Track 2:
Social Media Analytics and Mobile Technology

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UNIVERSITY OF MINNESOTA

School of Nursing
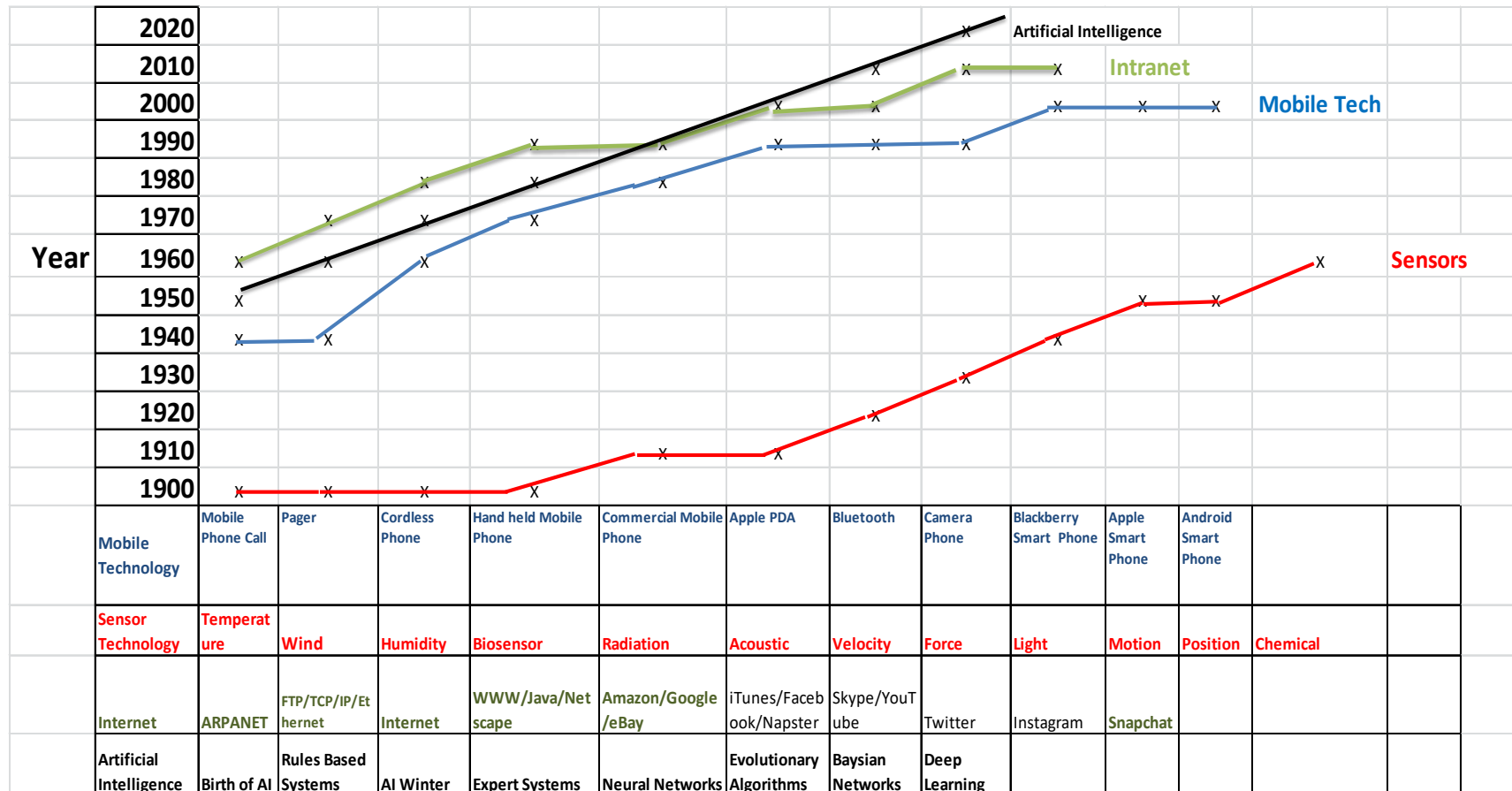**Driven to Discover**℠

Objectives

- Discuss the impact of social media websites on improving Nursing care using CaringBridge as an exemplar.
- Describe benefits and challenges of sensor technology and the Internet of Things in the care and treatment of Alzheimer's Disease or a related disease (ADRD).
- Discuss the use of mobile technology for improved patient adherence to treatment through education and engagement within the context of cardiovascular disease.
- Review the benefits of online precision engagement in connecting with patients at the right time, in the right place and with the right information based on their personal readiness to engage.
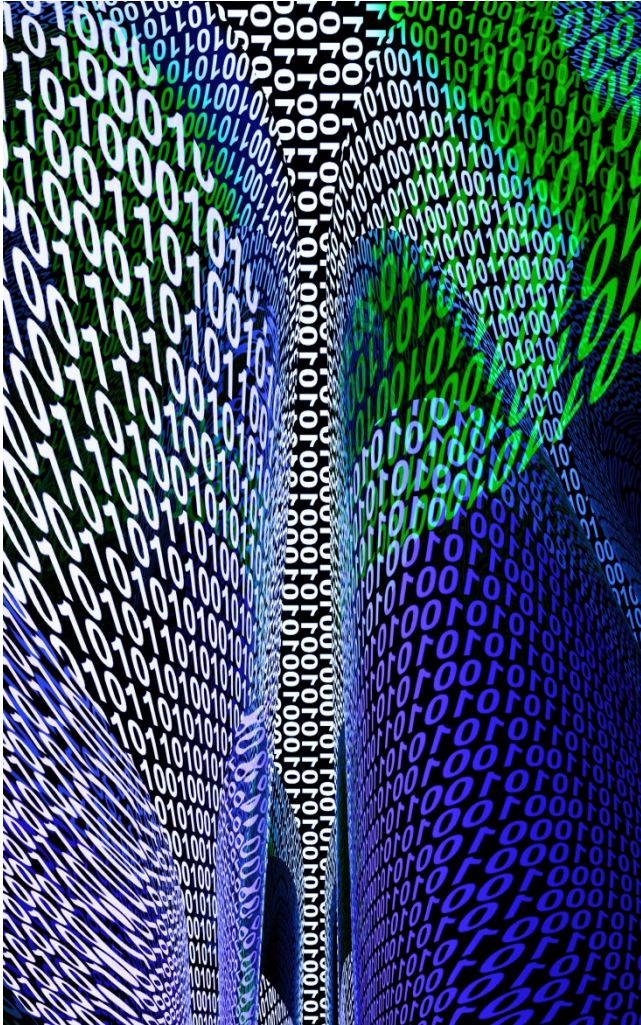
Long Term World Growth in
Gross Domestic Product/Per Capita
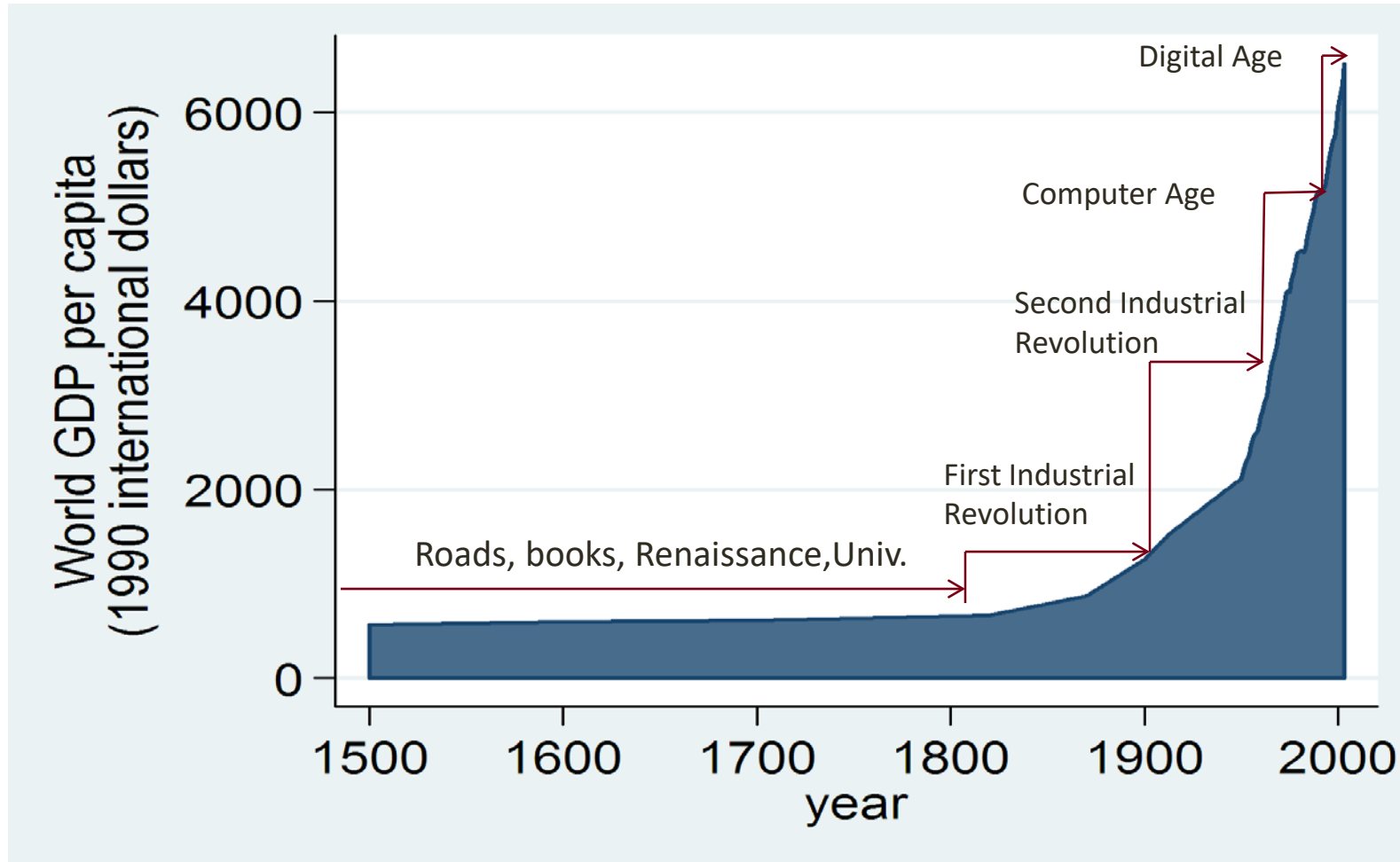
The Perfect Storm:
Mobile Technology, Sensors,
The Intranet & Artificial Intelligence

Artificial Intelligence · Intranet · Mobile Tech · Sensors

Year: 2020, 2010, 2000, 1990, 1980, 1970, 1960, 1950, 1940, 1930, 1920, 1910, 1900

Mobile Technology	Mobile Phone Call	Pager	Cordless Phone	Hand held Mobile Phone	Commercial Mobile Phone	Apple PDA	Bluetooth	Camera Phone	Blackberry Smart Phone	Apple Smart Phone	Android Smart Phone	
Sensor Technology	Temperature	Wind	Humidity	Biosensor	Radiation	Acoustic	Velocity	Force	Light	Motion	Position	Chemical
Internet	ARPANET	FTP/TCP/IP/Ethernet	Internet	WWW/Java/Netscape	Amazon/Google/eBay	iTunes/Facebook/Napster	Skype/YouTube	Twitter	Instagram	Snapchat		
Artificial Intelligence	Birth of AI	Rules Based Systems	AI Winter	Expert Systems	Neural Networks	Evolutionary Algorithms	Baysian Networks	Deep Learning				

https://en.wikipedia.org/wiki/Moore's_law#/media/File:Transistor_Count_and_Moore%27s_Law_-_2011.svg
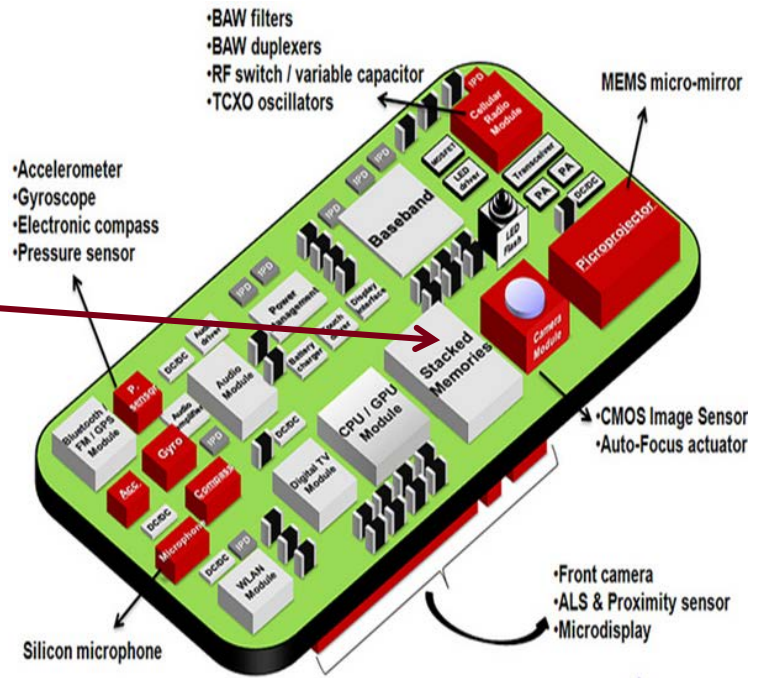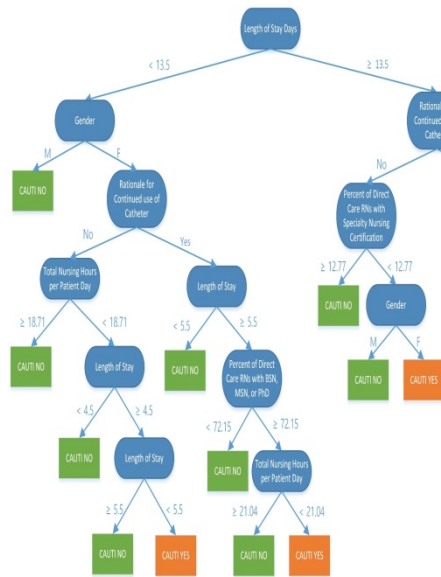
Sources of Data in Healthcare

- Electronic Health Record
- Health Insurance Claims
- Sensor Data (2.9 billion)
- Geo-spatial Data (GPS mapping)
- Patient Reported Outcomes (quantified self movement)
- Human Genome (6 billion/pair)
- Financial Systems (credit cards, bank accounts)
- Environmental and Weather Data
- Social Media (1.8 billion subscribers in top 5 websites)

Social Media

Forms of electronic communication (such as websites for social networking and microblogging) through which users create online communities to share information, ideas, personal messages, and other content (such as videos)

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Merriam-Webster Dictionary at: https://www.merriam-webster.com/dictionary/social%20media

AI Algorithms -> Augmented Intelligence Embedded in Devices

Park, J. (2016). Developing a Predictive Model for Hospital-Acquired Catheter-Associated Urinary Tract Infections Using Electronic Health Records and Nurse Staffing Data. Dissertation. University of Minnesota
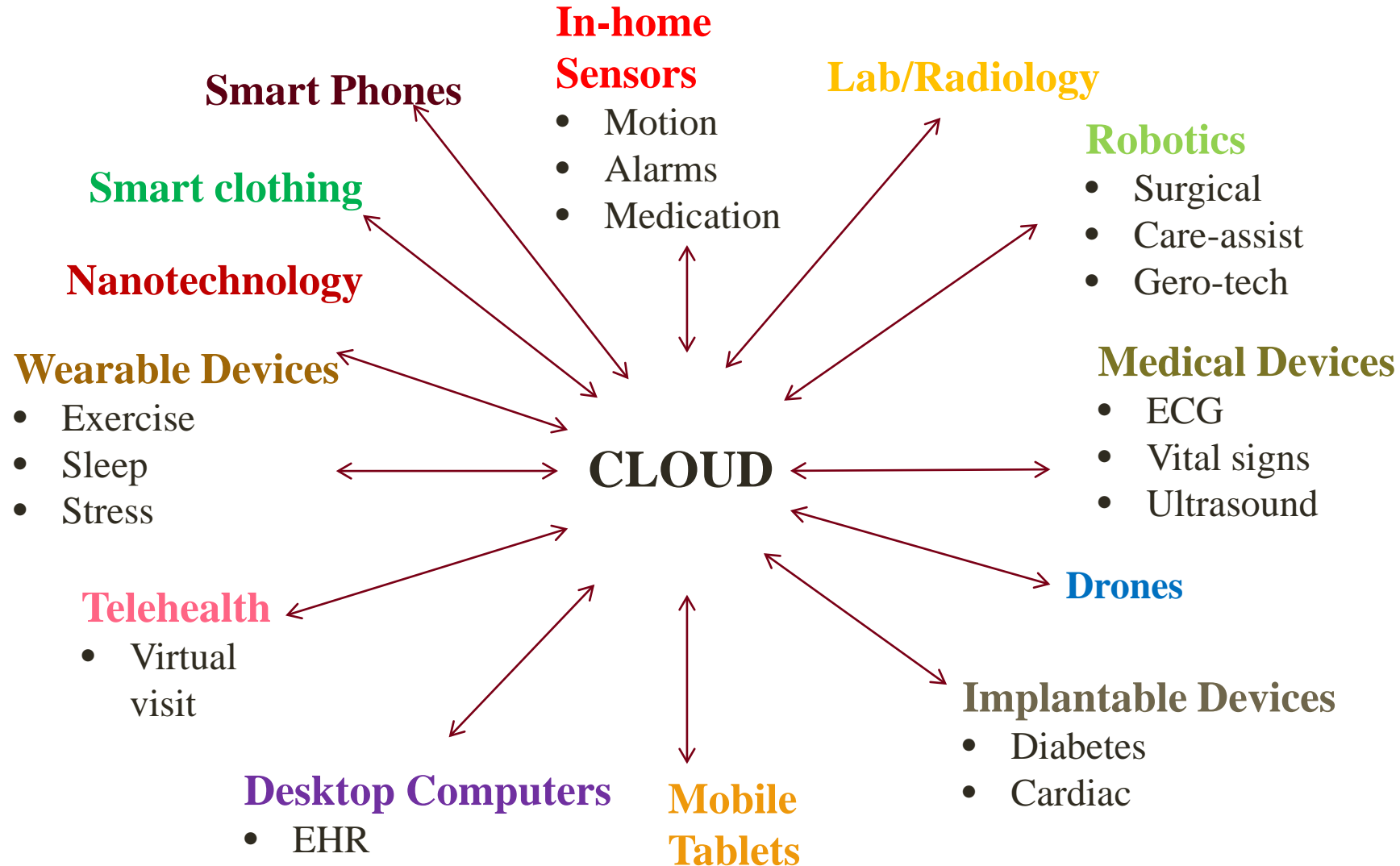
The Intranet of Things

"The integration of people, processes and technology with connectable devices and sensors to enable remote monitoring, status, manipulation and evaluation of trends of such devices."

Peter Lewis. First use of the term given at a presentation to
U.S. Federal Communications Commission (FCC) in 1985.

https://www.youtube.com/watch?v=sGQeWRpmglU

The Intranet of Things

In-home Sensors
- Motion
- Alarms
- Medication

Smart Phones

Lab/Radiology

Robotics
- Surgical
- Care-assist
- Gero-tech

Smart clothing

Nanotechnology

Wearable Devices
- Exercise
- Sleep
- Stress

Medical Devices
- ECG
- Vital signs
- Ultrasound

CLOUD

Drones

Telehealth
- Virtual visit

Implantable Devices
- Diabetes
- Cardiac

Desktop Computers
- EHR

Mobile Tablets

The Information Value Loop

- Create
  - Sensors (generate data)
- Communicate
  - Network (transmit data)
- Aggregate
  - Standards (gather data)
- Analyze
  - Augmented intelligence (patterns and signals)
- Act
  - Augment (change) behavior

Holdowsky, J., Mahto, M., Raynor, M. and Cotteleer, M. Inside the Intranet of Things. A primer on the technologies building the IoT. Deloitte University Press.

Track 2:
Social Media Analytics and Mobile Technology

- **9:30 am**
- **10:00 am**

- **11:00 am**

- **12:00 pm**
- **1:00 pm**

- **2:00 pm**

- **3:00 pm**

- **Introduction –** Tom Clancy and Martin Michalowski
- **Nursing Insights From CaringBridge Notes –** Karen Monsen
- **The eNeighbor: A Proactive Health Monitoring Intervention for Dementia Caregivers –** Rachel Zmora
- **Lunch**
- **Improved Patient Adherence Through Mobile Technology –** Martin Michalowski
- **Improving Care Through Precision Engagement and the Interactive Care Model –** Karen Drenkard
- **Reflection** (All)

Healthcare Social Media Data Analytics
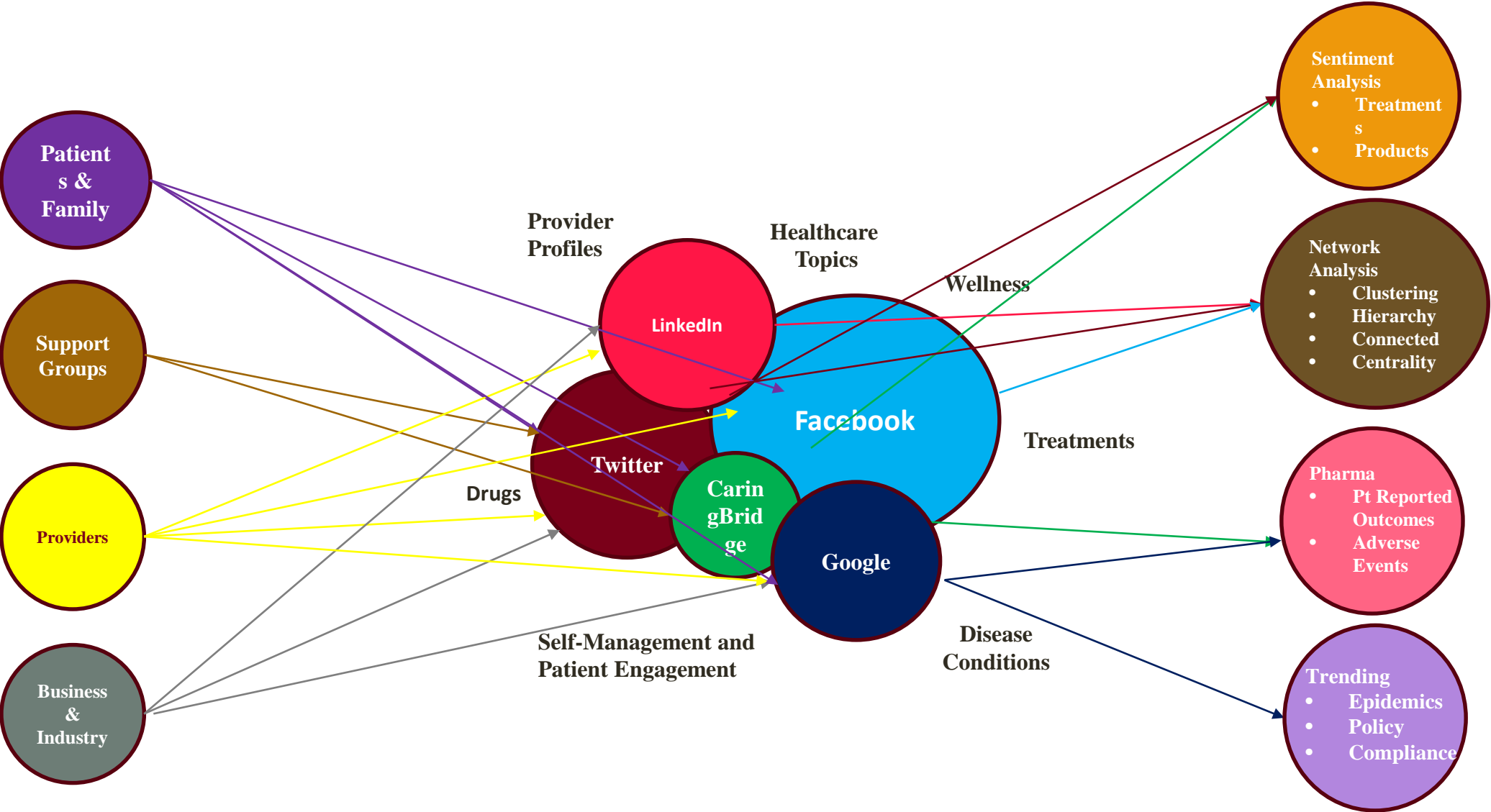
Sentiment Analysis/Opinion Mining

- The process of computationally identifying and categorizing opinions expressed in a piece of text, especially in order to determine whether the writer's attitude towards a particular topic, product, etc., is positive, negative, or neutral.
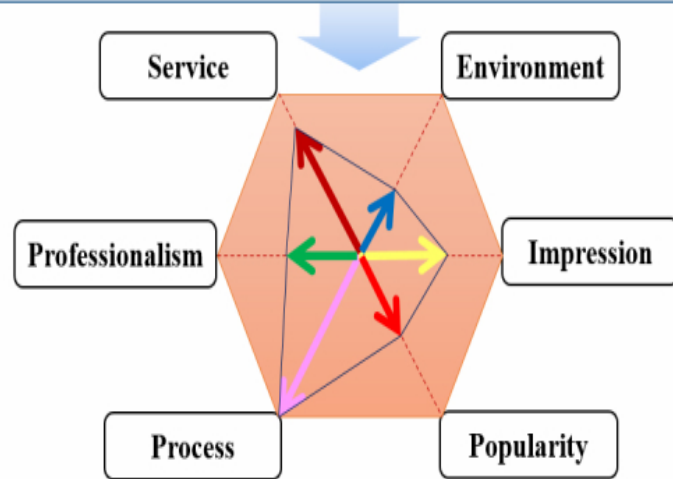

Crawly, John. Reproduced from Quora at: https://www.quora.com/Who-are-the-leading-providers-of-sentiment-analysis-for-social-media-data-and-which-companies-use-them-versus-developing-their-own-technology

Yuchul Jung, PhD, Cinyoung Hur, MS Com Sc, Dain Jung, BSC, and Minki Kim, PhD

Data statistics (from Naver and Daum Web portals).

Sentiment Analysis

District	Threads, n	Messages, n	Messages per thread, n	Messages containing quality factors, n
Seoul	10,832	54,392	5.02	12,421
Daegu	8072	47,419	5.87	4240
Busan	5965	28,910	4.85	9509
Daejeon	3952	22,475	5.69	2358
Incheon	775	5184	6.69	1525
Gwangju	2826	15,368	5.44	2012
Total	32,422	173,748		32,065 (18.45%)
Average	5403.66	28,958	5.59	

Use of the Omaha System for ontology-based text mining to discover meaning within CaringBridge social media journals

Karen A.Monsen, Sasank Maganti, Robert A.Giaquinto, Michelle A.Mathiason, Ragnhildur I.Bjarnadottir, Mary JoKreitzer

Goals

Examine the feasibility of using ontology-based text mining with CaringBridge social media journal entries to understand journal content from a whole-person perspective.

Specific aims

- Describe Omaha System problem concept frequencies in the journal entries over a four-step process overall, and relative to Omaha System Domains,

- Examine the four step method including the use of standardized terms and related words.

Alzheimer's Disease or a Related dementia (ADRD)

- 5.7 million persons with Alzheimer's disease or a related dementia (ADRD) in the U.S. (Alzheimer's Association, 2018)
- Over 16 million family caregivers for these individuals in 2017 (Alzheimer's Association, 2018)
- The majority of care hours (78%) provided to persons with ADRD is from family/unpaid sources (Friedman et al., 2015; Stone, 2015)
  - ADRD family care was valued at $232 billion (Alzheimer's Association, 2018)

Specific Aims

- Do family caregivers of persons with dementia perceive a remote activity monitoring (RAM) system as feasible and useful over 6 months and up to 1.5 years?

- Whether and RAM technology improves key family caregiver outcomes over a 6-month period
  - Caregiver self-efficacy and competence
  - Caregiver distress

Passive Health Monitoring
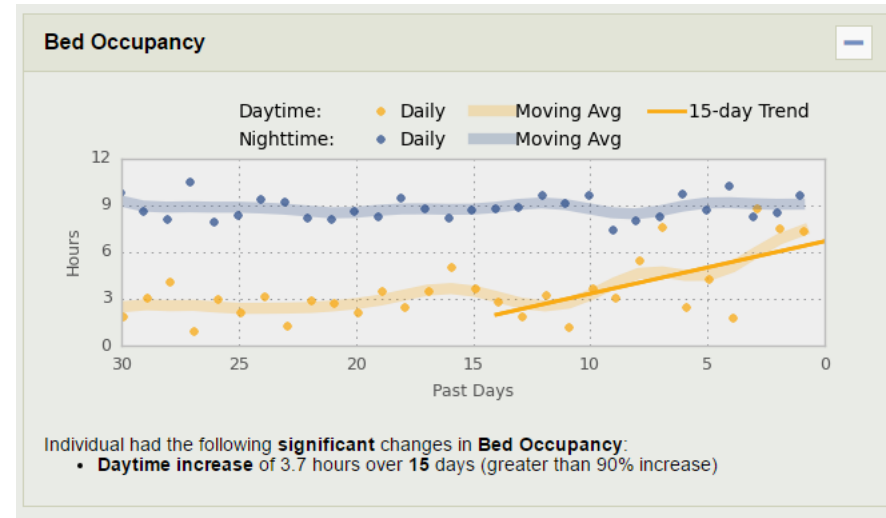
1 **Sensors detect a change in behavior**

By passively monitoring patterns in activities of daily living, the GreatCall system is able to identify residents who may be undergoing a significant behavioral change, generating an alert.

2 **Algorithms generate an actionable alert**

The GreatCall dashboard generates a HealthNote™ alert that outlines the change in behavior, providing graphical and text representations of the observed change.
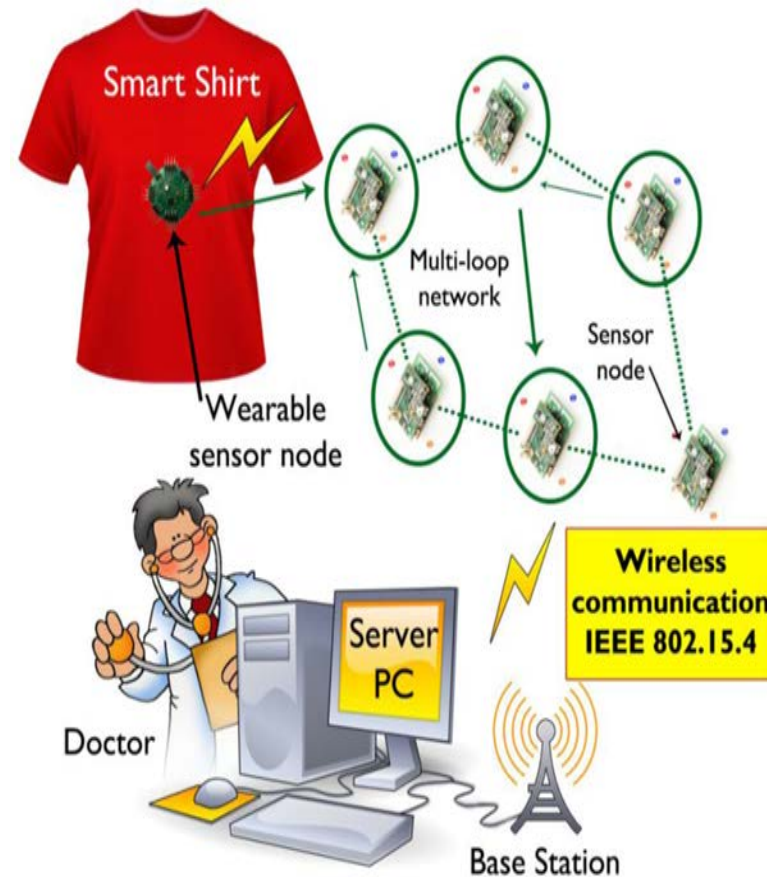
3 **Caregiver provides an intervention**

A caregiver then interacts with the resident to determine if an intervention is required, whether it's a change in medication, additional services, or simply wellness education.

Prevention: Cardiovascular Disease

Mobile Technology & Sensors

- Beat to beat variability
- Fluid status
- Sleep quality
- Apneic spells
- Vital signs
- Lab tests (via smart phone app)
- Med. adherence (via digitized pills)

Wearable and Implantable Wireless Sensor Network Solutions for Healthcare Monitoring. Ashraf Darwish and Aboul Ella Hassanien
: Accessed at Sensors website: http://www.mdpi.com/1424-8220/11/6/5561/htm

Heart Disease Monitoring

5. Act
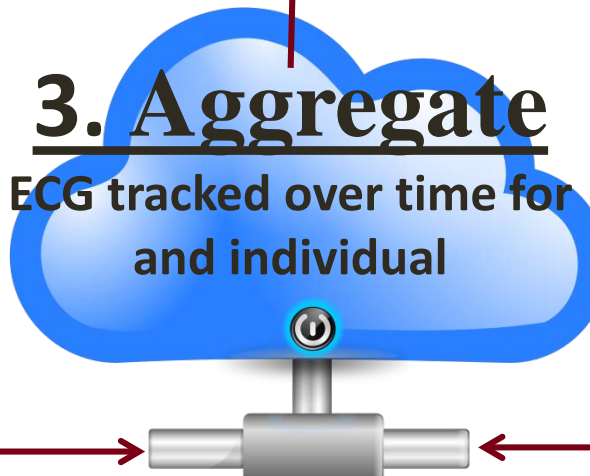**Patient adjusts medications
and other factors
(Augmented Behavior)**
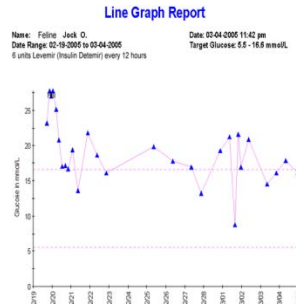
4. Analyze
**ECG signals
are trended and care
plan created.
(Augmented Intelligence)**

3. Aggregate
**ECG tracked over time for
and individual**

1. Create
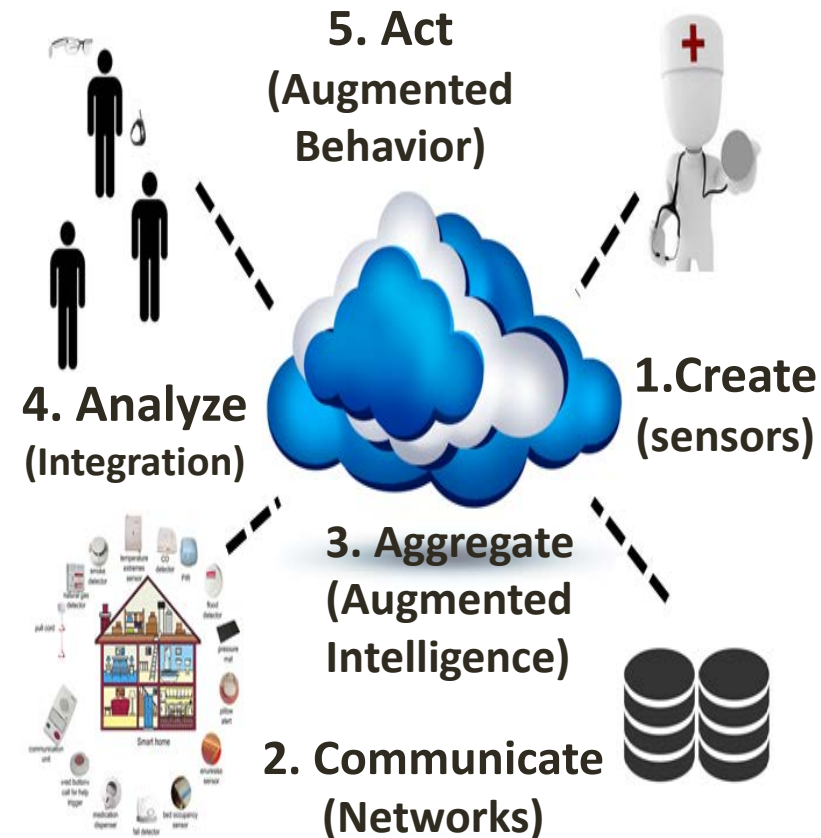**Sensors send
ECG signals
Via home monitor**

2. Communicate
**Signals sent via
Bluetooth and the Intranet**

Intranet of Things:
# The Information Value Loop

- Augmented Behavior is the end of the information loop and results in an action:
  - Recommendation to a provider from a BPG
  - Text message to a diabetic patient to increase their insulin.
- Data Science ⟶ Behavioral Science

5. Act (Augmented Behavior)

4. Analyze (Integration)

1.Create (sensors)

3. Aggregate (Augmented Intelligence)

2. Communicate (Networks)

Holdowsky, J., Mahto, M., Raynor, M. and Cotteleer, M. Inside the Intranet of Things. A primer on the technologies building the IoT. Deloitte University Press.
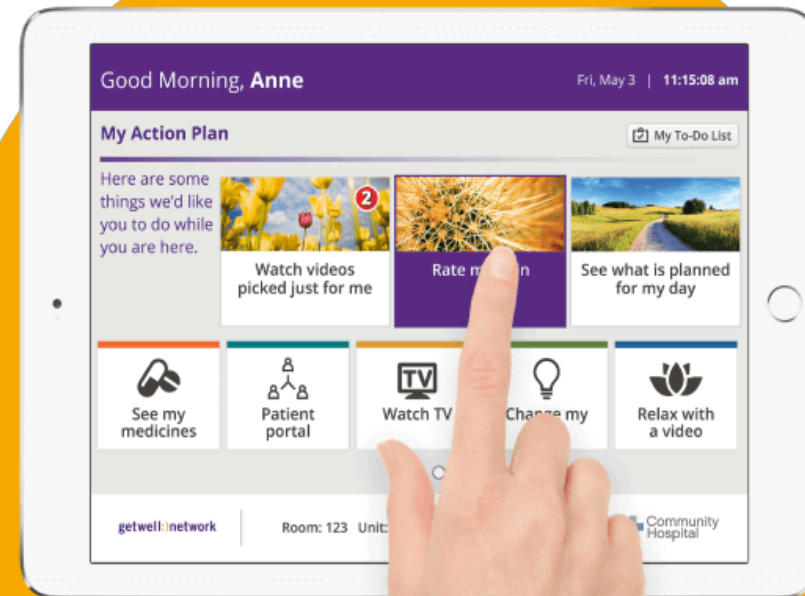
Precision Engagement

Connecting with patients:

- At the right time,
- In the right place,
- With the right information based on their personal readiness to engage.
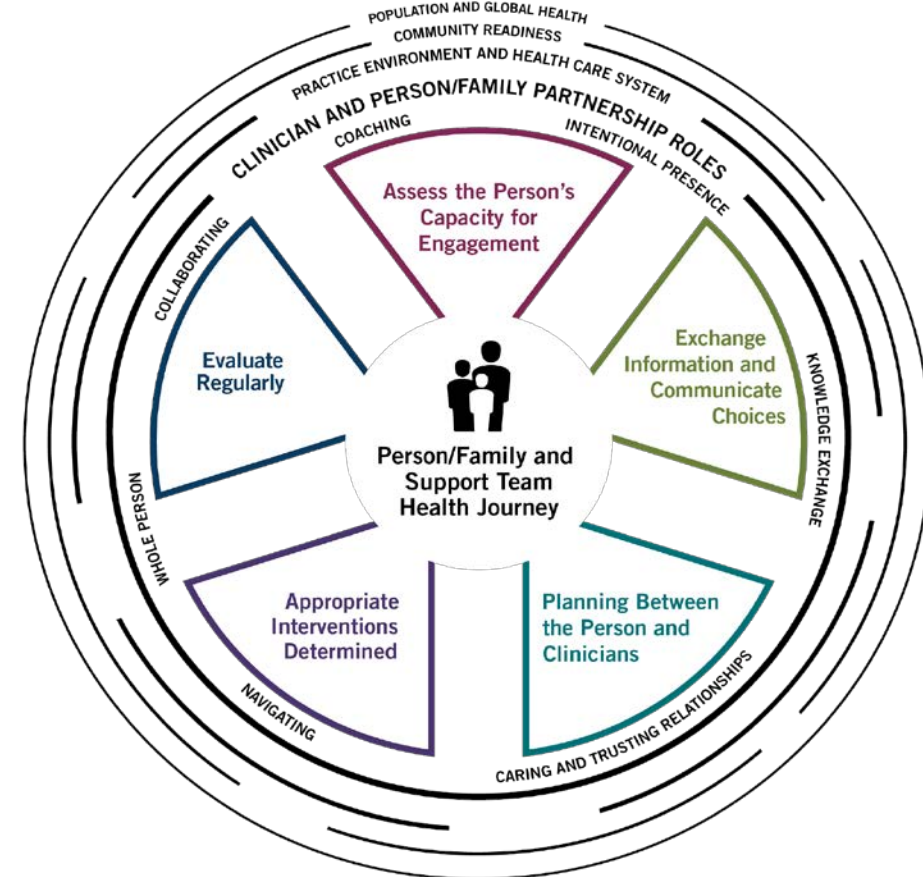
Key Imperatives for PE

1. Supported by evidenced based science
2. Engaged across the care continuum
3. Personalized patient education
4. Capturing the patient's voice
5. Interoperability

GetWellNetwork website. Accessed 4/4/2018: https://www.getwellnetwork.com/solutions/patient-engagement/inpatient/

Social Media Analytics and Mobile Technology

Questions?