# Part I (Research): Mobile, Pervasive and Social Computing

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# Background

- Ph.D., University of Central Florida, Orlando
  Computer Science (1988)
  [Washington State University, Pullman, 1985-1986]

- M.S., Indian Institute of Science, Bangalore
  Computer Science (1984)

- B.S., University of Calcutta, India
  - Computer Science and Engineering (1983)
  - Physics Honors (1980)

Founded 1963

Founded 1890

Founded 1909

Founded 1857

# Experience

- Assistant/Associate/Full Professor, Computer Science, University of North Texas, 1988–1999
- Professor, Computer Science and Engineering, University of Texas at Arlington, 1999–2013
- University Distinguished Scholar Professor, UT Arlington, 2006–2013
- Founding Director, Center for Research in Wireless Mobility and Networking (CReWMaN), 2000–2013
- Program Director, National Science Foundation, 2008-11
- Chair, Computer Science, Missouri S&T, 2013 –

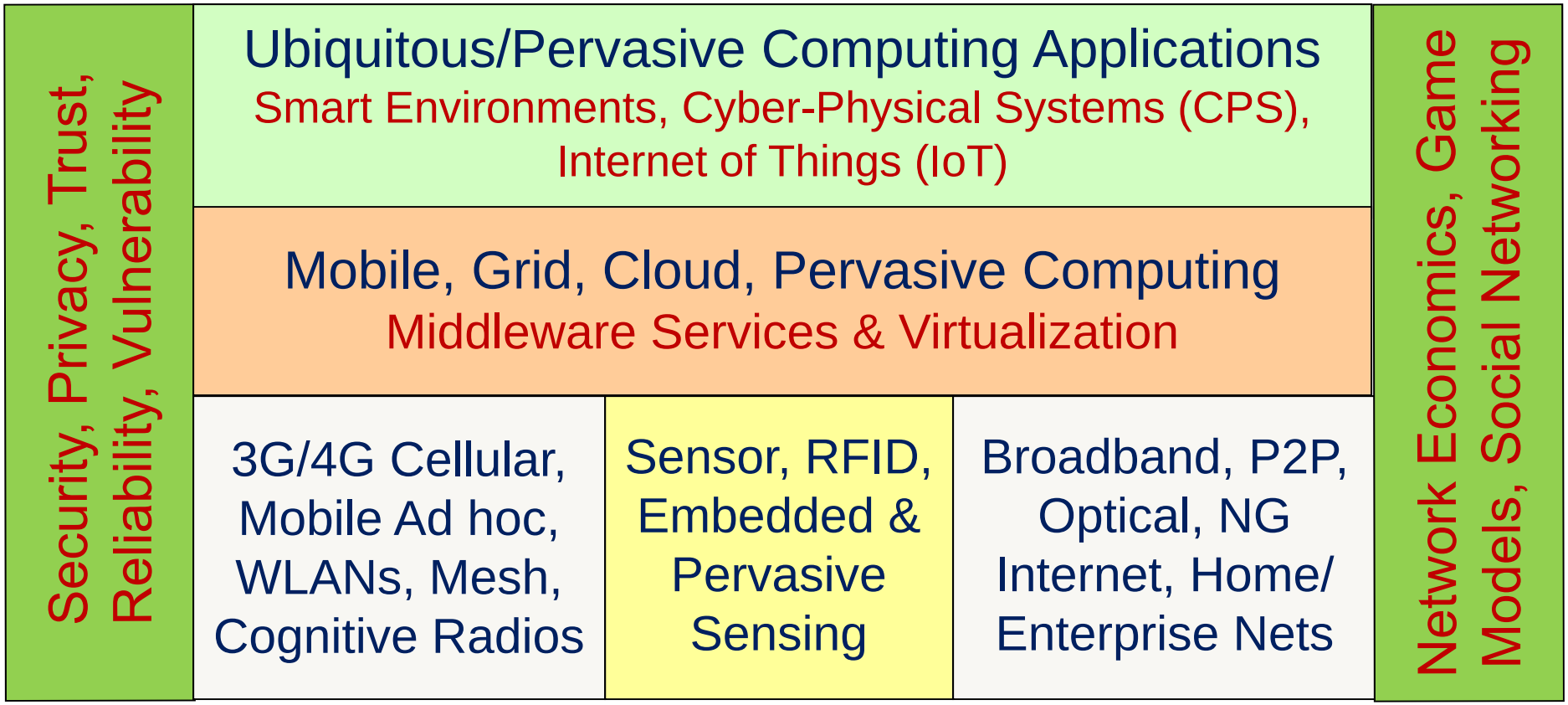
# My Career Evolution

| Distributed Computing (1984-) | Mobile Computing (1995-) | Pervasive Computing (2001-) |
|---|---|---|
| • Petri Nets | • Cellular (3G/4G)Networks | • Wireless Sensors, RFID |
| • Parallel Algorithms | • Ad hoc Networks, WLANs | • Context-Aware Computing |
| • Distributed Systems | • Opportunistic Networking | • Situation-awareness |
| • Interconnection Networks | • Cognitive Radios | • Middleware Services |
| • Task Scheduling | • Wireless Mesh Networks | • Pervasive Computing |
| • Load Balancing | • Mobility Management | • Smart Environments |
| • Cluster Computing | • Resource Management | • Cyber-Physical Systems |
| • P2P Networking | • Wireless Internet | • Smart Health Care |
| • Grid Computing | • Wireless Multimedia | • Mobile and Smart Grids |
| • Cloud Computing | • Mobile Caching | • Security, Privacy, Trust |
| • Green Computing | • Mobile QoS and QoE | • Energy and Sustainability |

- Systems Biology and Biological Network Modeling (2005-)
- Social Networks (2009-)

# My Group's Research

Architectures, Algorithms, Protocols, Modeling, Analysis,
Performance Optimization, Test Beds, Experimental Study



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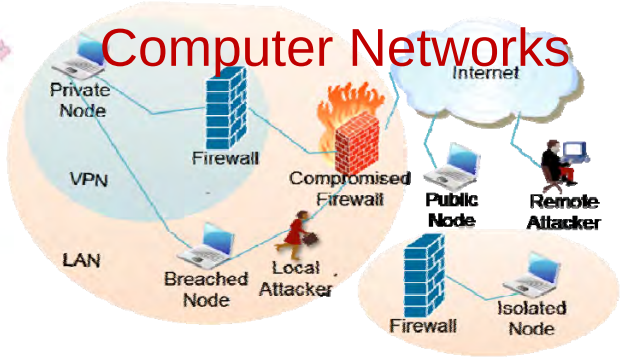
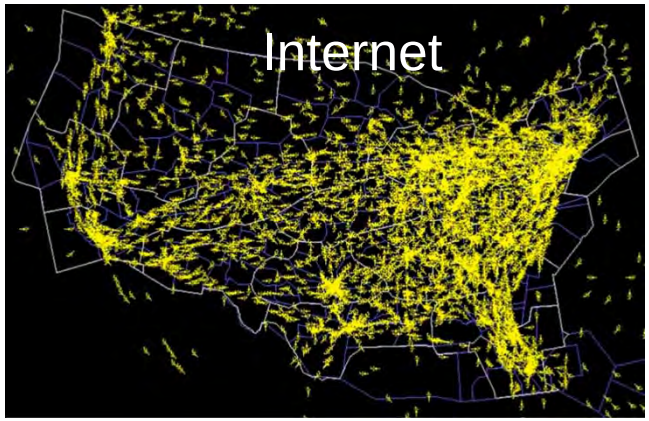
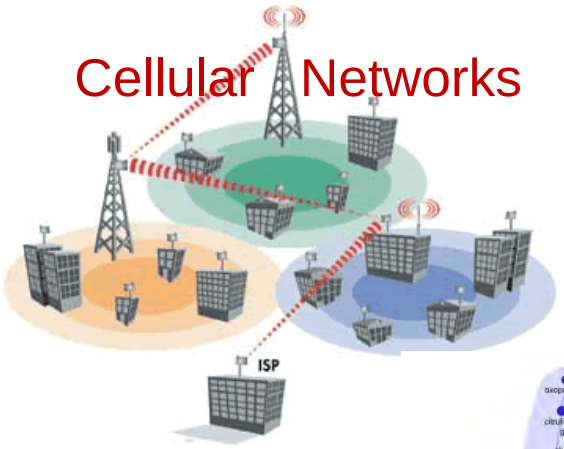
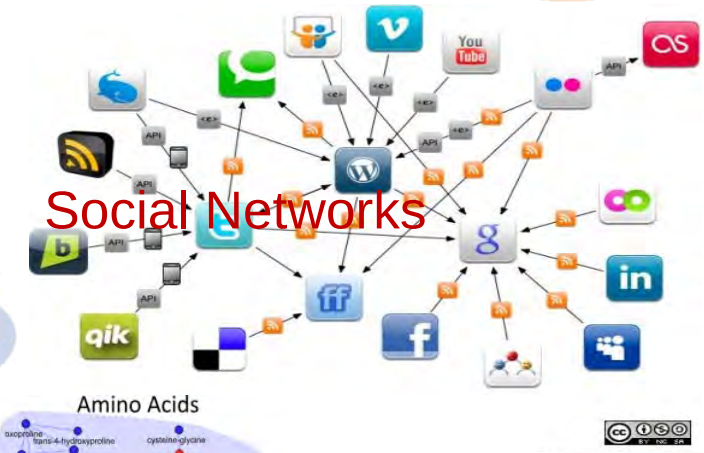
# We are Networked…

# We are Networked…

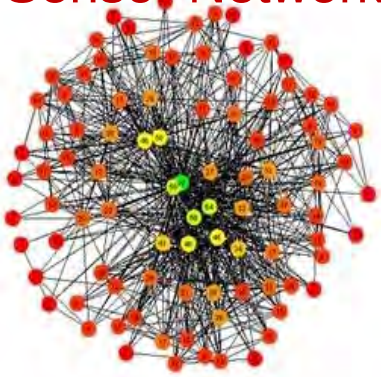



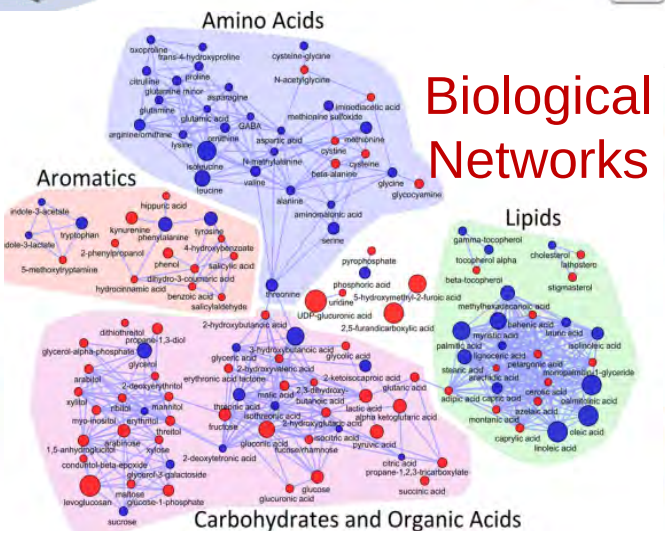



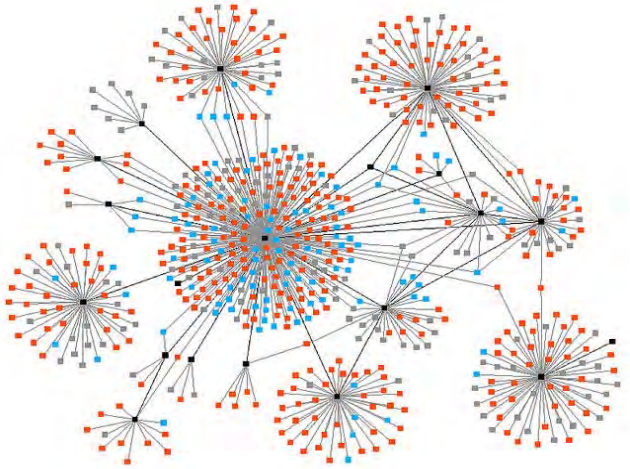


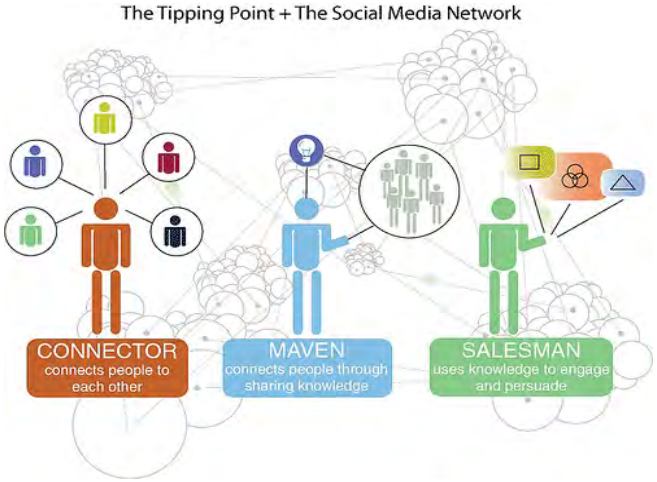



# Complex Networks

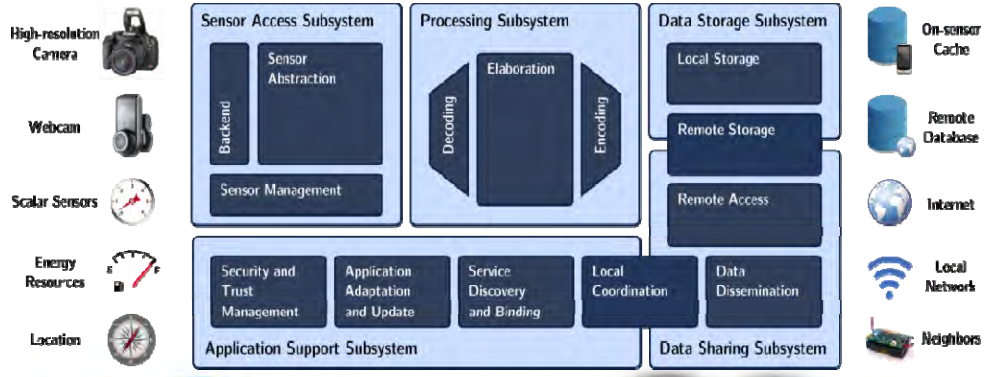
- Infrastructure Networks
  - Internet, Computer Networks
  - Cellular Nobile, Home Area Networks
  - Transportation Networks (Road, Air)
  - Electric Grid Networks (Smart Grids)
- Financial Networks
- Security Networks
- Disaster Rescue Networks
- Social Networks
- Biological Networks
- Scale-free, Small-world Networks






**Characteristics:** Scale (spatial / temporal), Heterogeneity, Dependability, Robustness, Cyber-Physical-Social

# Enabling Technologies



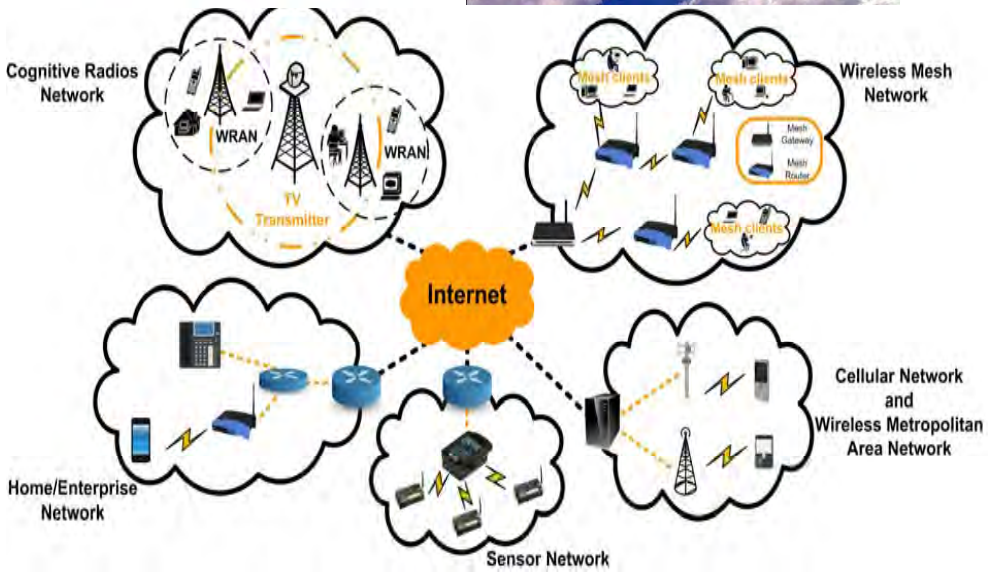

## Software / Middleware Services

- Data to storage to computation to service
- Agent based technologies, J2ME
- Intelligent Decision Making
- HCI, MMI, M2M (voice, touch, GUI)


## Computing Paradigms

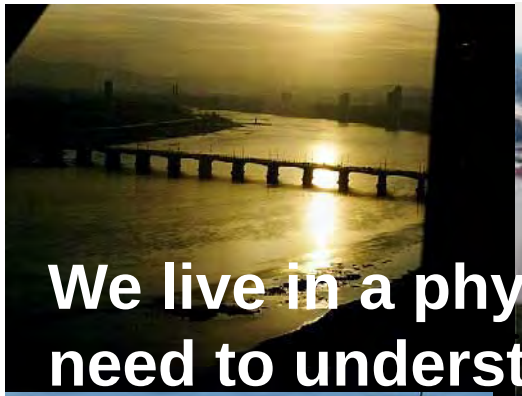
- Distributed, Grid, P2P, Cloud Computing
- Mobile, Pervasive / Ubiquitous Computing

Smart Devices




Ubiquitous Connectivity

# Sensing the Physical World

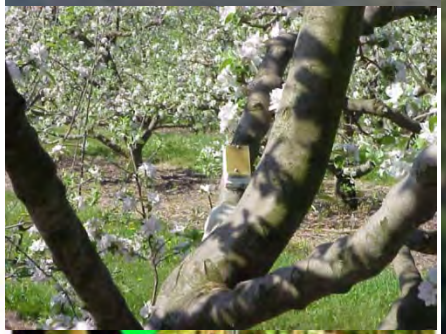


We live in a physical world, which we need to understand, serve, and control

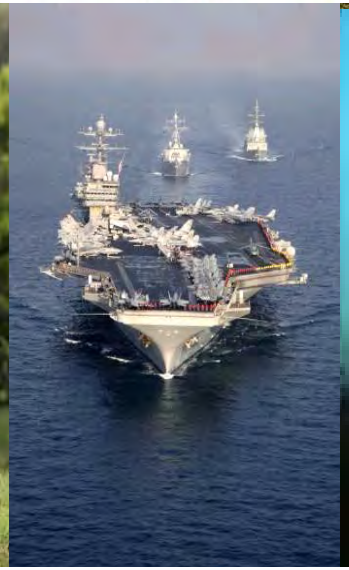
**Monitoring**

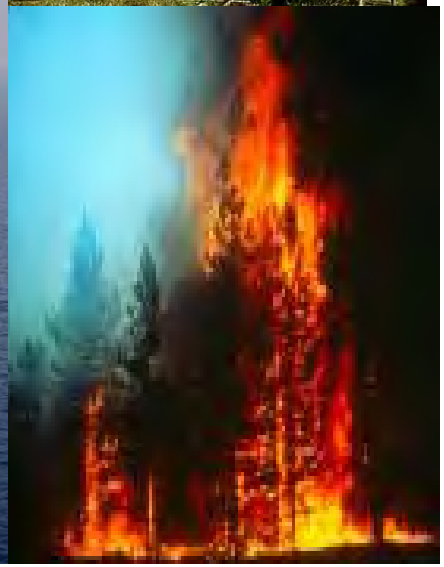
- Agriculture
- Border Surveillance
- Ecosystem
- Environment
- Habitat
- Health, Wellbeing
- Infrastructure

Hudson River Valley

Ecosystems, Biocomplexity





# Wireless Sensors

## Sensor node Architecture

**Computation**
In-network Processing:
Fusion, Estimation,
Filtering, Aggregation

**Communication**
**(Wireless)**
Transmission/Reception:
Broadcasting, Routing,
Dissemination

**Control**
**(Sensing / Actuation)**
Data Sensing & Collection:
temperature, humidity,
pressure, light, velocity,
sound, image

# Smart Phone Sensing

- Smartphone as a Sensing Platform
  - Abundance of sensors
  - Multiple wireless technologies
    - WiFi, Bluetooth, long range cellular radio
- Collaborative (Mutimedia) Sensing
  - Scalar sensors: Temperature, humidity, pressure, …
  - Multimedia sensors: Audio, video, image, text, …
- Participatory, Persuasive and Social Sensing
  - Integration of sensing with social networks
  - Incentives for users in sensing campaigns
    - Traffic / accident monitoring, activity, well being, pollution control

# Premise

## Smart Multi-modal Devices, Heterogeneous Wireless Networks, Computing paradigms, Middleware Services

- Ultra light, energy-efficient, embedded devices
- Sensors are pervasive: coffee mugs to clothing to buildings
- Wireless and ubiquitous connectivity taken for granted
- Opportunistic networking embedded in pervasive computing
- Cognitive networks, overlaying architectures and protocols
- Content rich wireless, sensor and social media applications
- Information deluge: mechanisms to record every event in life

→ New paradigms for information management

# Ubiquitous / Pervasive Computing

"The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it."

Mark Weiser

*"The Computer for the 21st Century"*

Scientific American, Sept 1991

# Why Pervasive Computing?

- Societal Grand Challenges
  - Pervasive Security

    Security and safety of people and infrastructures

  - Smart Healthcare

    Activities of Daily Living, wellness management, m-Health

  - Energy & Sustainability

    Smart energy management, carbon footprint, natural resources

  - Extreme Events Management

    Natural and inflicted disasters, emergency response

D. J. Cook and S. K. Das, "Pervasive Computing at Scale: Transforming the State of the Art," *Pervasive and Mobile Computing*, 8(1): 22-35, Feb. 2012.

# Cyber-Physical Systems (CPS)

**Integration of Sensing, Communication, Computing and Control**

[Courtesy: NSF]

M. Conti, S. K. Das, et al. “Looking Ahead in Pervasive Computing: Challenges and Opportunities in the Era of Cyber-physical Convergence. *Pervasive and Mobile Computing*, *8*(1): 2-21 (2012)

# Cyber-Physical Applications

| | | |
|---|---|---|
| **Intelligent Transportation** | ▪ Fast, energy-efficient aircrafts<br>▪ Automated highway, aerial nets<br>▪ Safer, efficient automobiles |  |
| **Energy, Sustainability, Automation** | ▪ Green, Zero carbon building<br>▪ Smart homes, offices, hospitals<br>▪ Smart grid, microgrid generator |  |
| **Smart Healthcare** | ▪ Effective in-home health care<br>▪ Capable devices for diagnosis<br>▪ Internal & external prosthetics |  |
| **Critical Infrastructure Protection** | ▪ Reliability, safety, security<br>▪ Buildings, airports, harbors, bridges, utility plants |  |

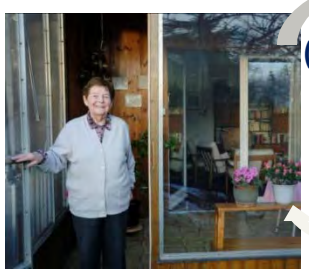
Pervasive sensing, networking, computing, and control

→ Cyber-Physical Systems (CPS) → Internet of Things (IoT)

# Sensing, Reasoning and Control

## Environment Sensing



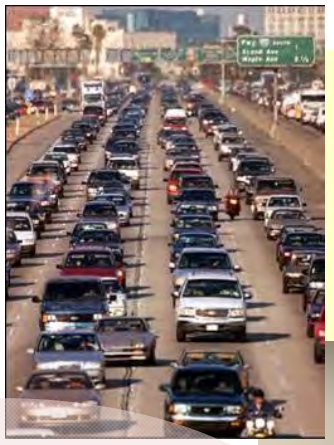




Sensing (Perception)

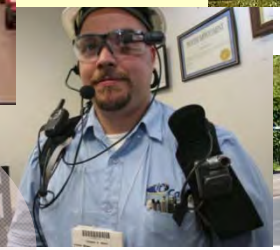
Reasoning (Agent)

Contol (Actions)

## Emergency Response



Situation-Awareness: Humans as sensors feed multi-modal data streams

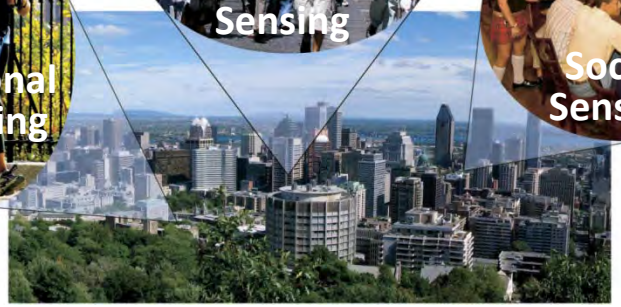




Pervasive Computing

Social Informatics

## People-Centric Sensing



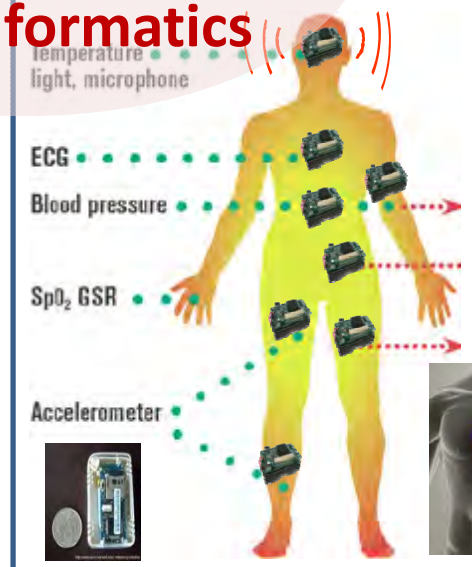



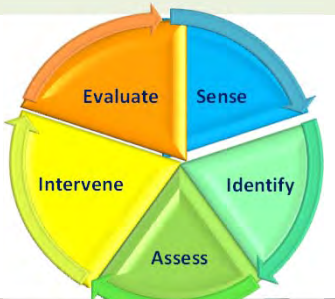
Personal Sensing

Public Sensing

Social Sensing

## Smart Hearth Care

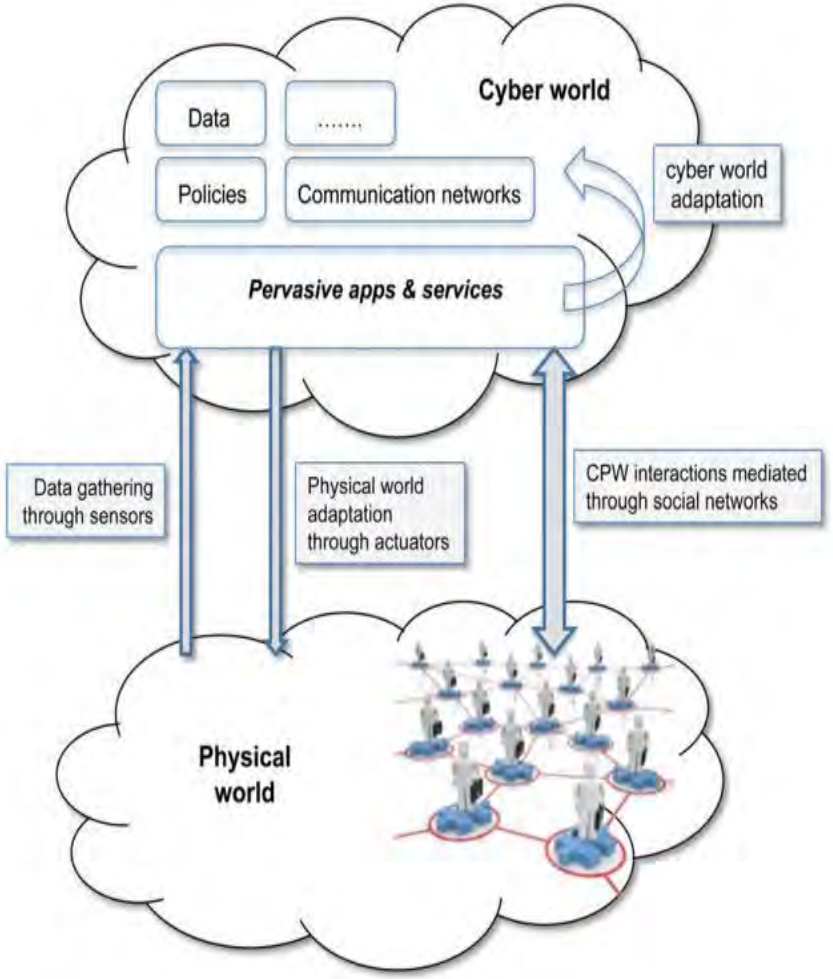


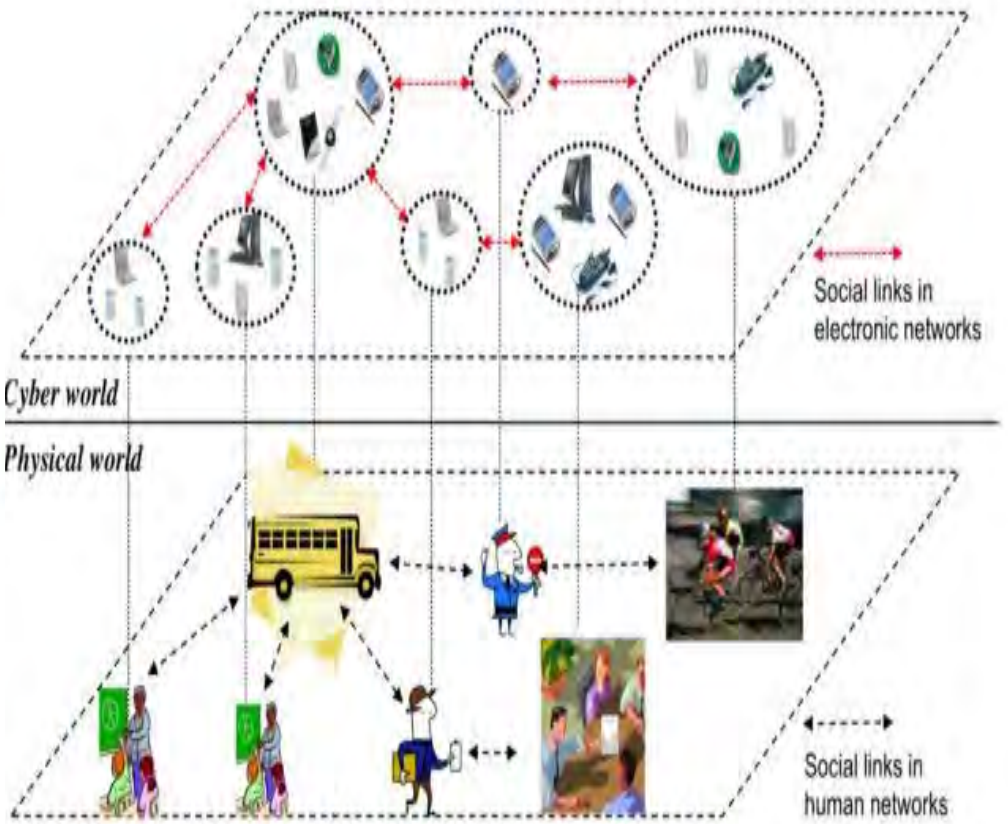





# Cyber-Physical-Social Convergence

CPS are natural or engineered systems that integrate sensing, communication, computing and control: WSN is the ideal technology




M. Conti, S. K. Das, et al. "Looking Ahead in Pervasive Computing: Challenges and Opportunities in the Era of Cyber-physical Convergence. *Pervasive and Mobile Computing, 8*(1): 2-21, 2012.

# Project

Pervasively Secure Infrastructures (PSI):
Integrating Smart Sensing, Data Mining,
Pervasive Networking and Community Computing

http://crewman.uta.edu/psi

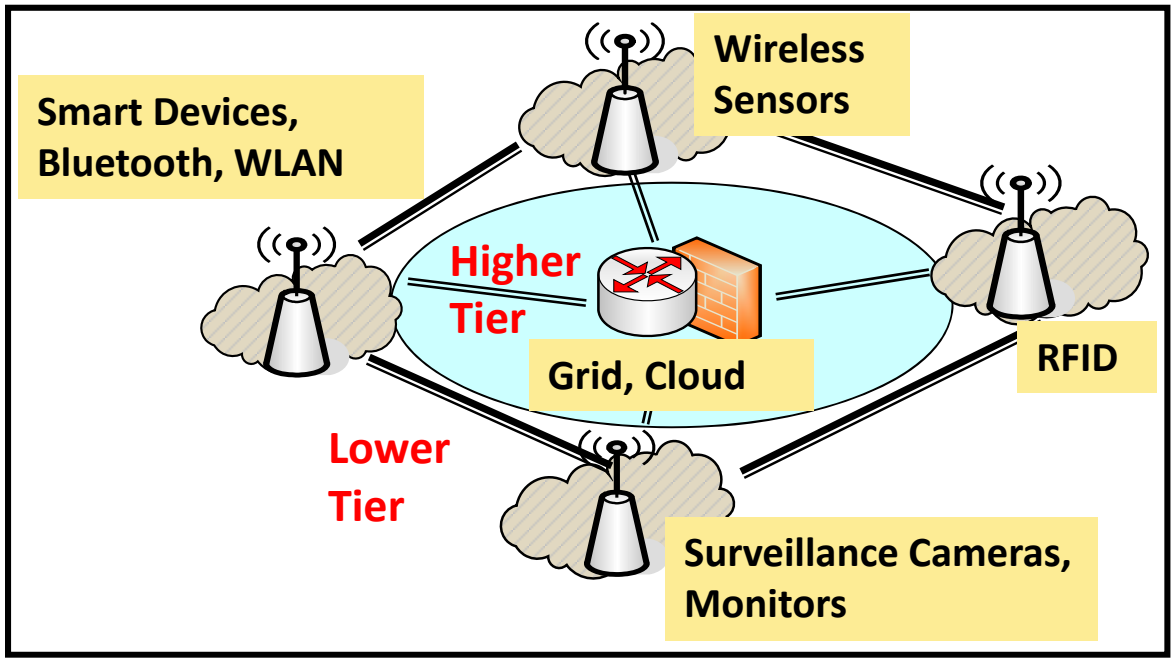
NSF ITR Project (2004-2013)

4 Universities,9 PIs (CS, CE, EE, EECS)

# PSI Overview

**Goal:** Create a technology-enabled, multi-level security framework for monitoring, preventing, or recovering from natural and inflicted disasters.

**Technology:** Embedded sensors, RFID, wireless networking, pervasive computing, agent technologies, middleware.




**Broader Impact:**

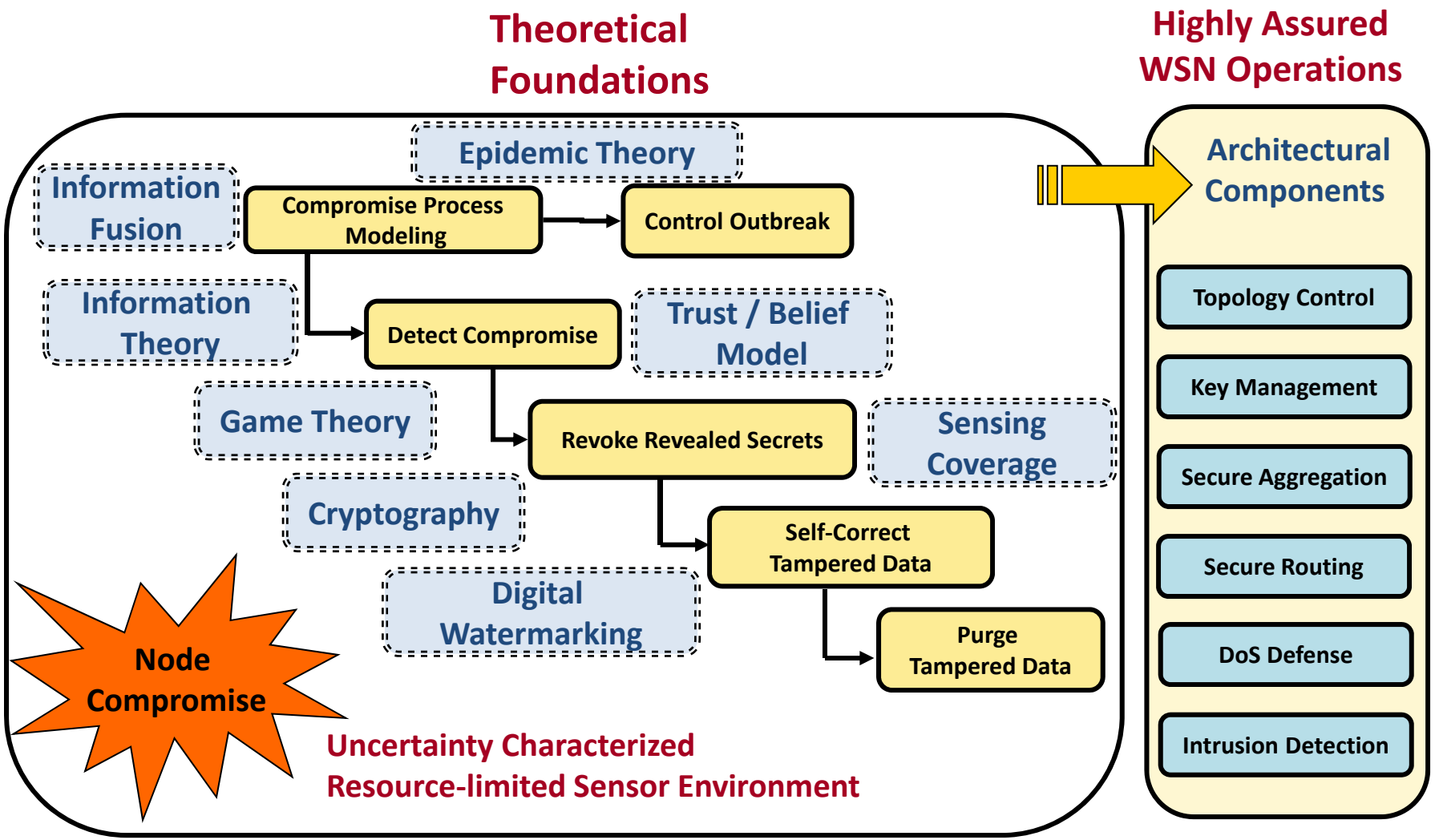
Infrastructure and border security, surveillance

- Transportation (air, rail)
- Utility plants (water, gas, electricity, nuclear)
- Public / private places (airport, train stations, shopping malls, parks)

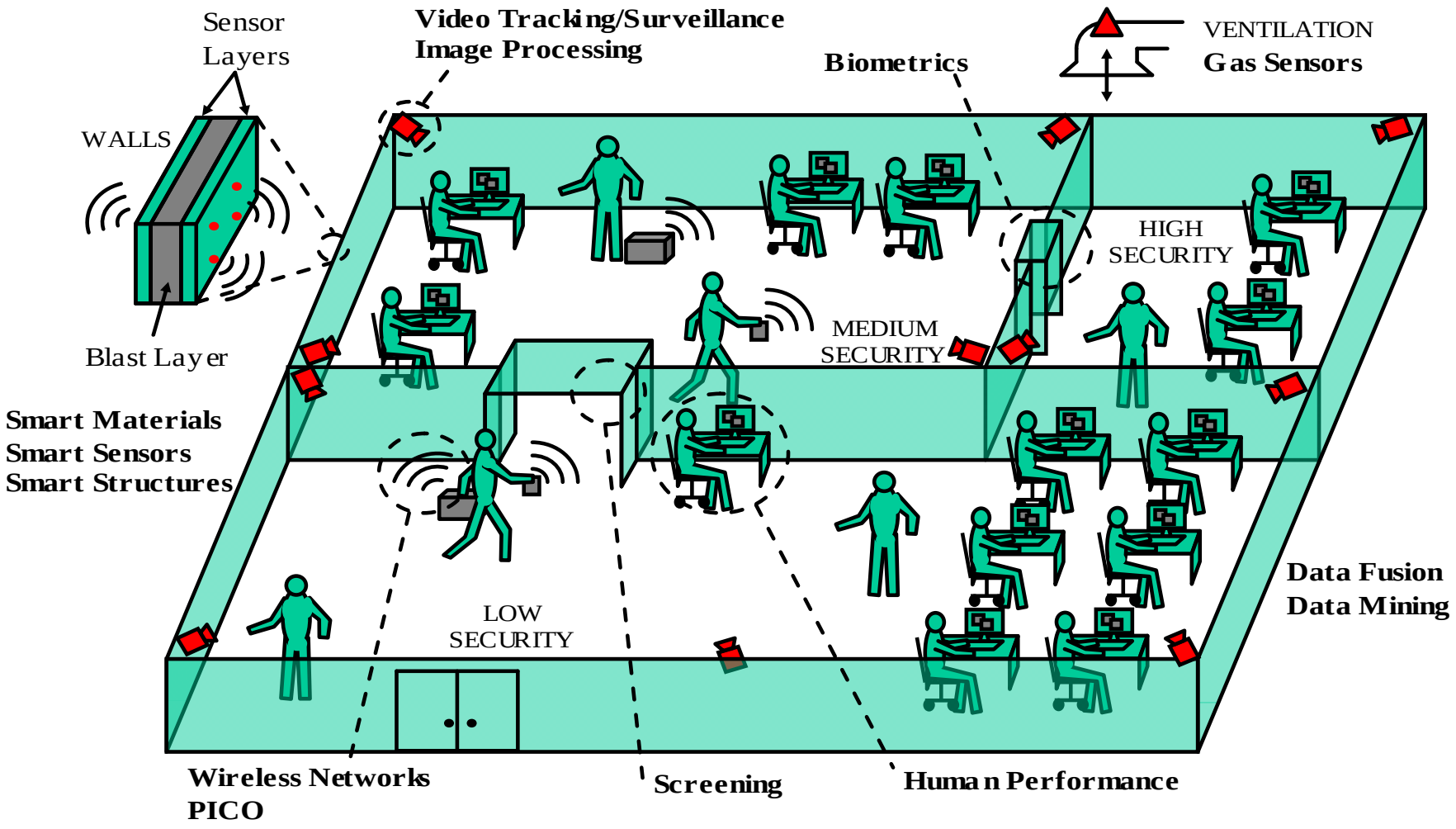
**Methodology:**

Information theory, uncertainty reasoning, epidemic theory, trust model, game theory, graph theory, data mining

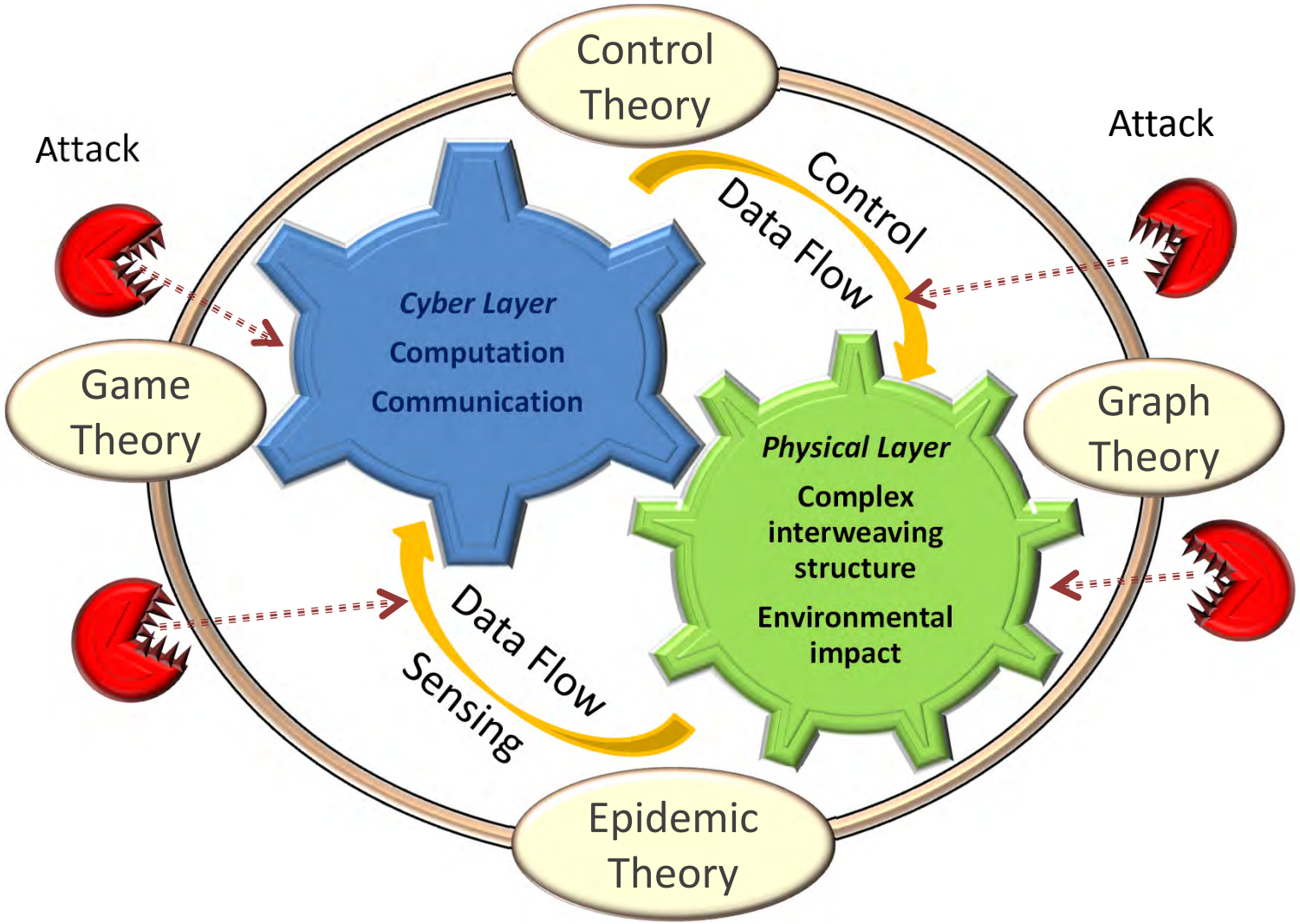
# Multi-Level Security Framework



# PSI Prototype

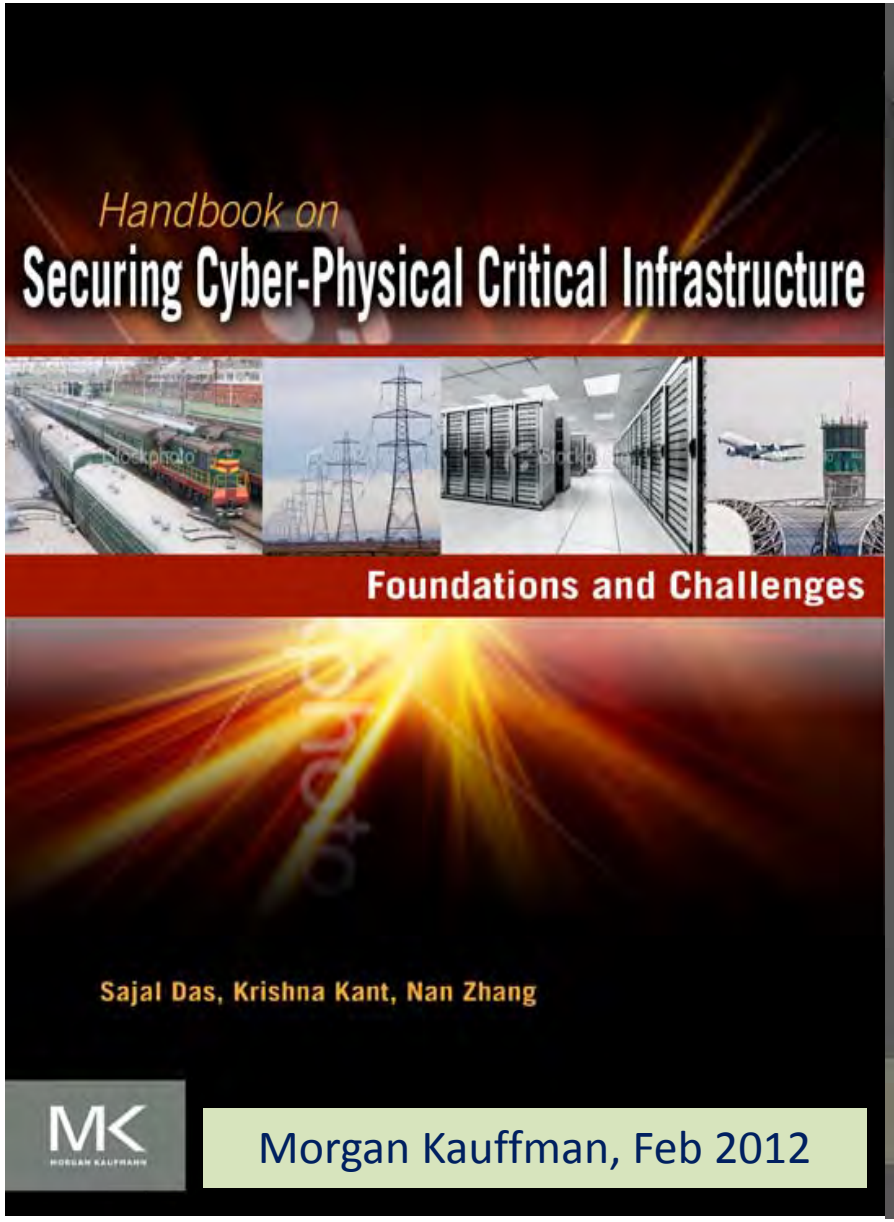


# Foundations of CPS Security




M. Xue, S. Roy, S. K. Das, "Security and Discoverability of Spread Dynamics in Cyber-Physical Networks," *IEEE Transactions on Parallel and Distributed Systems* (special issue on CPS), Sept 2012.

# Foundations of CPS Security




Morgan Kauffman, Feb 2012


## Handbook on Securing Cyber-Physical Critical Infrastructure

Edited By Sajal Das, Krishna Kant and Nan Zhang

ISBN: 9780124158153 | Paperback | 824pp

### About the Book:

The worldwide reach of the Internet allows malicious cyber criminals to coordinate and launch attacks on both cyber and cyber-physical infrastructure from anywhere in the world. The purpose of this handbook is to introduce theoretical foundations and practical techniques for securing critical cyber and physical infrastructures as well as their underlying computing and communication architectures and systems. Examples of such infrastructures include utility networks (e.g., electrical power grids), ground transportation systems (automotives, roads, bridges and tunnels), airports and air traffic control systems, wired and wireless communication and sensor networks, systems for storing and distributing water and food supplies, medical and healthcare delivery systems, as well as financial, banking and commercial transaction assets. The handbook focuses primarily on the scientific foundations and engineering techniques - while also addressing the proper integration of policies and access control mechanisms.

### Key Features:

- Addresses the technical challenges facing design of secure infrastructures by providing examples of problems and solutions from a wide variety of internal and external attack scenarios
- Includes contributions from leading researchers and practitioners in relevant application areas such as smart power grid, intelligent transportation systems, healthcare industry and so on.
- Loaded with examples of real world problems and pathways to solutions utilizing specific tools and techniques described in detail

### About The Editors:

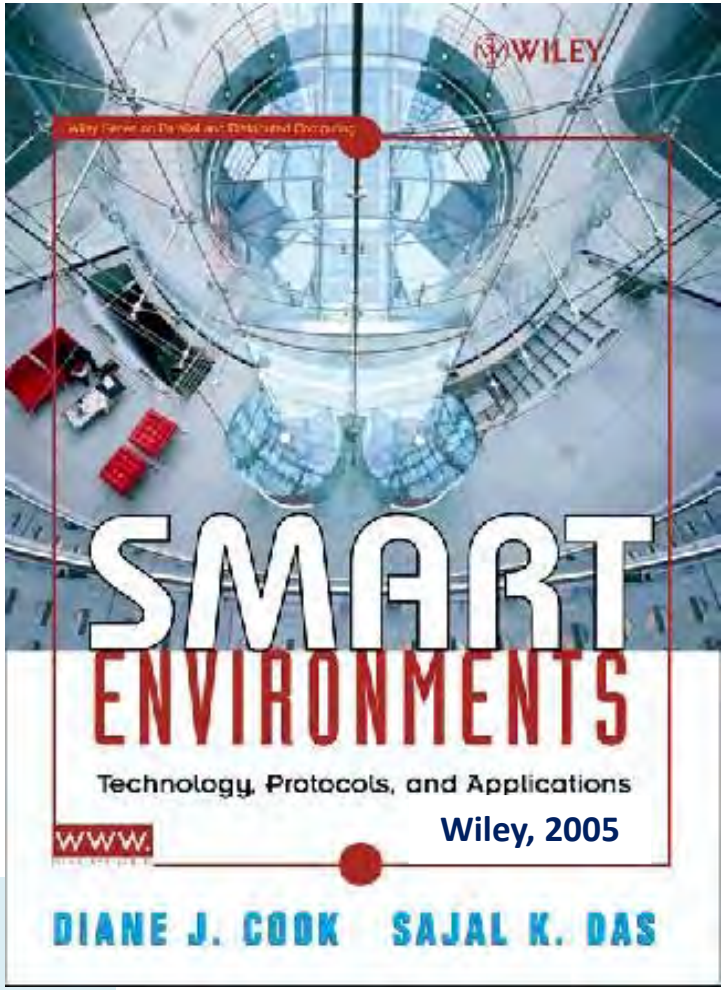
**Sajal K. Das** is a University Distinguished Scholar Professor of Computer Science and Engineering and the Founding Director of the Center for Research in Wireless Mobility and Networking (CReWMaN) at the University of Texas at Arlington (UTA).

**Krishna Kant** is currently with George Mason University and on leave of absence from Intel Corporation where he has worked since 1997. His current areas of research include robustness in the Internet, cloud computing security, and sustainable computing.

**Nan Zhang** is an Assistant Professor of Computer Science at the George Washington University, Washington, DC, USA. Prior to joining GWU, he was an assistant professor of Computer Science and Engineering at the University of Texas at Arlington from 2006 to 2008. His current research interests span security and privacy issues in databases, data mining, and computer networks.

# Smart Environments

• A Smart Environment is one that is able to autonomously *acquire* and *apply* knowledge about inhabitants and surroundings (environment), and *adapt* to improve experience *without explicit awareness*




• Corollary: makes *intelligent decisions* in *automated, context-aware* manner → pervasive computing

• Context and Situation-awareness

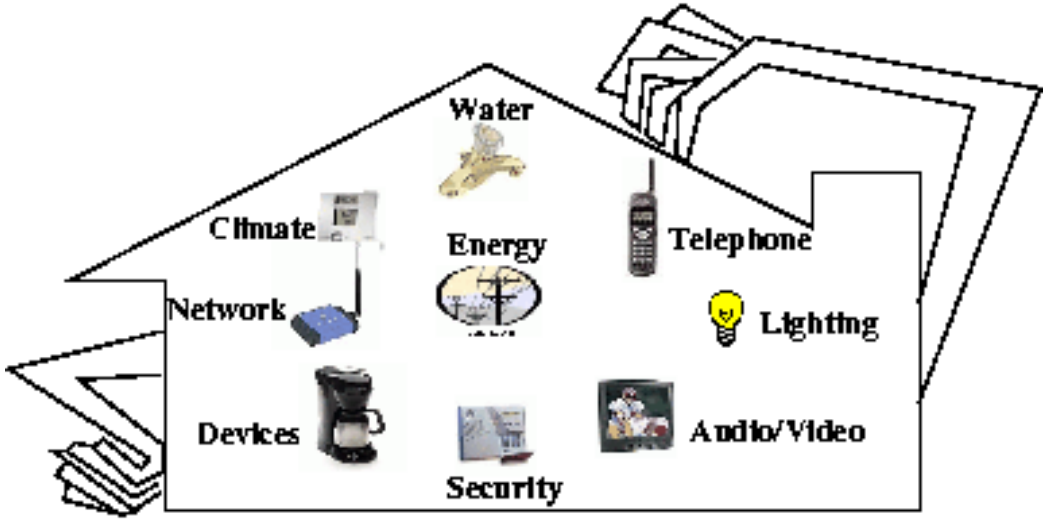
• Example Contexts:
  - Mobility, Activity, Occupancy, Preferences, …
  - Desire, Behavior, Mood, …

D. J. Cook and S.K. Das, "How Smart Are Our Environments? An Updated Look at State of the Art," *Pervasive and Mobile Computing*, Vol. 3, No. 2, Mar. 2007.

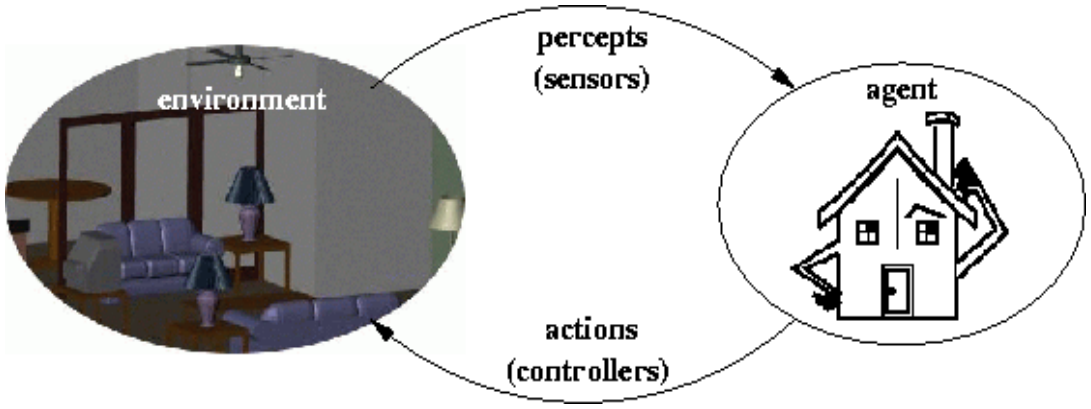
# Smart Home Objectives

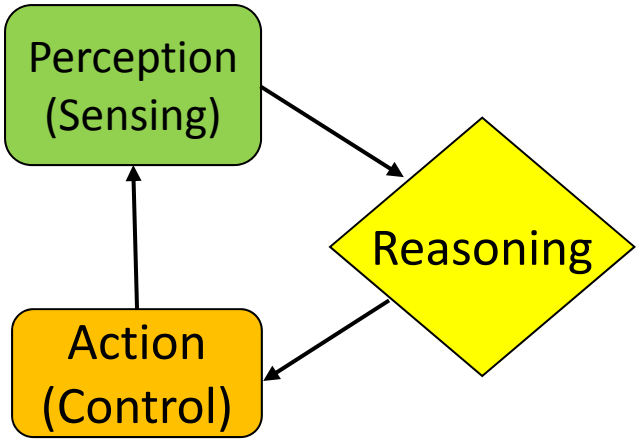
- **Use smart and pro-active technology**
  - Cognizant of inhabitant's daily life and *contexts*
  - Absence of inhabitant's explicit *awareness*
  - *Learning* and *prediction* as key components
  - Pervasive communications and computing capability
- **Smart Environments Utility: Optimize goal functions**
  - Minimize operation cost of managing home (e.g., proactive warning)
  - Minimize resource consumption (e.g., utility bills, network bandwidth)
  - Optimize automation of devices (i.e., reduction in manual operations)
  - Maximize security, …
- **User Utility: Provide inhabitants with**
  - Comfort : Reduction of inhabitant's explicit activities
  - Productivity: Savings of inhabitant's time

# Smart Home as a Rational Agent



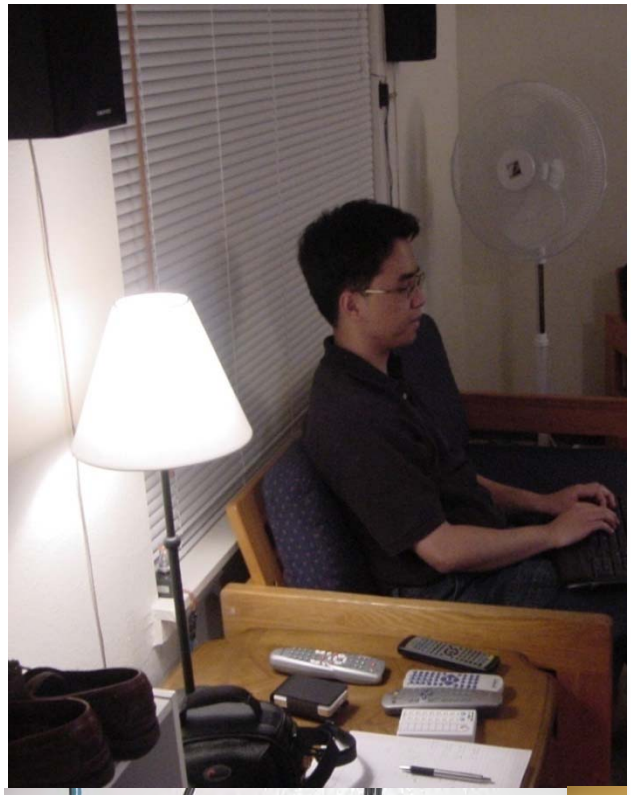

- *Perceive* the state of homes via *sensors* and *acts* on the environment via *actuators (*controllers)
- *Reasons* about and adapts to inhabitants, predicts context awareness and makes *intelligent decisions*

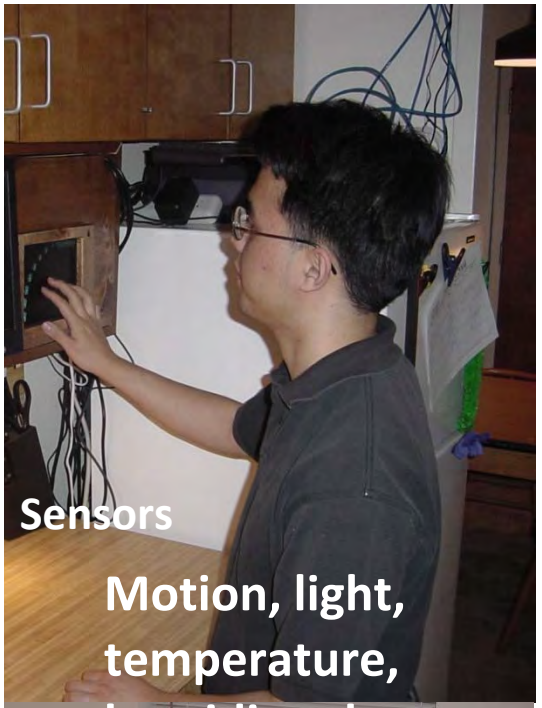



D. J. Cook and S.K. Das, "How Smart Are Our Environments? An Updated Look at the State of the Art," *Pervasive and Mobile Computing*, Vol. 3, No. 2, Mar. 2007.

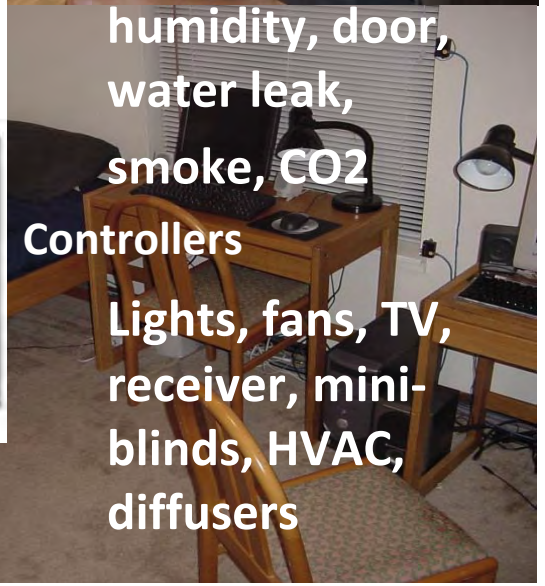
# MavPad: Apartment in the Dorm



**Sensors**

**Motion, light, temperature, humidity, door, water leak, smoke, CO2**



**Controllers**

**Lights, fans, TV, receiver, mini-blinds, HVAC, diffusers**

# Smart Computing?

# Smart Health Care

**NSF Smart Health and Wellbeing (SHB):** Crafting a Human-Centric Environment to Support Human Health Needs, 2011-2015.

## Aging World Population

- By 2040, 23% US population 65+
- 9% of adults aged 65+ and 50% 0f adults aged 85+ need assistance

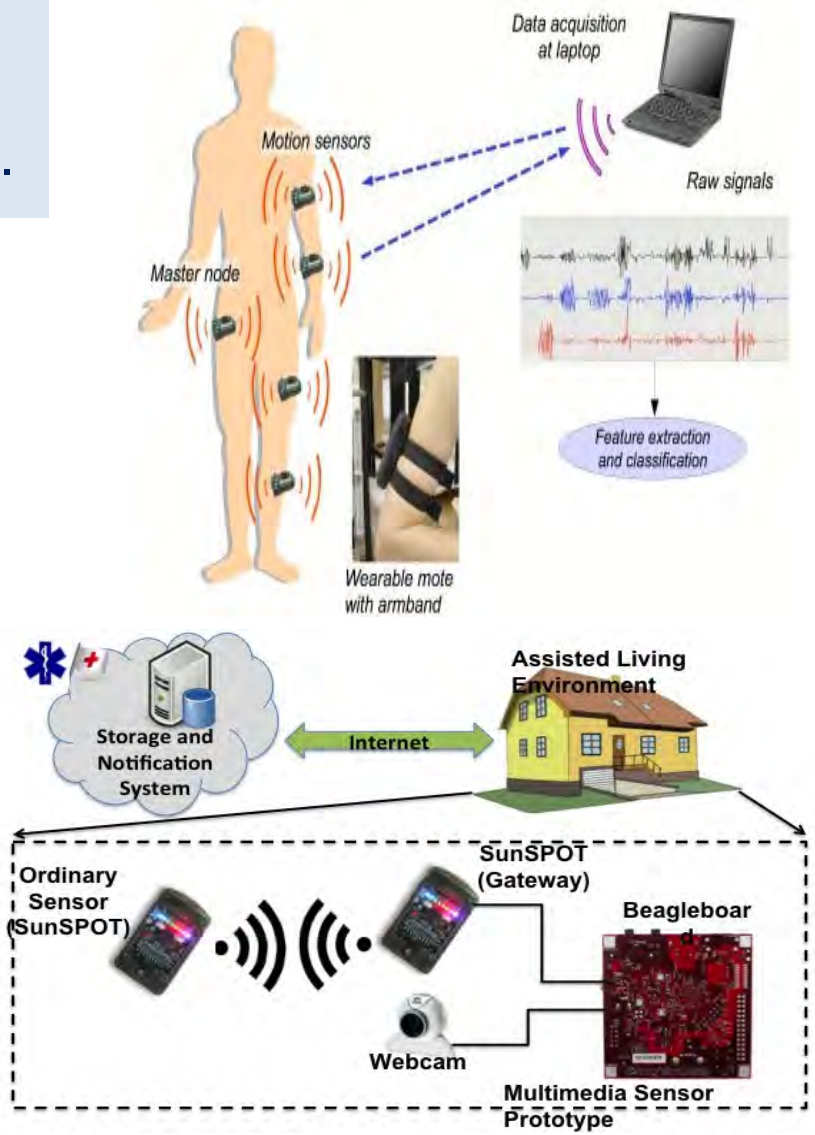
**Goal:** Automate and improve healthcare

## Multimodal Sensing Framework

- Monitor using heterogeneous sensors
- Fuse and process of multimodal data
- Efficient storage and fast notification

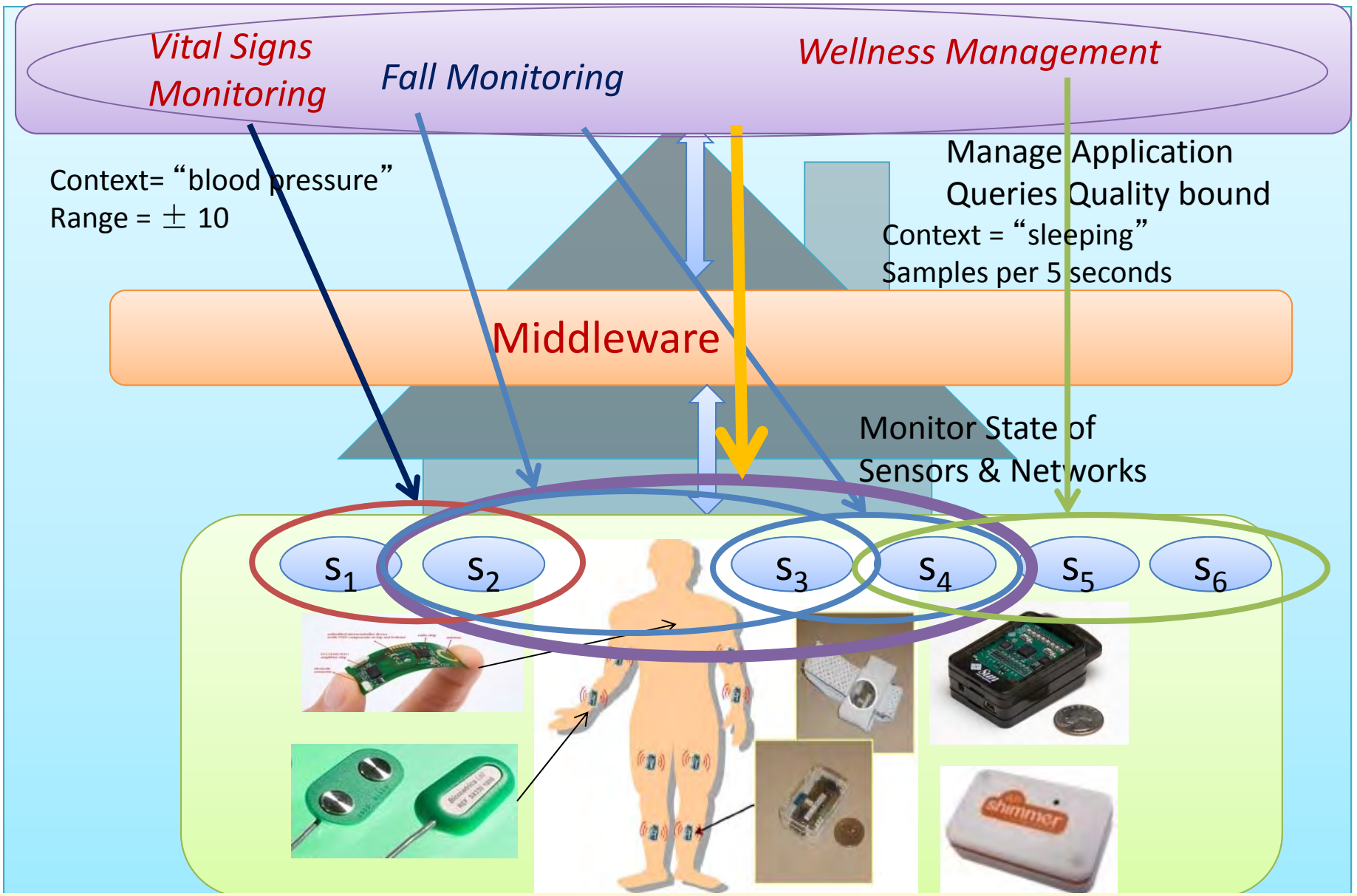
## Implementation

- Case Study: Elderly fall detection
- Middleware, CouchDB server
- Validation using SunSPOT sensors




M. Di Francesco, S. Das, et al., "A Framework for Multimodal Sensing in Heterogeneous Multimedia Wireless Sensor Networks in Smart Healthcare," Proc. IEEE WoWMoM, June 2011.

# Smart Healthcare: Middleware Solution




N. Roy, S. K. Das, C. Julien, "Resource-Optimized Quality-Assured Ambiguous Context Mediation Framework in Pervasive Environments," *IEEE Trans. Mobile Computing*, 11(2): 218-229, Feb 2012. (Best Paper, QShine 2009)

# Mobile Cloud Computing

## People Centric Applications

- E.g. Campus Connect and E$^2$Home
- Sensory information from smartphones

**Goal:** Improve efficiency of data capture, collection and processing as well as application deployment

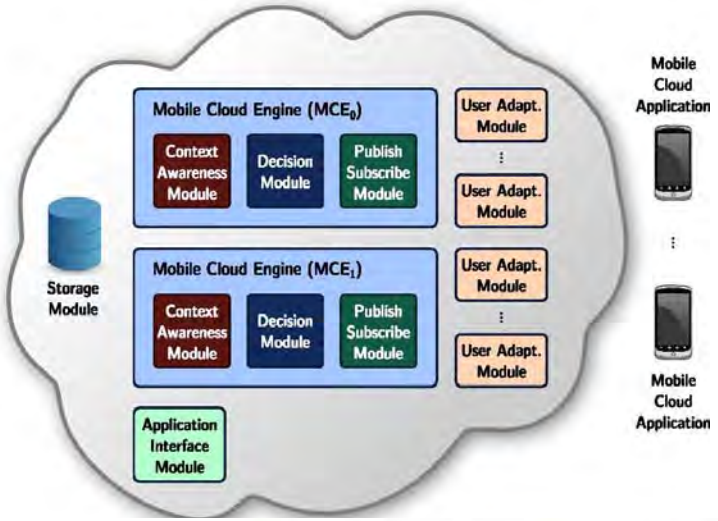
## Mobile Phone Sensing Framework

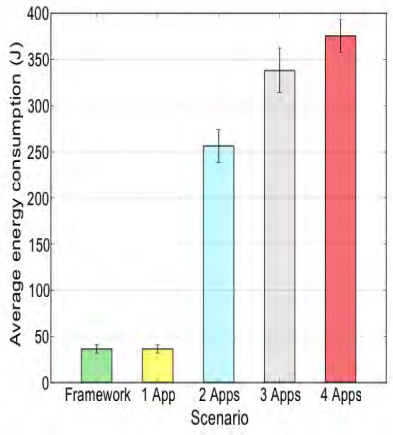
- Scalable and flexible architecture
- Integrated data collection, storage, processing, dissemination
- Unified sensing to conserve energy of smartphones
- Energy aware application deployment
- Using virtual network embedding

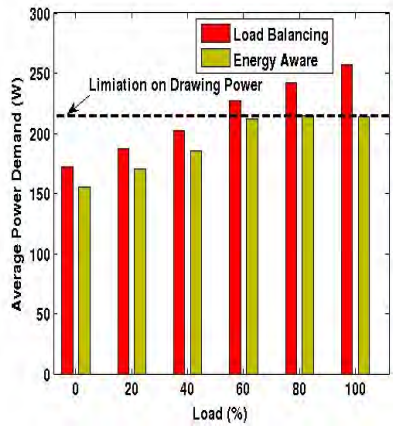
## Results

- Implemented on Amazon AWS clouds
- Can support 4 million concurrent users
- Reduced energy consumption

## NSF Project: Mobile Application Security through Remote Sandboxing and Cloud Computing, 2012-2014.




R. Fakoor, A. Nazi, M. Raj, M. Di Francesco, and S. K. Das, "An Integrated Cloud-based Framework for Mobile Phone Sensing," *Proc. of ACM SIGCOMM Workshop on Mobile Cloud Computing* (MCC-2012), Finland, Aug 2012.

# Campus Connect: Crime Reduction

## Crime Incidents on Campus

- More than 50K crime incidents each year in postsecondary schools including gunshot, theft, assault
- Delay introduced to report authority
- Inaccuracy/ lack of evidence in reporting

## Goal

- Provide proactive and reactive solutions with least delay

## Smart Emergency Solution

- Detect emergency situations
- Collect evidence via smartphone sensors
- Proactive real time alerts for crime mitigation
- Enhanced alerts with multimedia and location information

## UT Arlington campus wide deployment

- Cloud deployment for scalability
- Collaboration with UTA Police and OIT



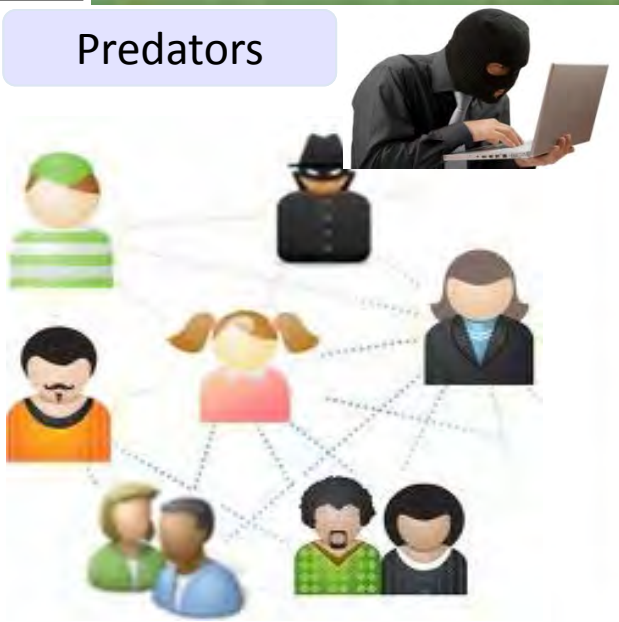

# Privacy in Social Networks

Unemployment

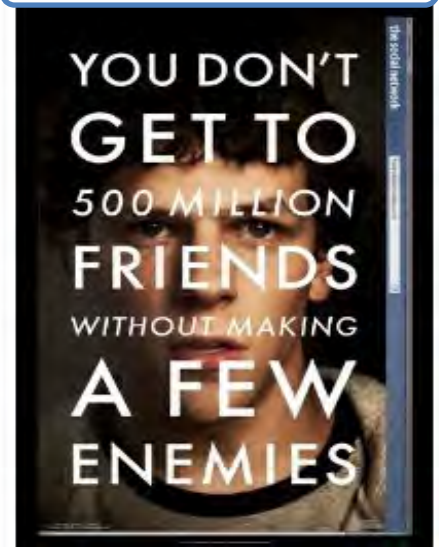

Safety


Identity Theft

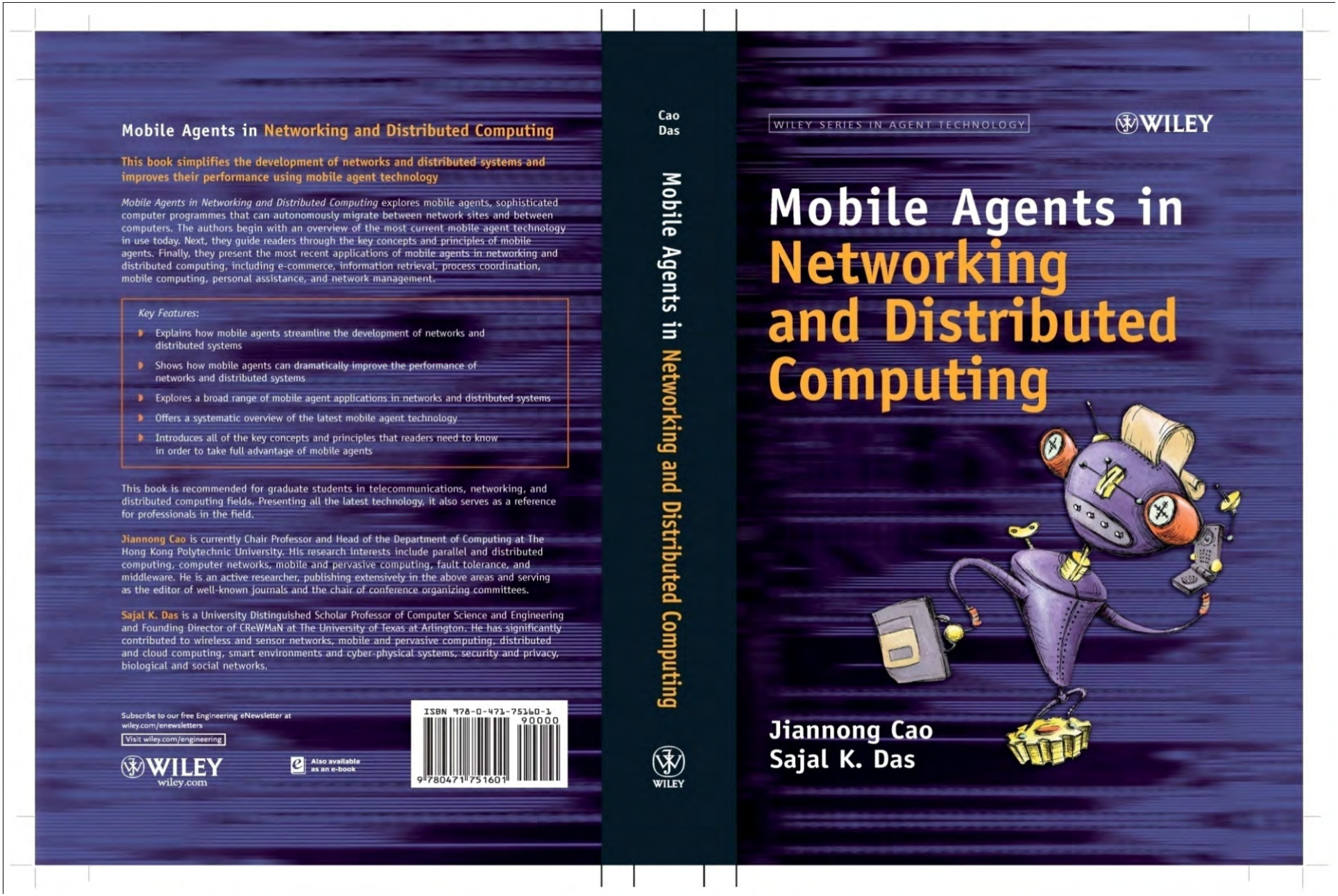

Predators



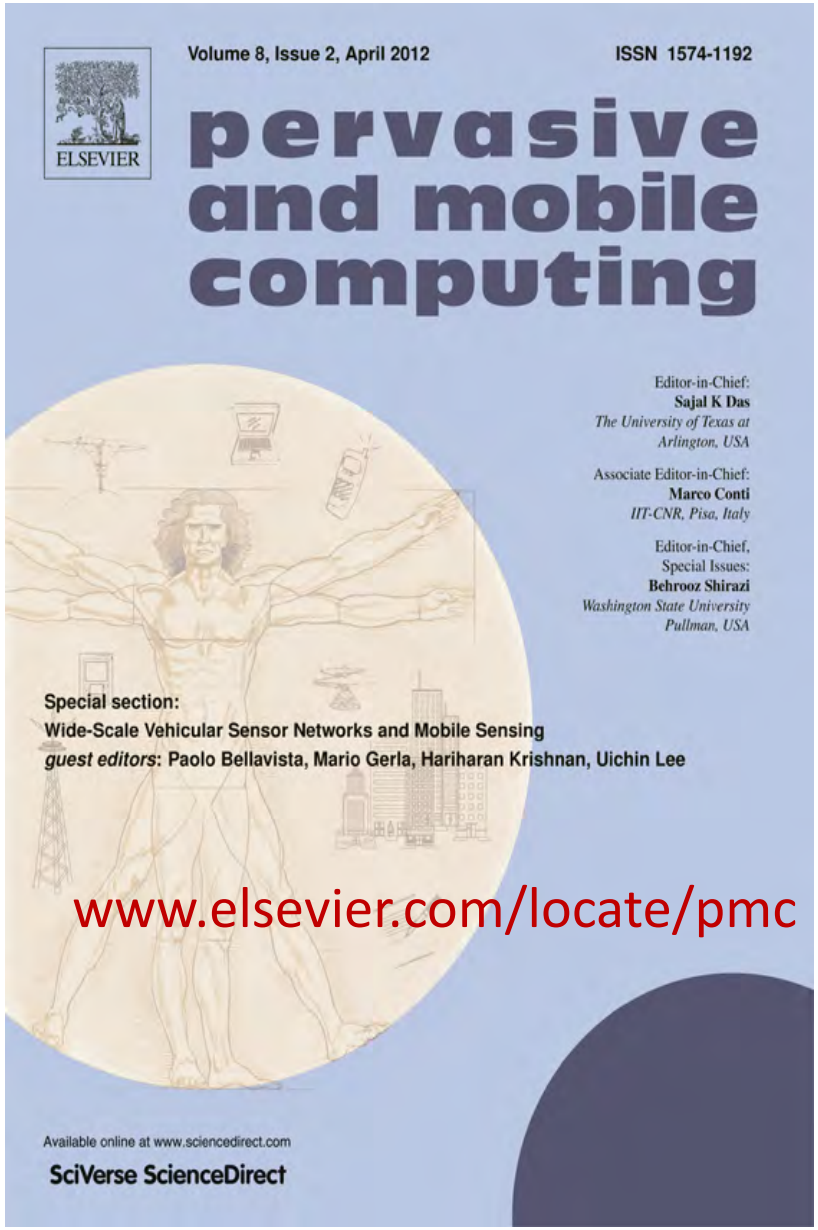
Unintentional Fame



# Book Published



# Journal / Conferences




## ICDCN 2014

15th Int'l Conference on Distributed Computing and Networking
Amrita University, Coimbatore, India
January 4-7, 2014
www.icdcn.org

## IEEE PerCom 2014

12th Int'l Conf on Pervasive Computing
Budapest, Hungary
March 24-28, 2014
www.percom.org

## IEEE WoWMoM 2014

15th Int'l Symp. on a World of Wireless Mobile Multimedia Networks
Sydney, Australia
June 16-19, 2014
www.ieee-wowmom.org

# Quiz Time

- “Heavier-than air flying machines are not possible.”

  - Lord Kelvin, 1895

- “I think there is a world market for maybe five computers.”

  - IBM Chairman Thomas Watson, 1943

- “640,000 bytes of memory ought to be enough for anybody.”

  - Bill Gates, 1981

- “The Internet will catastrophically collapse in 1996.”

  - Robert Metcalfe

# Part II (Vision): Computer Science Department

Sajal K. Das

Chair, Computer Science
Daniel St. Clair Endowed Chair
Missouri University of Science and Technology
sdas@mst.edu

# Motivation

"Our progress as a nation can be no swifter than our progress in education. The human mind is our fundamental resource."

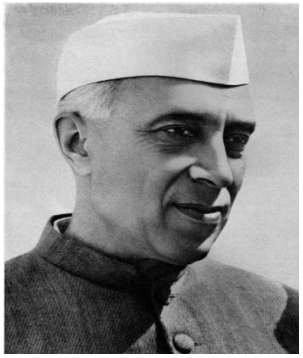
– John F. Kennedy

(US 35th President, 1917-1963)

"A University stands for Humanism, for an adventure of ideas and for search for truth…"

– Jawaharlal Nehru

(Indian 1st Prime Minister, 1889-1964)



# Transformative Approach

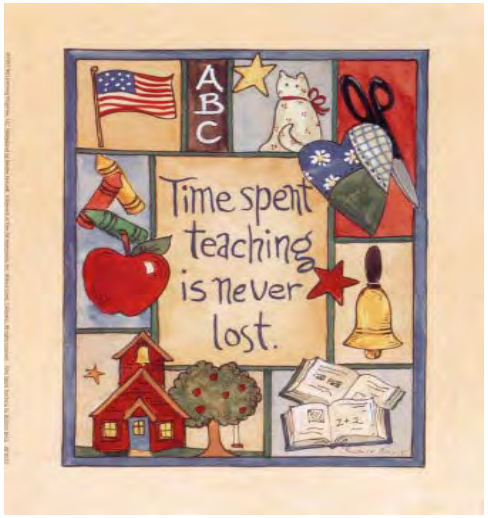
"Think what you can do for the Department, not what the Department can do for you."

– (Paraphrasing) John Kennedy

- *Inside-out approach:* In a winning team, everyone is an MVP.
- Are you an MVP? What are your skills? How can you contribute and help the department?
- Is the CS Department an MVP at Missouri S&T?
- Are we the best CS Department in Missouri?
- Where do we stand nationally and globally?

# Motto: Value-Added Education

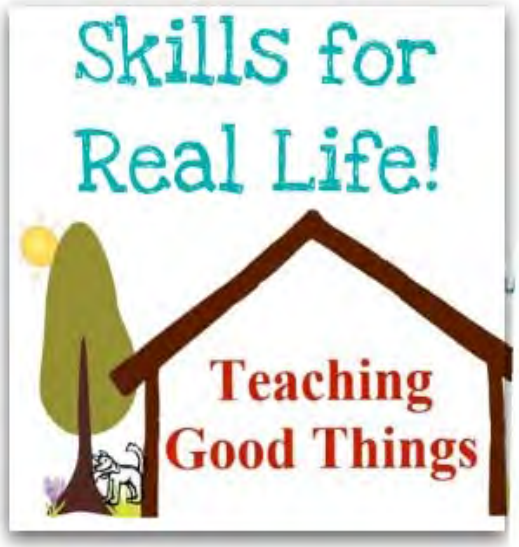
## Teaching




## Mentoring

## Research

## Societal Impact

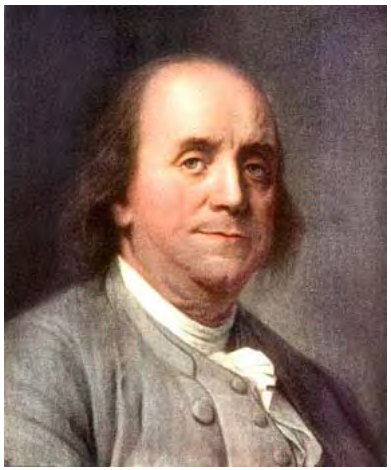


# Teaching Innovation

- Innovate teaching methodology – be pedagogy teacher
- Train our students to think and motivate for higher education
- Provide Master teachers in classes
- Focus on foundations and fundamentals
- Bring cutting-edge research to the classroom
- Make classroom as mutual learning environment
- Mentor our students to reach for the stars!
- Involve in research and entrepreneurship

"Tell me and I forget, teach me and I remember. Involve me and I learn."

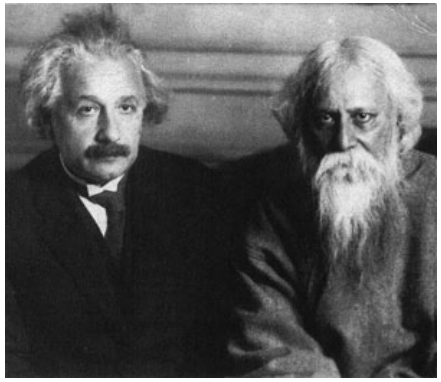
– Benjamin Franklin (1706-1790)



# Master Teacher

"A teacher can never truly teach unless he is still learning himself. A lamp can never light another lamp unless it continues to burn its own flame. The teacher who has come to the end of his subject, who has no living traffic with his knowledge but merely repeats his lesson to his students, can only load their minds, he cannot quicken them."

*– Rabindranath Tagore (1861-1941)*
*Nobel Laureate Poet (1913)*

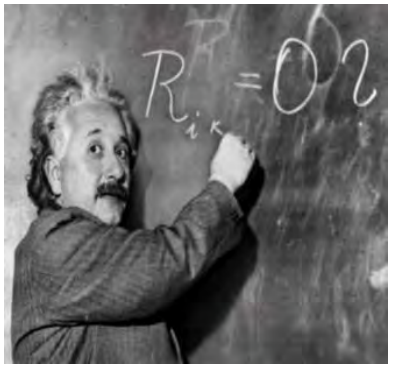


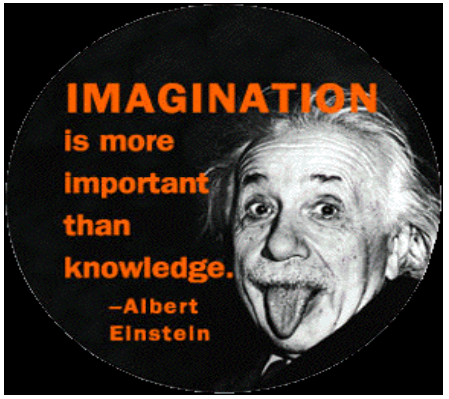
**Where the Mind is Without Fear …**

# Scholarly Activities

"Imagination is more important than knowledge."

– Albert Einstein
(Nobel Laureate Physicist, 1879-1955)






- Conduct impactful research
- Publish in top journals and conferences
- Bring national and international reputation
- Win competitive research grants
- Be available to students, have open door policy
- Make labs more vibrant
- Take research from labs to the real world
- Mentor students to write award winning thesis and dissertations

# Service and Outreach

- "Education is the manifestation of the perfection already in man."

- Total Education
  - *Microcosmic: Individual level*
  - *Macrocosmic: Collective* good of the world, translating to the society

Swami Vivekananda
(1863-1902)

- Disseminate to benefit the society
- Community Outreach: K-12 schools, and 4-year Colleges . . .
- Diversity: Increase female and minority students enrollment
- Innovation Engine: Create jobs and entrepreneurship

# Strategic Planning

- Revise and enhance departmental strategic plan and align with university's 2020 vision (Provost's deadline: January 4, 2014)
- Develop short-term, mid-term, and long-term goals
- Request faculty lines to grow in strategic areas
- Executive Committee in charge of Strategic Planning with input from faculty, staff and students

# Grand Vision

- Rolla as a Smart City Living Lab

  - Help solve societal grand challenges
    - Smart healthcare
    - Smart transportation
    - Energy and sustainability
    - Cyber-security
    - Disaster management

  - Center for Missouri Urban Sensing Technologies (MUST)
    - Bring existing CS labs under this umbrella
    - Establish interdisciplinary collaboration involving
      - Other engineering, science and social science departments on campus
      - City and the community
      - Industry, Government and national labs

# Branding and Marketing

- Publicize well what we do
  - Strengthen research areas and build critical mass in each
  - Informative website to attract potential students and employers
  - Student competition for Departmental logo and slogan

- Launch 50th Anniversary Campaign
  - Year long celebration: 2014-15 or 2015-16?
  - Involve CS Academy and bring back alumni
  - Establish ***MC²*** (Missouri Computing Conference / Consortium)
  - Bring top conferences to the area (St. Louis?) as organizers
  - Other exciting ideas …

# Summary

- Collaboration is the key to success!
- Engage in inter-disciplinary team-driven research projects

# Mantra

"Create like a God, Command like a King, Work like a Slave."

*– Constantin Brancusi*

# Make a change!

It’s about time we change -
to secure the future of those that are to follow!

# Epilogue

CS Dept

MISSOURI S&T

Thank You

# Rising to the Challenge


K. Krishnamurthy
Vice Provost for Research
Missouri University of Science and Technology

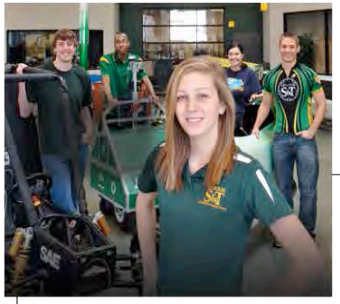
# Higher Education Trends

- Need to remain affordable and accessible amid dwindling resources from state and federal sources.
- Need to be accountable to our students and their families, as well as the public, our research partners, donors, employers, state and federal funding agencies, and many others.
- Changing demographics and globalization.
- Environmental, fiscal and social sustainability.
- Pace of technological change continues to accelerate and disrupt conventional approaches to learning, discovery and engagement.

# Key Customer Groups

- Undergraduate students
- Distance and online students
- Employers
- Research-based graduate students
- Research investors
- Donors

# Strategy Statement

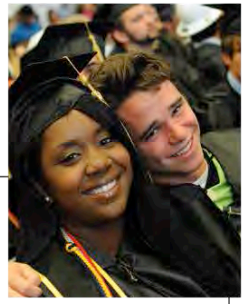


1
*inspire creative*
THINKERS

## THE STRATEGY

Missouri S&T will provide by 2020 **a top return on investment among public research universities** to students, employers, research partners and donors through **extraordinary access to renowned expertise, services** and **experiential learning opportunities**.

3
*ensure return on*
INVESTMENT



2
*raise*
VISIBILITY

4
*increase meaningful*
INTERACTIONS

http://strategicplan.mst.edu/

# Measuring ROI

- Starting salaries for undergraduate students.
- Engineering doctoral students per faculty.
- Number of graduate engineering/science distance/online programs, number of students enrolled via distance or online.
- National Science Foundation grant expenditures per faculty, number of invention disclosures.
- Employer satisfaction with hires.
- Donor satisfaction with the S&T giving experience.
- Third-party resources (such as *PayScale*, *U.S. News & World Report* recruiter assessment score).

# Themes

1. Develop and inspire creative thinkers and leaders for life-long success.
2. Enhance reputation and raise visibility.
3. Achieve sustainable growth to ensure best return on investment.
4. Increase and facilitate meaningful access to and interaction with renowned faculty, staff and services.

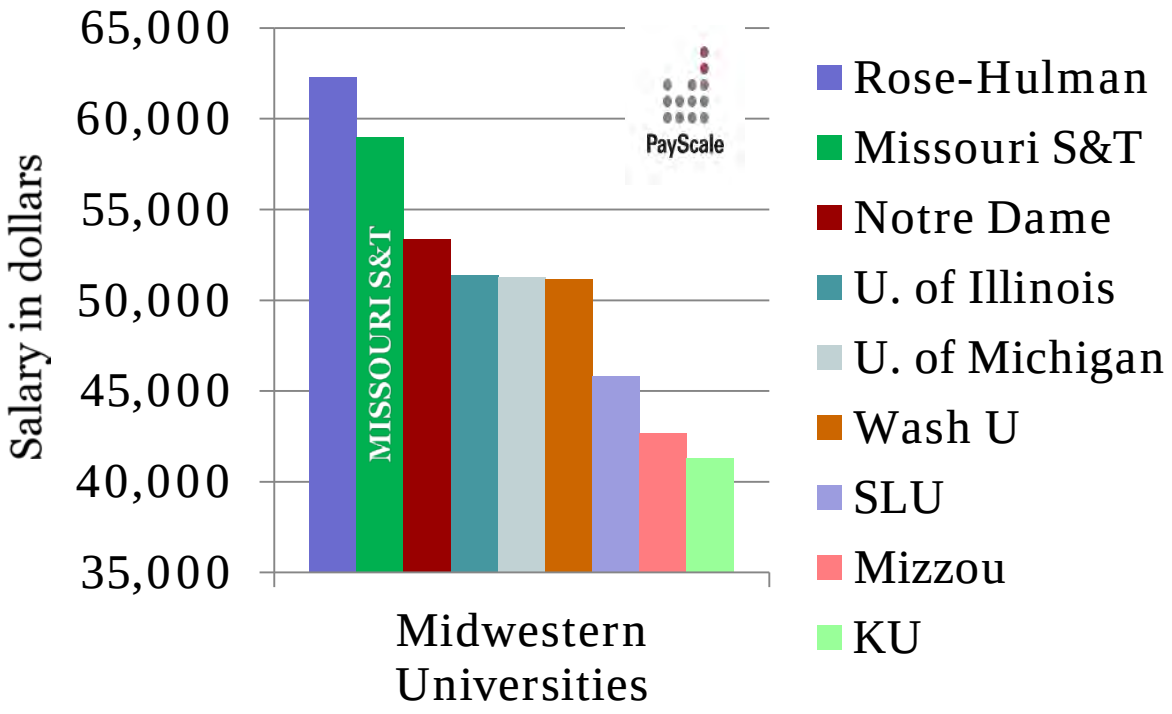
# Strategic Funding

- 33 new faculty positions to be filled in FY15 and FY16
  - $2.57M annually from state funds
  - $1.26M annually plus $1M for start-up packages from S&T as match
- Improve instructional labs
  - $500,000 in one-time state funds
  - $500,000 in private gifts or grants as match
- Redesign three calculus courses to improve student success
  - $132,000 in one-time state funds
  - $66,000 in one-time funds from S&T as match

# Best-in-Class Strategic Areas

- Four strategic areas will be identified this academic year for achieving best-in-class status by 2020.
- Each area will be anchored by an individual of national academy stature.
- Some faculty will be hired in advance of the national academy stature “anchor” faculty and others will be hired after the anchor faculty has joined the strategic area team.
- Review criteria for identifying the four strategic areas are currently being developed.

# Providing Exceptional ROI




- No. 2 in Midwest schools for starting salary potential ($59,000)
- **No. 33 for overall ROI (out of 1,511!)**

# Rankings

- ***Newsweek***
  - #1 in the nation among all public universities for the value to out-of-state students
  - #3 in the nation among all public universities for the value to in-state students

- ***U.S. News & World Report***
  - #7 among all public universities for providing the best return on investment