Prasad Kanhegaonkar

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Brief Bio

Prasad Kanhegaonkar received his B.Tech. & M.E. degrees in Computer Science & Engineering from Shri Guru Gobind Singhji Institute of Engineering & Technology, Nanded, India & Government Engineering College, Aurangabad, India respectively. He is an Assistant Professor in the Department of Computer Science & Engineering at Shri Guru Gobind Singhji Institute of Engineering & Technology, Nanded, India. He is currently pursuing a Ph.D. from the Department of Computer Science & Engineering, Indian Institute of Technology, Indore, India. His broad research interests include Computer Vision, Medical Image Analysis, Machine Learning, Deep Learning & Parallel Computing.

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 that are suitable for deployment in real-time & resource-constrained environments.
  - In my Ph.D. thesis, I am working on the development of new & efficient methods for the diagnosis of skin diseases by analyzing skin lesion images. For this task, I am currently using standard datasets including HAM10000, MedNode, Derm7Pt, PH2, DDI, PAD-UFES-20, Fitzpatrick17k, ISIC challenge datasets such as ISIC 2016, 2017, 2018, 2019, 2020, etc. The methods under development are expected to be suitable for deployment in real-time & resource-constrained environments. The major contributions in this research will be related to overcoming certain challenges such as dataset imbalance, varying & improper shape, size, color, texture & other properties of the skin lesions, unwanted artifacts removal, etc. The solutions are planned to be built by innovating & exploiting standard techniques such as Attention Mechanisms, Semantic Segmentation, Lightweight CNN Architectures (EfficientNetB0, MobileNet, DenseNet, GhostNet, etc.), Transfer Learning, Contrastive Learning, Meta Learning, Continual Learning, Domain Adaptation, Disentangled Representation Learning, Trustworthy Machine Learning, etc. The designed solutions will be evaluated using standard performance metrics such as Balanced Multi Class Accuracy, Recall, F1-Score, AUC ROC, IOU, Dice Score, etc.

Academic Projects

- **M.E. Thesis Work** 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 & robust image steganographic method to hide secret data/information in images.
  - The Proposed solution is based on a novel image steganographic method that uses an octa-way pixel value differencing approach to hide the secret data in an image. An image pixel is paired with its 8 surrounding pixels (octa-way). The difference between two pixel intensities which are part of 8 such pairs is calculated. The secret data is converted into binary string & certain bits from this bit string are chosen. The proposed method ensures that the embedded information in the original image does not alter the original image much which is verified by comparing histograms of the original image & the embedded image. By analyzing the embedded image that contains secret messages using various performance metrics, the proposed method ensures the robustness, imperceptibility & accuracy of the overall procedure.

- **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 a secure & robust Anomaly Based Network Intrusion Detection System.
  - The Proposed solution is based on a neural network-based method that finds anomalies in packet data that are captured in real time through packet sniffers. The identified anomalous packets are labeled as abnormal packets that may be injected by attackers for network intrusion. The developed system alerts admins for such abnormal activities through analysis of packet data & avoid network intrusions or attacks to safeguard the networks. The neural network is trained on a subset of the KDD Cup 1999 Dataset. The developed system can thwart various types of network intrusions/attacks such as active attacks, passive attacks, denial of service attacks (e.g. smurf attack), etc.

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-2011 & 2020

Publications

Google Scholar ORCID Vidwan

Under Review / Revision Journal Papers

[1] **Prasad Kanhegaonkar**, Surya Prakash, "A Lightweight, Explainable and Fair Technique to Handle Imbalanced Data in Skin Lesion Classification," *Image Vision & Computing*, Elsevier. [Manuscript: IMAVIS-D-24-02508, Submitted: 10 Sept 2024]

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)
- CS419/619 Computer Vision (Dec 2022-Apr 2023)
- 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)
- Web Technology Lab (Jul 2011-Nov 2011)
- Advanced Java Programming (Dec 2010-Apr 2011)
- Operating Systems Lab (Jul 2010-Nov 2010)
- Web Technology 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 Software, 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)

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, Associate Professor
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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)**