Vishal Kaushal

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PhD (Machine Learning) (pre-syn done)

Department of Computer Sc. & Engg., **IIT Bombay**

BTech (CSE) IIT Kharagpur (2004) **(Institute Silver Medalist)**

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Career Objective

I bring to the table, proven technical rigour and intuitive insights in Machine (Deep) Learning and Computer Vision on one hand, and on the other hand, around 17 years of experience in end-to-end product development lifecycle through roles spanning software development, research & consultancy, leading teams, product ownership, customer interactions, engaging with Government organizations, mentoring and teaching. With this I see myself uniquely positioned to realize business value through applied machine learning in computer vision. I am looking for exciting opportunities in industry where I can use my strengths and experience to lead ML R&D teams see beyond the glamour of machine learning and help them with its nuances to power the software of the future, thereby contributing to an organization's success.

Summary of Professional Experience

17 years of experience in diverse roles as follows:

- **Research & consultancy** (5 years: 2016-2021) in ML/DL for computer vision involving image classification, object/human detection, face recognition on images and videos for video search, real-time surveillance and quality & compliance monitoring applications **leading to successful deployments at IITB, Naval Dockyard (Visakhapatnam) and Ministry of Rural Development**. **ML Consultant** for two video analytics startups. **Engaged with customers and led and managed** a team of about 12 software engineers as **consultant CTO** for a video analytics startup.
- **Engaged with Government of India organisations** like **Indian Army, Madhya Pradesh Police, National Technical Research Organization (NTRO)** to understand their video analytics requirements, assessed technical feasibility and translated them to solutions.
- **Owned** a video analytics based compliance and quality monitoring project (Drishti) with the **Ministry of Rural Development** and led it right from conceptualization to successful commercial engagement between IITB and MoRD.
- **Open Source Software:** developed and released Submodlib, an easy-to-use, efficient and scalable Python library for submodular optimization with C++ optimization engine.
- **Product development in an exclusive Oracle Beehive team at Oracle India Pvt. Ltd., Bangalore** (6 years: 2004-2010) in the area of real-time collaboration (instant messaging and presence client, multi-user chat server).
- **Conceptualizing and building prototypes in the niche R&D Incubator team at BMC Software, Pune** (~2 years: 2010-2012) for next generation products around data center management and incident management with mobile first and cloud first focus. Received Star Award. Encouraged cross-pollination of ideas across teams by **running a much appreciated company-wide innovation newsletter and a highly successful international ideation contest**
- **Mentored** several junior engineers, BTech and MTech students and interns throughout, contributing to their growth and success
- **Several publications** at top machine learning and computer vision conferences and workshops (WACV, ACM MM, ECCV) and invited reviewer for premiere conferences like WACV, CVPR, AAAI.
- **Teaching** (4 years: 2012-2016)**:** taught core CS and Data Science courses at Vishwakarma Institute of Technology, Pune. **Improved the teaching-learning practices** of the department of Computer Engineering by deploying a collaborative wiki based solution. **Brought revenue to the college by conducting a two-weeks workshop on "Intuitive Data Analytics"** for the employees of Zensar Technologies, Pune. Bagged **best faculty award** every year.

Technical Skills

- **Programming languages**: Python, C++, Java
- **ML/DataScience** - sklearn, numpy, pandas
- **DL Frameworks**: PyTorch, Darknet (C++), Caffe (C++), OpenCV-DNN, TensorFlow, Keras
- **Image/Video**: OpenCV
- **GUI development:** Qt, Glade, Tkinter
- **Version control system**: Git, Perforce, ADE
- **GUI Prototyping**: Moqups.com, Adobe Flex, Balsamiq
- **Web application** (working knowledge): Node, HTML, CSS, JavaScript, REST, JSP, Servlets
- **Real-time collaboration**: XMPP
- **Database design and development**: Mongodb, PL/SQL, JDBC, Oracle, MySQL
- **Mobile Application development**: Native (Android, iOS), Web and Hybrid
- **Data mining, data warehousing:** Weka, Oracle Warehouse Builder, OLAP, RapidMiner, Pentaho, QlikView
- **Testing/Performance** - JUnit, JMeter, gdb, pytest, cprof, valgrind
- **Documentation** - Sphinx, Javadoc, Doxygen

PhD Thesis

Title: "*Subset Selection and Summarization Problems In Visual Data*"

Advisors: Ganesh Ramakrishnan, Professor, Department of Computer Science and Engineering, IIT Bombay and Rishabh Iyer (Senior ML Scientist, Microsoft Seattle; now Assistant Professor, Department of Computer Science, The University of Texas at Dallas)

Award: Our work on "Video Analytics for Security and Compliance Applications" has won us **Dr. P. K. Patwardhan Technology Development Award for the year 2020**.

Summary: My work focused on **subset selection and summarization** problems in visual data (**image/video**). We demonstrated the application of submodular functions in selecting training data subsets with interesting characteristics leading to **quicker training, quicker hyper parameter tuning, reduced labeling effort and diversified active learning** helpful in downstream computer vision tasks. We proposed a rich class of parameterized submodular information measures for **targeted data subset selection** where the subsets need to additionally align to certain targets of interest. We demonstrated the utility of such selection in **improving the model performance** and in **image collection summarization**. As an interesting application of subset selection, we studied the challenges present in **video summarization** and made advances to addressing those challenges. In particular, we applied different forms of subset selection to cater to different flavors of video summarization, proposed mixture models for learning richer summaries and released a gold standard dataset and evaluation framework (VISIOCITY) to address some of the current challenges in video summarization. My work also involved applying some of these techniques in building **video analytics software products** in the area of surveillance, video search and quality & compliance monitoring. I have also developed and released an **open source submodular optimization library** called Submodlib.

Details

Work Experience During Full-Time PhD

(*as a part of Research Assistantship*)

Period	Organization	Role	Work / Accomplishments
Apr 2019 - Mar 2020	SrivisifAI Technologies Pvt. Ltd., Pune	ML Consultant	- Did **transfer of technology (video analytics POCs and summarization algorithms) to SrivisifAI** which is our current industrial partner for productizing and taking them to market - Guided SrivisifAI's development team on the ML aspects of the solutions (specifically **deployment challenges and improving the accuracy of the models**) - The solutions have been deployed at **Naval Dockyard Vishakhapatnam, IIT Bombay and Ministry of Rural Development** - In the news
Apr 2018 - Mar 2019	aiSight Video Analytics Pvt. Ltd., Mumbai	Consultant CTO	- Engaged with clients to **understand their video analytics requirements, assessed technical feasibility and translated them to ML solutions** **Led a team of about 12 developers** towards design and implementation of three web-based video analytics products using MERN/MEAN stack for real-time surveillance (SurakshaVyuha), video search (Jigyasa) and compliance & quality monitoring (Drishti) - Drishti involved **uniform detection, attendance, instructor face recognition, video summarization and class punctuality detection for DDU-GKY**, a scheme of Ministry of Rural Development (MoRD) under Skill India Campaign - The products were built upon the machine learning based automated video analytics on surveillance cameras using **motion detection, image classification, object detection, face detection and face recognition developed by me (C++/Darknet/Caffe/OpenCV)** under the aegis of National Center of Excellence in Technology for Internal Security (NCETIS), IIT Bombay
Jul 2017 - Mar 2018	AITOE Video Analytics Pvt. Ltd., Mumbai	ML Consultant	**Guided a small development team** to develop a Windows desktop application wrapper (WPF/.Net) on top of the initial prototype to support multiple cameras and to enhance the models for human detection and on other deployment specific ML challenges - Led the **deployment of the solution at Gopinath Dairy, Mumbai**
Apr 2016 - Jul 2016	Industrial Research and Consultancy Center (IRCC), Indian Institute of Technology Bombay (IITB), Mumbai	Project Engineer	**Developed initial prototype of a real-time surveillance application using C++, Qt and OpenCV**. Real-time alerts for motion detection, intrusion detection and loitering by automatically analyzing video feed coming from a surveillance camera

Industry Experience Before Joining Full-Time PhD

Period	Organization	Role	Work / Accomplishments
Apr 2010 - Dec 2011	**BMC Software**, Pune	Staff Specialist Product Developer	- Worked in a **niche research and innovations group** chartered with **conceptualizing and prototyping** the next generation enhancements to the existing products in the domain of Data Center Management and Incident Management - Developed prototypes for making products **cloud ready (saas) and mobile ready (Android and iOS mobile application development)** - Received **Star Award** for "Outstanding Performance and lasting contribution to the Incubator team" **Got groomed as a leader through Workshops on Stepping into Leadership** conducted by Atyaasaa for BMC Software India Pvt Ltd. **Mentored interns and led them to success** **ITIL v3 Foundation Certification** with 92% marks (conducted by TUV SUD Akademie GmbH)
Dec 2006 - Mar 2010	**Oracle India Pvt. Ltd.**, Bangalore	Senior Member Technical Staff	**Worked as a key member in the Server Technologies' Real Time Collaboration product development group** on several **Java based projects** like Multi-User Chat Server Design and Implementation; Design and Implementation of Instant Messaging Server for Beehive - Oracle's Next Gen Collaboration Suite based on service-oriented architecture (SOA); Integrated UI for unit testing of Instant Messaging service, etc. **Successfully fixed fundamental design issues** in the co-working of the instant messaging service and the conferencing service of Oracle Beehive **Mentored interns and contributed to their growth**
Jun 2004 - Nov 2006	**Oracle India Pvt. Ltd.**, Bangalore	Member Technical Staff	**Worked as a key member in the Server Technologies' Real Time Collaboration product development group** on several **Java based projects** like XMPP (eXtensible Messaging and Presence Protocol) Service, Stanza Recognizer (to achieve two-stage parsing of XML/XMPP), Oracle Messaging and Presence Library, Time-Zone Synchronization for Oracle Web Conferencing, User Management Schema design, Context-based and user sensitive Help System

Teaching Experience

Period	Organization	Role	Work / Accomplishments
Jan 2012 - Mar 2016	Vishwakarma Institute of Technology, Pune	Assistant Professor, Department of Computer Engineering	- Received **best faculty award every year** **Four publications** - Member of the **Industry Advisory Boar**d - Guided 14 BTech projects **Improved the teaching-learning practices** of the department of Computer Engineering by deploying a collaborative wiki based solution **Brought revenue to the college by conducting a two-weeks workshop on "Intuitive Data Analytics"** for the employees of Zensar Technologies, Pune - Taught Computer Programming, Business Intelligence and Data Analytics, Advanced Data Structures, Operating Systems, Principles of Programming Languages, Advanced Java **Brought about a tangible improvement in the coding skills of the students** - Some testimonials of how I have positively affected people professionally

Relevant Publications Towards PhD Thesis

(in reverse chronological order) [More complete list with additional material](#)

- **PRISM: A Rich Class of Parameterized Submodular Information Measures for Targeted Data Subset Selection**, Vishal Kaushal, Suraj Nandkishor Kothawade, Ganesh Ramakrishnan, Jeff Bilmes, Rishabh K Iyer. Submitted to NeurIPS 2021. Decision awaited.
- [**Submodular Mutual Information for Targeted Data Subset Selection**](#), Suraj Kothawade; Vishal Kaushal; Ganesh Ramakrishnan; Jeff Bilmes; Rishabh Iyer. ICLR 2021 S2D-OLAD Workshop
- [**Realistic Video Summarization through VISIOCITY: A New Benchmark and Evaluation Framework**](#), Vishal Kaushal, Suraj Kothwade, Rishabh Iyer, Ganesh Ramakrishnan, October 2020, Accepted paper at the ACM MM' 20 Workshop "2nd International Workshop On AI For Smart TV Content Production, Access And Delivery".
- [**Watch Hours in Minutes: Summarizing Video with User Intent**](#), Saiteja Nalla, Mohit Agrawal, Vishal Kaushal, Rishabh Iyer, Ganesh Ramakrishnan, September 2020, Accepted paper at the ECCV' 20 Workshop "The 2nd Workshop on Video Turing Test: Toward Human-Level Video Story Understanding"
- [**A Framework towards Domain Specific Video Summarization**](#), Vishal Kaushal, Sandeep Subramanian, Suraj Kothawade, Rishabh Iyer, Ganesh Ramakrishnan - Accepted paper at the 7th IEEE Winter Conference on Applications of Computer Vision (WACV), 2019, Hawaii, USA
- [**Learning From Less Data: Diversified Subset Selection and Active Learning in Image Classification Tasks**](#), Vishal Kaushal, Rishabh Iyer, Anurag Sahoo, Khoshrav Doctor, Narasimha Raju, Ganesh Ramakrishnan - Accepted paper at the 7th IEEE Winter Conference on Applications of Computer Vision (WACV), 2019, Hawaii, USA
- [**Demystifying Multi-Faceted Video Summarization: Tradeoff Between Diversity,Representation, Coverage and Importance**](#), Vishal Kaushal, Rishabh Iyer, Anurag Sahoo, Pratik Dubal, Suraj Kothawade, Rohan Mahadev, Kunal Dargan, Ganesh Ramakrishnan - Accepted paper at the 7th IEEE Winter Conference on Applications of Computer Vision (WACV), 2019, Hawaii, USA

Talks & Workshops Delivered

(in reverse chronological order)

- Delivered a talk on "**Video Analytics for Compliance and Security**" at Research and Innovation Symposium in Computing (**RISC**) 2019, IIT Bombay
- Delivered a talk on "**Machine Learning for Surveillance Video Analytics**" in **Intel AI Academy Workshop** held in IIT Bombay on 7th April 2018
- Showcased our video analytics solutions at 20th **India International Security Expo**, 2017 in New Delhi (also presented to **Mr. Kiran Rijiju**, the then Minister of State for Home Affairs), **All India Heads of Police Communication Conference** 2018, Vigyan Bhawan, New Delhi and in **TechConnect under TechFest 2017**, IIT Bombay
- **Conducted a two-weeks workshop on "Data Analytics"** for the employees of **Zensar Technologies**, Pune from 18th Jan 2016 – 29th Jan 2016
- **Conducted 5 days workshop on "Object Oriented Programming through Java" under Infosys Campus Connect programme** from 14th December 2015 – 19th December 2015

Other Interests

- **Lifestyle management counselor** guiding many towards leading a holistic and fulfilling life
- **Writing blogs** on technical topics and on topics pertaining to science and spirituality
- Deliver **personality development seminars** in esteemed institutes on self-development topics like Art of Mind Control, Stress Management, Power of Habits, Mind Your Mind and Will Power to Excel
- **Anchored** various corporate and college technical and non-technical events
- **Authored several technical articles** in college magazine of Vishwakarma Institute of Technology, Pune (PI) and newsletters (Inside Incubator, BMC Software)
- Acted as **spokesperson** for the Incubator team at various events while working with BMC Software

Education

Degree and Major	Institute	When	Special Achievements
PhD, Computer Science & Engineering (Machine Learning)	Indian Institute of Technology Bombay (**IIT Bombay**)	July 2016 - current Final stage. Pre-synopsis done. Thesis underway.	**6 publications at top avenues (+ 1 under review at NeurIPS 2021)** - Developed and released an **open-source library** submodlib **Spear-headed several video analytics projects** - Recipient of Ekal Fellowship
BTech (Hons), Computer Science & Engineering	Indian Institute of Technology Kharagpur (**IIT Kharagpur**)	July 2000 - May 2004	- CGPA - 9.61/10 **Institute Silver Medalist** **Department Rank 1** **Institute Rank 2** **BTech Project: Visual Language Processing:** Computational Semiotics, Visual Languages and their grammars, Study of various methods and techniques of building a communication model facilitating human-computer and human-human interactions. **Advisor**: Prof. Anupam Basu, Head, Department of Computer Science and Engineering, IIT Kharagpur

			● 3 months internship at **INRIA, Paris, France**
MTech, Computer Science & Engineering	Vishwakarma Institute of Technology (**University of Pune**)	June 2012 - May 2014	● CGPA - 9.75/10 ● **Department Rank 1** ● **Institute Rank 1** ● **MTech Project: Personality recognition from Facebook status updates**: Extending PRT (Personality Recognition from Text) techniques to online social networks. **Advisor**: Prof. (Dr.) Manasi Patwardhan, Head, Department of Computer Science and Engineering, Dean R&D, Vishwakarma Institute of Technology, Pune
Higher Secondary (12th)	School: St. Michael's High School, Patna (CBSE)	1999	● PCM: 94.7% ● Aggregate: 92.0% ● **District Topper among all CBSE schools**
Secondary (10th)	School: St. Karen's High School, Patna (ICSE)	1997	● Science & Maths: 95.5% ● Aggregate: 92.7%

Educational Awards and Honors

1.	**Institute Silver Medal**	**Topper in CSE Dep, IIT Kharagpur**	IIT Kharagpur	2004
2.	Bigyan Sinha Memorial Prize	**Second best student in the institute**	IIT Kharagpur	2004
3.	Selected for Summer Internship in Paris, at INRIA, France	On the basis of academic merit	INRIA, France	2003
4.	J. C. Ghosh Memorial Prize	For securing highest CGPA at the end of 6 semesters	IIT Kharagpur	2003
5.	2nd Runners Up, Sanganana 0x7D3	Computer Science Quiz 2003	Dep. of CSE, IIT KGP	2003
6.	Certificate of Merit	**For securing 65th position among 1000 participating teams worldwide in Bitwise 2K2, an algorithm intensive programming contest**	Department of CSE, IIT Kharagpur	2002
8.	**All India Rank 191, JEE**	Joint Entrance Examination for entrance to IITs	JEE	2000
9.	Award of recognition	For excelling in CBSE class 12 exam	Rotary Club of Patna West	1999
10.	Certificate of Merit	For outstanding academic performance and for being among the top 0.1% of successful candidates of AISSCE 99 in English Core	CBSE	1999
11.	**District Topper**	Among all CBSE schools in Patna in 12th	CBSE	1999
12.	Certificate of Merit	School topper in 12th and 11th	St. Michael's High School, Patna	1998-99