Amit Kale

Chief Scientist & Head of Research, Bosch India — Driving Generative AI & Computer Vision Innovation — R&D Strategy & Global Team Leadership — 20+ Years Technology Leader.
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Objective

To lead and scale AI research and innovation delivering real-world, production-grade AI systems that enable measurable business impact.

Summary

I am a highly accomplished Chief Scientist and Technology Leader with over **20** years of experience translating cutting-edge Applied Research into high-impact, commercial solutions. My leadership is focused on driving innovation and expanding the global R&D footprint within large-scale technology organizations.

Leadership and Scale at Bosch: As Chief Scientist and Head of Research and Innovation at Bosch, India, I manage significant resources and strategic initiatives in the areas of real-world perception systems, multimodal AI (vision,text, time series), Directly leading three critical departments (Applied Research, Applied AI, and Engineering for R&D) comprising a team of **120+ staff**.

Built and deployed real-world AI systems across industrial environments.

Budget and Strategy: Responsible for executing R&D Strategy and managing annual research budgets > 8**million Euro**.

Business Impact: My work ensures research contributions flow directly to engineering and manufacturing workflows, with proven $20 **million+** bottom-line impact.

Education

Ph.D., Electrical and Computer Engineering, October 2003; GPA: 3.8
"Algorithms for Gait-Based Human Identification from a Monocular Video Sequence"
University of Maryland at College Park, College Park, MD

M.Tech., Systems and Control Engineering, Spring 1998; GPA: 3.95
Indian Institute of Technology, Bombay, Mumbai India.

B.E., Electrical Engineering, Fall 1996; GPA: 3.75
Victoria Jubilee Technical Institute (affiliated to University of Bombay), Mumbai, India.

Core Expertise and Technology Focus

My deep expertise lies at the convergence of advanced technical domains, specializing in:

- AI/ML and Computer Vision: Extensive experience in developing and deploying solutions using Deep Learning and advanced Digital Imaging techniques.
- Generative AI (GenAI): Currently spearheading the development of GenAI assets to dramatically enhance engineering efficiency and accelerate R&D cycles.
- AI Solution Architecture: Combining the power of GenAI and other approaches to derive AI strategies to obtain optimal performance.
- Virtual Systems: Pioneering the creation and deployment of Virtual Sensors and Hybrid Models to reduce simulation time and enhance predictive capabilities.

Work Experience

Head
Robert Bosch Research and Technology Center, Bangalore India
April 2024- date

- Lead three departments (Applied Research, Applied AI, and Engineering for R&D) comprising 120 staff, with a budget of 8 million.
- Drive AI contributions to manufacturing and engineering problems.
- Spearhead the development of GenAI assets for SW development, hybrid models to reduce simulation time, and reduce costs using AI based virtual sensors.
- Expand research footprint in India through talent acquisition, retention, and leadership mentoring.
- Explore regional growth opportunities and propose strategic initiatives to address upcoming opportunities.

Chief Scientist
Robert Bosch Research and Technology Center, Bangalore India
October 2022- date

- Responsible for technology development across the AI data lifecycle, including synthetic data generation, data curation, labeling, quality check, and validation, most recently contributing to multi-agentic approaches for data preparation.
- Led the development of a domain-specific foundation model (for automotive)leveraging legacy data and perception algorithms, including deployment on resource constrained hardware for novel mobility applications.
- Introduced novel concepts and supervised the development of MLOps solutions for generating auto-labels using self-supervised learning and GenAI.
- Delivered assets contributing to $20 million bottom-line impact.
- AI Solution Architecture: Combining the power of GenAI and other approaches to derive AI strategies for optimal performance.
- 50+ patents filed in the areas of multimodal AI, computer vision, intelligent systems.

Director of Research
Robert Bosch Research and Technology Center, Bangalore India
April 2022- date

- Defined technology strategy, drove project acquisition, and led a team of 30 scientists in AI/ML, focusing on NLP, hybrid models and time series for embedded hardware.

Principal Senior Expert and Group Manager
Computer Vision and Machine Learning
Robert Bosch Research and Technology Center, Bangalore India
June 2016- March 2022

- Led technology strategy, project acquisition, and the development of the computer vision and machine learning research group.
- Focused on core technologies to improve the AI development data loop, including acquisition, data selection, curation, search, and validation.
- Developed high-value, scalable assets with relevant IP, transferred to business units globally and regionally.
- Key achievements include:
  - Developed approaches for assisted annotation, achieving a 70% reduction in image annotation time.
  - Reduced labeling costs by 90% using a novel graph-based approach for identifying redundant images.

  - Created a search tool for curating images of interest from over 1 billion autonomous driving images, resulting in 95% time savings.

Head of Research Group
Imaging and Computer Vision
Siemens Corporate Technology India
July 2012- to June 2016

- Led technology strategy, project acquisition, and research projects for the imaging and computer vision program.
- Explored the clinical collaboration ecosystem in India, publishing work in leading conferences and journals (RSNA, Clinical Radiology Journal).
- Interfaced with the imaging and computer vision technology field to develop solutions for clinicians in India.
- Collaborated with development centers to deliver proof-of-concept solutions.
- Key achievements:
  - Developed successful partnerships with various Siemens business units (MR, CT, AX, Computer-aided diagnostics).
  - Contributed to Siemens global IP portfolio (10 granted US patents).
  - Led recruitment, mentoring, and career development for a team of 10 scientists and engineers.
  - Developed the business case for novel MR imaging applications for preventive healthcare in India.
  - Managed a team budget of approximately 500k Euro.

Program Manager
Imaging and Intelligent Signal Processing
Siemens Corporate Technology India
Feb 2007 – June 2012

- Led and drove the mission of the imaging program in India.
- Developed technical expertise within the team in computer vision applications (medical imaging, video surveillance).
- Responsibilities included staffing, budgeting, university relations, market opportunity scouting, and IP creation.
- Key projects included:
  - Automated analysis of ECG and IECG signals.
  - Development of a low-cost patient positioning and monitoring system.
  - Vessel segmentation in angio images.
  - Human activity analysis.
  - Face detection and tracking.

Postdoctoral Research Associate and Assistant Research Professor
Department of Computer Science and
Center for Visualization and Virtual Environments
University of Kentucky Lexington, KY
Oct 2003 – January 2007

In this role I was responsible for development of novel applications in augmented environments using computer vision techniques. I supervised research conducted by Masters students and interns in the following areas:

- Augmented Reality systems using projector and camera including for Camera Projector based Scene Augmentation and Human Computer Interaction in Projector Camera Systems
- Semi-Supervised Learning for Background Subtraction and Object Detection
- Robust Visual tracking using parametric illumination models

Research Assistant
Center for Automation Research
University of Maryland, College Park
College Park, MD
Aug 1998 – Oct. 2003

- Developed robust algorithms for human identification using gait.
- Worked on template matching, hidden Markov models, view-invariant gait recognition, and fusion of gait and face.

Honors

- Best Paper award at the IEEE Conference on Parallel Distributed and Grid Computing 2012
- Best paper award (poster) at British Machine Vision Conference (BMVC) 2005
- Recognition for top-percentile paper in human motion analysis and tracking.

Professional Activities

- Jury member for grant proposal reviews.
- Program Co-chair, IEEE Workshop on Multimodal Surveillance Sensors, Algorithms and Systems, 2007.
- Reviewer for top-tier journals (IEEE Transactions on Image Processing, etc.).
- Program committee member for leading conferences (CVPR, ICIP, ECCV, etc.).

Featured Activities

- Research profile at Bosch Research https://www.bosch.com/research/know-how/research-experts/amit-kale/
- Research Blog article on Improving annotation efficiency for deep learning algorithms for computer vision https://www.bosch.com/stories/improving-annotation-efficiency-for-deep-learning-algorithms-for-computer-vision/

Technology Stack

Python, PyTorch, TensorFlow, OpenCV, CUDA, EdgeAI frameworks, MLOps

Patents

"A fast and robust Technique for Segmenting Angiogram Images", US Patent 8077954 granted 13.12.2011

"A robust and fast approach to automated coronary artery segmentation using cardiac phase based tracking and a novel vessel detection criterion", Vipin Gupta, Amit Kale and Hari Sundar. US patent 8422754 Granted 16.04.2013

"A robust and accurate approach to automatic Blood Vessel detection and segmentation from Angiography X-ray images using multi-stage Random Forests", Vipin Gupta, Amit Kale and Hari Sundar. US patent 8488852. Granted 16.07.2013

"An Automatic Non parametric Approach for classification and segmentation of ECG signals with high accuracy", Kaustubh Kulkarni, Stefan Kimmer and Amit Kale. US Patent 8880352. Granted 4.11.14

"A robust and accurate algorithm for automated measurement of intervals in an intracardiac eletrogram " Venkata Suryanarayana and Amit Kale. US Patent 9226682. Granted 5.1.16

"Determining plaque deposits in blood vessels" Yogesh Bathina, Parmeet Singh Bhatia, Rajendra Prasad Jadiyappa, Amit Kale, US Patent 9462987. Granted October 11, 2016.

"Automatic assessment of perceptual visual quality of different image sets" Parmeet Bhatia, Amit Kale US Patent 14/752395. Granted April 23, 2018

"Automatic detection of medical image acquisition protocol", Parmeet Bhatia, Amit Kale, US Patent 20170185713. Granted June 1 2020.

"Method and system for personalizing a vessel stent" Y.Bathina, A. Piriyakumar, R. Jadiyappa, Amit Kale, US Patent 10898266. Granted Jan 26, 2021.

"A system and method for image content translation across different Cameras", Koustav Mullick, Harshil Jain and Amit Kale, Indian Patent 585888. Granted Mar 30 206

"System and method for searching an object in a target image using augmentation", Sonam Singh and Amit Kale. Indian Patent 586374. Granted Apr 6 2026.

Publications

Publications in IEEE TIP, CVPR, BMVC, ICIP and leading AI venues

Selected Journal Publications and Book Chapters

"On Kharitonov's theorem without invariant degree assumption "Amit Kale and Andre' L.Tits. Technical Report.Institute for Systems Research.1999. Automatica 36-7 pp 1075-1076 July 2000.

"Identification of Humans Using Gait" Amit Kale, A. N Rajagopalan, A. Sundaresan, N. Cuntoor, A. RoyChowdhury, V Kruger, Rama Chellappa IEEE Transactions on Image Processing September 2004

"Gait-based human identification using appearance matching" Amit Kale, Naresh Cuntoor, B Yegnanarayana, A N Rajagopalan and Rama Chellappa "Optical and Digital Techniques for Information Security" Ed. B Javidi et.al Springer Verlag 2004.

"Particle filter with Mode Tracker for Visual tracking across Illumination Changes" Samarjit Das, Amit Kale, Namrata Vaswani. "IEEE Trans. on Image Processing. April 2012

"Non-invasive quantification of hepatic steatosis in living, related liver donors using dual-echo Dixon imaging and single-voxel proton spectroscopy" S Krishan D Jain Y Bathina A Kale N Saraf S Saigal N Choudhary S.S. Baijal A Soin, Journal of Clinical Radiology. Nov 2015.

Selected Refereed Conference Proceedings

"Self-Supervised Learning for texture classification using limited labeled data", Sahana Prabhu, Jitendra Yasaswi and Amit Kale, ICIP 2022.

"Volumetric texture modeling using dominant and discriminative binary patterns", Parmeet S. Bhatia, Amit Kale, Zhigang Peng SPIE Medical Imaging 2019

"Automatic Optic Disk and cup segmentation of fundus images using deep learning", Venkata Gopal Edupuganti, Akshay Chawla, Amit Kale. ICIP 2018

"Fast 3D Structure Localization in Medical Volumes using CUDA-enabled GPUs",Proceedings of the 2nd IEEE International Conference on Parallel Distributed and Grid Computing 2012, Sharan Vaswani, Rahul Thota, Nagavijayalakshmi Vydyanathan and Amit Kale, **Won the best paper award at PDGC 2012**

"A robust and accurate approach to automatic Blood Vessel detection and segmentation from Angiography X-ray images using multi-stage Random Forests", Vipin Gupta, Amit Kale and Hari Sundar, Proc SPIE Medical Imaging 2012

"An Unsupervised Framework for Action Recognition Using Actemes", Kaustubh Kulkarni, Edmond Boyer, Radu Horaud, and Amit Kale, Proc. of ACCV 2010.

"A Framework for indexing human actions in video",Kaustubh Kulkarni, Srikanth Cherla, Amit Kale and V.Ramasubramanian. Proceedings of the 1st workshop on Machine Learning for Visual Motion Analysis, 2008.

"A Joint Model of Illumination and Shape for Visual tracking" Amit Kale and Christopher Jaynes. Proceedings of IEEE Computer Society CVPR 2006.

"Offline Generation of High Quality Background Subtraction Data" Etienne Grossmann, Amit Kale, Christopher Jaynes and Samson Cheung Proceedings of British Machine Vision Conference, September 2005, Oxford Brookes,UK. (**Best Poster Award at BMVC**)

"Towards Interactive Generation of "Ground Truth" in Background Subtraction from Partially Labeled Examples" Etienne Grossmann, Amit Kale, Christopher Jaynes Proceedings of the IEEE Workshop on Visual Surveillance and Performance Evaluation of Tracking and Surveillance, October 2005 Beijing China.

"The Smart Bookshelf: A study of camera projector scene augmentation of an everyday environment " Danny Crasto, Amit Kale and Christopher Jaynes Proceedings of the IEEE Workshop on Applications of Computer Vision, Colorado Springs CO January 2005

"Epipolar Constrained User Push Button Selection in Projected Interfaces " Amit Kale, Kenneth Kwan and Christopher Jaynes Proceedings of the 1st IEEE workshop on Real time Vision for Human Computer Interaction, Washington DC June 2004