BHI-2017 International Conference on Biomedical and Health Informatics
"Integrative informatics for precision and preventive medicine"

◆IEEE   16 -19 February 2017   Rosen Plaza Hotel, Orlando, FL   EMB

BHI 2017 - Special Session #365
"Advancement of IoT and impact on the future of Healthcare and Wellness

Sponsor: Celia Desmond

Session Chair: Fawzi Behmann

Moderator/Speaker1

Fawzi Behmann, President, TelNet Management Consulting Inc. and Vice Chair IEEE NA Communications Society Board

Speaker/Panelist 2

Elizabeth (E.) Koumpan, IBM Senior Certified Executive Architect, Watson Cognitive Business Solutions CoC, IBM Global Business Services

Speaker/Panelist 3

Jennifer D. Davis, Ph.D., R&D Technology Principal, Accenture

Speaker/Panelist 4

Brent Lunceford, President of Memstronics

Speaker/Panelist 5

Danda B. Rawat, Ph.D., Assoc. Prof., Department of EE & CS, Howard University, Washington, DC

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BHI 2017 - Special Session #365

"Advancement of IoT and impact on the future of Healthcare and Wellness"

- **Session Outline**
- **Session Abstract**
- **Speakers - Presentation Title & Abstract**
- **Speakers - Bios**

"Advancement of IoT and impact on the future of Healthcare and Wellness"

Session Intro/Overview   (Fawzi Behmann)   20 min

Speaker 1/Presentation Title: 20 min
Fawzi Behmann, President, TelNet Management Consulting, Inc.
"IoT & Technology Convergence in Healthcare & Wellness"

Speaker 2/Presentation Title: 20 min
Elizabeth (E.) Koumpan, IBM Senior Certified Executive Architect, Watson Cognitive, Business Solutions CoC,
 IBM GBS Watson Health
"Watson Health Analytics & Cognitive Nutrition"

Speaker 3/Presentation Title: 20 min
Jennifer D. Davis, Ph.D., R&D Technology Principal, Accenture
"Social Awareness and Artificial Intelligence: A wheelchair fitness tracker, an Indoor Farm and a Choice Agent"

Break 20 min

Speaker 4/Presentation Title: 20 min
Brent Lunceford, President of Memstronics
"Sensors, IoT in Health & Wellness"

Speaker 5/Presentation Title: 20 min
Danda B. Rawat, Ph.D., Assoc. Prof., Department of EE & CS, Howard University, Washington, DC
"Trusted & Scalable Networks"

Round table/Panel/Interactive discussion   40 min
All speakers/Moderated by session chair

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BHI 2017 - Special Session #365
"Advancement of IoT and impact on the future of Healthcare and Wellness"

Session Abstract

Today we witness an accelerated growth and advancement in various technologies such as IoT, wireless and 5G, mobile & medical devices & wearables, 3-D, robot, and drone.

Advancement in computing processing power, cloud based services and virtualization have resulted in an environment and platform for convergence some of these technologies for products, applications and services in key markets such as Healthcare and Wellness.

A panel of multi-disciplinary subject matter experts will explore current and emerging solutions at hospitals, clinics, care centers and homes. Solution building blocks include sensing, aggregation, and data analytics. The notion of cloud based big data/analytics will be presented. Some initiatives across Watson Health and nutrition will be presented followed by an interactive dialogue with the audience.

The session will provide innovative examples of IoT enabling technology convergence and connectivity that include sensors, mobile/wearables, 3D, robot, drone and use in healthcare services.

Finally the session will conclude with some of the factors and challenges to deliver secure systems, scalable solutions, enriched quality of services and experience. This would include virtualization, development platforms, 5G, collaborative applications and security.

Takeaway points:
- Understanding of rapid evolution of IoT & biomedical technology and impact in critical healthcare areas
- Considerations for cloud based big data/analytics – use case in healthcare & nutrition.
- Considerations for scalable and secure networks.

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"Advancement of IoT and impact on the future of Healthcare and Wellness"

Session Chair, Moderator and Speaker

Fawzi Behmann

Vice Chair, IEEE Communications Society for North America, and

President, TelNet Management Consulting, Inc.

Title:

"IoT & Technology Convergence in Healthcare""

Session Abstract:

Healthcare is one of the largest industries with 5-18% of GDPs spent on health and care globally. The healthcare budgets of the vast majority of nations continue to outgrow their GDPs.

This segment will provide an overview of trends and technological advancement and solutions in the areas of Healthcare and Wellness. Key examples will be highlighted include sensing, connectivity, data aggregation and analytics in some of the healthcare & wellness areas such as hospitals, treatment, telehealth and gyms.

Scenarios will highlight some of the cloud-based solution that include mobile/wearable/embedded patches and medical devices used in the detection, treatment and prevention. Future challenges and impact on IoT, 5G and virtualization will be highlighted.

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"Advancement of IoT and impact on the future of Healthcare and Wellness"

Speaker/Panelist

Elizabeth (E.) Koumpan,

IBM Senior Certified Executive Architect, Watson Cognitive
Business Solutions CoC, IBM GBS Watson Health

Title:

"Watson Health Analytics & Cognitive Nutrition",

Harness the Power of Food for Health and Well- Being

Abstract:

Food dietary components may affect gene expression directly or indirectly. No two humans are alike, reflecting in differences in nutritional processes such as absorption, metabolism, receptor action, and excretion. Genetic variation may also affect food likes and dislikes and, as a consequence, nutrition. There are more than 200 food disorders. Those who think they have no time for healthy eating, will sooner or later have to find time for illnesses. What we eat can change our lives. If we can improve our diet by accounting for specific medical disorder, environmental characteristics, such as location, weather conditions, we can have options for disease management.

Genetic variability in biochemical processes is ubiquitous; every person is genetically unique. The relevance of this genetic individuality for nutrition and for the role of certain nutrients in disease causation requires much greater understanding. Nutrition models can be used for estimating human requirements and nutrients derived from menus created for specific disease, and used by particular population based on geography, demographic, physiological, education, medical pre - condition. Insights from such data can be used to enhance the diet. 'To eat is a necessity, but to eat intelligent is an art'.

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"Advancement of IoT and impact on the future of Healthcare and Wellness"

Speaker/Panelist

Jennifer D. Davis, Ph.D.,

R&D Technology Principal, Accenture
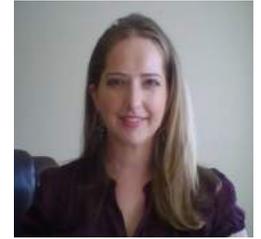
Title:

"Social Awareness and Artificial Intelligence: A wheelchair fitness tracker, an Indoor Farm and a Choice Agent"

Abstract:

The integration of hardware, software and artificial intelligence will drive wellness and healthcare of humans in the future. Our group has a number of projects in this space, some of which have won multiple awards. We will highlight two projects geared towards physical and nutritional challenges and touch on a third. The first project is a patented application of a mobile wheelchair fitness tracker. The tracker has integrated an algorithm that accounts for caloric burn in the positioning of a wheelchair user, and works via a unique pulse sensor that uses two algorithms to measure physics through space, as well as biometric data (weight, age, sex). The tracker has the ability to infer information about the physical environment, (inclination and downturns, smoothness of sidewalks) and coordinate this with global positioning services. This anonymous data can be used to make the GIS application more inclusive for individuals who use wheelchairs. User research indicates that the fitness tracker would be useful for athletic teams to gain x-games metrics for performance enhancement. Another novel use for this application would be clinicians using it to train wheelchair users on proper chair usage and body form to prevent shoulder injury.

The Open Agricultural Project (OpenAg) addresses nutrition and food availability. This collaboration with the MIT Media Lab uses open-source software to make a 'food computer' that allows people to successfully grow their own food using a hydroponic apparatus attached to a computer. The computer desktop software controls the aeroponics, feeding of plants and LED lights. Grow recipes are collected and can be distributed across the country. This project offers a way for inner-city individuals to harvest plants for food in an indoor, urban setting.

A final project we are currently working on pushes the bounds of artificial intelligence. Our intelligent agent will be able to lead humans towards positive choices by presenting options within a personalized intelligence framework of individual choice dynamics.

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"Advancement of IoT and impact on the future of Healthcare and Wellness"

Speaker/Panelist

Brent Lunceford, President of Memstronics

Title:

"Sensors, IoT in Health & Wellness"

Abstract

This segment will provide an overview of the enabling technology that led to the rapid emergence and commercialization of activity and fitness tracking IoT technologies that are expected to evolve to IoT Health & Wellness products and services. Key technological examples will be highlighted including: sensor technologies, communication technologies and data analysis techniques. Scenarios will highlight high value applications including: health & wellness; safety, home rehabilitation; assessment of treatment efficacy; early detection of disorders; point of care diagnostics; telemedicine and smart home. In addition, future challenges will be outlined.

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"Advancement of IoT and impact on the future of Healthcare and Wellness"

Speaker/Panelist

Danda B. Rawat, Ph.D.

Assoc. Prof., Department of EE & CS, Howard University, Washington, DC

Title:

"Trusted & Scalable Networks "

Abstract:

Cyber-attacks are increasing in terms of numbers and complexity because of heterogeneous networked systems and scale of cyber space. Large scale deployment of networked devices for Internet of Things and machine-to-machine communications, privacy and trust issues are in the center of discussion and are major concerns. Most of the end devices are technically open platforms and pose security threats. Thus design and implementation of trusted and scalable networks are central components in IoT framework. To create a trusted network, devices could be remotely validated before they are allowed to authenticate and gain access to the networked resources. Furthermore, most of the devices in IoT would not have keyboard or keypad to change their PINs or passwords if they were compromised. This necessitates the automated process for robust policy, password and patch update in distributed real-time manner to avoid any cyber damages. Furthermore, when medical devices are connected to body area networks or medical network and are compromised, it could lead to the death. When devices connected, they offer various services but come with security cost and vulnerabilities. Moreover, other insecure links for tele-health and remote management could also play major role in cyber attacks. We will talk about why trusted and scalable networks are important, what are the requirements and how we can meet those requirements using trusted and scalable networks for IoT.

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BHI 2017 - Special Session #365

"Advancement of IoT and impact on the future of Healthcare and Wellness"

Bios

- **Fawzi Behmann**
- **Elizabeth (E.) Koumpan,**
- **Jennifer D. Davis, Ph.D.**
- **Brent Lunceford**
- **Danda B. Rawat, Ph.D.**

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"Advancement of IoT and impact on the future of Healthcare and Wellness"
Moderator & Speaker Bio

Bio: Fawzi Behmann,

President, TelNet Management Consulting, Inc.

Vice Chair, IEEE Communications Society Board

Distinguished Lecturer, Communications and Computer societies

Founding chapter Chair, IEEE CTS EMBS and chapter chair of Computer Society and ComSoc/SP joint Chapters

Fawzi is a visionary, thought leader, author and is currently the president of TelNet Management Consulting, Inc. He holds a Bachelor of Science with honors and distinction from Concordia University, Montreal, QC, Masters in Computer Science from University of Waterloo, Waterloo, ON, and Executive MBA from Queens University, ON, Canada.

The academic foundation empowered Fawzi in his career path in the areas of communications and networking spanning supply-chain from service provider with Teleglobe Canada, equipment vendor with Nortel Networks, and semiconductor with Motorola/Freescale in Canada and USA. Fawzi started offering consulting services in the areas of corporate governance, technology positioning for IoT/GIS/mobile/wearables technology positioning and solution roadmap in key markets such as healthcare & fitness, smart homes/building, smart energy, smart infrastructure and smart cities. Recently, Fawzi collaborated with consortiums and offered consultation for GIS/IoT risk-based approach in the area of public safety for the ministry of Environment & Water.

Fawzi has been a keynote & distinguished speaker, and presenter at several domestic and international conferences. He is active in international forums and standards activities with ITU, ITRS and IEEE. Fawzi is a senior member of IEEE and is the NA and chair of the IEEE Computer Society Chapter in Austin. Fawzi was a recipient of several awards including IEEE Communications Society Chapter Achievement Award and Chapter of the Year Award for 2015 (across 212 chapters), and IEEE Region 5 Outstanding member service award for 2013, 2014 and 2015.

Finally, Fawzi is a recent co-author of a new book on the future of IoT "Collaborative Internet of Things for Future Smart Connected Life and Business " published by Wiley (June 2015) and is available with Wiley, Amazon, Barnes & Noble and others.

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"Advancement of IoT and impact on the future of Healthcare and Wellness"
Speaker Bio

Elizabeth (E.) Koumpan

IBM Senior Certified Executive Architect

Watson Cognitive Business Solutions CoC

IBM Global Business Services, Toronto, Canada

Ms. Elizabeth Koumpan is an Executive Architect (IBM Senior Certified Application Architect) in IBM Global Business Services Cognitive CoC.

She is well recognized as a technology leader across IBM based on her ability to lead transformational emerging IBM solutions that are highly impactful to IBM's clients. In her past, Elizabeth led multiple strategic engagements across Financial, Public and Health Care sectors. She has extensive architecture development knowledge, and transformation expertise across technology, processes, and organizational domains. Elizabeth was serving as Industrial Sector WW Solution architect, bringing innovative ideas that cross IBM divisions as well as geographies, and developing reference architectures.

Elizabeth was an Architect with Watson Health group, where her responsibilities included translating the client's business requirements to define the structures of Watson technology solutions and architectures in conjunction with the Offering Management team and Market Adoption leaders. She provided leadership to mature Healthcare sector industry and exploiting IBM strategic initiatives, such as IoT for connected medical devices and health care ecosystems, Cloud and Mobile solutions for Electronics & Health, strategic nutrition offering.

She is an active participant with the IBM Academy of Technology, and recently has been involved in a cognitive and security studies. Elizabeth's research contributions include external publications, presentations at both IBM internal and external client events and public conferences, including, IBM Insights, Open Group, Interconnect, ADIPEC, and others.

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"Advancement of IoT and impact on the future of Healthcare and Wellness"
Speaker Bio

Jennifer D. Davis, Ph.D., R&D Technology Principal

Jennifer enjoys aligning data and innovation as teams drive strategic decision-making and product development. Her talents encompass (i) positioning and strategizing technology for maximum impact, (ii) integrating multinational, cross-organizational teams to drive innovation (iii) thought leadership and contributions of subject matter expertise on nutrition, wellness and other aspects of life sciences, as well as (iv) technical skills and experience developing customized machine learning, big data and artificial intelligence. Jennifer has a doctorate in cancer prevention and diet from Georgetown University Medical School. She studied obesity and cancer risk during her research fellowship at Dell Pediatric Research Center and MD Anderson Cancer Center. She is a published author, peer reviewer for PLoS One and Cancer Informatics, a licensed data scientist and trained systems and computational biologist. Currently Jennifer is a member of Chaotic R&D at Fjord Austin, part of Accenture Interactive.

"Advancement of IoT and impact on the future of Healthcare and Wellness" Speaker Bio

Brent Lunceford,

President of Memstronics

Founding Chair, IEEE Central Texas MEMS & Sensors Chapter

Executive Committee, IEEE SF Bay Area MEMS & Sensors Chapter

Brent Lunceford started his career in 1995 at the Microelectronic and Computer Technology Corporation (or MCC) where he commercialized a new class of electronics materials developed at Texas State University and developed novel RF MEMS technology that resulted in spin out of Teravicta Technology, Austin's first MEMS company. He joined Silicon Light Machines in 2000 (prior to the acquisition by Cypress Semiconductor) where he formed and led a MEMS engineering team and strategic innovation initiatives developing and manufacturing optical MEMS and sensors in a high-volume CMOS fab. In 2010 he joined 3M Energy and Electronics Global Innovation Center where he led the development of roll-to-roll MEMS sensor, fiber optic and flexible electronics products. Brent graduated with an Executive MBA from the University of Texas at Austin-McCombs School of Business. Previously he received Master of Science and Bachelor of Science degrees in Chemistry from Texas State University. Lunceford served as 2014-2016 Workshop Chair in the IEEE SF Bay Area MEMS & Sensors Chapter – the first MEMS & Sensors chapter under IEEE where he chaired the hardware session of the 2015 MEPTEC 1st Annual Internet of Things Symposium in San Jose, CA and orchestrated the joint IEEE-SEMI workshop "Current Status and Future of MEMS Standards" held at Texas Instruments, Santa Clara, CA in 2015. Lunceford is President of Memstronics, a consulting firm that helps fabless MEMS and sensor companies with product development, scaling, and technology transfers.

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"Advancement of IoT and impact on the future of Healthcare and Wellness" Speaker Bio

Danda B. Rawat, Assoc. Prof., Department of Electrical Engineering & Computer Science, Howard University, Washington DC

Danda B. Rawat is an Associate Professor in the Department of Electrical Engineering & Computer Science at Howard University, Washington, DC, USA. Prior to Howard University, he was with the College of Engineering & Information Technology of Georgia Southern University, Statesboro, GA as a faculty member until 2016. Dr. Rawat's research focuses on wireless communication networks, cyber security, cyber physical systems, Internet of Things, big data analytics, wireless virtualization, software-defined networks, eHealth, smart grid systems, wireless sensor networks, and vehicular/wireless ad-hoc networks. His research is supported by US National Science Foundation, University Sponsored Programs and Center for Sustainability grants. Dr. Rawat is the recipient of NSF Faculty Early Career Development (CAREER) Award. Dr. Rawat has published over 120 scientific/technical articles and 8 books. He has been serving as an Editor/Guest Editor for over 10 international journals. He serves as a Web-Chair for IEEE INFOCOM 2016/2017, served as a Student Travel Grant Co-chair of IEEE INFOCOM 2015, Track Chair for Wireless Networking and Mobility of IEEE CCNC 2016, Track Chair for Communications Network and Protocols of IEEE AINA 2015, and so on. He served as a program chair, general chair, and session chair for numerous international conferences and workshops, and served as a technical program committee (TPC) member for several international conferences including IEEE INFOCOM, IEEE GLOBECOM, IEEE CCNC, IEEE GreenCom, IEEE AINA, IEEE ICC, IEEE WCNC and IEEE VTC conferences. He is the recipient of Outstanding Research Faculty Award (Award for Excellence in Scholarly Activity) 2015, Allen E. Paulson College of Engineering and Technology, GSU among others. He is the Founder and Director of the Cyber-security and Wireless Networking Innovations (CWiNs) Research Lab. He received the Ph.D. in Electrical and Computer Engineering from Old Dominion University, Norfolk, Virginia. Dr. Rawat is a Senior Member of IEEE and member of ACM and ASEE. He served as a Vice Chair of the Executive Committee of the IEEE Savannah Section and Webmaster for the section from 2013 to 2017.

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