Amogh **Hiremath**

Graduate Research Assistant

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Education

Case Western Reserve University   *Cleveland, Ohio, US*

Ph.D. in Biomedical Engineering   *Aug. 2018 - PRESENT*

- Research primarily focused on applications of deep learning/machine learning on medical images for diagnosis and prognosis of various diseases.

National Institute of Technology, Karnataka   *Surathkal, Karnataka, India*

M.Tech in Communication Engineering   *Jun. 2014 - May 2016*

- CGPA: 8.31/10.
- Coursework primarily focused on advanced signal and image processing.

SDMCET, Dharwad   *Dharwad, Karnataka, India*

B.E in Electronics and Communication Engineering   *Jul. 2010 - Jun. 2014*

- CGPA: 9.23/10
- Coursework primarily focused on fundamentals of signal and image processing, engineering mathematics and telecommunication.

Experience

Philips Reasearch, India   *Bangalore, Karnataka, India*

Senior Research Engineer   *Jun. 2016 - Jul. 2018*

- A data scientist job where my work involved writing ETL (Extract, Transfer, Load) scripts using Apache Spark, pre-processing of massive ICU databases and converting them in to a unified format. Along with ETL, my work also involved model building for early prediction of different Hospital Acquired Infections acquired by patients in the ICUs
- Building quick prototypes in applications of healthcare using concepts of machine learning, image processing, and natural language processing.

Philips Research, India   *Bangalore, Karnataka, India*

Project Trainee (Intern)   *May. 2014 - Jun. 2016*

- Development of inverse planning and optimization algorithm using Linear Programming and Quadratic programming for cancer radiation therapy.
- An exploratory project on vessel extraction from CT Angiography images.

Indian Institute of Technology, (IIT) Kharagpur   *Kolkata, West Bengal, India*

Deep Learning for Visual Computing (DLVC) Summer School, 2017   *Jul. 2017*

- A summer school conducted by IIT Kharagpur, India covering different deep learning techniques applied on images with an overview of convolutional neural networks from LeNet to DenseNet.
- Earned 1st Place in DLVC 2017 Challenge (Bengali Language Digit Recognition).

Carnegie Mellon University - National Institue of Technology, Karantaka   *Surathkal, Karnataka, India*

NITK - CMU Winter School, 2014   *Dec. 2014*

- Jointly conducted by CMU and NITK focusing on multimedia analysis, neural networks for data analysis and computational models for civic problems.
- In a team of five, built a machine learning model to classify different environmental sounds - "An Approach Towards Never Ending Learning of Sound".

Skills

Programming	Python, JAVA, C#, C++, LaTeX
Tools	Matlab, R, ITK Snap, Slicer 3D, MySQL, PostgreSQL, Elasticsearch, Apache Solr, Spark, Python Flask, Android Studio, Eclipse, NetBeans.
Libraries	pytorch, numpy, matplotlib, pandas, sklearn, scipy, nltk, keras, pyspark, rdflib, ITK (C++), simpleITK (Python), openCV.

Patents

- Ulman, S, Prasad, RV, **Hiremath, A**; Koninklijke Philips N.V, assignee, **"Nutrition support systems and methods"**, WIPO (PCT), WO2019063762A1, 2019, April.

Journal Publications

- **Hiremath, A**, Shiradkar, R, Merisaari, H, Prasanna, P, Ettala, O, Taimen, P, Aronen, H, Boström, P, A, Jambor, I, and Madabhushi, A, **"Test-retest repeatability of a deep learning architecture in detecting and segmenting clinically significant prostate cancer on apparent diffusion coefficient (ADC) maps"**, European Radiology, 2020.

Conference Publications

- **Hiremath, A**, Shiradkar, R, Merisaari, H, Braman, N, Prasanna, P, Ettala, O, Taimen, P, Aronen, H, Boström, P, Jambor, I, Purysko, A, and Madabhushi A, **"A combination of intra- and peri-tumoral deep features from prostate bi-parametric MRI can distinguish clinically significant and insignificant prostate cancer"**, The International Society for Optics and Photonics (SPIE) Medical Imaging, Houston, U.S.A, February 15-20, 2020.

Peer-reviewed abstracts/posters

- **Hiremath, A**, Shiradkar, R, Merisaari, H, Prasanna, P, Ettala, O, Taimen, P, Aronen, H, Boström, P, Pierce, J, Tirumani, S, Rastinehad, A, Jambor, I, Purysko, A, and Madabhushi, A, **"A deep learning network along with PIRADS can distinguish clinically significant and insignificant prostate cancer on bi-parametric MRI: A multi-center study"**, American Urological Association (**AUA**), Washington DC, May 15-16th, 2020.

- **Hiremath, A**, Shiradkar, R, Merisaari, H, Prasanna, P, Ettala, O, Taimen, P, Aronen, H, Boström, P, A, Jambor, I, and Madabhushi, A, **"Test-retest repeatability of convolutional neural networks in detecting prostate cancer regions on diffusion weighted imaging in 112 patients"**, 28th Annual Meeting of the 28th Annual Meeting of the International Society for Magnetic Resonance in Medicine (**ISMRM**), Sydney, Australia, April 18-23, 2020.

- Merisaari, H, Shiradkar, R, Toivonen, J, **Hiremath, A**, Khorrami, M, Montoya Perez, I, Pahikkala, T, Taimen, P, Verho, J, Boström, P, Aronen H, Madabhushi, A, and Jambor, I, **"Repeatability of radiomics features for prostate cancer diffusion weighted imaging obtained using b-values up to 2000 s/mm2"**, 27th Annual Meeting of the 28th Annual Meeting of the International Society for Magnetic Resonance in Medicine (**ISMRM**), Montreal, Canada, May 11-16, 2019

- Merisaari, H, **Hiremath, A**, Shiradkar, R, Montoya Perez, I, Toivonen, J, Taimen, P et al., **"Repeatability of Machine Learning Classification of Prostate Cancer Using Diffusion Weighted Imaging: Short-term Repeatability Study of 112 Men Who Underwent Two Prostate MR Examinations Before Prostatectomy"**, Annual Meeting of the Radiologic Society of North America (**RSNA**), Chicago, U.S.A, November 29 - December 4, 2019

Honors & Awards

2020	**Professional Development Travel Funding**, Case Western Reserve University	*Cleveland, U.S.A*
2020	**Trainee Travel Award**, Case Comprehensive Cancer Center	*Cleveland, U.S.A*
2020	**Educational Stipend**, International Society for Magnetic Resonance in Medicine (ISMRM)	*Sydney, Australia*
2020	**Runner up**, Art of STEM Competition, Case Western Reserve University	*Cleveland, U.S.A*
2018	**1st Place**, Cleveland Medical Hackathon, 2018	*Cleveland, U.S.A*
2017	**1st Place**, Deep Learning for Visual Computing Challenge, 2017	*Kolkata, India*

Projects

Integrated deep learning and a clinical nomogram to identify which COVID-19 patients would end up needing a mechanical ventilation

Case Western Reserve University

- Segmentaion of lung lesions such as ground-glass opacities and consolidations usin U-Net on baseline Chest CT scans.
- Direct attention based convolutional neural network for identifying COVID-19 patients who might need mechanical ventilation
- Univariate and multivariate analysis of various routinely collected lab parameters and integration with deep learning to construct and integrated nomogram.

Distinguishing clinically significant and insignificant prostate cancer on bi-parametric MRI

Case Western Reserve University

- Using multiple instance learning based convolutional neural networks to aggregate patch level decisions to lesion level decisions.
- Extracting deep features from intra- and peri- tumoral region and training a machine learning model to distinguish clinically significant and insignificant prostate cancer on MRI

Test-retest repeatability of convolutional neural networks in segmenting and detecting clinically significant prostate cancer regions on apparent diffusion coefficient maps

Case Western Reserve University

- Evaluating the repeatability of convolutional neural networks in segmenting and detecting clinically significant prostate cancer regions by training two models on test-retest scans of ADC maps.
- Analyzing the effect of inter- scan ground-truth segmentation repeatability with network's segmentation repeatability.

Patient Analytics Query Engine (PAQE)

Philips Research, India

- Designing ETL (Extract, Transform, Load) for large publicly available relational medical databases like MIMIC, ERI.
- Designing interfaces for performing complex queries from the Elasticsearch database.
- Designing a machine Learning interface to query and obtain the desired training and test data.

Lung Cancer Prediction

Philips Research, India

- Pre-processing of CT images, lung segmentation using 2-D and 3-D connected component analysis and region growing algorithm.
- Lung nodule candidate generation using hessian matrix and subsequent feature extraction and classification of lung cancer.

Inverse Planning and Optimization of Dwell position and Time in HDR Brachytherapy using Linear and Quadratic Programming, Mixed Integer Programming

Philips Research, India

- Optimization of parameters like dwell positions and dwell time for giving exact dosage of radiation to cancer tissues while minimizing radiation to healthy tissues surrounding the cancer tissues.

Consent Based Access Policies for Medical Data in RDF (Resource Description Format)

Philips Research, India

- Designing role based and rule based access policies for restricted access of medical data present in RDF format using Web Ontology Language(OWL) and SPARQL, the query language for RDF.

Vessel Extraction in CT Angiography Images

Philips Research, India

- A project involving computer vision and image processing techniques to extract the blood vessels from CT Angiography images.
- Bone subtraction from CT images using image registration techniques and other image processing algorithms to extract blood vessels.

Never Ending Learning of Sound

CMU - NITK Winterschool

- Collecting different categories of sound by using a web crawler.
- Extracting different features related to the sound, cleaning up and generation of training and test data set.
- Training a classifier model using bag-of-frames approach using K-means to generate a codebook of different sounds and evaluating with different classifiers like SVM, KNN and Random Forests.

Environmental Sound Classification using Acoustic Features and Texture Features from Spectrogram Image

Hobby project

- Audio denoising using wavelets, silence removal and segmentation using K-means on spectrogram image.
- Extracting acoustic features like Mel-Frequency Cepstrum Coeffients (MFCCs), Root Mean Square Error (RMSE), Zero Crossing Rate (ZCR), spectral features and Gray-Level Co-occurrence Matrix (GLCM) features from spectrogram image of an audio.
- Evaluating the approach with publicly available datasets ESC-10, ESC-50, Freiburg-106 dataset.

Recognition

- **Case Western Reserve University lab using digital images of chest scans from coronavirus patients from Wuhan, China, to teach its computers to triage patients**
  https://thedaily.case.edu/researchers-using-artificial-intelligence-to-find-out-which-covid-19-patients-are-most-likely-to-need-ventilators

- **CCIPD PhD student receives three travel awards**
  https://engineering.case.edu/centers/ccipd/content/ccipd-phd-student-receives-three-travel-awardss

- **BME Graduate Students Win Top Prizes at the Cleveland Medical Hackathon Event**
  https://engineering.case.edu/ebme/Cleveland-Medical-Hackathon-Event