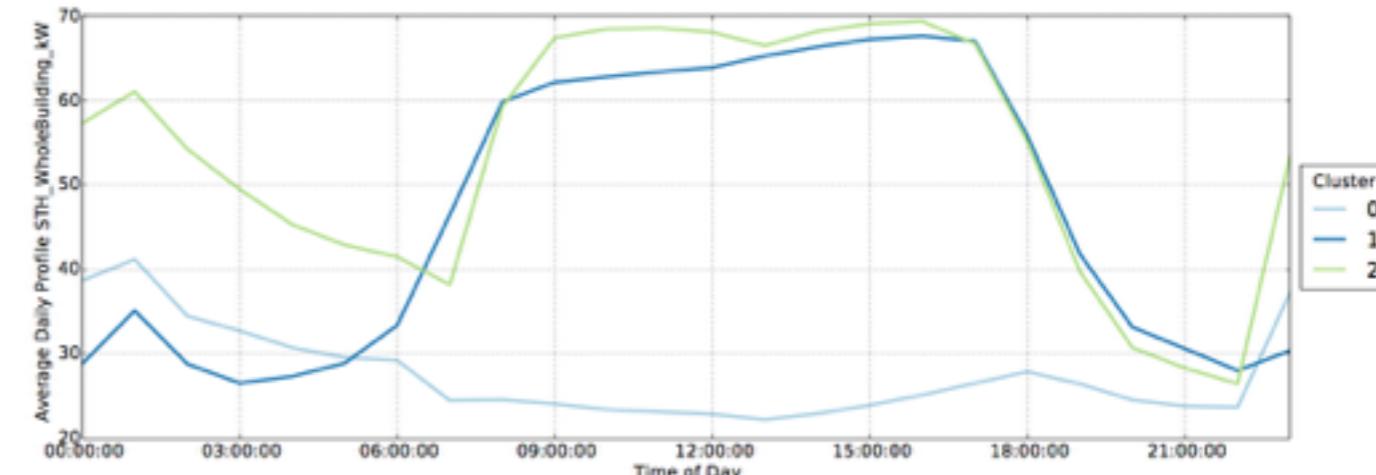
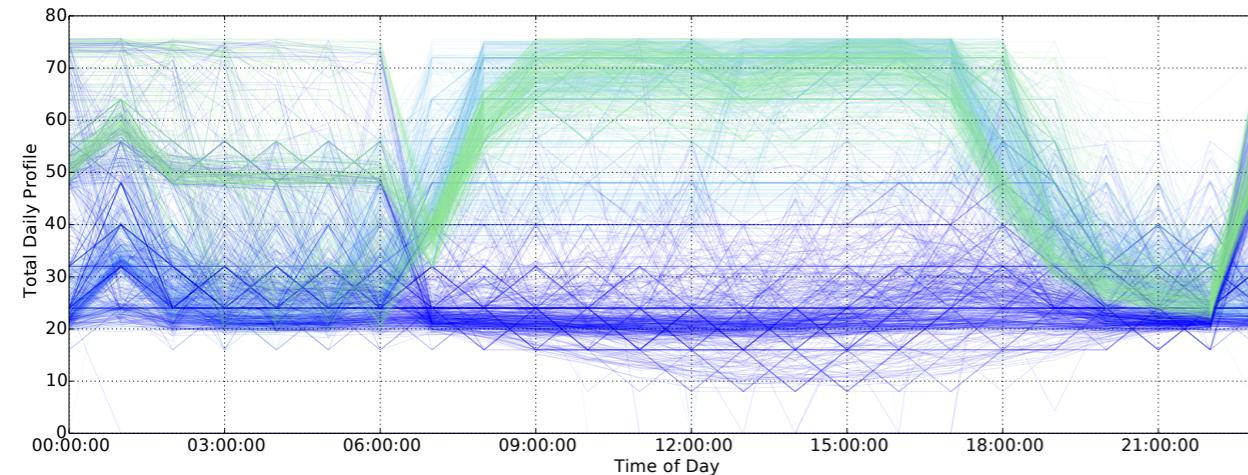
# Detailed Model Calibration (Reddy et al. 2007)

# Requires intimate knowledge of detailed data

# Process of Analysis



# Clustering Example - Whole Building Electricity - 3 Clusters



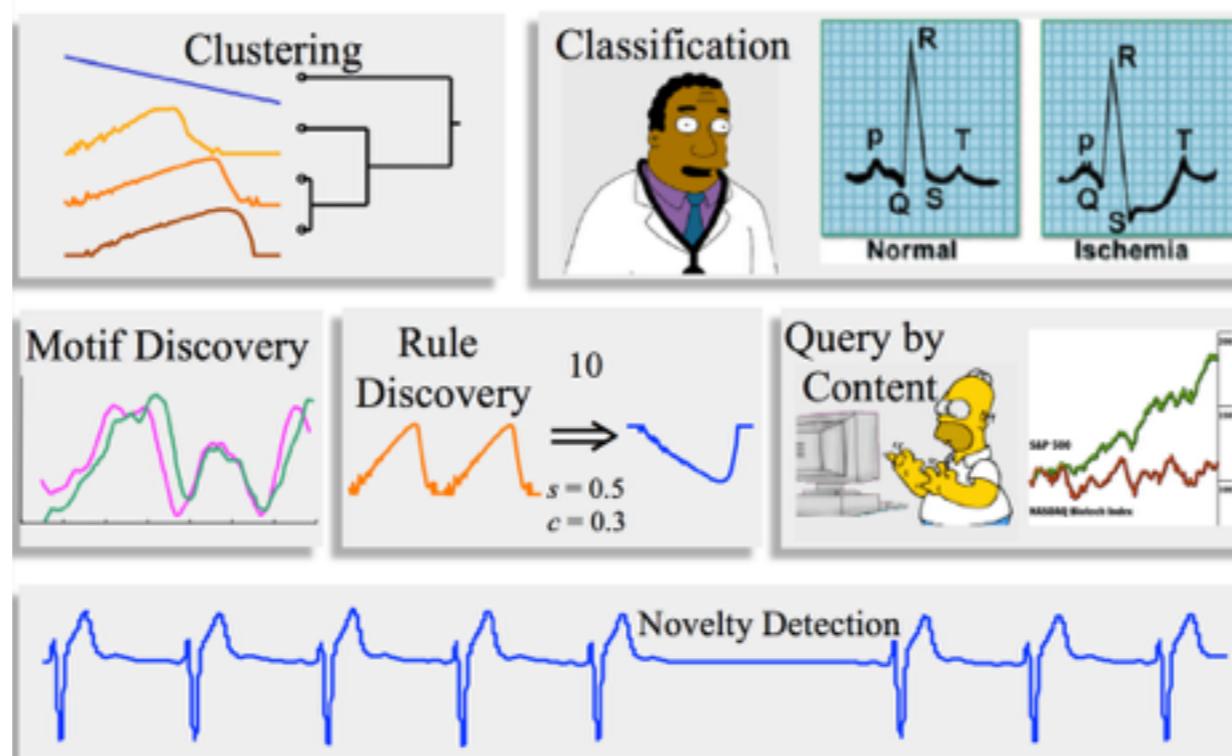
# Symbolic Time Series Representation

## SAX! A Symbolic Representations of Time Series

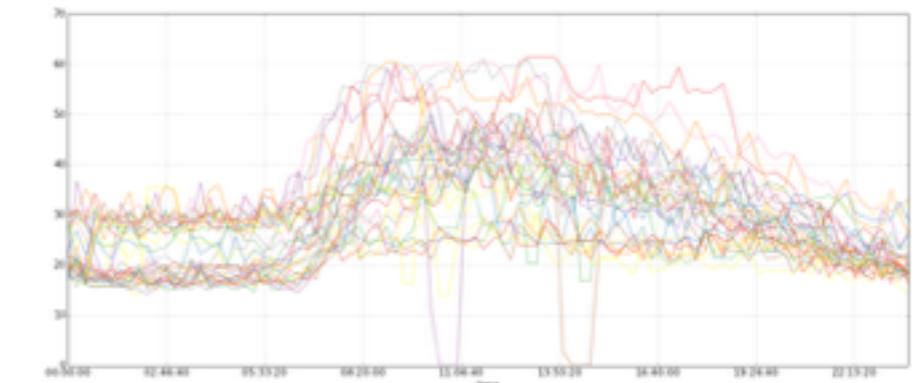
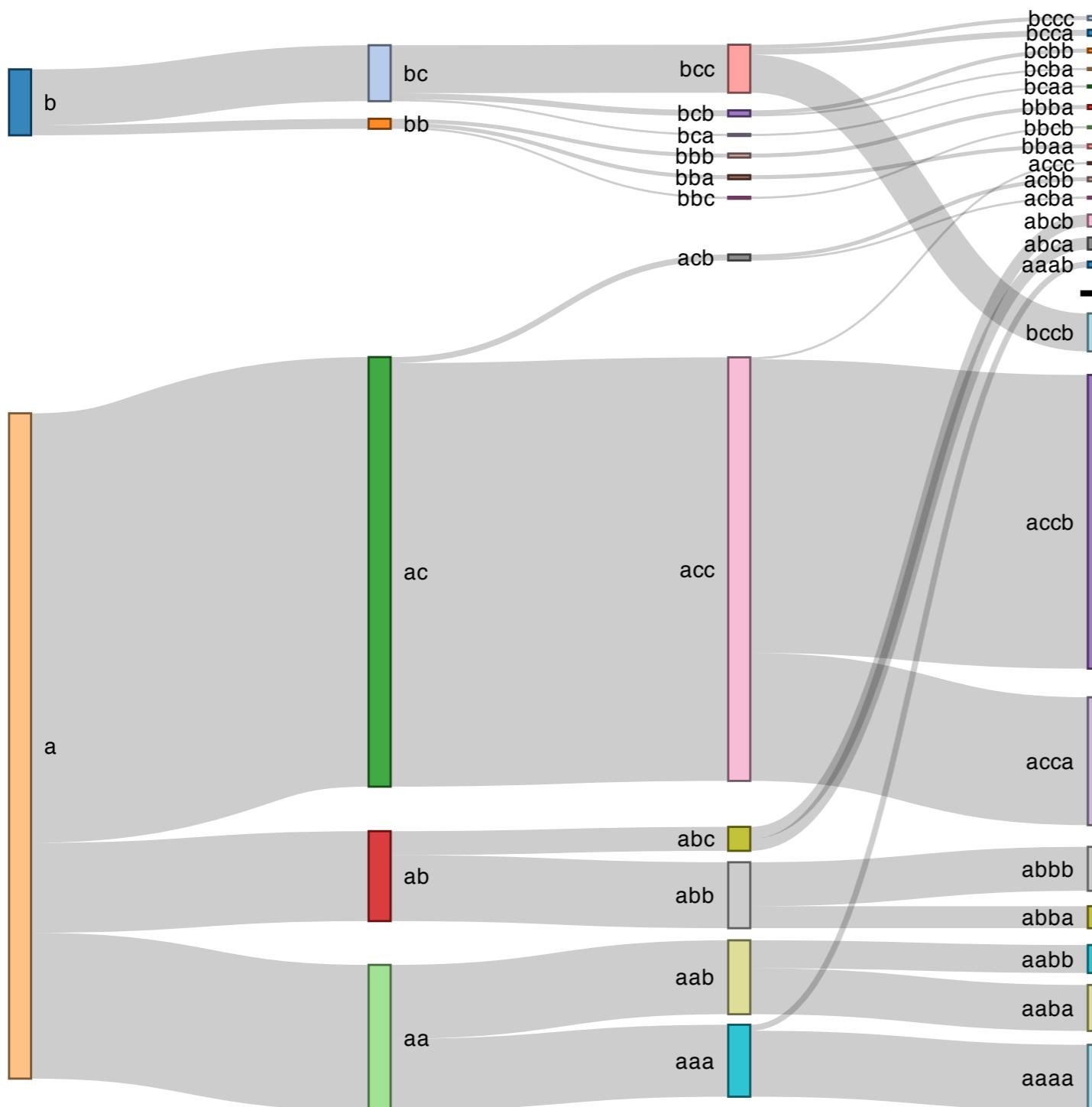
Eamonn Keogh and Jessica Lin

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University of California - Riverside  
Riverside, CA 92521  
[eamonn@cs.ucr.edu](mailto:eamonn@cs.ucr.edu)

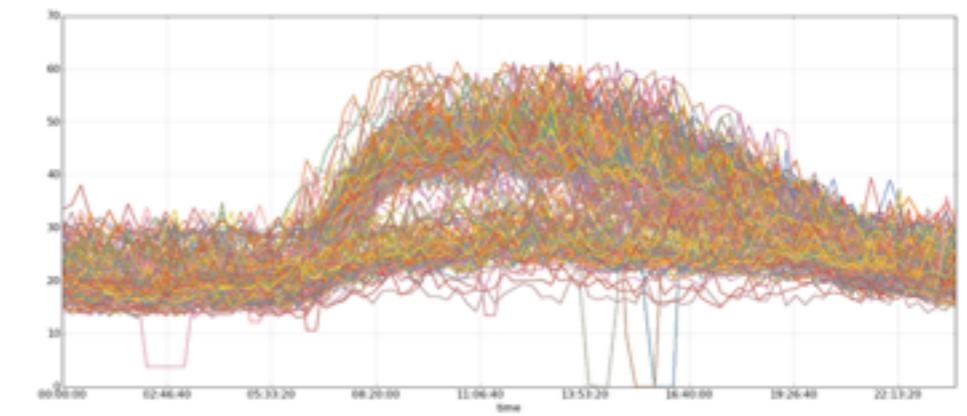
All these problems require **similarity** matching



# Berlin Hospital Dataset - Daily kW Average 2012



"Tagged" for Investigation  
"Normal" - High Frequency



# Traditional R Graphics for Sparklines and Logos

Kristian Omland