Editorial
Special Issue on "AI-Driven Informatics, Sensing, Imaging and Big Data Analytics for Fighting the COVID-19 Pandemic"

ON March 12th 2020, the World Health Organization (WHO) announced COVID-19 (COronaVIrus Disease 2019) outbreak as a pandemic. This global pandemic, the second in more than a 100 years after the Spanish Flu of 1918, is caused by a new coronavirus named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which was first discovered in December 2019 in China. In nine months, COVID-19 has spread to 213 countries and territories; infected 27,775,000 people; and taken more than 900,000 lives as of September 9, 2020. Despite more success in therapeutics, Seniors and people with suppressed immune system or chronic diseases continue to be at higher risk. The Economic impact of the pandemic has been devastating leading to complete or partial shut down of regional and national economies for various periods for many countries around the globe.

COVID-19 has become a global pandemic not only because SARS-COV-2 is new without curable treatments, but also because it is easily transmissible from person to person. Among the infected population, approximately 80% are asymptomatic/mild-symptomatic and continually spread the virus before self-quarantine, and 20% exhibit serious respiratory symptom requiring hospitalization. For the first few months of the pandemic and in many regions with high infection rate, the total number of infected people with severe symptoms went up rapidly and in a short time window, causing the health care systems to be overwhelmed due to insufficient number of beds, ventilators, and care providers. Until such time that an effective and safe vaccine becomes available for mass inoculation, social distancing, and wearing masks has become the new norm and the only safe way to stop the spread. From the early days of the pandemic, the large science and technology community sprang into action to fight the pandemic, from sequencing the genome, to development of a highly sensitive and specific RT-PCR test, to development of personal protective equipment

Biomedical big data, advanced informatics, and artificial intelligence has played and will continue to play an important role. For example, in translational bioinformatics, the mechanism of SARS-CoV-2 and its subtypes data are being investigated for developing targeted drug, vaccine, and early screening to reduce transmission and outbreak. In sensor informatics, wearable sensor data are being analyzed in real-time for monitoring asymptomatic and mild-symptom home-based COVID-19 patients, or for caring for patients with severe symptoms in hospital intensive care units (ICU). In imaging informatics, routine CT or X-ray imaging data have been used for monitoring progression and detection of disease in concert with RT-PCR to improve accuracy of COVID-19 diagnosis. In clinical informatics, multimodality data are being integrally analyzed to assist hospital care providers in using more effective clinical workflow when caring for critically ill COVID-19 patients. In behavioral informatics, human behavior data (e.g. self-quarantine, or community-quarantine etc.) are analyzed for different countries to get better policy and execution routine. In mental health informatics, human mental, emotional, and physical data are being analyzed and solutions provided for people to cope with self-quarantine, and to cope with any potential agoraphobia post self-quarantine. In rehabilitation informatics, physiological data are being analyzed to understand whether and how much patients with various degree of COVID-19 infections will get full recovery of organ (e.g. lung, heart etc.) functions post recovery. In infectious disease modeling, epidemiology models have been developed with field data to predict COVID-19 spread speed so to assist policy makers in taking proper actions. In public health informatics, outbreak data analyzed for population health management and COVID-19 care resource supply chain management.

This Special Issues aims are to (1) to encourage the stakeholders relating to COVID-19 to share data source, data harmonization, and tools, which can speed up COVID-19 research for years to come; (2) to inspire new informatics method development for rapid testing of virus in humans; (3) to present advanced informatics solutions that utilize machine learning and artificial intelligence methods such as deep learning to analyze COVID-19 data for diagnosis, treatment, and prognosis; (4) to develop computational models and tools to track virus propagation and recurrence; and (5) to model outbreaks for policy makers for better decision making. Informatics goals include data harmonization, data quality control, multi-modality data integration, advanced analysis pipeline such as deep learning, causal inference, real-time decision making, and interpretable models.

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In the Call-for-papers, researchers, using informatics to address COVID – 19 issues were encouraged to submit high quality data and unpublished work. The submitted manuscripts were processed through a fast track procedure, and the time from submission to first decision was limited to 15 days. To date, 109 submissions have been received covering a variety of topics in these areas with the papers in the area of imaging informatics seeing the most number of submissions. Of the 107 papers, 9 have been accepted, 70 have been rejected, and the rest are under review. As stated in the original call-for-papers, the special issue will continue to accept papers for peer-review until December 2020.

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