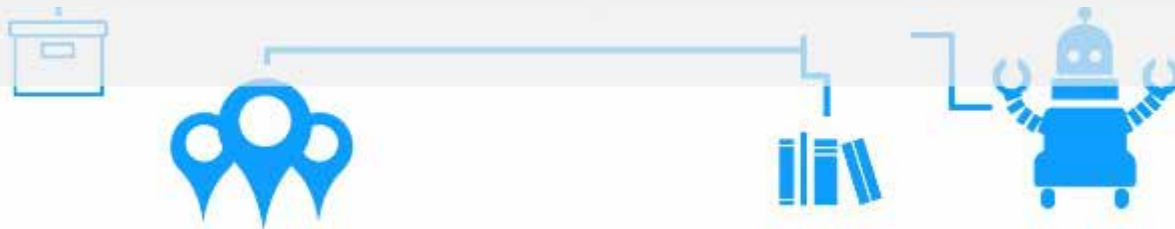




# Ubiquitous Computing: Every where, Every day, Everybody

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# Definition of Ubiquitous Computing

- Components
  - Everyday user
  - Everyday object
  - Everyday activity
- Characteristics
  - Embedded (invisible)
  - Connected
  - Distributed
  - Mobile

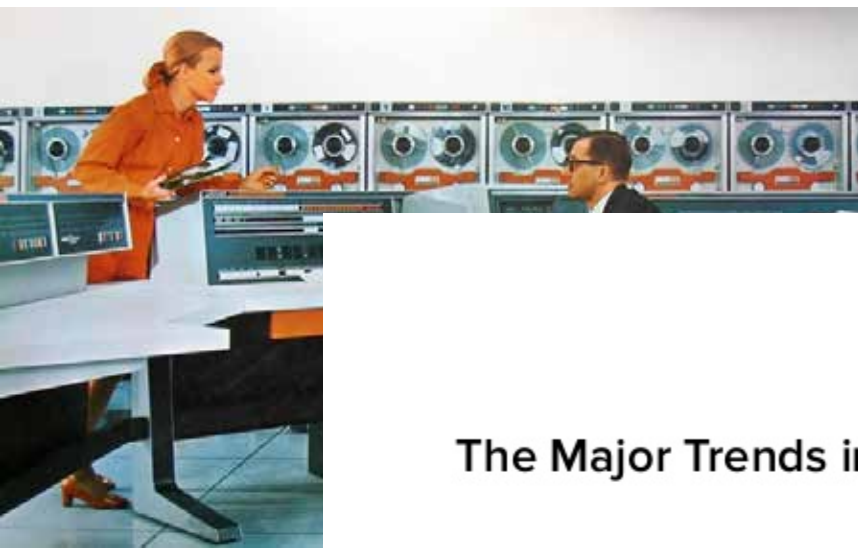




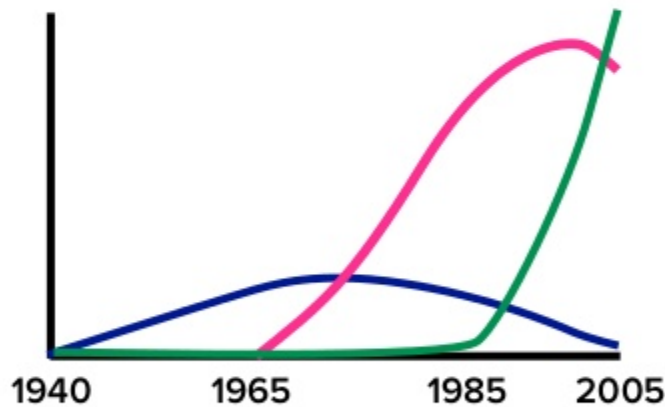
# EVERYTHING IS CONNECTED TO EVERYTHING ELSE

The First Law of Ecology, proposed by biologist  
Barry Commoner

# Mainframe Computing



## The Major Trends in Computing



XEROX  
**1988**  
**PARC**  
Mark Weiser

Mainframes (many:one)  
Personal Computers (one:one)  
Ubiquitous Computing (one:many)

omputing



<http://www.slideshare.net/whipplehill/responsive-web-design-rwd-in-a-multiscreen-world>

## Ubiquitous Computing

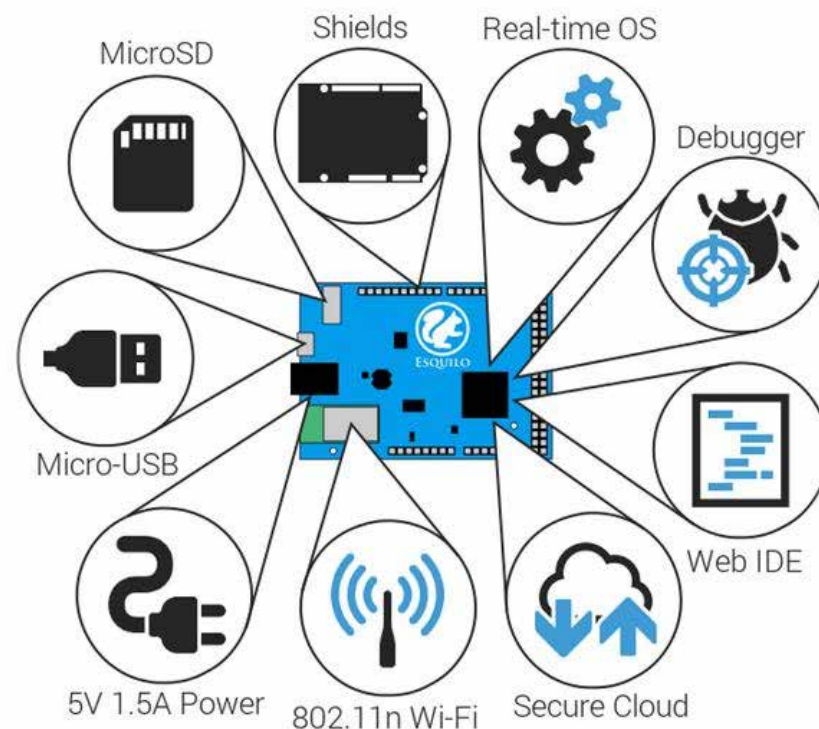


<http://time.com/tag/know-right-now/>



# Enabling Technologies

- Embedded processors and sensors
  - Small form factor
  - Low expenses
  - Enduring Energy
  - Processing power
  - Data storage
  - Data communication





# Related Concepts

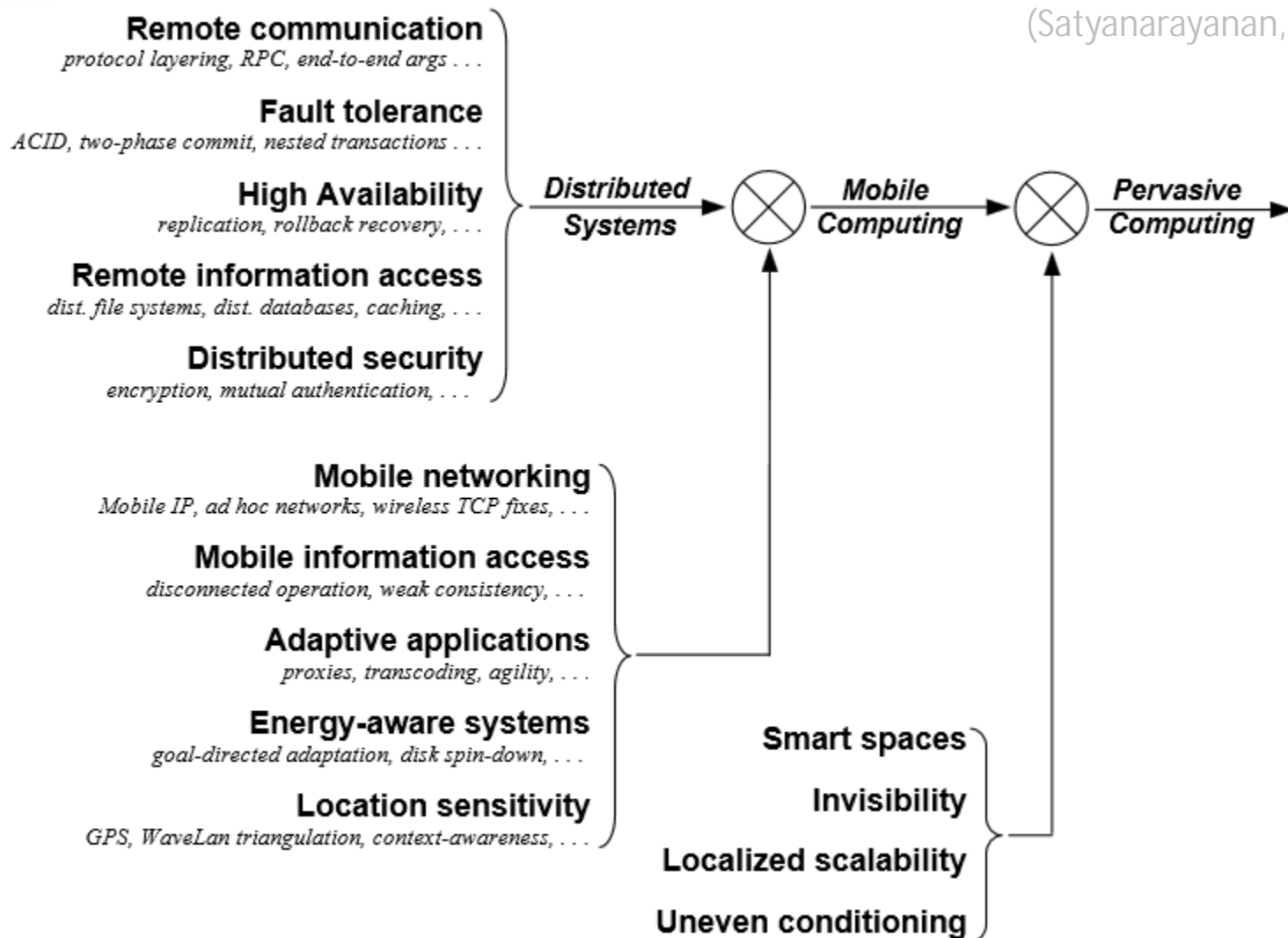
- Embeddedness → pervasive computing
- Mobility → mobile computing
  - No physical wire, e.g. WiFi, Bluetooth, etc.
  - Can be transported during normal usage
- Object → Internet of Things (IoT)
  - Automatic identification
  - Tracking





# Related Concepts

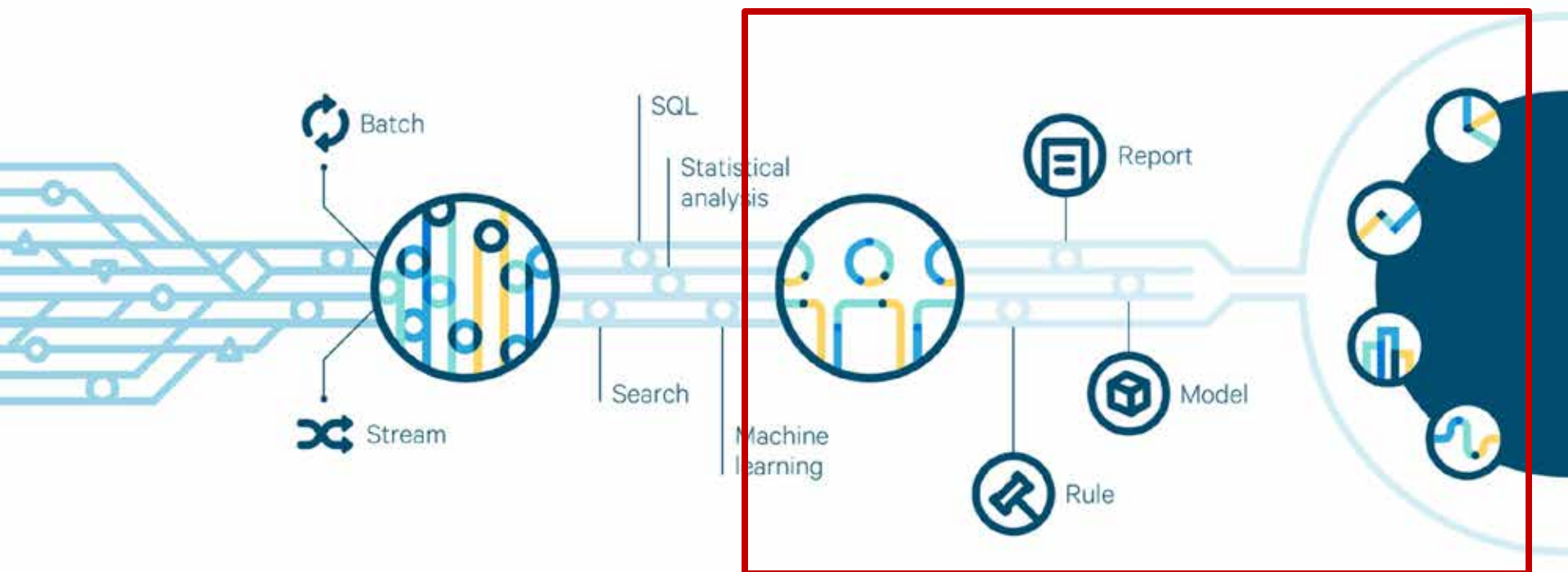
(Satyanarayanan, 2001)







# Flow of Ubiquitous Computing



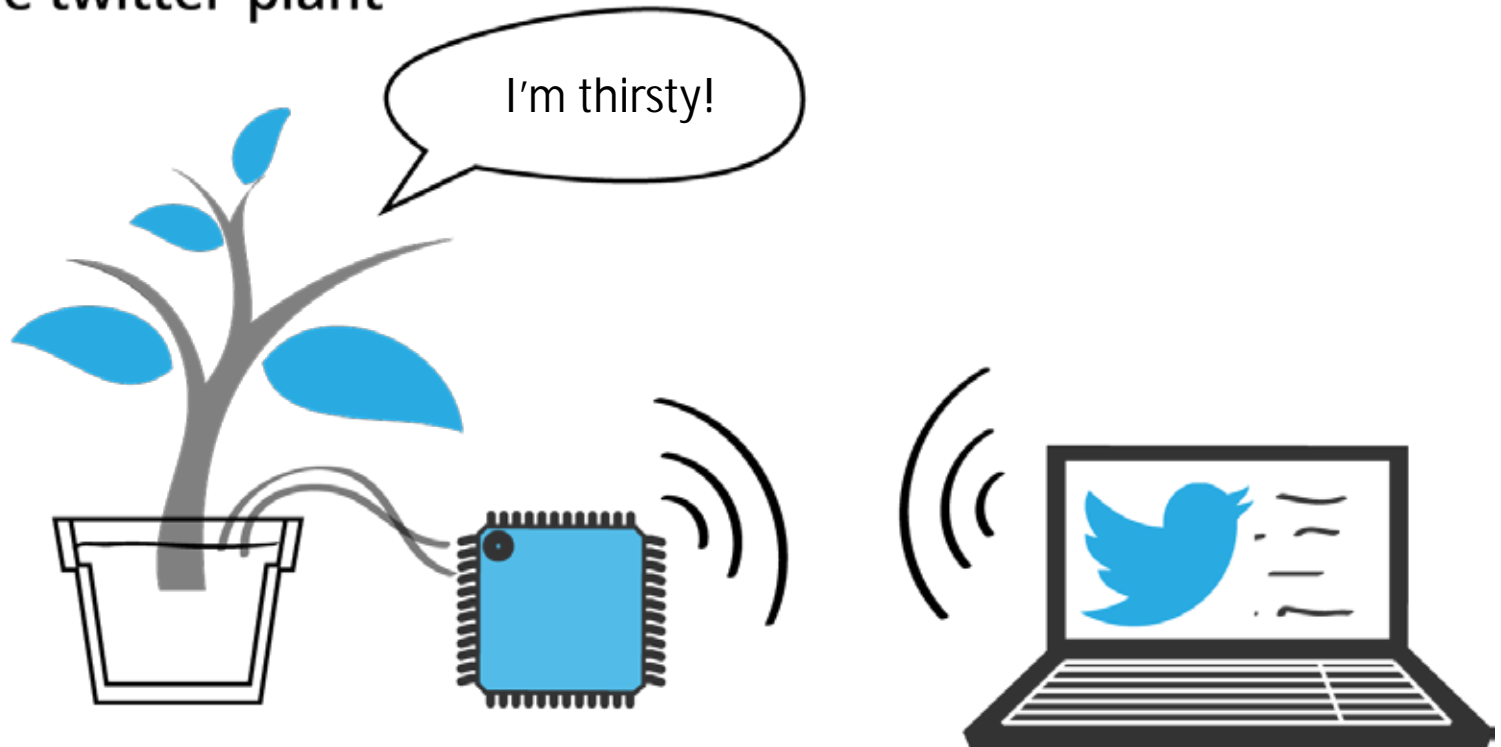




# Connections to HCI (Interaction)

- Enrich interactions
- Make physical objects **interactive & intelligent**

De twitter-plant





# Connections to HCI (Intelligent)

- Human-Data Relationship
  - Get data from humans
  - Present data to humans
  - Learn about humans from data
  - Facilitate humans based on data

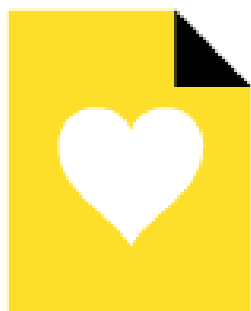




# Three Keywords



**User-centric**



**Context-aware**



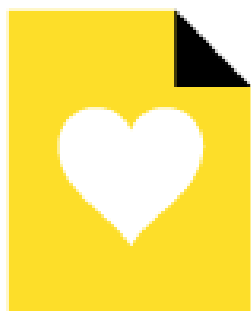
**Data-driven**



# Three Application Domains



**User-centric**  
Personal  
Informatics



**Context-aware**  
Smart  
Home



**Data-driven**  
Urban  
Dynamics



- Help people collect personally relevant information for the purpose of self-reflection and gaining self-knowledge



# Stage Process of Personal Informatics

- “Quantified Self” (Li et al, CHI2010)

Help people collect personally relevant information for the purpose of self-reflection and gaining self-knowledge

Preparation



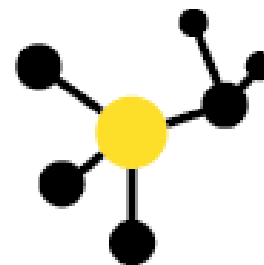
Collection

Integration



Reflection

Action





A STEM-CELL GAMBLE p52

# technology review

Published by MIT

BRIEFING  
SOCIAL  
NETWORKS  
p61

## The Measured Life

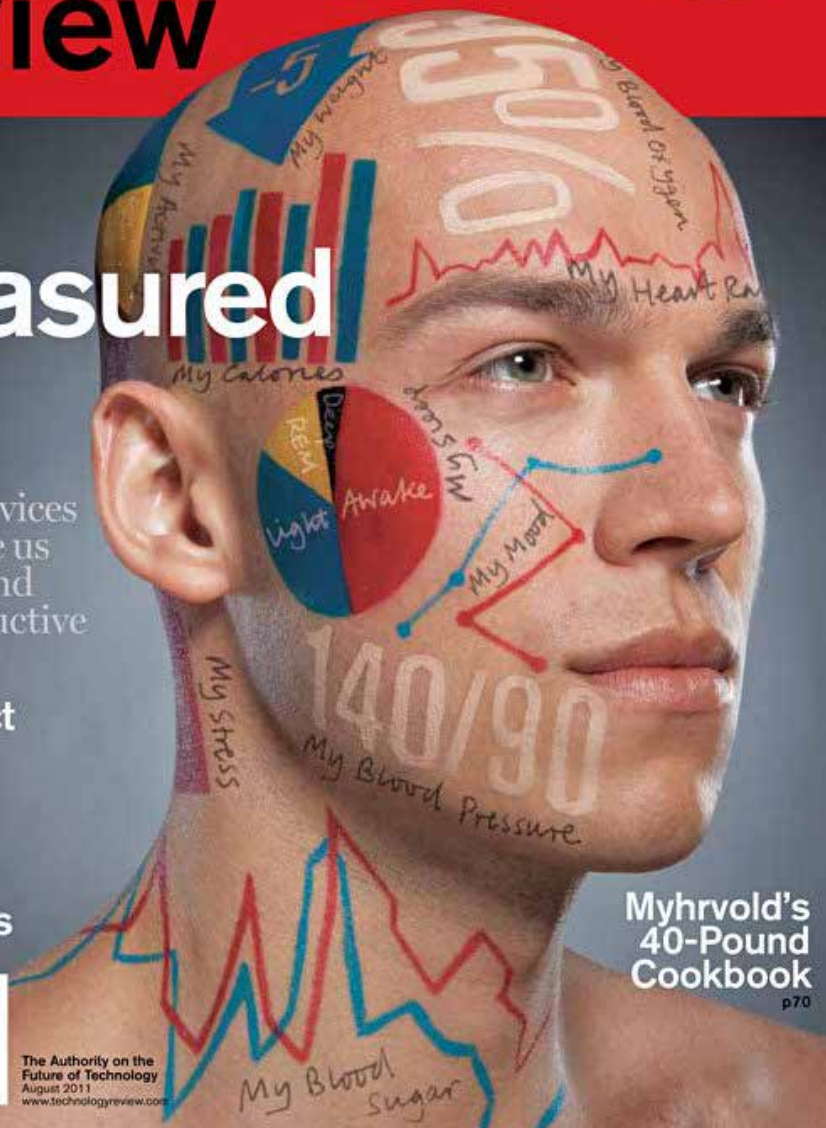
New self-tracking devices could make us healthier and more productive  
p38

The Perfect  
Malware  
Scam  
p46

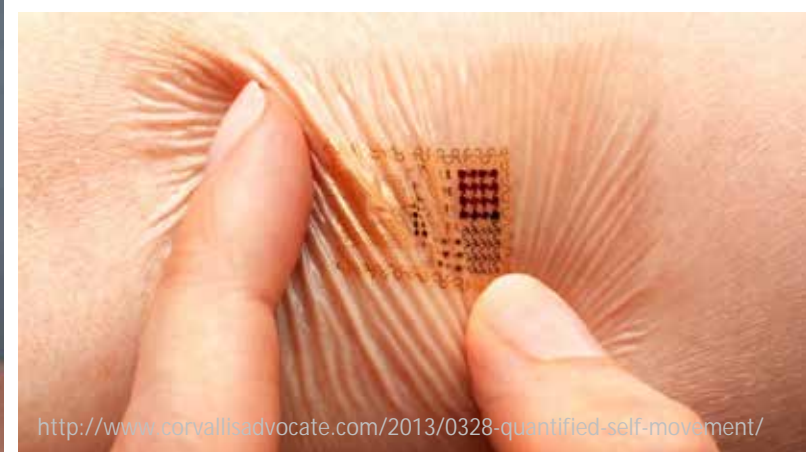
Climate-  
Change  
Economics  
p28



The Authority on the  
Future of Technology  
August 2011  
www.technologyreview.com



Myhrvold's  
40-Pound  
Cookbook  
p70









# Reflection: Sensing, Knowing, Doing



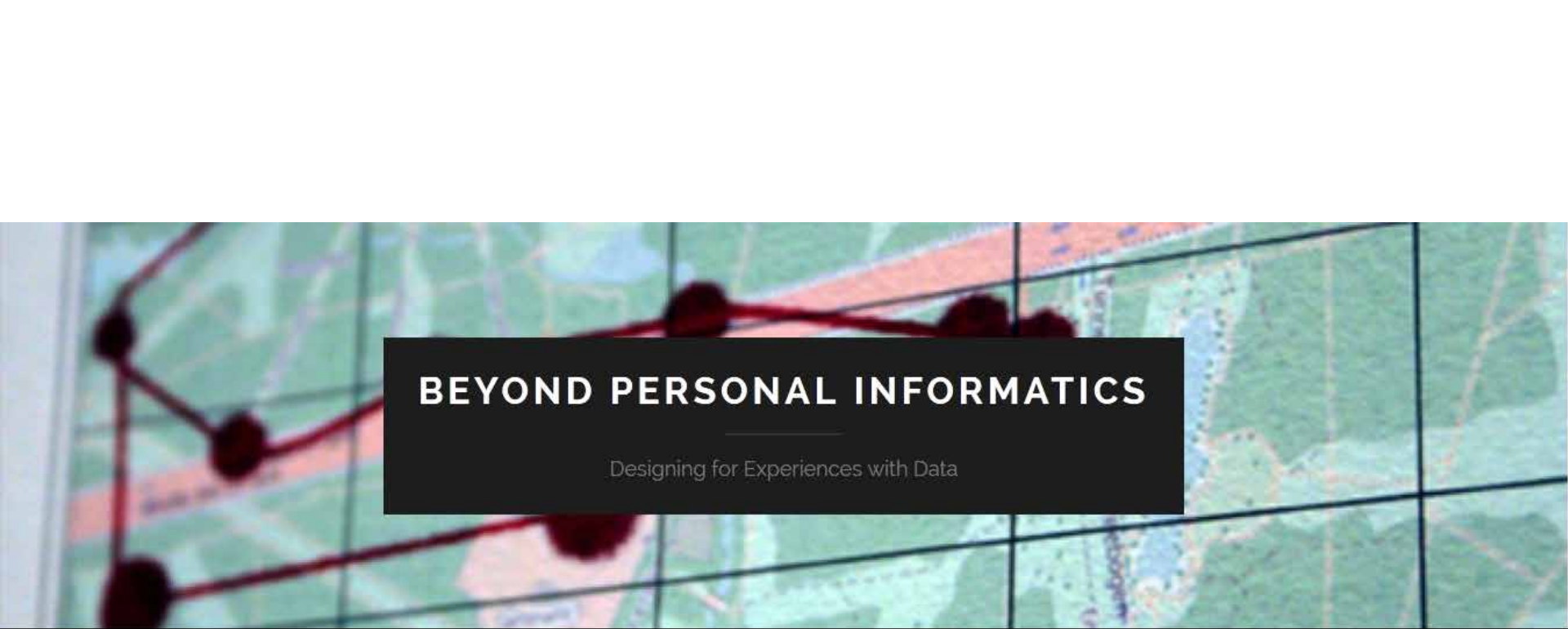
<http://blog.underarmour.com/devices/activity-trackers/the-beginners-guide-to-quantified-self-plus-a-list-of-the-best-personal-data-tools-out-there/>



# Expression: Making a Personal Statement



<http://www.wearable.com/fashion/new-york-fashion-week-wearable-tech-september-2015>

The background of the slide features a map with a grid of latitude and longitude lines. Overlaid on the map is a network of red lines connecting several dark red circular nodes, suggesting a data network or a path on a map.

## BEYOND PERSONAL INFORMATICS

Designing for Experiences with Data

# What research problem would you propose?



# BEYOND PERSONAL INFORMATICS

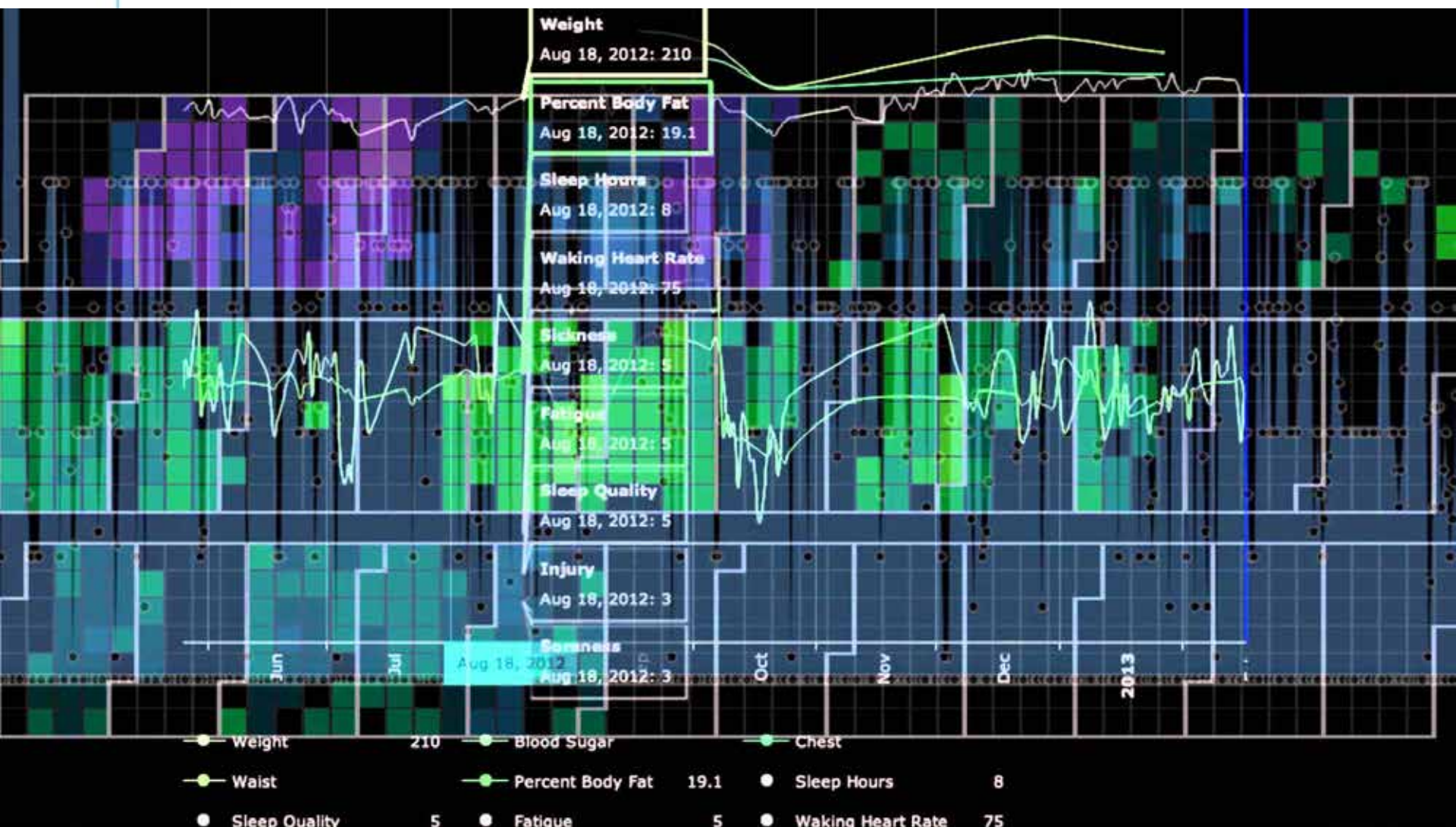
Designing for Experiences with Data



<http://openlab.ncl.ac.uk/beyondpersonalinformatics/>



# Ethics: Accuracy, Reliability, Security, Privacy



<http://blog.dacadoo.com/blog/2015/06/10/dacadoo-showcasting-at-qs15-expo/>

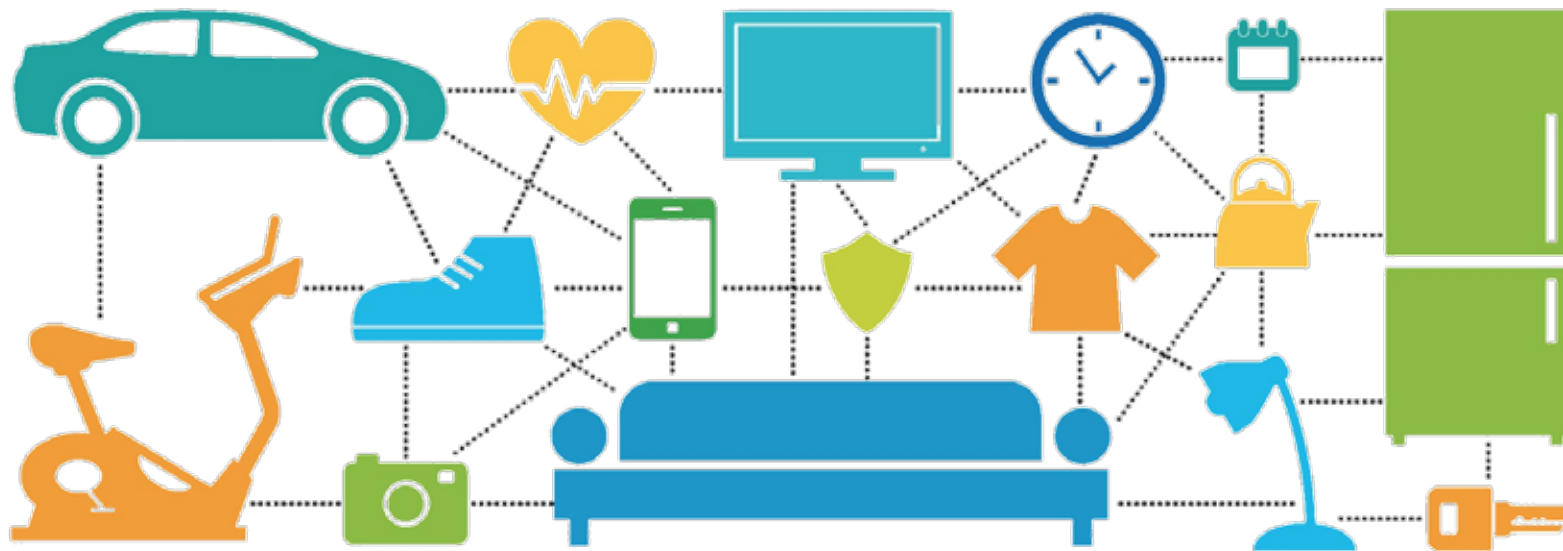




# Case2: Smart Home (Context)

- “Home Intelligence”

Smart environment, smart living







# Context Awareness and Adaption



<https://brokersdirect.co.uk/2014/04/nest-the-thermostat-that-will-save-home-owners-money/>



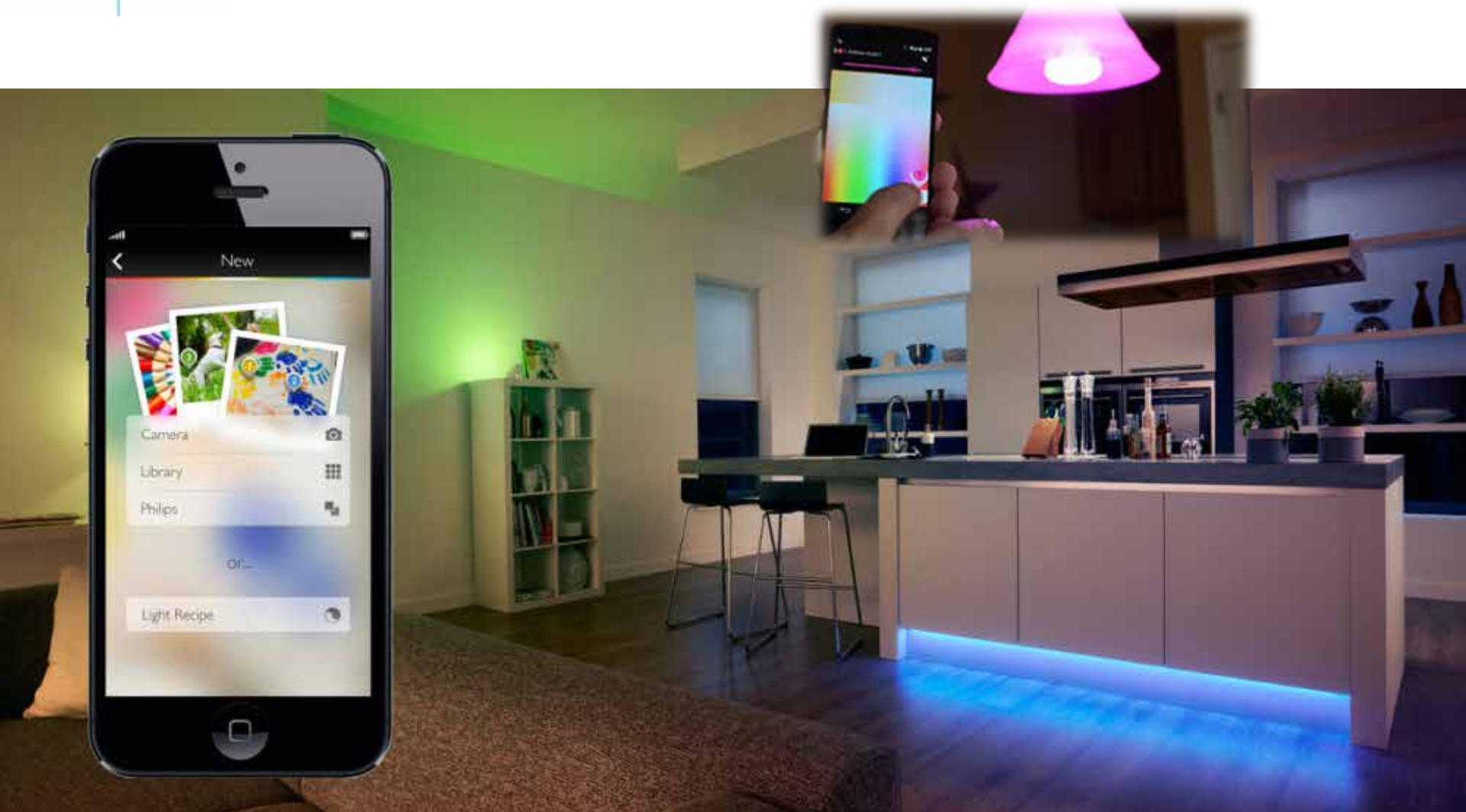
# Adoption and Trust



<https://gigaom.com/2015/01/05/here-are-15-more-products-that-work-with-nest/>



# Proactivity and Transparency



<http://www.cnet.com/products/philips-hue-connected-bulb-starter-pack/>



# Case 3: Urban Dynamics (Data)

- Urban Computing

Acquisition, integration, and utilization of data generated by a diversity of sources in urban spaces to tackle the major issues that cities face



<http://blog.marketo.com/2015/04/infographic-the-marketing-power-of-the-internet-of-things-connectivity-for-better-customer-interactivity.html>





# "Sensor"





# "Sensitivity"

google.org Flu Trends

Language: English (United States)

[Google.org home](#)

Explore flu trends around the world



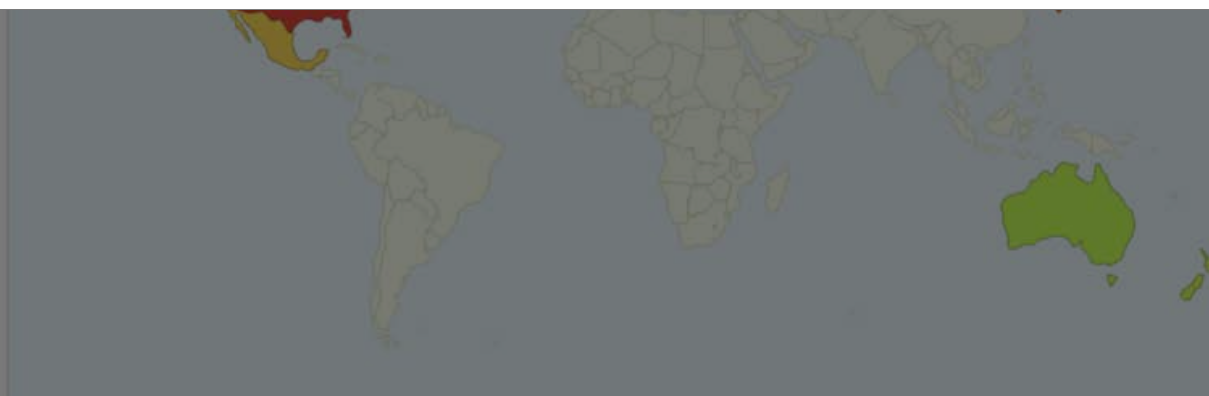
## Thank you for stopping by.

Google Flu Trends and Google Dengue Trends are [no longer publishing](#) current estimates of Flu and Dengue fever based on search patterns. The historic estimates produced by Google Flu Trends and Google Dengue Trends are available below. It is still early days for nowcasting and similar tools for understanding the spread of diseases like flu and dengue – we're excited to see what comes next. Academic research groups interested in working with us should fill out this [form](#).

Sincerely,

The Google Flu and Dengue Trends Team.

Low  
Minimal



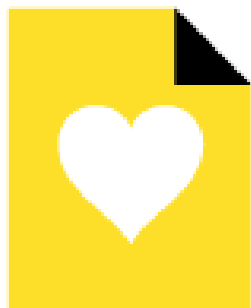
<https://www.google.org/flutrends/about/>



# Recap of Ubiquitous Computing



User-centric



Context-aware



Data-driven

Preparation

Integration

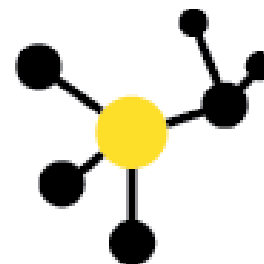
Action



Collection



Reflection







# References

- Li, Ian, Anind Dey, and Jodi Forlizzi. "A stage-based model of personal informatics systems." In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, pp. 557-566. ACM, 2010.
- Satyanarayanan, Mahadev. "Pervasive computing: Vision and challenges." *Personal Communications, IEEE* 8, no. 4 (2001): 10-17.



Thank You J

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