(1) DL topics:

1: Hybridization with Rough Sets: Application to Bioinformatics and Biomedical Imagery

Rough set theory is an established tool for dealing with imprecision, noise, and uncertainty in data. It provides an important and mathematically established tool for dimensionality reduction in large data. A lot of research has been undertaken, over the last decade, for integrating rough sets into the broader framework of computational intelligence. In this talk we provide an overview of such hybridization, along with some applications. We begin with a brief introduction to rough sets, followed by some of their hybridization with fuzzy sets and genetic algorithms, in tasks involving dimensionality reduction and clustering. Experimental results demonstrate their effectiveness in diverse domains like microarray gene expressions, face recognition, and CT scan images.

2: Mining Gene Expressions using Domain Knowledge: Application to Gene Regulation and Evaluation

Incorporation of domain knowledge is found to facilitate the mining of high-dimensional microarray gene expression data, particularly towards their clustering followed by selection of genes. In this talk we focus on the use of taxonomic knowledge, in terms of gene ontology, for improved grouping and selection of significant genes. The concepts of fold change and medoids help in determining the representatives of biologically relevant fuzzy clusters of genes.
Next we discuss the quantitative evaluation of gene subsets using domain knowledge. This is followed by the extraction of regulatory gene interaction sub-networks using correlation, least-squares fitting, and radial basis functions. Experimental results are provided on publicly available gene expression data.

3: Intelligent Biomedical Image Analysis

Medical imaging inherently entails imperfection, and is therefore an appropriate domain for involving computational intelligence. We introduce the concepts of quantitative imaging and radiomics, followed by a discussion on segmentation by clustering. Next we describe an automated and fast detection algorithm for brain tumor in MRI, and its efficient segmentation. Visual saliency is utilized for a fast localization and detection of the tumor. Use of just a single user-provided seed for an efficient delineation of the GBM tumor is also elaborated. The role of neuro-fuzzy feature selection in brain tumor detection and its classification is also detailed. Finally a discussion on Radiogenomics, and Personalized Medicine concludes the talk.

4: From Learning to Deep Learning

In this talk we provide a walk through the development of machine learning, encompassing simple supervised and unsupervised learning, followed by neural learning. Finally this culminates in the development and promise of deep learning and transfer learning. Illustrative examples serve to explain