MEDICAL IMAGE ANALYSIS

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PRE-REQUISITES : Knowledge of calculus, Linear Algebra, introductory optimization and introductory matrix computations

INTENDED AUDIENCE : UG/PG

INDUSTRY SUPPORT : Any diagnostic imaging company will be interested.

COURSE OUTLINE :

This course deals with automated analysis of diagnostic medical images, namely X-rays, CT and MRI scans. We will start with some basic material on how to visualize medical images and how to interpret the resolution of medical images correctly in addition to standard techniques for image processing. In successive weeks we will examine often used and powerful algorithms for image segmentation and image registration. We will then look at how these automated methods can be used to enable computer aided diagnosis. In the final 2 weeks, we will discuss deep learning for medial image analysis , especially state of the art 3D convolutional neural networks.

ABOUT INSTRUCTOR :

Prof. Ganapathy Krishnamurthi is now an Associate Professor in the Department of Engineering Design at IIT-Madras. His research work is primarily in the area of medical image analysis and image reconstruction.

COURSE PLAN :

Week 1: Introduction to medical imaging

Week 2: Basic image processing techniques

Week 3: Image registration – 1- Rigid models

Week 4: Image registration – 2- Non-Rigid models

Week 5: Image registration – 3- Application and demonstration

Week 6: Image segmentation - Statistical shape model

Week 7: Image segmentation – PDE based methods

Week 8: Image segmentation – application and demonstration

Week 9: Computer Aided Diagnosis – Case Study 1

Week 10: Computer Aided Diagnosis – Case Study 2

Week 11: Deep Learning for Medical image analysis – 3D Convolutional Neural Networks

Week 12: Deep Learning for Medical image analysis – Generative models for synthetic data