Urban Computing

MANEESH AGRAWALA AND MICHAEL BERNSTEIN

CS 247
Cal State Fullerton redesign

Your super-rapid iteration!
Welcome to English, Comparative Literature, and Linguistics

As an English major at Cal State Fullerton, you enter a community of researchers and educators who care intensely about the study of literature and writing and who value the learning that happens in the classroom and in the hallways and walkways between classrooms. At Cal State Fullerton, you will have the opportunity to take classes from faculty who have completed advanced study in literature from a variety of cultural and historical traditions, including literary studies, literary theory, creative writing, rhetorical studies, and English education. You will also have the chance to develop leadership skills in English service organizations and academic programs and to hone advanced research and
Welcome to English, Comparative Literature, and Linguistics

As an English major at Cal State Fullerton, you enter a community of researchers and educators who care intensely about the study of literature and writing and who value the learning that happens in the classroom and in the hallways and walkways between classrooms. At Cal State Fullerton, you will have the opportunity to take classes from faculty who have completed advanced study in literature from a variety of cultural and historical traditions, including literary studies, literary theory, creative writing, rhetorical studies, and English education. You will also have the chance to develop leadership skills in English service organizations and academic programs and to hone your research and writing skills through collaborations with other students.
As an English major at Cal State Fullerton, you enter a community of researchers and educators who care intensely about the study of literature and writing and who value the learning that happens in the classroom and in the hallways and walkways between classrooms. At Cal State Fullerton, you will have the opportunity to take classes from faculty who have completed advanced study in literature from a variety of cultural and historical traditions, including literary studies, literary theory, creative writing, rhetorical studies, and English education. You will also have the chance to develop leadership skills in English service organizations and academic programs and to hone advanced research and communication techniques through collaborative research with your fellow students and with faculty.

Welcome to English, Comparative Literature, and Linguistics

The major in English at Cal State Fullerton is suitable for students interested in any of the wide-range of professions that expect excellence in reading and writing—including education, creative and professional writing, public service and preparation for further study in literature, law, medicine, or business. The major may be combined with preparation for elementary and secondary school teaching. In addition, it can provide a foundation for students who intend to pursue advanced degrees in preparation for teaching at the college level.

You will have the opportunity to take classes from faculty who have completed advanced study in literature from a variety of cultural and historical traditions.
Urban computing connects unobtrusive and ubiquitous sensing technologies, advanced data management and analytics models, and novel visualization methods, to create win-win-win solutions that improve urban environment, human life quality, and city operation systems.

-Yu Zheng, Urban Computing with Big Data
Urban Planning

Godzilla repents?
Cities full of strangers, so

- Sidewalks provide safety, social integration
- Mixed use areas draw activity at all hours
- Familiar strangers form neighborhoods
- Good parks function like sidewalks
People think of cities as collections of:

- **Paths**: streets, sidewalks, trails, canals, etc.
- **Edges**: boundaries e.g. walls, shorelines, etc.
- **Districts**: areas that have distinct features
- **Nodes**: large areas serving as foci of city
- **Landmarks**: points of reference e.g. buildings
Not just physical design

- Government
- Commerce
- Safety
- Accessibility
- Social integration
People and places

Who lives in a pineapple under the sea?
Familiar Strangers

People we encounter frequently in public spaces but don’t know

[Milgram 1977]
Familiar Strangers

People we encounter frequently in public spaces but don’t know

[Milgram 1977]
[Paulos 2004]
Crowdsourcing Bus Shelter Data

blue = bus stop sign,  magenta = bus stop shelter,
yellow = bench,     green = trash/recycling can

[Hara 2013]
Cellular phone “sensors”

- Location data from cell phones can help map out a city’s use in practice, better informing urban planning [Ratti et al. 2006]

- Left: Milan, Italy
Livehoods

• Use social media check-ins to identify neighborhoods as they are *lived* rather than as they are *defined*.

• Right: black lines are formal districts, colored polygons are clustered checkins [Cranshaw 2012]
Governance and participation

I’m just a bill, yes I’m only a bill, and I’m sitting here on Capitol Hill…
Living Voters’ Guide

2. Collect your thoughts on 1098, one point at a time.
Write your own points. Include points written by other participants into your list by clicking the arrows.

- **Pros**
  - by Richard Arthur
    The majority of taxes collected goes to a trust fund for education. Our state needs to dramatically increase funding for schools.
  - by Peter Lipsky
    This is a smart shift in tax policy. Lowering the property tax could help home-owners keep up with mortgage payments and lower foreclosures.
  - by Chris Tupasil
    Moves away from a regressive tax structure.

- **Cons**
  - by Michael Harris
    Addition of an income tax to existing sales, property and inheritance taxes will make Washington a very tax-unfriendly state and discourage.
  - by Christopher
    The property tax cut also applies to out-of-state corporations that own property here. Why would we want to give Bill-Mac a tax break?
  - by LVC admin
    This is just the first step to a state income tax for all Washingtonians.

• Support deliberation by adopting pro/con statements into your opinion

[Kriplean ’12]
Paper maps of lived experience

- Give paper maps to local teens and let them annotate
- Visualization techniques to recombine into a sense of “what it’s like”

[Van Wart ’10]
Hacking local problems, e.g., “Adopt a Hydrant” in Boston
Street Bump

- Crowdsourcing pothole detection
  - Use accelerometer and GPS to detect and record locations of potholes
Social media and crisis events

- Volunteers on social media (e.g., Twitter) contribute to *situational awareness* during crises
  - “Velma area residents: Officials say to take Old Hwy 7 to Speedy G to safely evacuate. Stephens Co Fairgrounds in Duncan for shelter”
  - “Could see flames above the trees two miles away from my house”

[Vieweg 2010]
Accessibility and Access

I can’t get no satisfaction
Finding Sidewalk Accessibility Issues

Crowdsourced identification pipeline on Google Street View Images

(a) Object in Path  (b) No Curb Ramp  (c) Surface Problem  (d) Prematurely Ending Sidewalk
Public transit availability

OneBusAway and Tiramisu: track bus locations and make the information available to commuters

[Ferris 2010, Zimmerman 2011]
Transportation sharing

- Now launched in the Bay Area: bike sharing for commuters

- Can we convince ourselves to treat bikes as a sharable commodity rather than a personally owned item?
VizWiz
[Bigham et al., UIST ’10]

• Visual question answering for the blind, from the crowd

Do you see picnic tables across the parking lot?

(13s) no
(46s) no
Technology use among homeless

[Le Dantec and Edwards, CHI '08]

- Cultural probe technique
  - Give a disposable camera and ask homeless to capture their lives

- Resulting observations:
  - Mobile phones used to maintain a stable connection to family
  - Presence on internet services showcases “I’m OK” to concerned friends and family
  - Very little use of traditional computers, but 50% had cell phones
  - Electronic bus cards cause stress when they malfunction. Observers: “it’s not buggy, you’re just broke”
Public space

No sleep till Brooklyn
Jogging over a distance

[Mueller 2007]
Geocaching

- Use the GPS on your phone to find hide and seek containers
Technology use among homeless
[Le Dantec and Edwards, CHI '08]

- Cultural probe technique
  - Give a disposable camera and ask homeless to capture their lives

- Resulting observations:
  - Mobile phones used to maintain a stable connection to family
  - Presence on internet services showcases “I’m OK” to concerned friends and family
  - Very little use of traditional computers, but 50% had cell phones
  - Electronic bus cards cause stress when they malfunction. Observers: “it’s not buggy, you’re just broke”
Environment

Heal the world
Sustainable behavior

- UbiGreen: semi-automatically record transit activity and make it visible on the user’s home screen

Froehlich et al. UbiGreen: Investigating a Mobile Tool for Tracking and Supporting Green Transportation Habits. CHI ’09.
Air quality sensing

Or if we can monitor secondary signals through biosensors?

What happens when air quality sensors are on everyone’s phones? [Willett 2010]

Or if we can monitor secondary signals through biosensors?

Nurturing Natural Sensors

Stacey Kuznetsov, William Odom, James Pierce, Eric Paulos
Human-Computer Interaction Institute
Carnegie Mellon University
Pittsburgh, PA, USA