Editorial Preface

International Journal of Extreme Automation and Connectivity in Healthcare:
Inaugural Issue

Sabah Mohammed, Lakehead University, Thunder Bay, Canada

Jinan Fiaidhi, Lakehead University, Thunder Bay, Canada

We are proud and honored to launch the inaugural issue of our International Journal of Extreme Automation and Connectivity in Healthcare (IJEACH). This note is our self-introduction to the readers of IJEACH. First, we would like to welcome you all to this IJEACH inaugural issue. The field of our endeavors is all matters related to the emerging technologies in healthcare in its broadest sense. This includes, of course, connected health technologies, digital health, healthcare as a service (including Over-the-Air cloud services), smart healthcare solutions (e.g. integrating rules-based systems with voice technology, robotic surgery, personalized medicine, smart body area networks), collaborative and community-based healthcare systems (including mobile, pervasive, P2P, grid for telemedicine, home care, mHealth and eHealth as well as medical devices like wearables that uses cellular connectivity), evidence-based data driven healthcare solutions and applications of Internet of Things in healthcare. IJEACH aims to achieve a scholarly balance between emerging technologies in healthcare (e.g. smart digital technologies, positive patient identification (PPID), etc.) and the direction in which the healthcare services and delivery is developing (e.g. Interoperable EHRs as in HL7 FHIR, meaningful use, healthcare in real-time). Actually, the healthcare delivery is undergoing a rapid expansion and follows a rocket speed reform cycle which is quickly becoming the fundamental direction for the health industry to create new solutions. According to the World Economic Forum (WEF) report in 2016 that was echoed by Fiaidhi (2018), the most important technology that will have tremendous impact on every industry is "Extreme Automation and Extreme Connectivity". Going by Gartner's findings which suggest that "25 billion of connected Things will be in use by 2020, it is important for the healthcare industry and the regulatory institutions to think of the strategies that the healthcare services will adopt, to uncover alternative possibilities as well risks involved in establishing effective connected digital health ecosystem. The roadmap to achieving this effective ecosystem is the increase use and popularity of the Internet of Things (IoT) with its wide promise in connecting diverse systems, variety of sensors based on multiple technologies and network connections. In other industries like automotive connecting cars have been achieved using complex amalgamation of IoT with Cloud, Telecom Service Providers, Mobile Network Operators, internal/external systems and embedded software/hardware of the telematics units used at the connected cars ecosystem. Similar to telematics, medical devices can be connected to Wi-Fi and uses 'black box' technologies to transmit data in real time back to caregivers.

The core strategies for extreme automation and connectivity is to empower industries to evolve from manufacturers to service providers, allowing growing amounts of individualization and personalization as a service to clients as well as providing greater success in solving important challenges facing service providers including interoperability, information transparency, technical assistance and decentralized decisions:

- **Interoperability and Interconnectivity:** The ability of machines, devices, sensors, and people to connect and communicate with each other via the Internet of Things (IoT) or the Internet of People (IoP);

- **Information and Data Transparency:** The ability of information systems to create a virtual copy of the physical world by enriching digital plant models with sensor data. This requires the aggregation of raw sensor data to higher-value context information;
- **Digital Consumer Interface:** The ability of assistance systems to support humans by aggregating and visualizing information comprehensibly for making informed decisions and solving urgent problems on short notice. In addition to the ability of cyber physical systems to physically support humans by conducting a range of tasks that are unpleasant, too exhausting, or unsafe for their human co-workers;
- **Decentralized Autonomous Decisions:** The ability of cyber physical systems to make decisions on their own and to perform their tasks as autonomously as possible. Only in the case of exceptions, interferences, or conflicting goals, are tasks delegated to a higher level.

This new model is opening the door to new business models for variety of industries like healthcare, pharmaceutical & biotech, automobile, chemical and metal engineering. However, the healthcare industry will gain ample amount of growth in their services, processes and other offerings in using this new automation model because the healthcare sector already uses advanced digital equipment and have the potential to eliminate billions of dollars in costs from the health care ecosystem, drive care delivery transformation to accelerate medical progress and create new and engaging experiences for patients and providers alike. The race amongst nations in adopting this model (which is now known as the Digital Health initiative) is growing exponentially to use optimum available knowledge and bring revolutionary products and services to the healthcare systems. Digital health is empowering us to better track, manage, and improve our own and our family's health, live better, more productive lives, and improve society. It's also helping to reduce inefficiencies in healthcare delivery, improve access, reduce costs, increase quality, and make medicine more personalized and precise (Sonnier, 2017). The new automation model of digital health is based on collecting and connecting health-related data from all available sources, extracting meaningful information from that data, and providing that information to other healthcare stakeholders. Digital health assistive technologies help also patients to access care more efficiently, delivering services where the patient is located, when they need it, and in a manner that is conveniently available. Digital healthcare is no longer a science fiction. It's happening now. Moreover, the industry moves toward full digitization and the previously resistant clinicians are gradually getting on board with embracing new digital technologies in acquiring, prioritizing and contextualizing medical dataand the way they interact with their patients. Digital health in the era of extreme automation is becoming the magic integration hub that include genomics, physiological and pathological data combined with longitudinal health data by billions of people. Both clinicians and patients seem to agree more on putting diagnostic tools into the hand of the patient and more physicians are comfortable relying on at-home test results to prescribe medication (McCann, 2014). Furthermore, most clinicians view consumer health apps to manage chronic disease and wellness as a good thing and they would prescribe such apps to help patients manage specific chronic conditions. Actually, physicians are increasing the amounts of data in their decision making to rethink considering any medical case. Both clinicians and care providers are counting on generating more actionable insights through analytics to yield better health outcomes. It will enable them to develop customized care plans for patients while also managing care for and improving the health of patient populations. That will also help caregivers identify high-risk targets and anticipate problems as well as to adjust workflow and workforce. The challenge now is determining how to target digital interventions where they make the most sense (e.g. telehealth visits versus in-office patient visits, e-health smart innovations like the Mobile Colposcope).

IN THIS ISSUE

The inaugural issue of the journal focuses on one of the most critical levers in healthcare improvement and innovation: Emerging Technologies that uses smart connectivity and automation. It features

four regular research articles that passes through rigorous reviewing process including a study on the "Similarity Measure of Breast Cancer Datasets Using Fuzzy Rule-based Classification by Attribute" by Tengyue Li and Simon Fong where they proposed a classifier ensemble-based method for comparison of two breast cancer datasets. The ensemble data mining learning methods are applied for rule generation, and a multi-criterion evaluation approach is used for selecting reliable rules over the results of the ensemble methods. The efficacy of the proposed methodology is illustrated via an example of two breast cancer datasets. This article introduces a novel fuzzy rule-based classification method called FURIA, to obtain a relationship between two breast cancer datasets by FURIA rules. The second research regular paper is on "Efficacy of Telemedicine in Psychiatry and Mental Health Nursing" by Michael Jones and Girmay Berhie where they examine and describe the efficacy of psychiatric care delivered via telemedicine (telepsychiatry) by conducting a literature review of the past research and uses of telepsychiatry. This article shows that telepsychiatry is useful in improving the outcome measures for mental healthcare patients. The third regular paper is on "Discovery of Characteristic Sequential Patterns based on Two Types of Constraints" by Shigeaki Sakurai where he proposes a method for discovering characteristic sequential patterns from sequential data by using background knowledge. The proposed method was general and can be applied to the analysis of variety of data including the healthcare data. The fourth regular research paper is entitled "A Fast Feature Selection Method Based on Coefficient of Variation for Diabetics Prediction Using Machine Learning" by Tengyue Li and Simon Fong where they proposed a simple feature selection criterion called Coefficient of Variation (CV). By following the CV method, attributes that have too low the data dispersion are disqualified from the model construction process. Thereby the attributes which are factors leading to poor model accuracy are discarded.

These regular research articles are complemented by several other papers **including invited editorial letters and papers, reviews, rising scholar's studies and perspectives pieces**. Our first invited scholar is Abraham Rudnick who wrote a letter to draw the attention of the readers to the black box argument (i.e. lack of knowledge) and its possible negative effects on healthcare as it may involve epigenome changes induced in humans, trans humans and other living beings by AI and its correlates, possibly resulting in disastrous health and ecological outcomes. The second invited paper was by Christo ElMorr where he discusses the opportunities and challenges that Virtual Communities, Machine Learning and IoT represent for Mental Health research. This issue includes three rising scholars' reports. The rising scholar's reports is one way to encourage publishing graduate student's research and new researchers (e.g. MSc, PhD). The rising scholar reports should demonstrate a critical perspective of the area, and awareness of open problems and research opportunities and it will be evaluated by two members of the editorial board. The rising scholar reports included in this issue are:

1. "JSON-LD as an Interchange Technology to Facilitate Health Information Exchange" by Daniel L Kaukinen;
2. "Cascading Workflow of Healthcare Services: Transforming COPD Related Clinical Narratives from Discharge Summaries into a Standardized Order Set" by Pillip Osail et al.;
3. Prescriptive Grammar for Clinical Prescribing Worklow by Kalle Kauranen et al.

ACKNOWLEDGMENT

Sabah Mohammed
Jinan Fiaidhi
Editors-in-Chief
IJEACH

REFERENCES

Fiaidhi, J. (2018). Extreme Automation: A New Game-Changing Technology. *IEEE IT Professional, 20*(2).

McCann, E. (2014, November 19). Paradigm shift coming for digital health. *Healthcare IT News*. Retrieved from http://www.healthcareitnews.com/news/report-more-docs-embracing-ehealth

Sonnier, P. (2017). *The Fourth Wave: Digital Health*. Amazon. Retrieved from https://www.amazon.com/dp/1976791553