Opportunities for PhD study:

1) Medical Imaging:

(i) Knowledge-constrained automatic brain tissue segmentation in 3D Magnetic Resonance images
(ARC Discovery Project)
Accurate segmentation of magnetic resonance (MRI) brain images allows a detailed study of 3D brain tissue anatomy. This is important in the study of many brain disorders, such as Alzheimer’s disease, where accurate volumetric analysis of grey matter, white matter and cerebrospinal fluid is needed to characterize morphological differences between subjects or to track disease progression. Such studies typically involve vast amount of data and manual segmentation is impractical. This project aims to develop robust computational techniques for MR brain image segmentation based on knowledge-guided constrained cluster analysis or similar techniques. This work would lead to substantial advances on automatic brain tissue segmentation and make a big impact on clinical research of neurological disorders.

Position description:
A PhD student is needed to work on this project asap. The candidate must have strong mathematical/analytical skill. The candidate should also have good scientific programming skill in C/C++. Background in medical imaging/image processing/computer vision would be helpful but not essential.

(ii) 3D modeling and reconstruction of the main speech articulators from high speed MRI and x-ray images
This research aims to investigate the primary physiological mechanism and the theoretical basis for speech and sound production. Possible applications of the findings of this research include: detection and clinical diagnosis of speech disorders in human, speech analysis and synthesis, physiology-based linguistic and phonology studies of indigenous languages and their origins.

2) Computer Vision and Visual Scene Analysis:
Research in this area mainly involves two aspects: (i) Facial expression and emotion understanding and synthesis, lipreading, and (ii) Visual scene analysis and interpretation.
For (i), the goal is to develop techniques that analyze and understand human emotion from facial images, with specific applications in the areas of Human-Machine Interaction and visual speech recognition for the hearing-impaired.
For (ii), the goal is to develop techniques that mimic human ability to interpret complex visual scene. One important problem in this research is the representation and encoding of visual knowledge in a probabilistic graph-based network.

3) Bioinformatics:
DNA sequence analysis, gene expression analysis, gene interaction modeling, regulatory network modeling, protein-protein interaction networks.
This research looks into the use of computer modeling, machine learning, and pattern recognition techniques to unravel the many unsolved problems in computational biology. A primary problem of interest is the modeling of gene regulatory network utilizing DNA sequence signal information, gene expression microarray data, and proteomic data.

Scholarships are available for successful candidates. If you are interested, please contact me:

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