2023 IEEE CRUISE TALK

EMERGING MOBILE TECHNOLOGY & CYBER HEALTH

by

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(founding) Industry Director, Smart Pandemic Management @ UC Berkeley
(founding) Vice Chair IEEE Blockchain TC
(founding) Chair IEEE Blockchain TC: Healthcare & AI
(founding) Chair IEEE-SA P3228 Recurring Transactions in DLT Workgroup
(founding) Co-Chair HL7 Mobile Health
(founding) Convenor ISO/TC215 WG#10: Traditional Medicine
(founding) Chairman & CEO CAL2CAL Corp

ABSTRACT

With the phenomenal rise of mobile devices & IoT-enabled solutions globally in the past few years, we have now entered the mobile age – the agricultural age, the scientific age, the industrial age, the information age and now the mobile age! Move over chalk & slate, paper & pencil, keyboards & laptops, here comes “swish, swipe & tap” on a mobile device.

“Beam me up Scotty!”

This global transformation is bringing a change that is impacting our world in every way - how we interact, play, read, write, watch, study, research, work or even relax.

Regulators are scrambling to stay ahead of the curve by defining policies and regulations that will help leverage its benefits but at the same time, hopefully, not throttle or chock innovation.

DIGITAL HEALTH SUBJECT MATTER EXPERT

- Over 39 years of international profession experience in Emerging Technologies
- Pioneer of the field of Mobile Health Standards
- Over 23 years in Mobile Technologies
- Over 22 years of leadership in Digital Health Standards
  - IEEE-SA, HL7, ISO/TC215
- Senior Health IT Subject Matter Expert (SME) to US-DHHS (ONC, CDC, FDA, NIH), US-NIST
- ICT SME to The World Bank, Asian Development Bank, WHO

HEALTH INFORMATICS STANDARDS SME

Gora DATTA

HL7

- Fellow HL7
- Member HL7 TSC: Technical Steering Committee
- HL7 International Ambassador
- (Founding) Co-Chair HL7 Mobile Health Workgroup
- (Founding) Member HL7 Education Advisory Council
- (Founding member) HL7 FHIR Foundation
- HL7 2009 Volunteer of the Year Award Recipient

ISO/TC215 (Health Informatics)

- (founding) Convenor WG#10 Traditional Medicine
- USA Delegate to ISO/TC215 (Health Informatics)
- Member AHG2 “Application of AI technologies in health informatics”
- Member WG#2: “Public Health Emergency Preparedness & Response”

IEEE: Senior Member

- Vice Chair IEEE Blockchain TC
    - Chair Conferences & Events
    - Chair Blockchain Healthcare & AI
    - Chair Blockchain TechBriefs
- Chair IEEE Southern California Council
- Chair IEEE OC Cybersecurity SIG
- Chair IEEE OC Engineering in Medicine & Biology Society (EMBS) Chapter
- Vice Chair IEEE OC Computer Society Chapter
- Member IEEE Standards Association
    - Chair P3228 Recurring Transactions in DLT WG

HIMSS & IHE

- HIMSS Speaker: 2023, 2021, 2014
- IHE 2020 Connectathon Speaker
- HIMSS Interoperability Ambassador: ’23. ‘22, ‘21
- HIMSS Reviewer: ‘24, ‘23, ‘22, ‘21, ‘20*, ‘19

MINE, MINE & MINE!!!

- The views and opinions expressed in this talk are those of the speaker and do not necessarily reflect the official policy or position of any entity, agency or corporation.
- All trademarks, service marks, trade names, trade dress, product names and logos appearing on this presentation are the property of their respective owners. Any rights not expressly granted herein are reserved.
- NOW, let’s take a closer look……

HEALTHCARE
IN

THE PAST: 1923

THE FUTURE: 2123?
(Life in 22nd Century)

Let PRESENT guide us….

WHAT WAS NOT THERE IN 1923!

- NO Commercial regular airline flights
- NO Penicillin
- NO Cell Phones…..not even rotary dial telephone
- NO TV
- NO Computers
- NO Internet
- NO Facebook, No WhatsApp, No Zoom
- NO X (Twitter), No TikTok…..(no Social Media)

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THE PRESENT
21st Century

THE CHANGING GENERATION

Changing Landscape: Paper to Digital

- Stage 1: capture coded data
  - 1) **Capture** health information in a coded format,
  - 2) Using the information to **track** key clinical conditions;
  - 3) **Communicate** captured information for care coordination purposes;
  - 4) **Report** clinical quality measures and public health information.

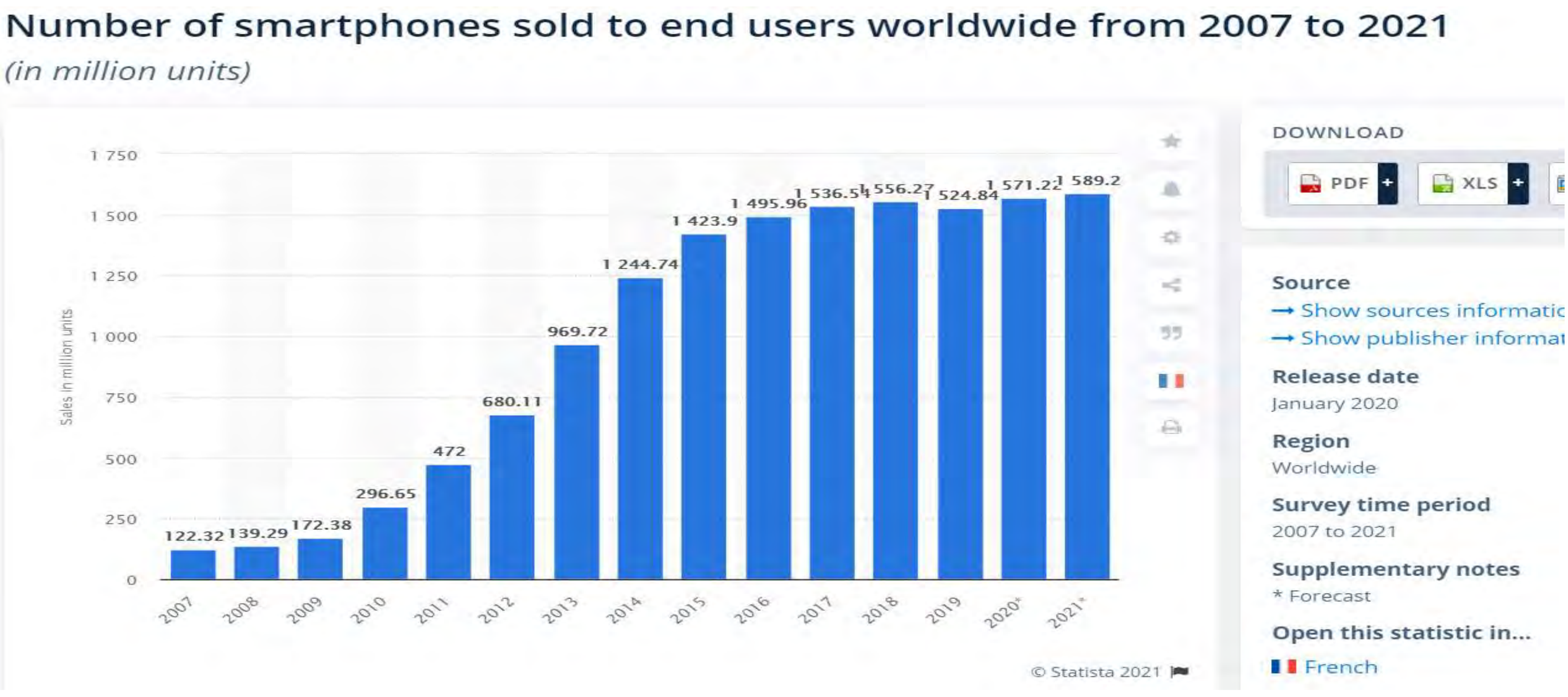
- Stage 2: share/exchange data
  - Focus on interoperability, disease management, clinical decision support, support for patient access to their health information, transitions in care, quality measurement, research, and bi-directional communication with public health agencies.

- Stage 3: convert data → information → knowledge → intelligence
  - Focus on achieving improvements in quality, safety and efficiency, focusing on decision support for national high priority conditions, patient access to self-management tools, access to comprehensive patient data and improving population health outcomes.

DIGITAL TRANSFORMATION

FUEL: MOBILE REVOLUTION!

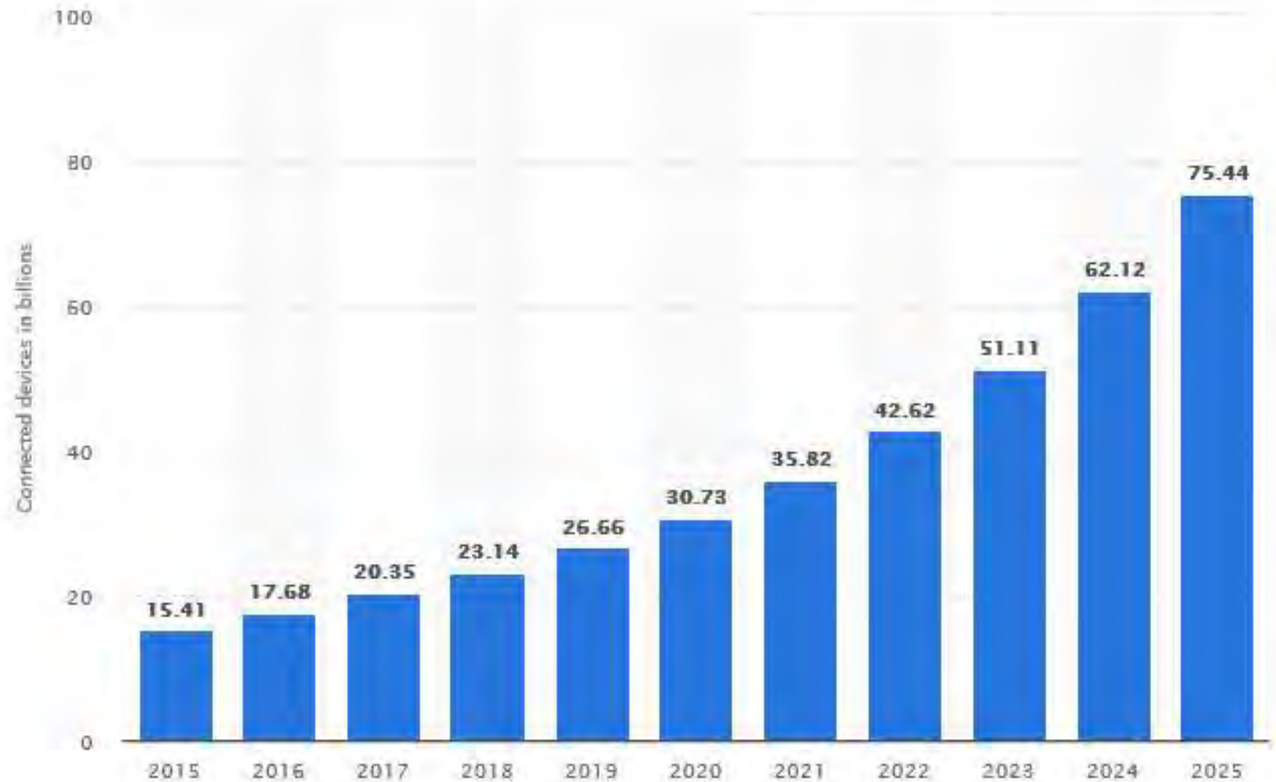
https://www.statista.com/statistics/263437/global-smartphone-sales-to-end-users-since-2007/



FUEL: IoT REVOLUTION!

Technology & Telecommunications › Consumer Electronics › Internet of Things - number of connected devices worldwide 2015-2025

Internet of Things (IoT) connected devices installed base worldwide from 2015 to 2025 (in billions)



DOWNLOAD SETTINGS SHARE

PNG + PDF + XLS + PPT +

DESCRIPTION SOURCE MORE INFORMATION

This statistic shows the number of connected devices (Internet of Things; IoT) worldwide from 2015 to 2025. For 2020, the installed base of Internet of Things devices is forecast to grow to almost 31 billion worldwide. The overall Internet of Things market is projected to be worth more than one billion U.S. dollars annually from 2017 onwards.

WORLD

OF

EMERGING TECHNOLOGIES

Emerging Techs Revolution

1. DLT/BC: Digital Ledger/Blockchain
2. Digital Health
3. Wearables
4. Medical Devices
5. AI/ML
6. IOT
7. Mobile Tech
8. Sensors
9. Robotics
10. Advanced Manufacturing
11. Digital Twins
12. AR/VR/MR/ER
13. 3D Printing
14. Nano Tech
15. Vehicular Tech
16. 5G/6G
17. Mobility
18. Space Tech
19. Genetic Technology
20. Fin-Tech
21. Clean-Tech
22. Energy
23. Quantum
24. CyberSecurity

...

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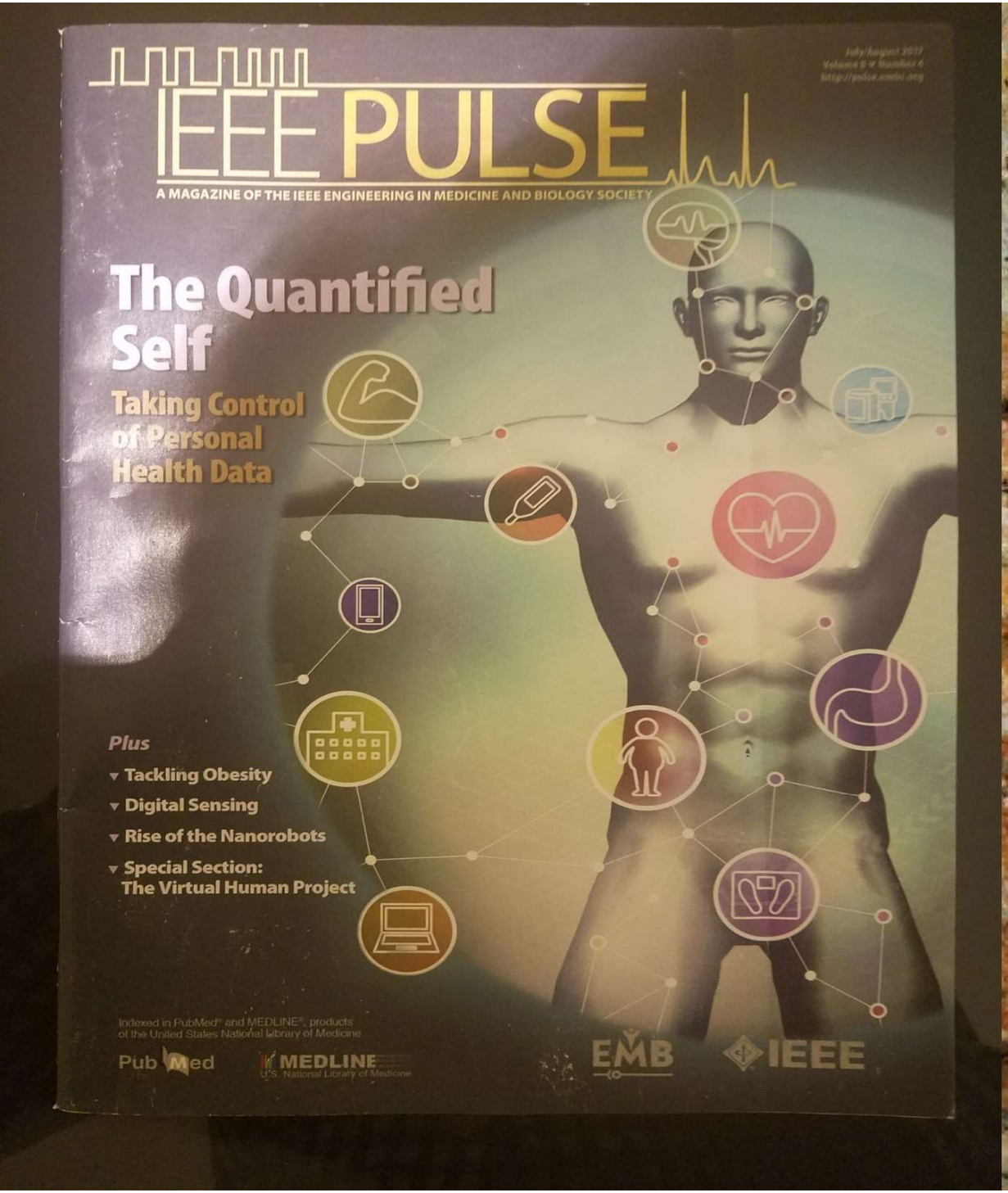
IEEE PULSE
A MAGAZINE OF THE IEEE ENGINEERING IN MEDICINE AND BIOLOGY SOCIETY
July/August 2017
Volume 8 ▪ Number 4
http://pulse.embs.org
The Quantified Self
Taking Control of Personal Health Data
Plus
Tackling Obesity
Digital Sensing
Rise of the Nanorobots
Special Section: The Virtual Human Project
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IEEE


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http://pulse.embs.org
Healthy Longevity
Caring for an Aging Population
Plus
Digital Tracking of Cognitive Decline
21st Century Hearing Technologies
Smart Imaging for Muscular Health
PubMed
MEDLINE
EMB
IEEE

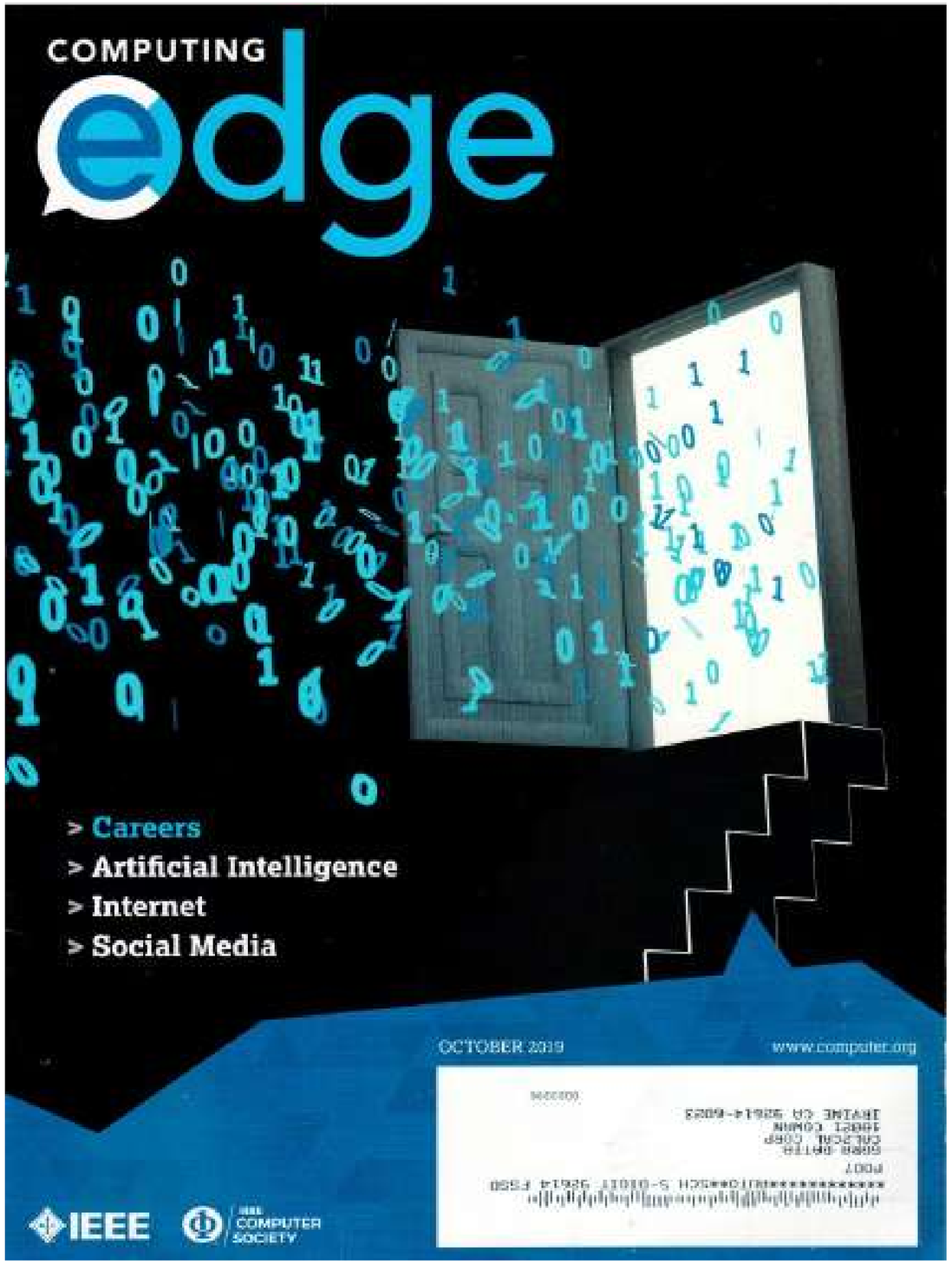
IEEE
Engineering Management Review

Volume 47 • Number 3 • Third Quarter • September 2019

Value, Values, and Valuations

www.ieee-tems.org

da Vinci Robotic Surgery. For more see Healthcare 4.0, by Mark Wehde, pp. 24-28



Mobile Health – Integrated Innovation

Engagement

Security
Privacy

Trust

Fitness

EHRs

Healthcare

Medication

Wearables

Safety

Patient Needs

Efficiency

Care Providers

Innovation

Guidelines
Best
Practices

IMPACT OF MOBILE PLATFORM

Mobile Platform Differentiators

1. Touch screen
2. Location service
3. IM (instant messaging)
4. Camera
5. Video (+ Augmented Reality)
6. IR (infra-red)
7. Bluetooth
8. Vibrations (haptic)
9. Biometrics
10. Gyroscope
11. Accelerometer
12. Easy-to-add sensors
13. Evolving form factor
14. Wearables
15. Flashlight
16. Micro payment service

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WORLD OF MOBILE HEALTH STANDARDS

IEEE 11073

- Point-of-care medical devices (PoC)
- Personal health devices (PHD)

IEEE 11073 Personal Health Devices Standards Series

EMERGING STANDARDS IN MOBILE HEALTH

- **ISO TS 82304-2: Quality Criteria for Health & Wellness Apps**
  - Technical Specification about quality criteria for health apps
  - doesn’t cover the detailed process of an assessment schema
  - ISO CASCO noted the object of conformity assessment of the ISO 82304-2 looks to be aligned with ‘Verification’ rather than ‘Certification’

- **HL7 Standard for Trial Use#2: cMHAFF – consumer Mobile Health App Functional Framework**
  - The primary goals of cMHAFF are to provide a standard against which a mobile app’s foundational characteristics -- including but not limited to security, privacy, data access, data export, and transparency/disclosure of conditions -- can be assessed.

NEW MOBILE HEALTH STANDARD IN THE MAKING

UMHAI: UNIQUE MOBILE HEALTH APP IDENTIFIER

- **HL7 UMHAI – newly approved HL7 project**
  - **This is a unique identifier that uniquely identifies mobile health application instance as installed on a mobile/virtual "device".**
  - **Related data elements would included Application name, App Builder, version, build number, hosting device, unique identifiers [similar to a Vehicle Identification Number (VIN) used to track and identify individual vehicle].**
  - **Unique Mobile Health Application Identifier enables identification of application instance to facilitate recall, maintenance, transparency and traceability.**

KEY POINTS FROM MH CONCEPT NOTE "MOBILE HEALTH APPS"

Author: Gora DATTA

- Mobile health app needs to be safe/secure/accurate not only for the user/patient but also for the clinician/payer/provider/regulatory community.
- Another aspect that is critical for mobile health app usage, by both patients and healthcare providers, is the impact of cyber security on these apps.
- Not having a collaborative approach amongst various global stakeholders runs the risk of seeing a "proliferation of non-standardized, country-specific, siloed certification process being established over the next few years" in the mobile health app space.

- https://healthinformatics.uic.edu/blog/cybersecurity-how-can-it-be-improved-in-health-care/
- https://www.nccoe.nist.gov/news/security-recommendations-mobile-health-apps

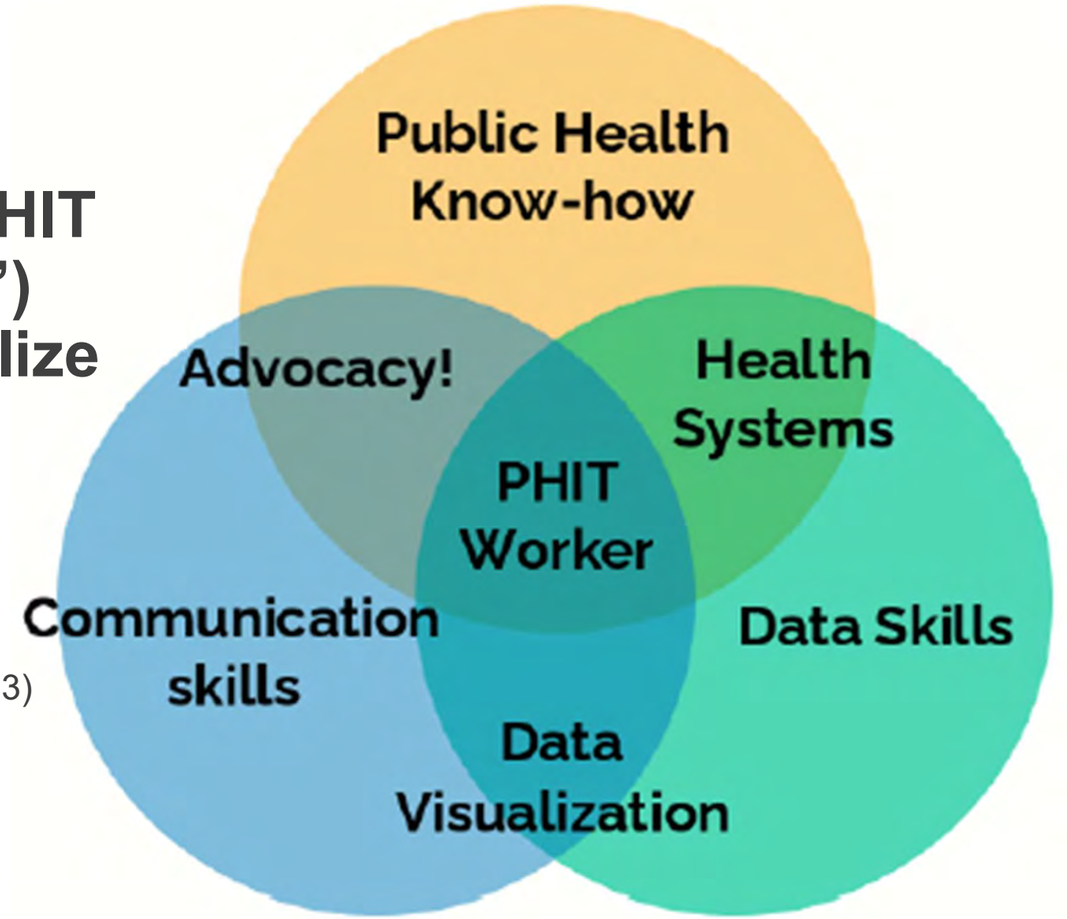
APPLYING EMERGING TECH

- CONSORTIUM – a PPP model
  – Academia, Industry, Government
- EDUCATION – new pathways
- NEXT GENERATION Workforce

Desirable Skills & Curriculum Development

- **Skills Assessment ("PHIT Worker Venn diagram") data gathered to visualize preferred skill-set domains for PHIT workers.**

(Hayward, C., Dean, R, & Fernandes, S. 2023)



New Course at UC Berkeley: Emerging Technologies for Public Health

Take this **unique one-time special topics course** taught by a group of top experts on using **technology and informatics** holistically for health, namely **public health**. Learn **how to use AI, smart devices, social media, apps, HL7, FHIR, and cloud technology** for better and more equitable **health outcomes** by looking at our environments, lifestyles, social determinants, and medical care in concert. Come develop interdisciplinary projects with our team, work with students from outside your field, and **qualify for internships** at https://www.csulb.edu/ccphit/internship-and-bootcamp-information

ENROLL FOR FALL 2023

SCAN TO ENROLL

Course: Emerging Technologies for Public Health
Section: CIVENG 190S (#33518) & 290 005 (#33525) **Units:** 3 credits
Prerequisites: Data 8 or any Introductory statistics course
Logistics: Friday lecture 10 AM-12 PM and lab 12-2 PM; In-person if you're on the Berkeley campus, Simulcast online if remote.
Instructors:

- Deryk Van Brunt, Professor School of Public Health**, UC Berkeley,** Founder & CEO of **Credible Mind**
- Ashok Gadgil, Professor of Engineering UC Berkeley, **National Academy of Engineering**
- Siva Bandaru, Entrepreneur **Aepnus Technology**, Lithium extraction, Arsenic removal
- Angel Desai, Professor of Infectious Diseases **UC Davis**, JAMA Fishbein Fellow
- Mohammad Usman, Entrepreneur, Former head **R&D Masimo**, with over a 100 patents
- Gora Datta, Fellow HL7, Chair **IEEE Blockchain**: Healthcare and AI, Standards SME
- Susan L. Ivey, Professor School of Public Health, **UC Berkeley**, Past Medical Director, City of Berkeley
- Raja Sengupta, Professor of Engineering **UC Berkeley,** Director spm.berkeley.edu

Berkeley UNIVERSITY OF CALIFORNIA · California Consortium for Public Health Informatics and Technology · CAL STATE EAST BAY · CALIFORNIA STATE UNIVERSITY LONG BEACH College of Health and Human Services

This course is supported in part by the Office of the National Coordinator for Health Information Technology (ONC) of the U.S. Department of Health and Human Services (HHS) under grant number 90PH0006/01-05 and title "The PHIT Workforce Development Program."

CCPHIT Virtual Series #1 IMA:

California Consortium for Public Health Informatics and Technology

Informatics, Mapping & Analysis Bootcamp & Internship

Course Description

This Virtual Series is a **self-paced**, **instructor moderated**, **online**, **hands-on learning** of fundamentals and foundations in Public Health Informatics and Technology. It also covers an experiential learning of Mapping & Analysis techniques.
Hours Requirement: 80 hrs.
Compensation (awarded at completion): stipend for current/eligible students who complete all 3 modules

Module #1: PHIT Power-Up

- Intro to field of Public Health Informatics and Technology
- 15 concise, 30-minute lectures
- Aims to empower learners by imparting essential insights, practical techniques, and key concepts

Module #2: Health & Human Services GIS Curriculum

- Gain experience with essential GIS concepts to analytics, field work, storytelling with data, collaboration, and more.
- Experience using most relevant ArcGIS software products for health-related practices.

Module #3: Informatics & GIS Project Practicum

- Individual Project Practicum in Informatics - Practice skills and knowledge on a FHIR enabled sandbox called MELD
- Team Practicum Project in GIS - Apply GIS skills to create an information product!

Our Students

300+ applications reviewed

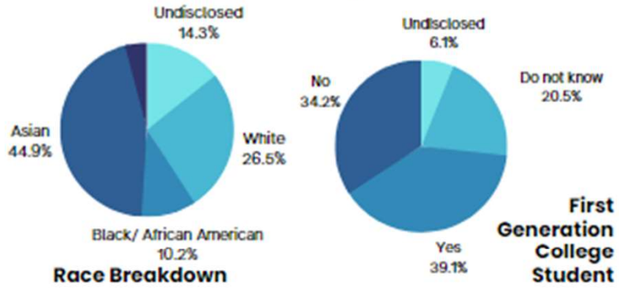
273 students enrolled on the course website

Student makeup included one high school student, community college students, undergraduate students, masters students, doctoral candidates, and working professionals

57 students received Certificate of Achievement

50 students completed all assignments and GIS internship, **qualifying for stipend**

Internship Data



Interoperability

Policy

Standards and Technology

Investments

Inferno

Lantern

HL7

IHE

LEAP in Health IT

LOINC w/ Regenstrief

NCPDP

PCOR

PULSE

Public Health Informatics & Technology (PHIT) Workforce Development Program

The Office of the National Coordinator for Health Information Technology (ONC) has awarded $75 million in cooperative agreements as part of its Public Health Informatics & Technology Workforce Development Program (PHIT Workforce Program). Funded through the American Rescue Plan, the program aims to strengthen U.S. public health information technology (IT) efforts, improve COVID-19 data collection, and increase representation of underrepresented communities within the public health IT workforce. ONC will support the overall administration of the program.

The 10 recipients, comprising Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs), Asian American and Native American Pacific Islander-Serving Institutions (AANAPISIs), and other institutions of higher education, will form multiple consortia to collectively train more than 5,000 individuals over a four-year period through an interdisciplinary approach in public health informatics and technology. The consortia will develop curricula, recruit and train participants, secure paid internship opportunities, and assist in career placement at public health agencies, public health-focused non-profits or other public health-focused organizations. In addition to increasing the number of public health professionals trained in public health and informatics, these awards will increase the capacity of minority-serving institutions to train underrepresented minority students during the project period and long after federal funding ceases.

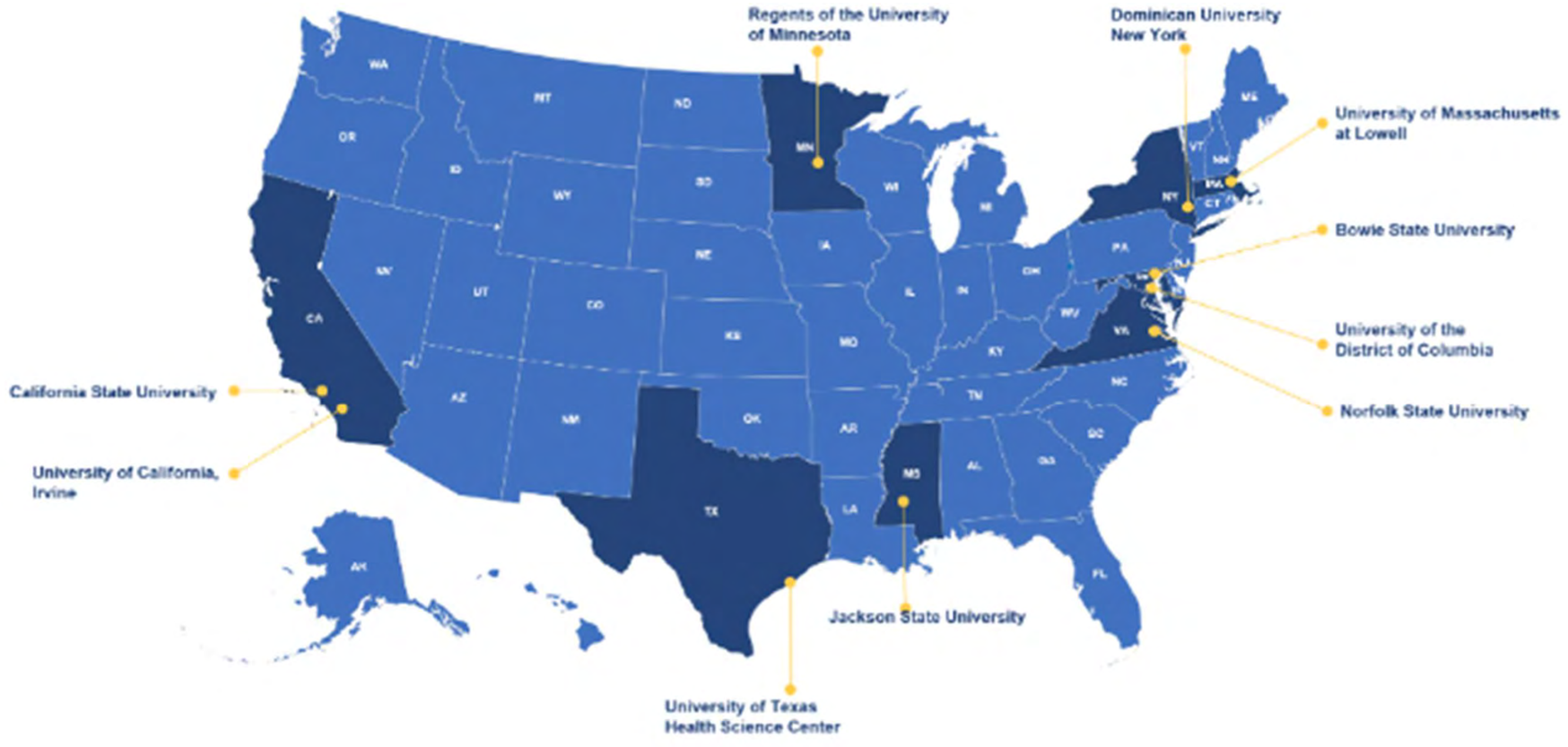
Archived Funding Opportunity Information

- View Archived Version on Grants.gov
- Read Frequently Asked Questions
- View the press release
- Read the entire funding opportunity

NOFO Information Session

- Watch the Recording
- Slides [PDF - 1.2MB]

PHIT Workforce Program Recipients



https://www.healthit.gov/topic/interoperability/investments/public-health-informatics-technology-phit-workforce-development

IEEE
Advancing Technology for Humanity

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August 9, 2021

Micky Tripathi, Ph.D. M.P.P.
National Coordinator for Health Information Technology
Department of Health and Human Services
330 C. Street, 7th Floor, Office 7009A, S.W.
Washington, DC 20201

Dear Dr. Tripathi,

We believe that IEEE would be an asset to this partnership, given our strategic focus on technology for humanity and that our global leadership position in the technology space.

IEEE welcomes the opportunity to help identify essential skills needed for PHIT through supporting the development of program curriculum and requirements. Additionally, through IEEE's activities to support our members with public health informatics, we can create connections and identify sites where the student(s) may be hosted during their internship to help meet the goals and objectives as described in the CPHIT training. Specifically, IEEE is available to participate in the following aspects of the program:

- CCPHIT Curriculum Advisory Board: providing input and helping to shape the PHIT Curriculum that the consortium will be developing.
- Nationwide Community of Practice.

HealthIT.gov

TOPICS BLOG NEWS DATA ABOUT ONC

Partners and consortia members: Adventist Health Bakersfield, AIDS Healthcare Foundation, Alameda public health department, Bakersfield College, CAL2CAL, California Black Women's Health project, California Department of Health Care Access and Information, California Department of Public Health, California Health Workers Union (SEIU-FHW), California Primary Care Association, California State University East Bay, Center for Latino Health at California State University Long Beach, Center for Successful Aging at California State University Long Beach, Chaffey College, City of Long Beach Public Health Department, Community Clinic Association of Los Angeles County, Dignity Health Southern California, ESRI, Fresno City College, Futuro Health, IEEE Southern California, Institute for International Health and Education, LA Community College District, Kaiser Permanente, Kern Public Health Department, Las Positas College, Long Beach City College, Masimo, MemorialCare Health System, Orange County Community Health Coalition, Saddleback College, San Francisco Public Health Department, Shasta College, Shasta County Public Health Department, University of California Berkeley School of Public Health and College of Engineering and US Department of Veterans Affairs Long Beach Healthcare Hospital.

a. Engineering in Medicine and Biology Society
b. IEEE Healthcare and Life Sciences
c. IEEE Healthcare: Blockchain and AI
d. IEEE Standards
e. IEEE Computer Society
f. IEEE Technical Committee on Privacy and Security
g. Robotics and Automation Society
h. Technology and Engineering Management Society

2. IEEE Experts
   a. Domain Experts in Public Health I.T
   b. Adjunct faculty

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“THROUGH THE LOOKING GLASS”

2123

HEALTHCARE IN THE 22nd CENTURY (baker's dozen)

1. Next generation: "iPAD™" kids
2. Blurred Lines:
   - Impact of Social Media
   - Concept of Privacy
3. Are we there yet: I want it NOW
4. Take Charge: Consumer Health, Patient Engagement, PGHD, PRO, SODH
5. Gene to genes: from Star-Trek (Gene Roddenberry) to Genetic Health – personalized medicine
6. Space – The Final Frontier: "Healthy" flights

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…..22nd CENTURY (cont.)

7. Back to the Future: Longitudinal Health Record
8. Live long & prosper: from provenance to preservation
9. Emerging Areas: IoT/HoT, Big Data, Cloud Computing, AR/VR/MR…
10. Global Village: Urban, Rural, Remote, Underserved
11. “l'addition s'il vous plaît”: Mobile micro-payments
12. Take care: CyberHealth, Blockchain, UDI, UMHAI
13. Alexa dating Siri?: AI, Machine Learning, Bots

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22nd CENTURY ~~HEALTHCARE~~ PATIENTCARE

“EMPOWERED PERSON”

SUMMARY!

- As we transition to a digital record framework; use of Mobile Technology leads the way (in access, capture and dissemination of health information)
- As Mobile & IoT Devices become more and more ubiquitous, accessing our health information is only a few tap/swipe/transmit away!
- LIFE IN 22nd CENTURY
  - Standards enabled, cloud connected, IoT driven, micro-services enhanced, cyber-safe Digital Health world

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THANK YOU!

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