Prasad Kanhegaonkar

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Brief Bio

Prasad Kanhegaonkar is a Ph.D. researcher in the CSE Dept at IIT Indore and an Assistant Professor in the CSE Dept at Shri Guru Gobind Singhji Institute of Engineering & Technology, Nanded. His research focuses on deep learning for medical image analysis, particularly in skin lesion classification for early diagnosis of skin diseases. His work aims to develop efficient, real-time AI models optimized for deployment in resource-constrained environments.

His research contributions address critical challenges in medical image analysis, including dataset imbalance, lesion variability, and artifact removal. To tackle these challenges, advanced techniques like attention mechanisms, contrastive learning, domain adaptation, meta-learning, and lightweight CNN architectures are used. He is extensively working with large-scale dermatology datasets, enhancing model robustness, generalizability, and clinical applicability.

Beyond research, he has substantial experience in teaching and mentoring students at both undergraduate and post-graduate levels. He has published in prestigious international conferences and journals and actively serves as a reviewer for leading scientific publications in AI and medical imaging. His academic interests extend to trustworthy and interpretable AI, ensuring the development of ethical, secure & reliable machine learning solutions for healthcare. With a strong commitment to bridging the gap between AI research and clinical applications, he aims to advance AI-driven innovations for improved medical diagnostics and patient outcomes.

Research Interests

Computer Vision, **Medical Image Analysis**, **Machine Learning**, **Deep Learning & Parallel Computing**

Current Research Activities

- **Ph.D. Thesis Work** Dec 2021 – Present
  Title: Analysis of Lesion Images for the Diagnosis of Skin Diseases
  Thesis Supervisor: **Dr. Surya Prakash**, Professor, CSE, IIT, Indore, India
  Keywords: Medical Image Analysis, Skin Lesion Classification, Deep Learning, Keras, PyTorch
  - **Problem Statement:** Development of efficient algorithms for skin lesion classification, optimized for real-time deployment in resource-constrained environments.
  - As part of my Ph.D. research, I am developing innovative and efficient methods for skin disease diagnosis through the analysis of skin lesion images. To accomplish this, I utilize standard datasets such as HAM10000, MedNode, Derm7Pt, PH2, HIBA, PAD-UFES-20, and ISIC challenge datasets (ISIC 2016–2024). The proposed methods are designed to be deployable in real-time scenarios and resource-constrained environments. A major aspect of my research involves tackling challenges like dataset imbalance, variations in lesion shape, size, color, and texture, as well as eliminating unwanted artifacts. To address these issues, I am leveraging and refining advanced techniques, including Attention Mechanisms, Semantic Segmentation, Lightweight CNN Architectures, Transfer Learning, Metric Learning, Meta-Learning, Continual Learning, Domain Adaptation, Disentangled Representation Learning, and Responsible AI. The performance of the developed solutions is generally assessed using standard evaluation metrics such as Balanced Accuracy, Recall, F1-Score, AUC-ROC, IoU, Dice Score, etc.

Academic Projects

- **M.E. Thesis** July 2011 – June 2012
  Title: A Novel Image Steganographic Method using Octa-Way Pixel-Value Differencing
  Thesis Supervisor: **Dr. Avinash Gulve**, Associate Professor, MCA, GEC, Aurangabad, India
  Keywords: Information Security, Image Steganography, Pixel Value Differencing, Matlab
  - **Problem Statement:** Development of a secure, imperceptible, and robust image steganographic method for concealing secret data within images.

– The proposed solution introduces a novel image steganographic method that employs an octa-way pixel value differencing approach to conceal secret data within an image. Each image pixel is paired with its eight surrounding pixels (octa-way), and the intensity differences across eight such pairs are computed. The secret data is first converted into a binary string, from which specific bits are selected for embedding. The method ensures minimal distortion to the original image, as verified by comparing the histograms of the original and embedded images. By evaluating the embedded image using various performance metrics, the proposed approach demonstrates robustness, imperceptibility, and accuracy in secure data hiding.

- **B.Tech. Major Project** Dec 2008 – Apr 2009
  Title: Sachet: An Anomaly Based Network Intrusion Detection System
  Thesis Supervisor: **Dr. U V Kulkarni**, Professor, CSE, SGGSIE&T, Nanded, India
  Keywords: Java, JPCAP, Matlab, Neural Networks, DARPA
  – **Problem Statement:** Development of Secure & Robust Anomaly Based Network Intrusion Detection System.
  – The proposed solution utilizes a neural network-based approach to detect anomalies in real-time packet data captured through packet sniffers. Identified anomalous packets are labeled as potential threats, indicating possible network intrusions by attackers. The system analyzes packet data to detect and prevent such intrusions, alerting administrators to abnormal activities and enhancing network security. The neural network is trained on a subset of the KDD Cup 1999 dataset, enabling it to recognize and mitigate various types of network attacks, including active and passive attacks, as well as denial-of-service (DoS) attacks (e.g. smurf attack).

Technical Skills

- Languages: MATLAB, Python, C, Shell Script
- Packages: PyTorch, Keras, Scikit-Learn, Numpy, LaTeX
- Selected Subjects: Data Structures, Algorithms, Operating Systems, Parallel Computing, Digital Image Processing, Computer Vision, Machine Learning, Deep Learning, Algorithmic Graph Theory, Bandit Algorithms

Education

- Ph.D. in Computer Science & Engineering — Dec 2021 – Pursuing
  Indian Institute of Technology Indore, Indore, India — **CGPA: 8.75**
- Post Graduate Diploma in Financial Management — Aug 2012 – Jul 2014
  Indira Gandhi National Open University, New Delhi, India — **CGPA: 3.28/5.00**
- M.E. in Computer Science & Engineering — Sept 2010 – Jun 2012
  Government Engineering College, Aurangabad, India — **CGPA: 8.33**
- B.Tech. in Computer Science & Engineering — Aug 2005 – May 2009
  SGGSIE&T, Nanded, India — **CGPA: 6.91**
- Higher Secondary, 12^{th} — Jul 2004 – Jun 2005
  MH State Board, Aurangabad, India — **Marks: 87.33%**
- High School, 10^{th} — Jul 2002 – Jun 2003
  MH State Board, Aurangabad, India — **Marks: 82.66%**

Experience

- Shri Guru Gobind Singhji Institute of Engineering & Technology — **Aug 2016 - Present**
  Assistant Professor — Nanded, India
- GES R H Sapat College of Engineering, Management Studies & Research — **Jul 2012 - Aug 2016**
  Assistant Professor — Nashik, India
- Government Polytechnic — **Sept 2009 - Sept 2010**
  Lecturer — Hingoli, India

Achievements

- Received fellowship from AICTE under QIP Program for pursuing PhD (Jan 2022 - Dec 2024)
- Qualified in GATE Exam (2011, 2020)

Publications

Google Scholar ORCID Vidwan

Conference Publications

[1] Avani Tiwari, **Prasad Kanhegaonkar**, Surya Prakash, "*One Shot Learning to Select Data Augmentations for Skin Lesion Classification,*" In: Proc. of the International Conference on Computer Vision & Image Processing **(CVIP)**, Nov 3-5, 2023, IIT Jammu, India

[2] **Prasad Kanhegaonkar**, Sruthi Ponugoti, Surya Prakash, "*Skin Lesion Classification using CNN & Transformer Networks for Computer Assisted Diagnosis,*" In: Proc. of the International Conference on Smart Systems & Advanced Computing **(SYSCOM)**, Dec 30-31, 2022, Macau, China (Virtual)

[3] **Prasad Kanhegaonkar**, Avinash Gulve, "*A Novel Image Steganographic Method using Octa-Way Pixel-Value Differencing,*" In: Proc. of International Conference on Computer Science & Information Technology **(CSIT)**, Jul 8, 2012, Bhopal, India

[4] **Prasad Kanhegaonkar**, Avinash Gulve, "*Review of Pixel Value Difference Methods in Steganography,*" In: Proc. of International Conference on Recent Technologies **(I-CORT)**, Feb 9-11, 2012, Institute of Knowledge College of Engineering, Pune, India

Book Chapters

[1] **Prasad Kanhegaonkar**, Surya Prakash, "*Federated Learning for Healthcare Applications,*" Data Fusion Techniques & Applications for Smart Healthcare, Elsevier, 2023

[2] Rahul Chaurasia, Anirban Sengupta, **Prasad Kanhegaonkar**, "*Secured Integrated Circuit (IC/IP) Design Flow,*" Nanoelectronics for Next-Generation Integrated Circuits, pp. 257-274, CRC Press, 2022

Teaching

Assistantship During Ph.D. (IIT Indore)

- CS419/619 Computer Vision (Jul 2022 - Nov 2022, Dec 2022 - Apr 2023, Dec 2024 - Apr 2025)
- CS309 Parallel Computing (Jul 2023 - Nov 2023, Jul 2024 - Nov 2024)
- CS432/632 Reinforcement Learning (Dec 2023 - Apr 2024)

Assistantship During M.E. (GEC Aurangabad)

- Advanced Java Programming (Dec 2011 - Apr 2012, Dec 2010 - Apr 2011)
- Web Technology Lab (Jul 2010 - Nov 2010, Jul 2011 - Nov 2011)
- Operating Systems Lab (Jul 2010 - Nov 2010)

Courses Taught at GES R H Sapat COE MSR, Nashik [Jul 2012 - Aug 2016]

- Digital Signal Processing, Digital Electronics & Logic Design, Software Engineering, Microprocessor Interfacing Techniques, Design & Analysis of Algorithms, Embedded Operating Systems, Data Communication & Wireless Sensor Networks, Smart System Design & Application

Courses Taught at SGGSIE&T Nanded [Aug 2016 - Present]

- UCS 101: Introduction to Computers & Programming, Aug16-Dec16, UG
- CS 329: Unix System Programming, Dec16-May17 & Dec17- May18, UG
- CS 335B: Combinatorics, Probability & Statistics, Dec16-May17 & Dec20- May21, UG
- CS 441A: Machine Learning, Jul17-Dec17 & Jul18- Dec18, UG
- ESC 107: Programming for Problem-Solving, Dec18-May19, UG
- PCC-NS-516: Number Theory & Cryptography, Dec18-May19, PG
- PCC-CS-202: Data Structures, Jul19-Dec19 & Jul21-Dec21, UG
- PCC-CS-207: Design & Analysis of Algorithms, Dec19-May20, UG
- CS 441I: Bandit Algorithm (Online Machine Learning), July20-Dec20, UG
- PEC-NS-531: Deep Learning, May21-Sept21, PG

Training

Training Programs Organized

- *Emerging New Dimensions of Higher Education in India*, GESRHSCOE Nashik, 20-21 Feb 2015
- *Machine Learning & Applications*, SGGSIE&T Nanded, 21-25 Jan 2019 (One Week FDP)
- *Probability & Statistics*, SGGSIE&T Nanded, 15 to 20 Mar 2019 (One Week FDP)
- *Fundamentals of Accelerated Computing using OpenMP & CUDA C*, SGGSIE&T Nanded, 27-29 Dec 2019

Invited Talks

- *Principal Component Analysis*, Data Mining using R, VNIT Nagpur, 27 Jun-2 Jul 2016 (One Week)
- *Basics of Machine Learning & its Applications*, Data Analytics & Machine Learning, Govt College of Engineering, Jalgaon, 25-29 Sept 2018 (One Week)
- *Decision Trees*, Machine Learning & Applications, SGGSIE&T Nanded, 21-25 Jan 2019 (One Week)
- *Introduction to R*, Probability & Statistics, SGGSIE&T Nanded, 15-20 Mar 2019 (One Week)

Training Programs Attended

- *Basics of LaTeX*, GESRHSCOE Nashik, 13-14 Jul 2013
- *Digital Electronics & Logic Design*, VIIT Pune (SPPU Workshop), 27 Jul 2013
- *Programming Lab - III*, G H Raisoni IE&T Pune (SPPU Workshop), 26-27 Dec 2014
- *Computer Lab- II*, PVG COET Pune (SPPU Workshop), 2014
- *Smart System Design & Applications*, JSPM Narhe Pune (SPPU Workshop), 17 Jul 2015
- *Fundamentals of Writing a Ph.D. Thesis*, GESRHSCOE Nashik, 9 Jan 2016
- *Importance of Statistics & Design of Experiments in Engineering*, VNIT Nagpur, 18-22 Jan 2016 (One Week)
- *Digital Signal Processing*, VNIT Nagpur, 5-7 Mar 2016
- *Data Mining using R*, VNIT Nagpur, 27 Jun-2 Jul, 2016
- *Coding Theory & Cryptography*, SGGSIE&T, Nanded, 26-31 Dec 2016 (One Week)
- *Deep Learning & Applications*, IIT Kanpur, 12-16 Jan 2017 (One Week)
- *Machine Learning & High Performance Computing*, SGGSIE&T, Nanded, 9-10 Mar 2017
- *Big Image Data Processing using ML Algorithms*, NIT Warangal, 11-16 Dec 2017 (One Week)
- *Essentials of Neural Network & Fuzzy Logic*, SGGSIE&T, Nanded, 18-22 Dec 2017 (One Week)
- *Cyber Security*, SGGSIE&T Nanded, 6-10 Mar 2018 (One Week)
- *Computer Networks*, SGGSIE&T, Nanded, 12-16 Mar 2018 (One Week)
- *AI & Machine Learning*, MNIT Jaipur, 4-8 Jun 2018 (One Week)
- *ANN & Deep Learning*, MNIT Jaipur, 11-15 Jun 2018 (One Week)
- *Internet of Things*, MNIT Jaipur, 18-22 Jun 2018 (One Week)
- *Analytical Techniques for Applied Research*, SGGSIE&T Nanded, 16-20 Feb 2020 (One Week)
- *Quantum Computing*, MNIT Jaipur, 24-29 Aug 2020 (One Week)
- *Matrix Computations*, SGGSIE&T Nanded, 22-27 Feb 2021 (One Week)
- *Current Trends of Deep Learning in Various Research Domains*, VIT-APU Amaravathi - NIT Warangal, 20-24 Sept 2021 (One Week)
- *Advanced Instructional School on Algorithmic Graph Theory*, Advanced Training in Mathematics Schools (Supported by National Board for Higher Mathematics), Jun 26-Jul 15, 2023 (3 weeks)
- *Art of Scientific Writing for PhD Students*, ACM PhD Student Workshop, 29 Sept 2023

Services

Administrative

- Class Coordinator - BTech(CSE), Jun 2018 to Jun 2019 & Jul 2020 to Dec 2020
- Class Coordinator - SYBTech(CSE), Jul 2019 to May 2020
- Lab In charge - Machine Learning Lab, May 2017 to Jan 2022

Other

- Member of DUGC, CSE Dept, SGGSIE&T, Nanded [Aug 2016 - Present]
- Coordinator for proposals submission to AICTE, DTE, NIRF [Aug 2016 - Jan 2022]
- Member of departmental purchase committee
- Convocation & Alumni Meet organizing committee
- Pragya 2021 organizing committee

Other (GESRHSCOE Nashik - Jul 2012 - Aug 2016)

- Senior supervisor for university exams at G N Sapkal COE, Nashik (Pune University)
- Examiner for Practical Exams
- Lab in charge of eLearning Lab
- Time Table Coordinator
- Rector of Boys' Hostel

Professional Activities

Memberships

- IEEE Professional Member
- IEEE Young Professionals
- Life Member ISTE, New Delhi

Reviewer

- Sadhana, Indian Academy of Sciences, (Springer) (ISSN: 0973-7677)
- Neural Computing and Applications, (Springer) (ISSN: 1433-3058)
- Applied Intelligence, (Springer) (ISSN: 1573-7497)

Certificate Courses

- SWAYAM Platform (NITTTR Bhopal):
  - Module 1: Orientation towards Technical Education & Curriculum Aspects, [Feb 2021]
  - Module 2: Professional Ethics & Sustainability, [Feb 2021]
  - Module 3: Communication Skills, Modes & Knowledge Dissemination, [Feb 2021]
  - Module 4: Instructional Planning & Delivery, [Feb 2021]
  - Module 5: Technology Enabled Learning & Life-Long Self Learning, [Feb 2022]
  - Module 6: Student Assessment & Evaluation, [Feb 2022]
  - Module 7: Creative Problem Solving, Innovation & Meaningful R & D, [Feb 2022]
  - Module 8: Institutional Management & Administrative Procedures, [Feb 2022]

Other

- Mentored UG & PG (MS by Research) students of IIT Indore & UG interns from the other institutes at IIT Indore.

Student Guidance

Core Areas

- Cryptography, Security, Image Processing, Computer Vision, Pattern Recognition, Machine Learning, Deep Learning, ERP Systems, [Android / PHP / Java / Python / JavaScript]

Masters Thesis

- ADAS : Automated Driver Assistance System, Kartik Bagade, 2019
- Face Recognition, Poonam Sable, 2020
- Plant Leaf & Disease Recognition using Deep Learning, Rohan Lone, 2021

Masters Seminars

- Fingerprint Recognition System Using Bozorth3 Algorithm, Vaibhav Supe, 2017
- Intrusion Detection System using Deep Learning, Katik Bagade, 2018
- Intrusion Detection System in Cloud Environment, Akshay Gujar, 2019
- Plant Leaf & Disease Recognition using Deep Learning, Rohan Lone, 2020

BTech Projects

- Recognizing speed limit on speed limit signs by using CNNs, Abhinav Shukla & Krishna Bhandari, 2018
- Clinic Management System (web portal), Ranjit Ubale, 2018
- IB Enterprise Resource Planning, Dnyaneshwar Ghuge, 2018, (Using Flask)
- Multi purpose web portal, Renuka Pailwan & Vaishali Nirude, 2018, (Using PHP-Laravel)
- A Neural Representation of Sketch Drawings, Sanskriti Dongare, Dipti Chavare & Ashwini Pawar, 2019
- Fingerprint Recognition & Liveness Detection, Priya Bhusalwad & Supriya Sawant, 2019
- Indoor Scene Understanding by Scene Classification & Object Detection, Kaustubh Joshi, Rohit Katariya & Kalpana Dhonde, 2019
- Document Summarization, Ankush Azade, Purudewa Pawar & Manaskar Devendra, 2020
- Image Steganography, Pranjali Pethe & Priyanka Suryawanshi, 2021
- Stock Price Prediction System, Sairaj Sontakke, 2021
- Drowsiness Detection using OpenCV, Shivani Awale, 2021

Student Internships

- Nikhil Chaudhari, 2019, Android app developer
- Jaideep Kadam, 2020, Javascript & PHP frameworks
- Pratik Wakode, 2020, Javascript & PHP frameworks
- Bhakti Somani, 2020, (Full Stack Developer)
- Juilee Edlabadkar, 2020, Deep Learning/Computer Vision
- Nishant Patil, 2020, Java/Android
- Abhijeet Dange, 2021, Web Application
- Sahil Rajendra Nagrale, 2021, Video LMS Portal
- Gagandeep Kaur Cheema, 2021, Alumni Web Portal

References

Dr. Surya Prakash, Professor
CSE, IIT Indore, Indore, India
surya@iiti.ac.in

Dr. Nagendra Kumar, Assistant Professor
CSE, IIT Indore, Indore, India
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Declaration

I hereby declare that all the information mentioned in my curriculum vitae is true & correct to the best of my knowledge.

Indore, India **(Prasad Kanhegaonkar)**