Rajbir (Raj) Kataria

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Summary

Established AI leader and innovator with deep expertise in computer vision, machine learning, and scalable system design. Leads high-impact teams and delivers AI solutions that drive innovation and transform business operations. Combines strategic vision with technical leadership to accelerate product development and deploy intelligent systems at scale.

Education

University of Illinois Urbana-Champaign — Champaign, IL, USA
Doctor of Philosophy: Computer Science(Computer Vision) **2016 - 2023**
Committee: Dr. Derek Hoiem (Advisor), Dr. David Forsyth, Dr. Yasutaka Furukawa, Dr. Mani Golparvar-Fard
Relevant Courses: Computer Vision, Deep Learning I/II, Cutting-Edge Trends in Deep Learning and Recognition

Stanford University — Palo Alto, CA, USA
Master of Science: Electrical Engineering **2012 - 2013**
Relevant Courses: Machine Learning, Applied Vision and Image Systems, Design and Analysis of Algorithms

University of Waterloo — Waterloo, ON, Canada
Bachelor of Science: Computer Engineering **2001 - 2006**
Relevant Courses: Applied Artificial Intelligence, Database Systems, Algorithms and Data Structures

Professional Experience

New Balance Athletics, Inc. — Boston, MA, USA
Robotics Architect **07/2023 - Current**

- **Directed the design and deployment of a proprietary computer vision platform**, delivering performance that exceeded leading commercial solutions while cutting implementation costs—demonstrating both strategic technical leadership and fiscal impact.
- **Architected and scaled a self-supervised machine learning framework** for automated segmentation and classification of footwear components, eliminating reliance on labeled datasets and accelerating innovation across product lines.
- **Led cross-functional AI initiatives with manufacturing, R&D, and product teams**, translating complex operational needs into AI-driven solutions that enhanced scalability, reduced manual effort, and supported digital transformation goals.
- **Oversaw exploratory research into emerging AI technologies**, managing proof-of-concept development and aligning technical validations with long-term business objectives; provided executive-level recommendations that shaped the enterprise AI roadmap.
- **Built and governed the end-to-end AI ecosystem at New Balance**, defining the strategic vision and identifying key integration points to embed machine learning capabilities across core business functions, from design and development to supply chain operations.

Skills: Leadership, Project Management, 3D Computer Vision, Algorithms, Software Engineering, Deep Learning, PyTorch, Azure, Python, Open3D, OpenCV

Microsoft Inc. — Remote
Researcher **05/2021 - 08/2021**

- **Pioneered novel approaches to image-based localization** by introducing rotation consistency constraints across retrieved image sets, resulting in improved robustness and accuracy in visually challenging environments.
- **Designed and deployed a multi-task learning framework** that jointly optimized feature representations for both image retrieval and camera pose estimation—streamlining model architecture and enhancing generalization across tasks.
- **Achieved state-of-the-art performance** in both image retrieval and pose estimation across multiple benchmark datasets, surpassing baseline models and validating the effectiveness of the proposed architecture in real-world scenarios.

Skills: 3D Computer Vision, Algorithms, Deep Learning, Multi-task Learning, Image Retrieval, PyTorch, Azure, Python, OpenCV

Reconstruct Inc. — Champaign, IL, USA
Researcher **05/2017 - 08/2017**

- **Redesigned and parallelized the Structure-from-Motion (SfM) pipeline**, enabling distributed reconstruction of image clusters across compute nodes—dramatically improving scalability and processing efficiency for large-scale 3D modeling tasks.
- **Designed and implemented a relevance-ranking algorithm** to identify the most informative image for a given scene based on camera pose and point visibility, optimizing downstream tasks such as localization and reconstruction accuracy.
- **Developed a next-best-view resectioning algorithm** that incorporated entropy-based match evaluation, significantly improving the robustness and precision of camera pose estimation in complex, feature-sparse environments.

Skills: 3D Computer Vision, Structure from Motion, Algorithms, OpenSfM, COLMAP, AWS, Python, OpenCV

Software Manager / Software Architect **08/2015 - 08/2016**

- **Led the end-to-end development of a web-based 3D visualization platform** for construction site point clouds, enabling real-time monitoring of project progress and enhancing operational visibility for stakeholders.

- **Architected a scalable, cloud-native infrastructure on AWS**, ensuring high availability, performance, and seamless integration with data pipelines to support enterprise-grade deployment across multiple construction sites.
- **Provided strategic technical mentorship across teams**, conducting in-depth code reviews and guiding engineers on best practices in software architecture, cloud engineering, and AI integration—resulting in improved code quality and team productivity.
- **Designed and deployed an advanced alignment module** to accurately register 3D site models with point cloud data, enabling precise tracking of construction progress and supporting data-driven decision-making on project timelines.

Skills: Leadership, Project Management, 3D Computer Vision, Algorithms, Software Engineering, AWS, Node.js, React, Python, OpenCV, Three.js

Iodine Inc. — San Francisco, CA, USA

Senior Software Engineer — **05/2014 - 07/2015**

- **Led the development of a deep learning–based pill identification system**, significantly improving medication adherence through accurate, real-time recognition—enhancing patient safety and engagement.
- **Designed and deployed an NLP solution to extract high-risk side effects from complex pharmaceutical labels**, enabling scalable, automated drug safety analysis and improving patient education outcomes.
- **Mentored and guided junior engineers**, cultivating a collaborative and high-performing team culture while accelerating development velocity and ensuring delivery of high-quality AI-driven healthcare solutions.

Skills: Leadership, Computer Vision, Deep Learning, Algorithms, Software Engineering, GCP, Node.js, React, MongoDB, Python

LiveMagic Inc. — Mountain View, CA, USA

Senior Machine Learning Engineer — **04/2013 - 05/2014**

- **Designed and optimized scalable data pipelines**, improving backend system efficiency and enhancing the overall user experience across high-traffic video services.
- **Led development of advanced NLP algorithms** for spelling correction and sentence boundary detection in closed captions, significantly improving search accuracy for users.
- **Spearheaded the development of a dynamic video recommendation engine**, leveraging behavioral data to deliver personalized content—resulting in a substantial uplift in user retention and watch time.

Skills: Machine Learning, Algorithms, Software Engineering, AWS, Python, JavaScript, HTML

Microsoft Inc. — Mountain View, CA, USA

Software Engineer — **07/2006 - 03/2012**

- **Optimized skeletal tracking algorithms for Kinect**, contributing to the technical evaluation and feasibility analysis of next-generation hardware—laying the groundwork for future motion-sensing innovations.
- **Led the development of diagnostic tools and system-level testing frameworks**, enabling early detection of hardware faults and validating new functionality across the software-hardware interface.
- **Directed software engineering efforts for the Southbridge silicon** used in the 2011 Xbox launch, ensuring seamless integration of low-level systems critical to product performance and reliability.
- **Partnered closely with chip design and verification teams** to identify and mitigate functionality risks, aligning software development milestones with hardware production schedules.
- **Provided on-site engineering leadership at global manufacturing and repair facilities**, supporting development builds, resolving critical system-level issues, and ensuring smooth handoff from R&D to production.

Skills: Leadership, Software Project Management, Algorithms, Software Engineering, C++

Publications

Improving Robustness of 3D Reconstruction for Sparse Captures and Challenging Environments
Rajbir Kataria, *Doctoral Thesis*, 2023.

Addressing Low-Shot MVS by Detecting and Completing Planar Surfaces
Rajbir Kataria, Zhizhong Li, Joseph DeGol, Derek Hoiem, 3DV 2024.

Improving Structure from Motion with Reliable Resectioning
Rajbir Kataria, Joseph DeGol, Derek Hoiem, 3DV 2020.

FEATS: Synthetic Feature Tracks for Structure from Motion Evaluation
Joseph DeGol, Jae Yong Lee, **Rajbir Kataria**, Daniel Yuan, Timothy Bretl, Derek Hoiem, 3DV 2018.

Skills Summary

Programming Languages	Python, C++
Deep Learning Frameworks	PyTorch, TensorFlow
3D Computer Vision	Structure from motion, Multi-view stereo, SLAM, Depth estimation
Computer Vision	Semantic segmentation, Object detection, Multi-task learning
Open-source Software and Libraries	OpenSfM, COLMAP, OpenCV, Open3D, NumPy, scikit-learn, PIL, OpenGL, Three.js
Cloud Platforms	Azure, AWS, GCP
Databases	MySQL, PostgreSQL, MongoDB
Development Tools	Visual Studio Code, Sublime, Git, SSH, Docker, tmux

**Skills with a high level of proficiency are underlined*