

3rd International Conference on

Diagnostic Microbiology and Infectious Diseases

September 24-25, 2018 | Montreal, Canada

Big data analytics in bioinformatics and infectious diseases

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With the increasing number and sophistication of biomedical instruments and data generation devices, there is, even more, increasing pressure on researchers to develop advanced data analytics tools to extract useful knowledge out of the massive collected data. This includes advanced sequencing technologies responsible for the generation of huge amounts of bioinformatics data as well as wearable devices and Internet of Things systems responsible for collecting different types of health and mobility-related data. The currently available data is not only massive in size but it also exhibits all the features of big data systems with a high degree of variability, veracity and velocity. How to leverage this raw data to advance biomedical research, particularly in dealing with outbreaks and infectious diseases and improve healthcare, through personalized and targeted medicine, can be considered the most exciting scientific challenge of our generation. Developing innovative data integration and mining techniques along with clever efficient computational methods to implement them will be critical in efficiently meeting those challenges and take advantage of the potential opportunities. In this talk, we propose new big data analytics tools using graph modeling and network analysis along with how to effectively utilize High-Performance Computing and private/public clouds in implementing such tools. Case studies illustrating how proposed tools were used to analyze data associated with infectious diseases that led to new biological discoveries will also be presented.

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