Pacific Center for Emerging Infectious Diseases Research

University of Hawai'i Mānoa

Department of Tropical Medicine, Medical Microbiology & Pharmacology

JOHN A BURNS SCHOOL OF MEDICINE, UNIVERSITY OF HAWAI'I AT MANOA

Deep Learning for Bioinformatics Applications

Deep learning is a very hot area of machine learning research with many remarkable recent successes in computer vision, automatic speech recognition, natural language processing, audio recognition, and medical image processing. AlphaGo, the first Computer Go program to beat a professional human Go player, uses deep learning methodology. Although various deep learning architectures (such as deep neural networks, convolutional deep neural networks, deep belief networks and recurrent neural networks) have been applied to many big data applications, using deep learning to solve bioinformatics problems is still in its infancy. In this talk, the challenges and problems in existing deep learning methods will be outlined, when applying it to big data in general and bioinformatics in particular, and several variations to improve the accuracies and learning speeds of the existing deep learning architectures and methods will be proposed. These new deep learning architectures and algorithms will be applied to several big data applications, including image segmentation, DNA sequence annotation, long intergenic non-coding RNA detection, and gene structure prediction. The data encoding schemes, the choice of architectures and methods used will be described in detail. Performance comparisons with other machine learning and existing deep learning methods will be reported. The experimental results show that deep learning is very promising for many bioinformatics applications. Future research directions in this existing area will also be outlined.

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John A. Burns School of Medicine, Kaka'ako Campus
Medical Education Building Auditorium (Room 315)
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