

e-Health Technical Committee NewsLetter

August, 2019

On behalf of the e-Health Technical Committee (TC) of the IEEE Communications Society (ComSoc), we wish all our members a very instructive reading of this letter.

The contribution from this edition is coming from Giorgio Quer at the Scripps Research Translational Institute on the topic of 'Machine Learning in Digital Medicine'.

Members of the e-Health community are invited to contact the author for further information or collaborations.

We also welcome all our members to share their research activities and field experiences through this open newsletter and to open up new opportunities for discussions and collaborations.

Editor: Dr. Nada Philip (Kingston University London, UK)

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Machine Learning in Digital Medicine

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Machine Learning in Digital Medicine has been the title for a successful IEEE Distinguished Lecturer Tour in Minnesota and Wisconsin on August 2019. The IEEE local sections of Rochester, MN, Madison, WI, and Minneapolis, MN, have been fantastic in welcoming me and advertising my talk, despite the summer season.

In the following, a brief summary of the talk:

Digitalize human beings using biosensors to track our complex physiologic system, process the large amount of data generated with artificial intelligence (AI) and change clinical practice towards individualized medicine: these are the goals of digital medicine. At Scripps Research, we are a team of computer scientists, engineers, and clinical researchers, in partnership with health industries, and we propose new solutions to analyze large longitudinal data using statistical learning and deep convolutional neural networks to address different cardiovascular health issues.



One of the greatest contributors to premature mortality worldwide is hypertension. Lowering blood pressure (BP) by just a few mmHg can bring substantial clinical benefits, but it is hard to assess the “true” BP for an individual, since it fluctuates significantly. With a dataset of 16 million BP measurements, we unveil the BP patterns and provide insights on the clinical relevance of these changes [1].

Looking to the future, we investigate new applications for wearable devices and advanced processing in the All of Us Research Program, an unprecedented research effort to accelerate the advent of precision medicine.



If you are interested in learning more about opportunities in Digital Medicine, or you think this IEEE Distinguished Lecture would be relevant for your institution, contact me at gquer@scripps.edu.

Another prevalent health issue is atrial fibrillation (AF), the most common sustained cardiac arrhythmia, associated with stroke, heart failure and coronary artery disease. AF detection from single-lead electrocardiography (ECG) recordings is still an open problem, as AF events may be episodic and the signal noisy. Indeed, the 10 second in-clinic ECG is unlikely to capture subclinical but still meaningful problems or changes over time. Thus, a longitudinal view of cardiac activity is needed, and the analysis of such longitudinal and noisy signals opens new opportunities for developing new sensors, signal processing and AI techniques [2].

Towards the goals of AF detection, we conduct a thoughtful analysis of recent convolutional neural network architectures developed in the computer vision field, redesigned to be suitable for a one-dimensional signal, and we evaluate their performance in the detection of AF using 200 thousand seconds of ECG, highlighting the potential and pitfall of this technology compared to the use of expert features.

References:

- [1] G. Quer, N. Nikzad, A. Chieh, A. Normand, M. Vegreville, E.J. Topol, S.R. Steinhubl, “Home Monitoring of Blood Pressure: Short-Term Changes during Serial Measurements for 56398 Subjects”, in IEEE Journal of Biomedical and Health Informatics, Vol. 22, No. 5, pp. 1691–1698, Sep. 2018.
- [2] G. Quer, E.D. Muse, E.J. Topol, S.R. Steinhubl, “Long data from the electrocardiogram”, in Lancet, Vol. 393, pp. 2189, June 1, 2019. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(19\)31186-9](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)31186-9)

Call for Papers 1 – Special issue in IEEE Journal on Selected Areas in Communications: Internet of Things for In-Home Health Monitoring

Internet of Things (IoT) has emerged as one of the most trending topics of technology in recent times since it gives rise to a number of trends and services related to different scenarios. Thanks to its multidisciplinary approach, IoT has been phenomenal in revolutionizing many aspects of traditional healthcare paradigms. At the same time, traditional healthcare systems can no longer satisfy the needs of a continuously growing and developing society. The world today needs to face the aging of population and the inherent need of assisted-living environments for elderly people.

This special issue aims at bringing together researchers from academia and industrial players to contribute with their latest research works from various fields of the state-of-the-art, pertaining to this new IoT paradigm at which disruptive solutions in medical sciences, healthcare and aging evolve with the unprecedented connecting power of IoT. The theme of this special issue is based on a three-fold approach. First, to discuss the latest advancements in the field of IoT for eHealth by presenting innovative and efficient solutions for in-home remote monitoring. Second, to illustrate the aspects of applying IoT in healthcare by experimental results, to analyze the effects over lifestyle and healthcare systems and the response to technology-assisted medical care and treatments. Third, to provide further directions for research posing new problems and challenges in the in-home remote monitoring field.

The special issue invites original and breakthrough research in the field of IoT for eHealth. High-quality surveys, tutorial and practical use-cases in real life scenarios are also welcomed. Contributions to this special issue should include (but not limited to):

- IoT sensors and architectures for in-home remote monitoring
- e-Health services and Applications
- Cloud and Edge computing for IoT-eHealth
- Interoperability and standards for IoT-eHealth
- Telemedicine and tele rehabilitation
- e-Health Devices and Instruments
- Big Data Analytics in eHealth
- Machine Learning and Artificial Intelligence in eHealth
- Digital Signal Processing (DSP) algorithms towards early diagnosis
- IoT-based remote healthcare for elderly
- Ambient Assisted Living IoT for active and healthy aging
- Safety, Security and Ethics in IoT-eHealth
- Data privacy in IoT-eHealth
- e-Health Supporting Technologies
- Exploiting 5G for eHealth in-home monitoring solutions

Important Dates

Submission Deadline: 1 December 2019

Notification of Acceptance: 1 May 2020

Final Manuscript Due: 15 May 2020

Publication: Third Quarter 2020

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Further details on the call can be found here

<https://www.comsoc.org/publications/journals/ieee-jsac/cfp/internet-things-home-health-monitoring>

Call for Papers – IEEE ICC 2020

IEEE ICC 2020 will feature a comprehensive technical and industry program covering the latest research and innovation in communications technologies. Themed, “Communications Enabling Shared Understanding,” this flagship conference of the IEEE Communications society will feature a comprehensive high-quality technical program including 13 symposia and a variety of tutorials and workshops. IEEE ICC 2020 will also include an attractive Industry program aimed at practitioners, with keynotes and panels from prominent research, industry and government leaders, business and industry panels, and vendor exhibits.

TECHNICAL SYMPOSIA

- Ad Hoc and Sensor Networks
- Cognitive Radio and AI-Enabled Networks
- Communication and Information Systems Security
- Communication QoS, Reliability and Modeling
- Communication Software, Services and Multimedia Applications
- Communication Theory
- Green Communication Systems and Networks
- Mobile and Wireless Networks
- Next-Generation Networking and Internet
- Optical Networks and Systems
- Signal Processing for Communications
- Wireless Communications
- Selected Areas in Communications
 - Access Networks/Systems and Power Line Communications
 - Big Data
 - Cloud & Fog Computing, Networking, and Storage
 - Smart Grid Communications
 - E-Health
 - Internet of Things
 - Molecular, Biological, and Multi-Scale Communication
 - Satellite and Space Communications
 - Social Networks
 - Tactile Internet

IMPORTANT DATES

- Paper Submission: 14 October 2019
- Acceptance Notification: 27 January 2020
- Camera-Ready: 24 February 2020

Further details on the call can be found here <https://icc2020.ieee-icc.org/call-symposium-papers>