Aditya **Rastogi**

PhD Scholar | Medical Imaging Group | Indian Institute of Science

linkedin.com/in/aditya-rastogi-8167417b github.com/adityarastogi2k12
+91 9818896702 adityar@iisc.ac.in http://adityarastogi2k12.github.io
Im neuenheimer feld 371, Heidelberg 69120, Germany
Born January 18, 1995 (26 years old) in Bareilly, India

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. I like working in close collaboration with clinicians and prefer a more participatory role in processes like data acquisition.

Education

Aug 2018 - Present — **PhD** in Computational and Data Sciences, from **Indian Institute of Science**, Bengaluru, India
Advisor : Dr. Phaneendra K Yalavarthy
Dissertation : *Towards efficient and accurate models for inverse problems in Magnetic Resonance Imaging.*

Aug 2012 - July 2016 — **BTech** in Mechanical Engineering, from **Delhi Technological University, New Delhi, India**
Advisor : Dr. Atul Kumar Agrawal
Dissertation : *Computational modelling of Composite dynamics and fabrication techniques.*

Research Projects

GreyBox : A hybrid algorithm for direct estimation of tracer kinetic parameters

PhD, IISc
Pre-submission
Feb 2021 -

- **Task :** To propose a hybrid deep learning model for solving nonlinear multiparametric inverse problem of permeability estimation.
- **Progress :** Implemented direct hybrid DL based algorithms for parameter estimation using linear Patlak model on multi organ DCE MRI data. The experiments shows that the network performs statistically better than iterative direct parameter estimation techniques.

Inverse problem | DCE MRI | Deep Learning | Quantitative MRI | Hybrid models | Compressive Sensing

SpiNet : A model based DL architecture for solving inverse problems

PhD, IISc
Code Paper
Feb 2020 - Feb 2021

- **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 l_p norm on prior where $p \in [0, 2)$ and it can be trainable or fixed. Current architectures only support either 1 norm or 2 norm on prior. This work is published [2] in **Medical Physics** journal.

Inverse problem | Fast MRI | Deep Learning | Hybrid models | Compressive Sensing

Tracer Kinetic parameter estimation from undersampled DCE MRI data

PhD, IISc
Code Paper
Aug 2019 - Aug 2020

- **Task :** To estimate permeability 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 published [1] in **Medical Physics** journal.

Inverse problem | DCE MRI | Deep Learning | Quantitative MRI | Hybrid models | Compressive Sensing

Reducing scan time in Arterial Spin Labelling MRI

PhD, IISc
Dec 2020 -

- In collaboration with National Institute of Mental Health and Allied Sciences (**NIMHANS**).
- **Task :** Reduce the number of Control/Label pair acquisition for perfusion estimation in psuedo continuous ASL brain image scans and thereby reduce the scan duration.

Inverse problem | ASL | Quantitative MRI | Hybrid models

Fusion of Cardiac Angiography Images — PhD, IISc

Jan 2019 - Aug 2019

- In collaboration with Shri Satya Sai Institute of Higher Medical Sciences, Bangalore (**SSSIHMS**).
- **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.

Image Fusion | Cardiac Imaging | Guided Filtering

Computational modelling of Composite dynamics and fabrication techniques — BTech, DTU

2015 - Aug 2016

- Bachelor's Thesis for completion of BTech in Mechanical Engineering
- **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 can 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.

Carbon fibre | FSAE | Computational modelling

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 Assistance

- **DS 288 : Numerical Methods** — CDS, IISc
- **DHIM : Advance Certification in Digital Health and Medical Imaging** — CDS, IISc
- **Class - XI Biology** — Kendriya Vidyalaya, IISc

  As a part of teaching requirement for Prime Minister's Research Fellowship Scheme

Research Grant Experience

Aug 2020 - Aug 2024 — **Prime Minister's Research Fellowship :** Awarded by Ministry of Human Resource Development of Government of India for research in the field of interdisciplinary sciences. The grant duration is of four years with a total grant amount of approximately INR 58,00,000 ($79,000).

Job Experience

December 2017 – July 2018 | **Engineer | Engine Calibration and Emission Group, R&D Hero MotoCorp Ltd., Jaipur, India**
- ECU control strategy development for BS 6 vehicles

Engine Calibration | Emission Control | ECU optimization

July 2016 – October 2017 | **Senior Engineer | Engine Calibration and Emission Group, R&D Bajaj Auto Ltd., Pune, India**
- Powertrain Calibration and Validation aspects of gasoline engines

Engine Calibration | Emission Control | ECU optimization

Computer Skills

- **Programming Languages** : MATLAB, C, Python, HTML
- **Libraries** : Keras, Tensorflow, Git
- **OS** : Windows, Linux, MacOS

Reviewer Work

- IEEE Transactions of Medical Imaging

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 (published; 24 pages in journal format) [**This work is the first comprehensive comparison of compressive sensing reconstruction methods with model-based deep learning methods for breast perfusion imaging and shows that deep learning methods are sub-optimal at higher undersampling rates.**][LINK]

[2] **Aditya Rastogi and Phaneendra K. Yalavarthy**, "*SpiNet : A Deep Neural Network for Schatten p-norm Regularized Medical Image Reconstruction*," published at Medical Physics, 2021, [**This work is the 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).**][LINK]

Talks/Presentations

EECS Research Student Symposium — IISc
Model based deep learning architecture for generalized p-norm regularization — May 2021

CDS Students' Research Presentation — IISc
Fast and Efficient Algorithms for Improving Magnetic Resonance Imaging — April 2021

IPWIN2021 : Virtual PhD Winter School at DTU, Denmark — DTU
Fast and Efficient Algorithms for Improving Magnetic Resonance Imaging — Jan 2021

CDS Students' Research Presentation (Poster presentation) — IISc
Model based techniques for indirect Tracer Kinetic parameter estimation — August 2019

Awards

PMRF 2020 | **Prime Minister's Research Fellowship**
Awarded Prime Minister's Research Fellowship (PMRF) for May 2020 cycle.

EECS 2021 2020 | **Best paper award**
July 2018

References

Dr Phaneendra K Yalavarthy
Associate Professor
Dept. of Computational and Data Sciences
Indian Institute of Science
@ phani@iisc.ac.in
+91-80-2293 2496

Dr Atul Kumar Agrawal
Professor
Dept of Mechanical Engineering
Delhi Technological University
@ atulkumaragarwal@dce.ac.in
+91-9811886443