

# Amogh Hiremath

SENIOR AI SCIENTIST

Pittsburgh, Pennsylvania

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## About Myself

More than five years of industry experience as a research scientist in healthcare AI. Currently leading the development of advanced AI based imaging biomarkers for oncology at an early-stage startup. Specialized in AI tools for disease diagnosis, treatment selection, and prognosis. Skilled in deep learning, machine learning, hand-crafted feature engineering (radiomics), model optimization, automated and semi-automated deep learning based image segmentation and detection. Committed to advancing healthcare through pioneering advancements in AI.

## Education

### Case Western Reserve University

Cleveland, Ohio, US

PH.D. IN BIOMEDICAL ENGINEERING

Aug. 2018 - Aug. 2022

- Research primarily focused on applications of deep learning and machine learning (radiomics) 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

### Picture Health

Pittsburgh, Pennsylvania, US

SENIOR AI SCIENTIST

May. 2022 - Present

- One of the earliest employees of the company (first AI scientist).
- Involved in developing AI based imaging biomarkers to improve treatment selection for cancer patients specifically to overcome the limitations of current standard of care biomarkers.
- Lead scientist overseeing a project for a pharmaceutical client, involved in the development of imaging biomarkers to facilitate patient selection for a clinical trial.
- Contributed to the development of tools for automated and semi-automated segmentation of lung tumors in CT scans.
- Built core AI tools and frameworks to support all research experiments.
- Published research findings in top-tier conferences and filed multiple patents and invention disclosures.
- Managing junior scientists and part time candidates.

### Philips Research, India

Bangalore, Karnataka, India

SENIOR RESEARCH ENGINEER

Jun. 2016 - Jul. 2018

- Data engineering (ETL (Extract, Transfer, Load)) of massive ICU databases
- Early prediction of different Hospital Acquired Infections acquired by patients in the ICUs

### Philips Research, India

Bangalore, Karnataka, India

PROJECT TRAINEE (INTERN)

May. 2015 - Jun. 2016

- Building quick prototypes in applications of healthcare using concepts of machine learning, image processing, and natural language processing.
- Software development: GUI based annotation tools for Chest X-rays

### 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.
- Earned 1st Place in DLVC 2017 Challenge (Bengali Language Digit Recognition).

### Carnegie Mellon University - National Institute of Technology, Karnataka

Surathkal, Karnataka, India

NITK - CMU WINTER SCHOOL, 2014

Dec. 2014

- Developing a machine learning model to classify environmental sounds - "An Approach Towards Never Ending Learning of Sound".

## Skills

### Programming

Language (Experience): Python (>8 years), JAVA (1 year), LaTeX (5 years)

### Tools

Matlab, R, ITK Snap, Slicer 3D

### Libraries

pytorch, hydra, openai, numpy, matplotlib, pandas, scikit-learn, scikit-image, scikit-survival, scipy, pyspark, ITK (C++), simpleITK (Python), openCV (python).

## Patents

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- Braman, N, **Hiremath, A**;; Picture Health Inc., assignee, “**Oncological Foundation Models, Systems, and Methods**”, 2024, July (Provision patent filed).
- **Hiremath, A**, Braman, N; Picture Health Inc., assignee, “**Methods and Systems for Medical Prediction Using Negative Predictive Value**”, 2023, November (Provision patent filed).
- Braman, N, **Hiremath, A**, Li, H; Picture Health Inc., assignee, “**System for Medical Prediction with Click-Based Segmentation**”, 2023, February (Provision patent filed).
- Madabhushi, A, Asaeikheybari, G, **Hiremath, A**, Chung, M.K, Barnard, K; Cleveland Clinic Foundation Case Western Reserve University, assignee, “**Atlas construction of branched structure for identification of shape differences among different cohorts**”, WIPO (PCT), US20230146428A1, 2022, November (Pending).
- Ulman, S, Prasad, RV, **Hiremath, A**; Koninklijke Philips N.V, assignee, “**Nutrition support systems and methods**”, WIPO (PCT), WO2019063762A1, 2019, April.

## Journal Publications

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- **Hiremath, A**, Viswanathan VS, Bera, K, Shiradkar R, Yuan, L, Armitage, K, Gilkeson, R, Ji, M, Fu P, Gupta, A, Lu, C, and Madabhushi, A. **Deep Learning reveals lung shape differences on baseline chest CT between mild and severe COVID-19: A multi-site retrospective study**, Computers in Biology and Medicine, May 2024, p108643.
- **Hiremath A**, Corredor G, Li L, Leo P, Magi-Galluzzi C, Elliott R, Purysko A, Shiradkar R, Madabhushi A. **An integrated radiology-pathology machine learning classifier for outcome prediction following radical prostatectomy: Preliminary findings**. Heliyon. 2024 Apr 15.
- Li L, Shiradkar R, Gottlieb N, Buzzy C, **Hiremath A**, Viswanathan VS, MacLennan GT, Lima DO, Gupta K, Shen DL, Tirumani SH. **Multi-scale statistical deformation based co-registration of prostate MRI and post-surgical whole mount histopathology**. Medical Physics, Sep 24, 2023.
- Midya, A, **Hiremath, A**, Huber, J, Viswanathan VS, Omil-Lima, D, Mahran, A, Bittencourt, L, Tirumani, SH, Ponsky, L, Shiradkar, R, Madabhushi, A, 2023, **Delta radiomic patterns on serial bi-parametric MRI are associated with pathologic upgrading in prostate cancer patients on active surveillance: preliminary findings**, Frontiers in Oncology, 13, p.1166047.
- Vaidya, P, Alilou, M, **Hiremath, A**, Gupta, A, Bera, K, Furin, J, Armitage, K, Gilkeson, R, Yuan, L, Fu, P, Lu, C, Ji, M, Madabhushi, A, 2022. **An End-to-End Integrated Clinical and CT-Based Radiomics Nomogram for Predicting Disease Severity and Need for Ventilator Support in COVID-19 Patients: A Large Multisite Retrospective Study**, Frontiers in Radiology 2, Jan 2022.
- **Hiremath, A**, Bera, K, Yuan, L, Vaidya, P, Alilou, M, Furin, J, Armitage, K, Gilkeson, R, Ji, M, Fu P, Gupta, A, Lu, C, and Madabhushi, A, 2021. **Integrated Clinical and CT based Artificial Intelligence nomogram for predicting severity and need for ventilator support in COVID-19 patients: A multi-site study**, IEEE Journal of Biomedical and Health Informatics, Aug, 2021.
- **Hiremath, A**, Shiradkar, R, Fu, P, Mahran, A, Rastinehad, A.R, Tewari, A, Tirumani, S.H, Purysko, A, Ponsky, L. and Madabhushi, A, 2021. **An integrated nomogram combining deep learning, Prostate Imaging-Reporting and Data System (PI-RADS) scoring, and clinical variables for identification of clinically significant prostate cancer on biparametric MRI: a retrospective multicentre study**. The Lancet Digital Health, 3(7), pp.e445-e454.
- **Hiremath, A**, Shiradkar, R, Merisaari, H, Prasanna, P, Ettala, O, Taimen, P, Aronen, H.J, Boström, P.J, Jambor, I. and Madabhushi, A, 2021. **Test-retest repeatability of a deep learning architecture in detecting and segmenting clinically significant prostate cancer on apparent diffusion coefficient (ADC) maps**. European radiology, 31(1), pp.379-391.
- Mahadevaiah, G, **Hiremath, A**, Agarwal, V, Kumaraguru, P, and Dekker, A ”**Automating data mining of medical reports**”, International Journal of Computer Science and Technology (IJCST) Vol.01, No.2, March 2019.

## Conference Publications

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- Roge, A, **Hiremath, A**, Sobota, M, Tirumani SH, Bittencourt LK, Ream J, Ward R, Olaniyan H, Verma S, Purysko A, Madabhushi A, Shiradkar R, 2022, March. **Evaluating the sensitivity of deep learning to human reader based lesion delineations in identifying clinically significant prostate cancer on MRI**, In Medical Imaging 2022: Computer-Aided Diagnosis. International Society for Optics and Photonics.
- **Hiremath, A**, Yuan, L, Shiradkar, R, Bera, K, Viswanathan V.S, Vaidya, P, Furin, J, Armitage, K, Gilkeson, R, Ji, M, Fu P, Gupta, A, Lu, C, and Madabhushi, A, 2021. **LuMiRa: An Integrated Lung Deformation Atlas and 3D-CNN model of Infiltrates for COVID-19 Prognosis..** The Medical Image Computing and Computer Assisted Intervention (MICCAI) (Accepted).
- **Hiremath, A**, Shiradkar, R, Braman, N, Prasanna, P, Rastinehad, A, Purysko, A. and Madabhushi, A, 2020, March. **A combination of intra- and peri-tumoral deep features from prostate bi-parametric MRI can distinguish clinically significant and insignificant prostate cancer**. In Medical Imaging 2020: Computer-Aided Diagnosis (Vol. 11314, p. 113140M). International Society for Optics and Photonics.

## Peer-reviewed Abstracts/Posters

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- Li H, Hiremath A, Lee S, Chung LI-Y, Lee J, Kim PH, and others. **“Multimodal AI biomarker fusing radiology, pathology, and molecular information for immune checkpoint inhibitor (ICI) response prediction in lung adenocarcinoma (LUAD).”**, SITC 2024 Annual Meeting; 2024 Nov 6-10; San Diego, CA, USA.
- Li H, Chung LI-Y, Kim L, Lee S, Haji Maghsoudi O, Hiremath A, Lee J, Kim PH, Lee S, Yadav M, Kim Y, Hong I, Kang G, Cho A, Cooper L, Madabhushi A, Braman N, Chae YK. **“Tumor-Immune Spatial Interactions on NSCLC H&E Slide Images Predicts Immunotherapy Response: Preliminary External Validation.”**, ESMO 2024 Congress; 2024 Oct 18-22; Madrid, Spain
- Lee S, Hiremath A, Lee J, Kim H, Zhang K, Lee S, Yadav M, Chung LI, Kim HS, Djunadi TA, Kim Y. **“CheckpointPx: A predictive radiology AI model of immune checkpoint inhibitor (ICI) benefit in non-small cell lung cancer (NSCLC)”**. American Society of Clinical Oncology (ASCO), Chicago, May 31st - June 4th, 2024.
- Maghsoudi, O, Chung, L, Lee S, Lee J, Kim P, Hiremath A and others **“An interpretable AI-derived radiology signature to identify patients at risk of progression on the PACIFIC regimen for unresectable non-small cell lung cancer.”**, American Society of Clinical Oncology (ASCO), Chicago, May 31st - June 4th, 2024.
- Lee, S, Li, H, Hiremath, A, and others, **“AI-based radiomics model for predicting immune checkpoint inhibitor-related pneumonitis (CIP) in patients with advanced NSCLC: An external validation study.”**, American Society of Clinical Oncology (ASCO), Chicago, May 31st - June 4th, 2024.
- Midya, A, Balakrishnan, S, Tirumani SH, Bittencourt LK, Hiremath, A, Ponsky, L, Madabhushi, A, Shiradkar, R, **“Population specific radiomics model improves prostate cancer diagnostic risk stratification at MRI in African American men”**, American Urological Association (AUA), San Antonio, TX, May 3 – May 6, 2024.
- Hiremath, A, Lee, S, Lee J, and others, **“CheckpointPx, an interpretable radiology AI tool, predicts checkpoint blockade benefit independent of PDL1 status in non-small cell lung cancers (NSCLC) A multi-institutional validation study”**, American Association for Cancer Research (AACR), San Diego, CA, April 5-10, 2024.
- Lee, S, Hiremath, A, Lee J, and others, **“AI-powered radiomics model predicts immune checkpoint inhibitor-related pneumonitis (CIP) in advanced NSCLC patients”**, American Association for Cancer Research (AACR), San Diego, CA, April 5-10, 2024.
- Lee, S, Zhang, K, Lee J, Kim PK, Hiremath, A and others, **“Accelerated and precise tumor segmentation in NSCLC: A comparative analysis of automated ClickSeg and manual annotation for radiomics”**, American Association for Cancer Research (AACR), San Diego, CA, April 5-10, 2024.
- Midya, A, Asaiekeybari, G, Hiremath A, Viswanathan VS, Sun, H, Harwood, S, Kim HS, Schilling, T, Telfer, W, Jin A, Baraboo J, Pradella, M, Markl, M, Passman, R, El-harasis, M, Shoemaker, MB, Tandon A, Barnard, J, Chung, MK, Madabhushi, A, **“Machine learning with Multimodal Pre-Ablation Imaging for predicting recurrence in Atrial Fibrillation patients”**, American Heart Association (AHA), November 11–13, 2023.
- Hiremath, A, Bera, K, Gupta, A, Velcheti, V, Madabhushi, A, and Braman, N, **“Radiomic signature of identifies outcome and prognosis to immune checkpoint inhibitors (ICI) in PD-L1 low non-small cell lung cancer (NSCLC)”**, 2023 World Conference on Lung Cancer (WCLC), Singapore, September 9-12, 2023.
- Hiremath, A, Li, H, Clement, A, Gupta, A, Velcheti, V, Madabhushi, A, and Braman, N, **“Single-click radiomic classifier is associated with response and prognosis in non-small cell lung cancers (NSCLC) treated with immune checkpoint inhibitors”**, American Society of Clinical Oncology (ASCO), Chicago, June 2-6th, 2023.
- Sompalle, P., Roge, A., Sobota, M., Hiremath, A., Tirumani, S.H., Kayat Bittencourt, L., Purysko, A., Viswanath, S., Madabhushi, A., and Shiradkar, R., **“Association of MR image quality measures with diagnostic accuracy and inter-reader agreement of PI-RADS for detection of prostate cancer”**, 32nd Annual Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM), Toronto, June 3-8, 2023.
- Asaiekeybari, G., Hiremath, A., Shiradkar, R., El-Harasis, M., Shoemaker, B., Barnard, J., Gupta, A., Chung, M., Madabhushi, A., Anant, **“Computationally identified shape differences in the Left Atrium on pre-ablation CT scans appear to be associated with recurrence of atrial fibrillation”**, American Heart Association (AHA), Boston, Nov 13-15th, 2021.
- Shiradkar R, Sobota M, Bittencourt LK, Tirumani SH, Ream J, Ward R, Hiremath, A, Roge A, Mahran A, Purysko A, Ponsky L, Madabhushi, **“Sensitivity of radiomics to inter-reader variations in prostate cancer delineation on MRI should be considered to improve generalizability”**, 29th Annual Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM), May 15-20, 2021.
- 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/mm<sup>2</sup>”**, 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

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2021	<b>MICCAI Student Travel Award</b> , The Medical Image Computing and Computer Assisted Intervention	Strasbourg, France
2021	<b>Excellence in Graduate Teaching</b> , Case Western Reserve University	Cleveland, U.S.A
2020	<b>I-Corps, Ohio Grant Funding</b> , Case Western Reserve University	Cleveland, U.S.A
2020	<b>Runner up, Trainee competition</b> , ISMRM MR of cancer study group	Sydney, Australia
2020	<b>Educational Stipend</b> , International Society for Magnetic Resonance in Medicine (ISMRM)	Sydney, Australia
2020	<b>Professional Development Travel Funding</b> , Case Western Reserve University	Cleveland, U.S.A
2020	<b>Trainee Travel Award</b> , Case Comprehensive Cancer Center	Cleveland, U.S.A
2020	<b>Runner up</b> , Art of STEM Competition, Case Western Reserve University	Cleveland, U.S.A
2018	<b>1st Place</b> , Cleveland Medical Hackathon, 2018	Cleveland, U.S.A
2017	<b>1st Place</b> , Deep Learning for Visual Computing Challenge, 2017	Kolkata, India

## Recognition

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- **Study Applying AI to CT Scans Unveils Lung Damage Severity in COVID-19 Patients**
- **Bioethics in the Age of COVID-19: Laundering bias and saving lives through**
- **Indian-Origin Engineer Builds AI To Predict If A Covid Patient Will Need Ventilator**
- **Case Western Reserve University lab using digital images of chest scans from coronavirus patients from Wuhan, China, to teach its computers to triage patients**
- **Test-Retest Repeatability of a Deep Learning Architecture in Detecting and Segmenting Clinically Significant Prostate Cancer on Apparent Diffusion Coefficient (ADC) Maps - Beyond the Abstract- Featured in UroToday**
- **BME Graduate Students Win Top Prizes at the Cleveland Medical Hackathon Event**
- **44 students prepare 10 projects at Winter School**
- **Study: Unveiling lung damage in COVID-19 patients using AI**