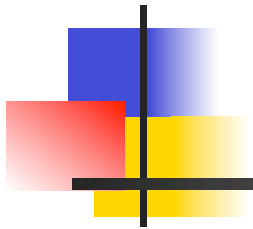


# Challenging Opportunities



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Jon Crowcroft,

<http://www.cl.cam.ac.uk/~jac22>



# History (personal:-)

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- Manet
  - Mobileman
  - Tschudin et al
  - Incredibles
- Dtn
  - Interplanetary/Oceanographic
  - Pocket Switched & Mobile Social
- Oppnet
  - Drive-Thru
  - Disaster



## Choosing Adversity

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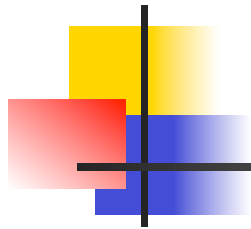
- Perverse, but valid research motive
- Make the network really really bad
  - (like it was in 1970s)
- And maybe neat new ideas will emerge
  - Which will work really, really well on a rock-solid network



## Compete with Infrastructure

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- "They have the guns, we have the numbers"
- But maybe opportunities give us information the infrastructure guys can't or won't get...



# Incentives

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- Hard to compute
  - Mostly assume rational selfish players
  - Recent market failures prove this is nonsense
- What to do instead?
  - Use *a priori* social knowledge
  - Travel plans, SIM, Fb/Buzz data



# Privacy and Risk Aversion

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- May be over sold
  - Known: younger people are more cavalier with their online presence than older (pre web) generation
- But needs respect
  - at least informed choice (opt out) by user
  - Prob. With id+loc is it is 2/3 of what you need to find out *everything*
  - (2 digits of postcode, age +gender)
  - There may be some *trigger event* which will change public view



## Back to drawing board #0

---

- Information theory and opportunities
- What can we infer
  - popularity in meeting
  - Popularity in communicating
  - Hub/centrality
  - Clique/giant component
- Predictive patterns of behaviour
  - Latest barabasi science paper on locn
  - Other?



# Back to drawing board #1

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- Non rational players
- Tools to measure&adapt to
  - Herding
  - Cascading
  - Opinion dynamics

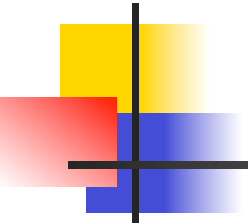




## Back to drawing board #2

---

- One small step at a time
- Pair of nodes -
  - why share anything?
  - What's useful
  - What does it cost
- Micro-research agenda...



# share between just 1 pair of phones

---

- Now a phone is much more than a computer
  - GPS, Camera, Mike,
  - Compass, Accelerometer
  - several networks
  - Several (heterogeneous) cores in processor
- We could share these
  - e.g. lots of people taking panoramic tiled photos,
  - or 1 GPS providing lots of people with location



## Lets look at actual resource costs

---

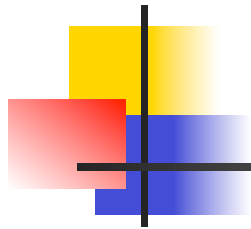
- Phone OS now about same as Desktop
  - Android == Linux
  - Iphone == OSX
  - Windows Mobile 6 (actually Windows 7!)
- Etc etc
- Software uses resources too
  - E.g. Java garbage collector surprise
  - Power/network aware applications...



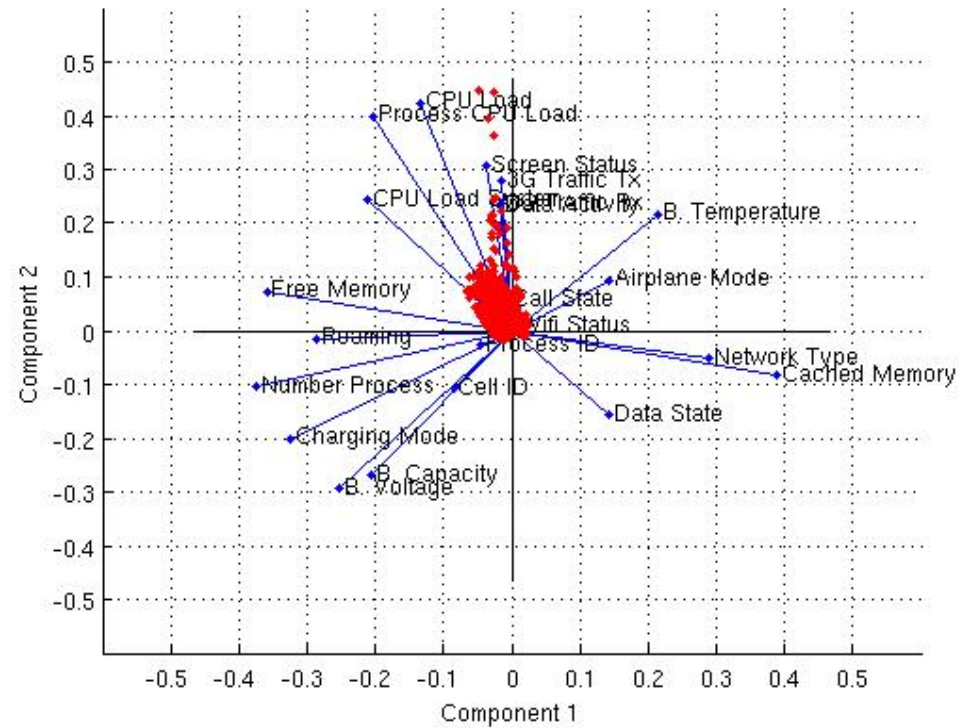
## Narseo's results...

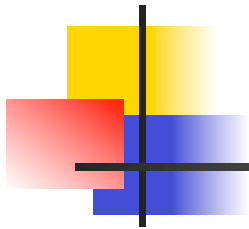
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- We've started looking at resource use in battery terms
- Calibrate OS tools for battery charge reporting
- By opening up phone and putting probe on battery:)
- Then run experiment with lots of users...

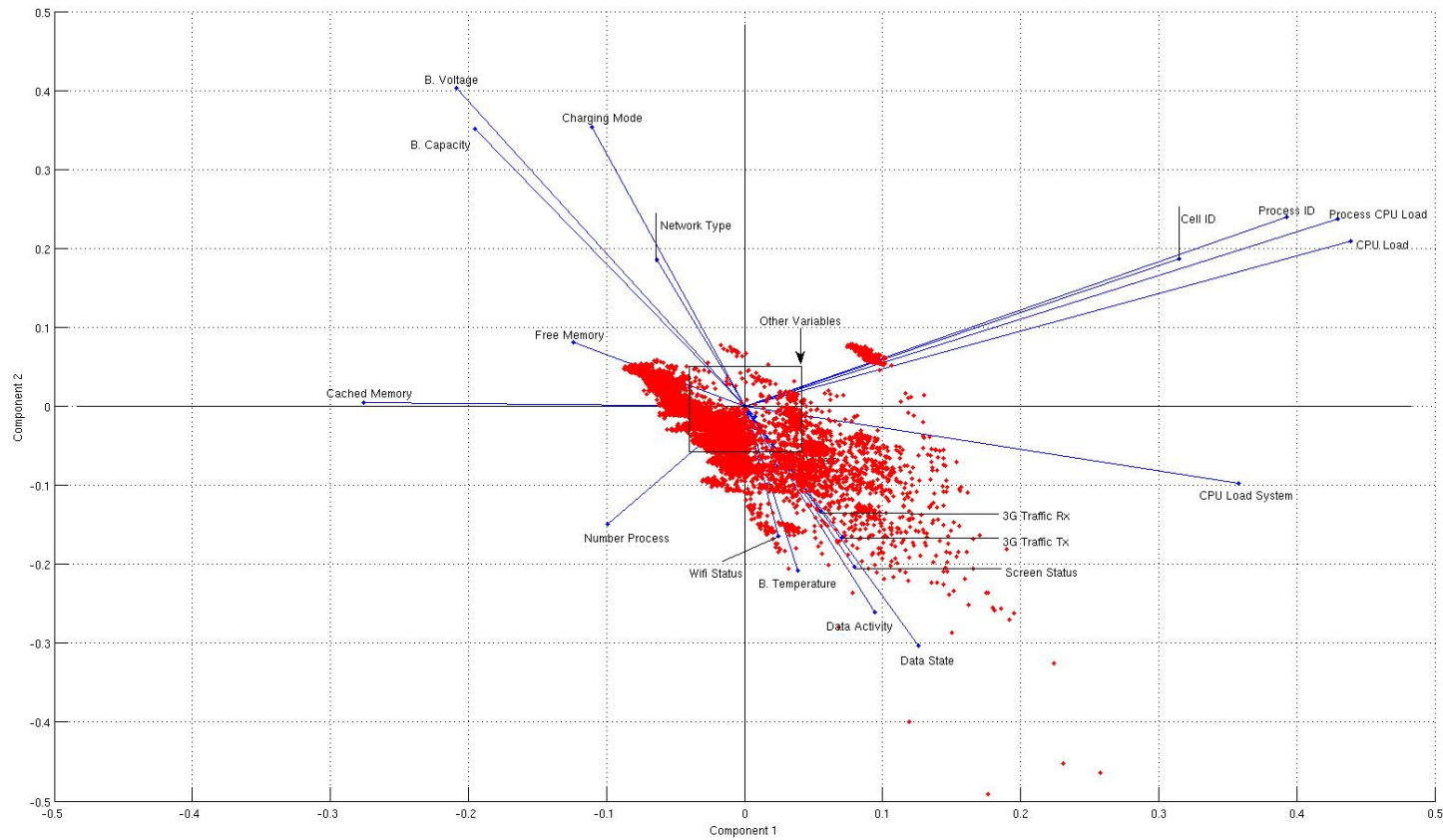


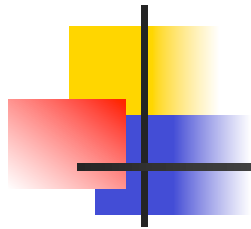
# Principal components on b's phone



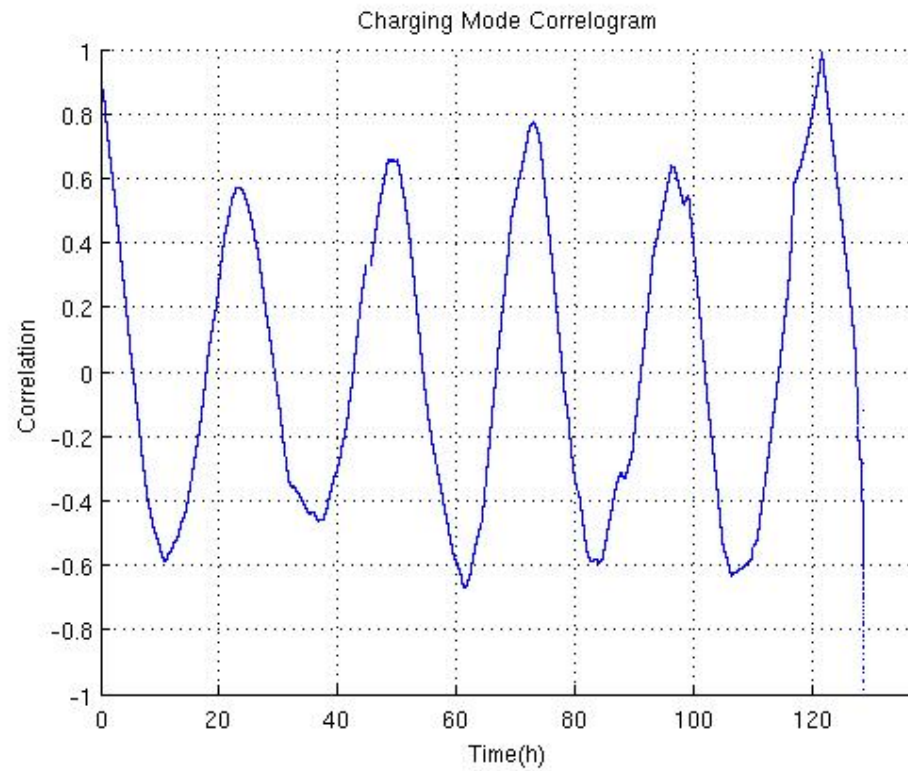


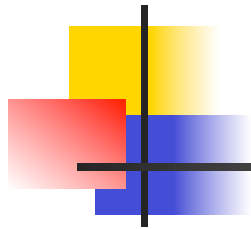
# Principal components on T's phone



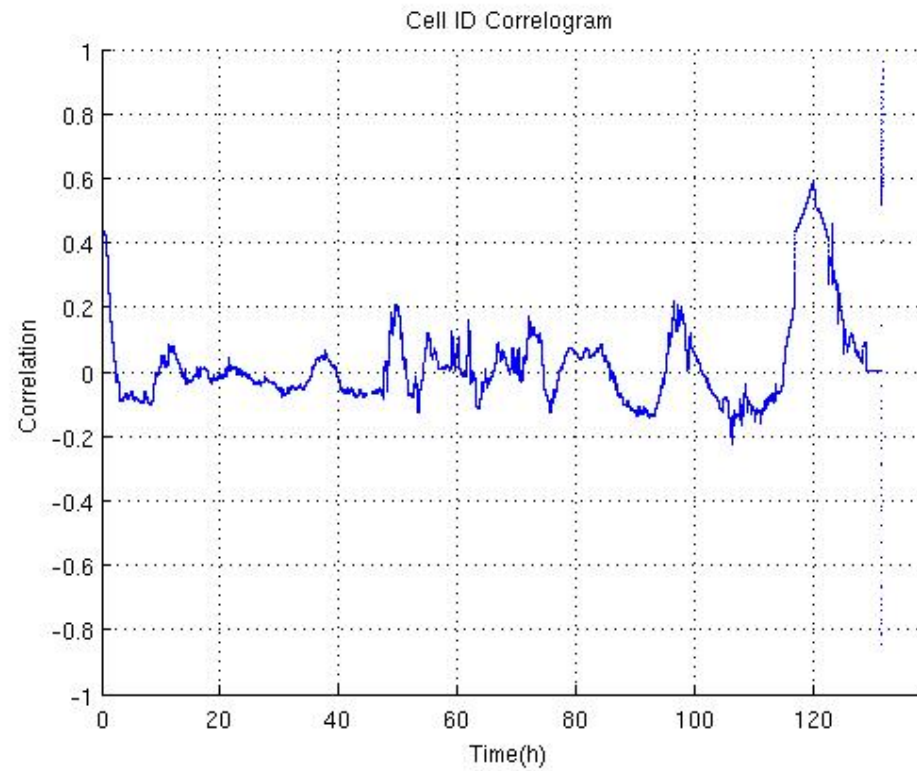


# N's phone charging correlogram

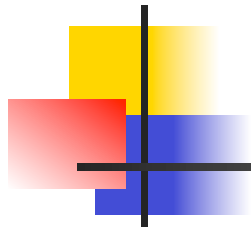




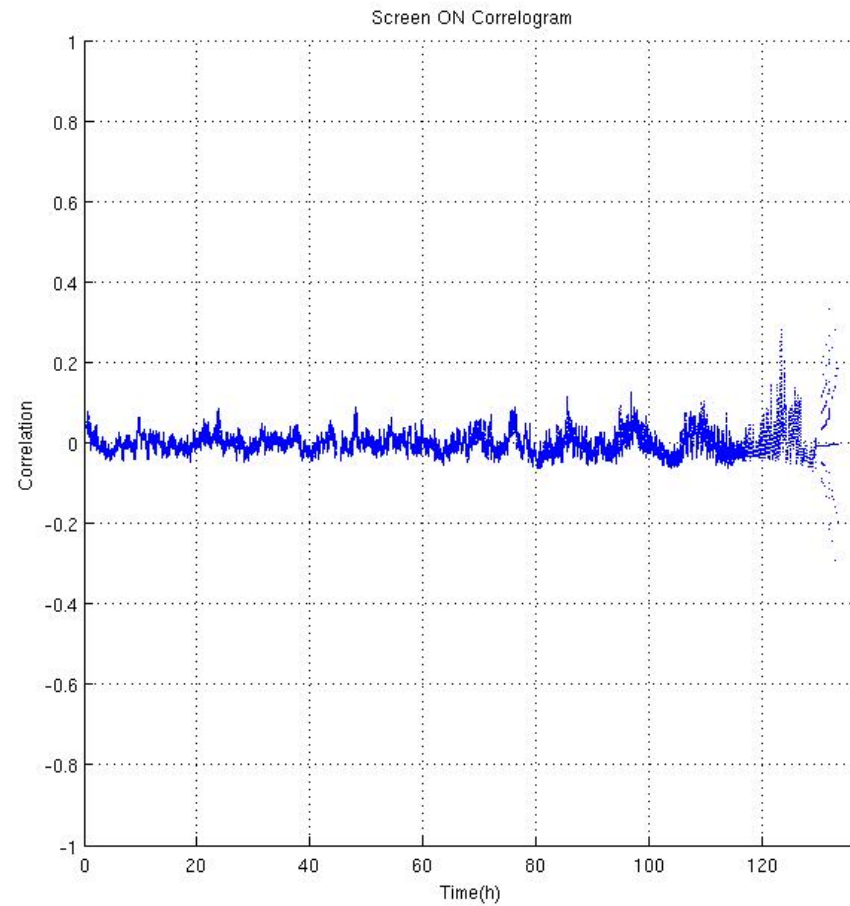
# N's cell location correlogram

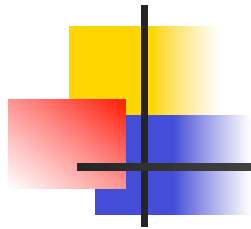




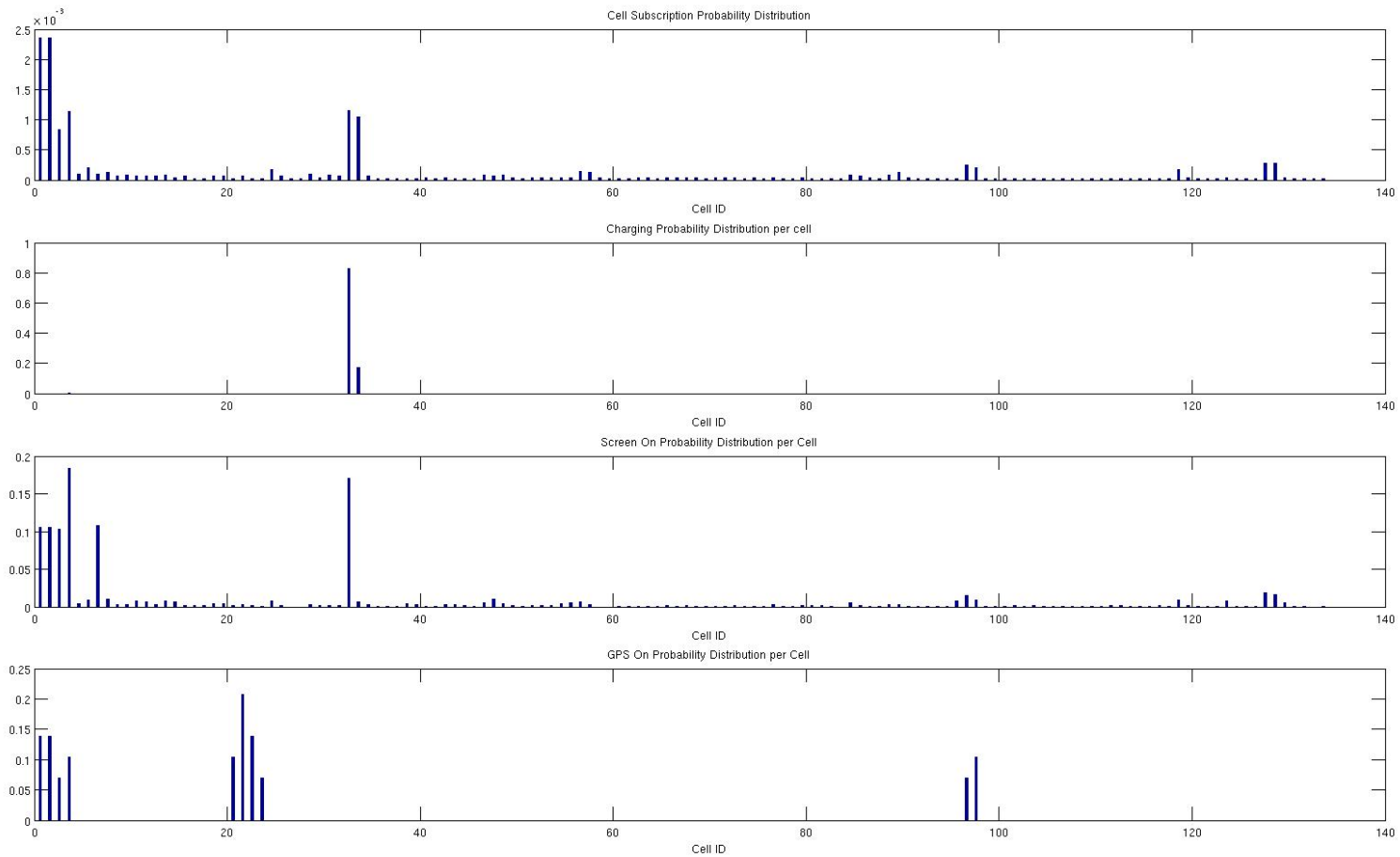


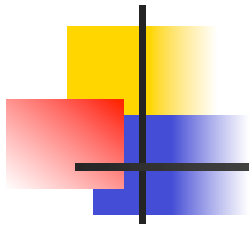
# N's "screen on" correlogram



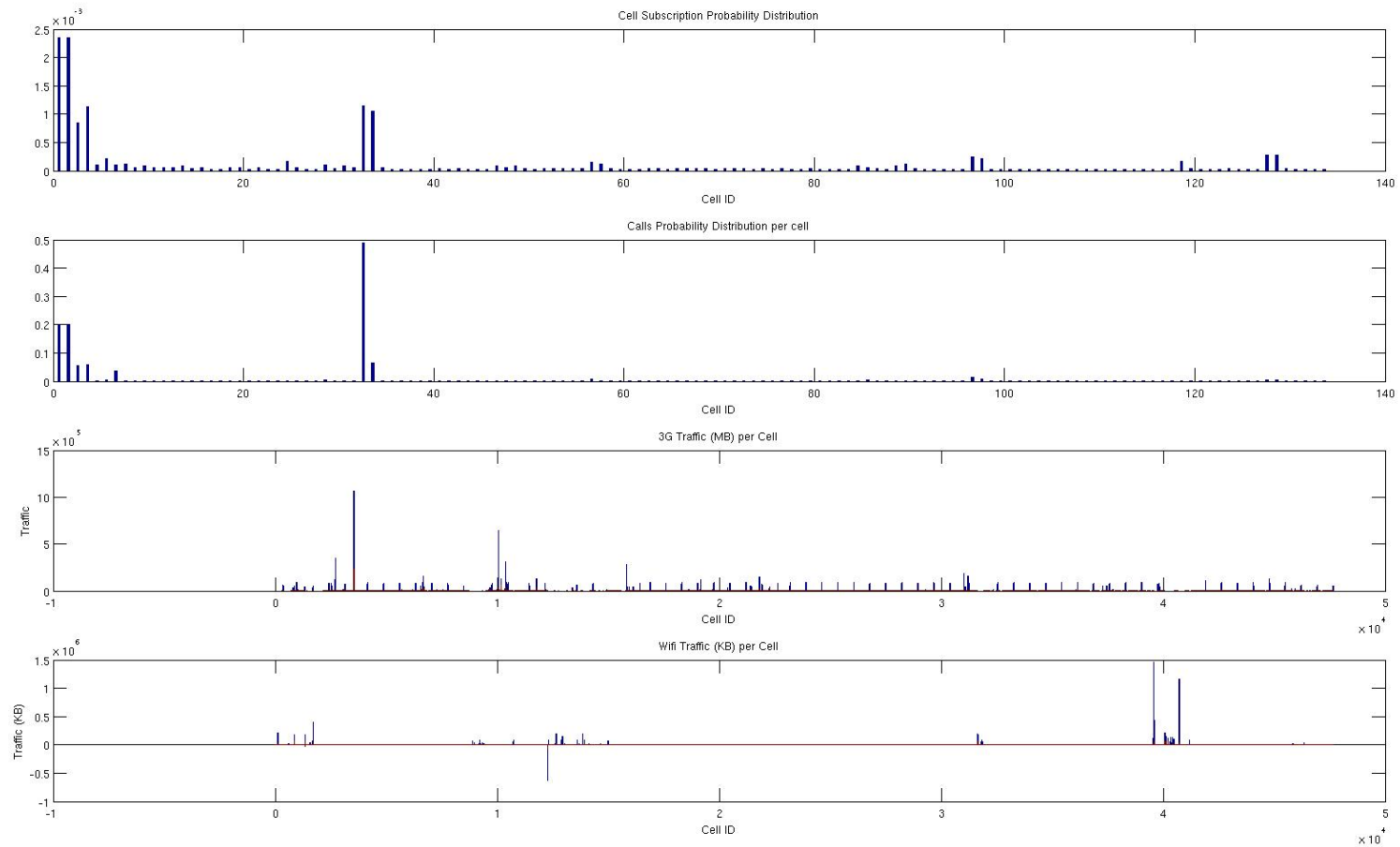


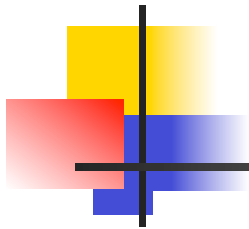
# J's interaction v. location



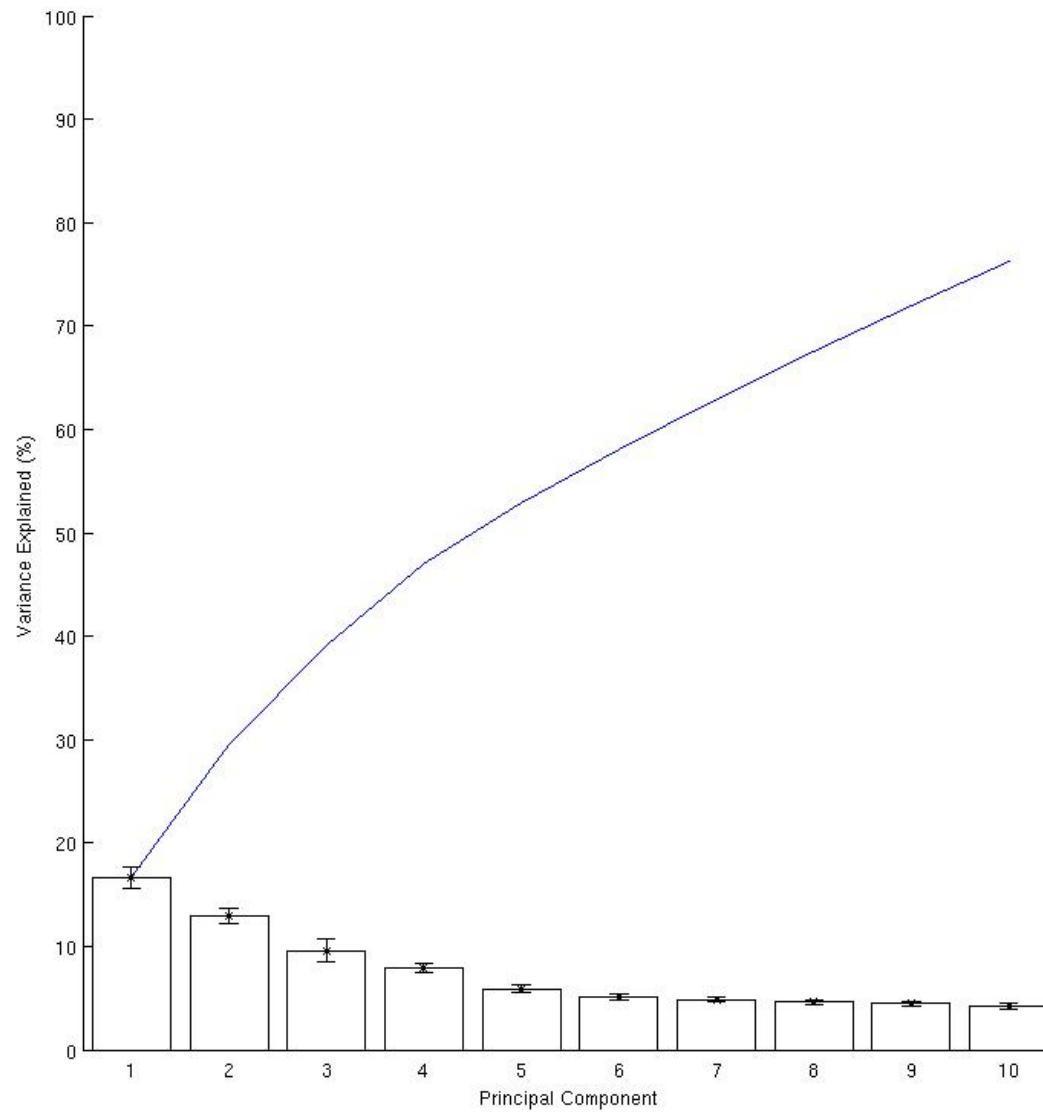


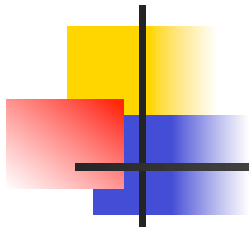
# J's net usage by location



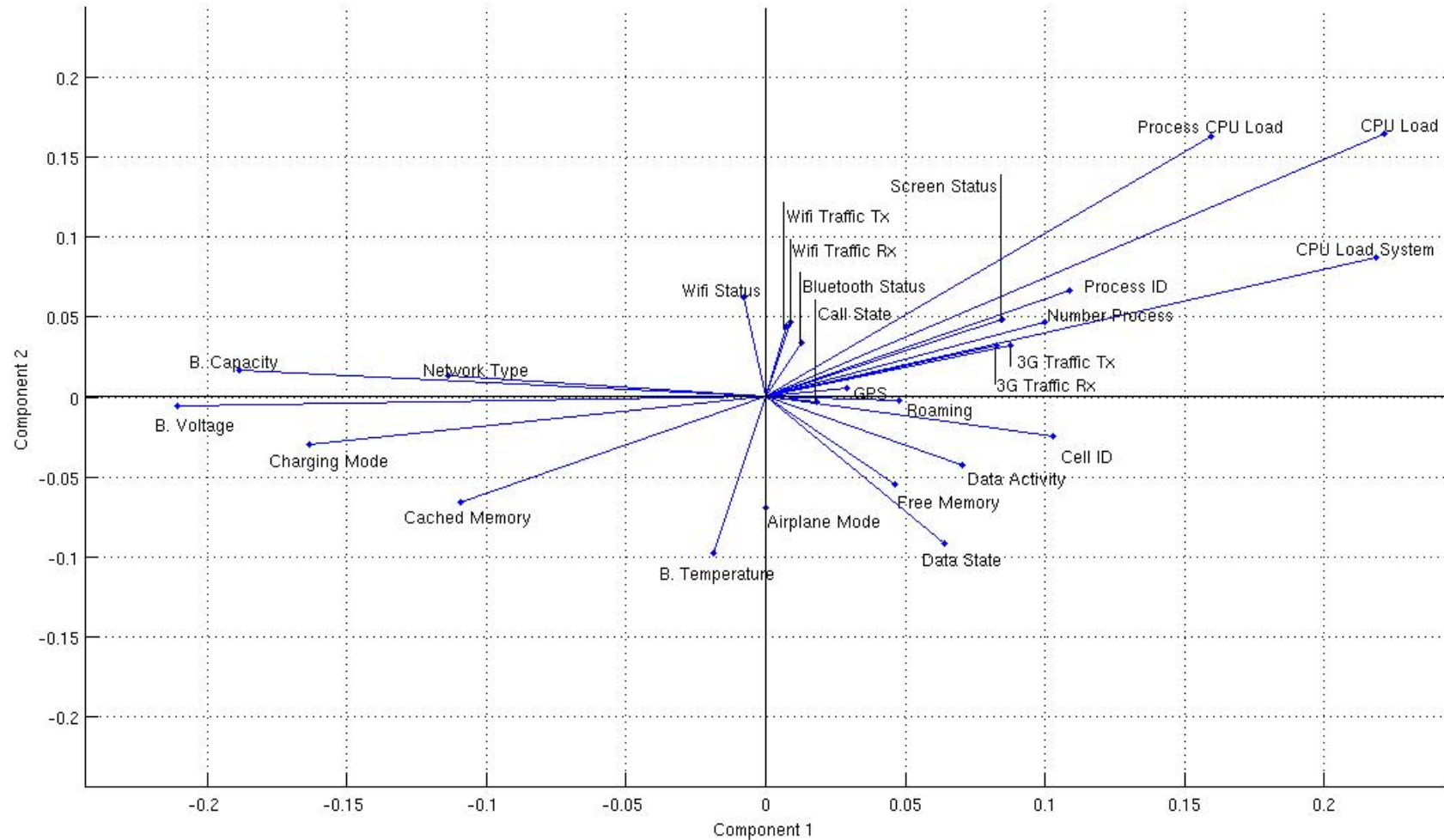


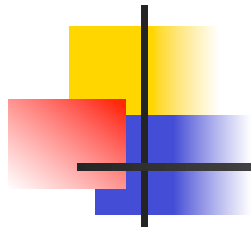
# PCA Analysis





# Average principal components





## Fooling the user

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- Buzz/Mobile Social
- Driving License
- Smart Badges:)



## Back to Drawing Board #3

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- What business model fools user best?
  - What are the ethics?
- Buzz was first “big bang” social mix
  - Take 1 network (gmail contacts, sorted by frequency of interaction)
  - And bootstrap another with it
  - How big a cognitive dissonance would this be to do on an opportunistic net?
  - Without informed consent, would cause major major headaches
  - Possibly illegal - viz healthcare workers

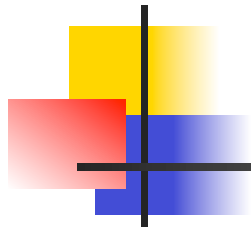


# Acknowledgements

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- Thanks to MSR for a bunch of WiMo phones
- Thanks to Google for a bunch of Android phones
- Thanks to volunteers in Cambridge for abandoning almost all privacy :-)





## Questions...

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- Do we need both the guns and the numbers?
- The truth is out there...