Aditya Rastogi

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Education

- **Indian Institute of Science** Bengaluru, India
  Ph.D. in Computation and Data Sciences; CGPA (RTP + Non RTP): 9.11/10 Aug. 2018 - Present
  Research Advisor : Dr. Phaneendra K. Yalavarthy

- **Delhi Technological University** New Delhi, India
  Bachelor of Technology in Mechanical; Percentage: 81.1 (8.86/10.0) Aug. 2012 – July. 2016
  Thesis Advisor: Dr. Atul Kumar Agrawal

Research interests

My research interests are computational methods in medical imaging, parameter estimation from dynamic magnetic resonance imaging namely DCE-MRI and ASL, multi-modal imaging, medical image reconstruction techniques, and physiological modelling of pathologies.

Ongoing Projects

- **Tracer Kinetic parameter estimation from undersampled DCE MRI of the breast data** IISc
  Under Dr. Phaneendra K. Yalavarthy Aug 2019 - Present

  - **Task** : To estimate permeability (perfusion) parameters from undersampled Dynamic Contrast Enhanced MRI data by implementing linear and non-linear pharmacokinetic models using iterative and deep learning based techniques.
  - **Progress** : Implemented indirect DL based and direct iterative algorithms for parameter estimation using linear Patlak model on Breast DCE MRI data. The study showed that for higher undersampling rates, indirect DL based techniques perform sub-par compared to direct iterative techniques. This work is accepted for publication [1] in **Medical Physics** journal.

- **SpiNet : A model based deep learning (DL) architecture for solving inverse problems** IISc
  Under Dr. Phaneendra K Yalavarthy Feb 2020 - Present

  - **Task** : To develop a model based DL architecture for solving linear inverse problems in medical imaging.
  - **Progress** : Developed a Schatten p-norm regularized medical image reconstruction architecture or **SpiNet**. This architecture is first of a kind DL architecture which can enforce any p-norm on prior between 0 and 2 and can be trainable or fixed. Current architectures only support either 1 norm or 2 norm on prior. This work is currently under review [2] in **Medical Physics**.

- **Fusion of Cardiac Angiography Images** IISc
  Under Dr. Phaneendra K Yalavarthy & SSSIHMS Jan 2019 - Present

  - **Task** : Fusion of Cardiac Angiography images of different RR phases using guided image fusion. The ECG data was used to detect the phases with less motion of right coronary artery. The objective is to reduce the number of study images required by the diagnostician for detecting stenosis in RCA or LDA. *In tandem with Shri Satya Sai Institute of Higher Medical Sciences, Bangalore.*

Completed Projects

- **Defianz Racing, DTU Formula Student Team** DTU
  Aerodynamics and Bodyworks department 2014 - 2016

  - **Overview** : Defianz Racing is an undergraduate student team of DTU which focuses on designing and developing a formula race car to participate in FSAE competition organised by SAE.
    https://www.facebook.com/teamdefianzracing/
  - **Task** : **1.** Designing of undertray diffuser and side pods of the car for increasing the downforce to provide better traction. **2.** Fabricate the package with carbon fibre using in-house vacuum bagging process.

- ○ **Participation** : FS India 2016 (now formula bharat) at BIC, Noida and got 3rd position in business proposal

- **Autonomous Underwater Vehicle, DTU** DTU
  Team Lead 2012 - 2016

  - ○ **Task** : Designed and fabricated ZYRA and ZYRA 2.0, 5th generation model of DTU AUV capable of grabbing objects and navigating its path by digital image processing and passive sonar navigation. It had the capacity to go up to 50 feet of depth and had 6 degrees of freedom. http://auv.dtu.ac.in
  - ○ **Application** : Funded by ONGC for its potential application in offshore pipeline fault detection and repairing
  - ○ **Participation** : **1**. RoboSub 2013, 2014 organised by AUVSI in San Diego, California and went into semi-finals. **2**. NIOT SAVe 2014 a competition for autonomous underwater vehicles held in Chennai, India.

- **Computational modelling of Composite dynamics and fabrication techniques** DTU
  Bachelor's Thesis, Advised by Dr. Atul Kumar Agrawal 2015-2016

  - ○ **Task** : The thesis was a part of my project of Defianz racing in which I built a MATLAB library for computing the dynamics of Carbon fibre composites and calculated their deformations under tensile, compressive, shear, thermal, moisture and curing induced stress for different layers of composites and their orientation. The library could be used to analyze the final shape of the composite after curing based on the orientation of the layers.
  - ○ **Application** : Main application was to decide the orientation of Carbon fibre layers w.r.t. each other while fabricating the aerodynamic packages of the car so that the composite takes the shape of the mould without much distortion.

Professional Experience

- **R&D Hero MotoCorp Ltd.** Jaipur, India
  Engineer , Engine Calibration and Emission group Dec 2017 - July 2018

  - ○ **Power Train Control Strategy development** : ECU control strategy development for BS 6 vehicles along with Magneti Marelli (Italy)

- **R&D Bajaj Auto Ltd.** Pune, India
  Senior Engineer, Engine Calibration and Emission group Aug 2016 - Oct 2017

  - ○ **ECU calibration** : Powertrain Calibration and Validation aspects of gasoline engines with Bosch Motronic software structure for Bajaj 2W.
  - ○ **Developing MIL algorithm** : Developing MIL(model in loop) testing algorithms for control strategy department to meet ISO26262 safety regulation, emission reduction and performance optimization

Relevant Courses

- **ML/DL/Mathematics** : Neural Networks and Learning Systems, Numerical Optimization, Numerical Methods, Numerical Linear Algebra, Computational Fluid Dynamics, and Quantitative Techniques.

- **Others** : Medical Imaging, Digital Signal Processing, Advance Image Processing, Instrumentation and Control Systems, Compressive Sensing and Sparse Signal Processing.

Teaching Assistant

- **DS 288: Numerical Methods** CDS,IISc
  Instructor: Dr. Phaneendra K Yalavarthy Aug - Dec 2019

- **DHIM: Advance Certification in Digital Health and Medical Imaging** IISc
  Instructor: Dr. Phaneendra K Yalavarthy Aug - Dec 2020

Programming Skills

- **Languages & libraries**: MATLAB, Python, C, HTML, Tensorflow(1.xx), Keras, Git/Github

Journal Publications

[1] **Aditya Rastogi** and Phaneendra K. Yalavarthy, "*Comparison of iterative parametric and indirect deep learning-based reconstruction methods in highly undersampled DCE-MR Imaging of the breast,*" Medical Physics 2020 (in press; 24 pages in journal format) [This work is the first comprehensive comparison of compressive sensing reconstruction methods with model based deep learning methods for the breast perfusion imaging and shows that deep learning methods are sub-optimal at higher undersampling rates.]

[2] **Aditya Rastogi** and Phaneendra K. Yalavarthy, "*SpiNet: A Deep Neural Network for Schatten p-norm Regularized Medical Image Reconstruction,*" in review at Medical Physics, 2020, Submission ID - 20-1402; Submitted on: August 27, 2020. [This work is first-of-its kind in proposing a generic Schatten p-norm $(0 < p \leq 2)$ regularization based deep learning network for medical image reconstruction, where p is a trainable parameter (chosen automatically).]