VIVEKA KULHARIA

Seattle, USA ⋄ vivekakulharia@gmail.com ⋄ https://vivkul.github.io

EDUCATION

University of Oxford, UK *October 2017 - Jan 2023*
DPhil in Computer Vision
Supervisors: Professor Philip H.S. Torr, Dr. Puneet K. Dokania
Information Engineering, Department of Engineering Science

Indian Institute of Technology Kanpur, India *July 2012 - July 2016*
Bachelor Of Technology GPA: 9.1/10
Department of Computer Science and Engineering

RESEARCH INTERESTS

Computer Vision, Deep Learning, Optimization, Machine Learning

RELEVANT EXPERIENCE

Cruise LLC, Seattle, USA October 2022 - Present
Senior Applied Research Scientist, Computer Vision

· Working on perception systems for self-driving cars
· Work spans simulation data, generative AI, real data, creating machine learning models

Huawei Technologies, Helsinki, Finland May 2022 - September 2022
Senior Computer Vision Researcher, Cloud R&D

· Worked on the similar image search project for petalsearch.com
· Worked on data preparation, benchmarked different neural networks to decide the candidate for our task, created tools for very fast evaluations, coordinated with internal and external team members for project goal alignment, helped deliver the trained neural network for deployment

Niantic Research, London May 2021 - August 2021
Research & Development Intern with Dr. Eric Brachmann, Dr. Aron Monszpart, Dr. Sara Vicente, Dr. Guillermo Garcia-Hernando, and Prof. Gabriel J. Brostow

· Worked on 3D scene understanding problem, useful for augmented reality
· Worked on creating dataset and a novel network architecture

Amazon Lab 126, Sunnyvale, California June 2019 - September 2019
Applied Scientist Intern with Dr. Siddhartha Chandra, Dr. Amit Agrawal, and Dr. Ambrish Tyagi

· Worked on weakly supervised image segmentation
· The work was accepted at ECCV 2020

Visual Computing Group, TUM, Munich June 2017 - August 2017
Research Intern advised by Prof. Matthias Niessner

· Able to predict coarse 3D shape and colors of an object given its image from a single viewpoint
· Rendered images and created voxel data from available meshes using MLib
· Worked on getting finer and diverse predictions

Microsoft Research India June 2016 - May 2017
Research Fellow advised by Dr. Sundararajan Sellamanickam

· Worked on Cloud Services Modeling. Designed anomaly detection models for multi-variate time-series
· Explored MRF based approach to compare time-series of different types based on unusual characteristics
· Worked on creating recommender system for Office application

Xerox Research Centre India May 2015 - July 2015
Research Intern advised by Dr. Narayanan Unny

· Explored lasso regression to get interpretable Sparse model for a high feature dataset
· Created a novel method to estimate missing values under constraints

Monet Networks Inc. May 2014-July 2014
Intern advised by Dr. Anurag Bist, CEO

· Understood the existing Facial Expression Recognition API and its usage. Worked on backend to capture and store video using existing WebRTC APIs
· Developed specific metrics on non-verbal cue analytics for content rating

PUBLICATIONS

1. **Calibrating Deep Neural Networks using Focal Loss**
   Jishnu Mukhoti*, **Viveka Kulharia***, Amartya Sanyal, Stuart Golodetz, Philip H. S. Torr, Puneet K. Dokania
   NeurIPS 2020

2. **Box2Seg: Attention Weighted Loss and Discriminative Feature Learning for Weakly Supervised Segmentation**
   Viveka Kulharia*, Siddhartha Chandra*, Amit Agrawal, Philip H.S. Torr, Ambrish Tyagi
   ECCV 2020

3. **On using Focal Loss for Neural Network Calibration**
   Jishnu Mukhoti*, **Viveka Kulharia***, Amartya Sanyal, Stuart Golodetz, Philip H. S. Torr, Puneet K. Dokania
   ICML 2020 workshop on Uncertainty and Robustness in Deep Learning (UDL) as **'Spotlight'**: top 10% of accepted papers

4. **A Revised Generative Evaluation of Visual Dialogue**
   Daniela Massiceti, **Viveka Kulharia**, Puneet K. Dokania, N. Siddharth, Philip H. S. Torr
   Preprint arXiv:2004.09272, 2020

5. **Domain Partitioning Network**
   Botos Csaba, Adnane Boukhayma, **Viveka Kulharia**, András Horváth, Philip H. S. Torr
   Preprint arXiv:1902.08134, 2019

6. **Multi-Agent Diverse Generative Adversarial Networks**
   Arnab Ghosh*, **Viveka Kulharia***, Vinay Namboodiri, Philip H. S. Torr, Puneet K. Dokania
   CVPR 2018 as **'Spotlight paper'**

7. **Similarity Learning for Dense Label Transfer**
   Mohammad Najafi*, **Viveka Kulharia***, Ajanthan Thalaiyasingam, Philip H. S. Torr
   CVPR 2018 workshop on The 2018 DAVIS Challenge on Interactive Video Object Segmentation - **'Second place'**

8. **Contextual RNN-GANs for Abstract Reasoning Diagram Generation**
   Viveka Kulharia*, Arnab Ghosh*, Amitabha Mukerjee, Vinay Namboodiri, Mohit Bansal
   AAAI 2017 as poster, **NIPS 2016** workshop on Adversarial Training

9. **Message Passing Multi-Agent GANs**
   Viveka Kulharia*, Arnab Ghosh*, Vinay Namboodiri
   Preprint arXiv:1612.01294, 2016

PATENTS

1. **Segmentation using attention-weighted loss and discriminative feature learning**
   Ambrish Tyagi, Siddhartha Chandra, Amit Kumar Agrawal, Viveka Kulharia
   US Patent 11,450,008

PROFESSIONAL SERVICE

Reviewer: CVPR 2022-23, ECCV 2022, NeurIPS 2021-22, TPAMI 2020-21, L3D-IVU CVPR2023 workshop, Pre-registration Experiment (NeurIPS workshop 2020-21 and special edition of PMLR 21), BMVC 2020

TALKS

2020 Presented Calibration work at NeurIPS 2020 in December
2020 Presented Box2Seg work at Multidisciplinary University Research Initiatives (MURI) in December
2020 Talk on Box2Seg work at Five AI, Cambridge in October
2020 Presented Box2Seg work at ECCV 2020 in August
2018 'Understanding and reconstructing scenes' talk at MURI in Boston, US in September
2018 Spotlight talk on MAD-GAN work at CVPR-18 at Salt Lake City, US in June
2018 Talk on MAD-GAN work at the University of Adelaide, Australia in February
2017 Discussed MAD-GAN work on Dataskeptic podcast in May

OTHER ACHIEVEMENTS

2018 Won the best poster prize at PAISS - AI summer school in Grenoble, awarded 350 euros
2018 Second position in CVPR-18 DAVIS Challenge on Interactive VOS, awarded Adobe creative license.
2018 Funding from NAVER Labs to attend Prairie AI Summer School (PAISS) in Inria Grenoble, France
2018 Awarded Light Senior Scholarship for the academic year 2018-19 by St Catherine's College, Oxford
2018 Travel grant for Robotics Vision Summer School (RVSS) in Kioloa, Australia
2017 Selected for PhD at University of Oxford funded by Toyota Research Institute
2016 Travel grant for NUS Workshop on Contemporary Research in Computer Science and Information Systems 2016, Singapore
2016 Selected for "Xerox Open 2016", Bangalore
2015 Got 13th position out of 702 registered teams in coding contest OPC-Pravega, Codechef.com
2014 Developed programs for Microchip controller dsPIC33FJ256GP710 at Lohia Corp Ltd.
2014 Developed Monopoly strategy game for windows 8 pc in Microsoft Appathon
2014 Academic Excellence Award by IIT Kanpur for the academic year 2012-13
2013 Got Yellow Belt in Taekwondo, IIT Kanpur
2012 Got 2nd Place, Basketball, overall among all 1st year students organized by CPA, IIT Kanpur
2012 All India Rank 254 in IIT-JEE among 5.6 lakh students
2008 Secured All India Rank 1, KVS Junior Mathematics Olympiad

TEACHING EXPERIENCE

- **British Physics Olympiad (BPhO) Marker**: Helped Department of Physics, University of Oxford in marking BPhO Round 1 copies in 2017.
- **Mentor, Machine Learning: Tools, techniques, applications (CS 771):** Conducted doubt sessions, helped setting assignment problems and post their solutions in the graduate level course of around 200 students under the guidance of Prof. Harish Karnick in 2016.
- **Teaching Assistant, Data Structure and Algorithms (ESO 207):** Helped setting assignments and exam problems, post their solutions, grade assignments, invigilate exams and set doubt remedy hours in the course of around 300 students under the guidance of Prof. Shashank K Mehta in 2015.
- **Mentor, Fundamentals of Computing (ESC 101):** Mentored 6 students in the course that deals with programming in C under the guidance of Prof. Raghunath Tewari in 2014.

UNDERGRADUATE RESEARCH PROJECTS

- **Contextual RNN-GAN:** Developed a new RNN learning framework using Generative Adversarial Networks (GANs) for generating images evolving with time and showed that it can solve Diagrammatic Abstract Reasoning section of IQ-Tests.
- **Message Passing Multi-Agent GANs:** Created a network of GANs which could compete or collaborate while passing messages. It performed better than DCGAN on representation learnt.
- **Neural Jigsaw Solver:** Designed a novel deep neural net based model for predicting the correct order of images in a scrambled jigsaw puzzle. It was competitive with heuristic based algorithms.
- **Alternating Least Squares:** Understood the implementations of ALS in Matlab, Hadoop and Spark. Studied the theoretical bounds on ALS through AltMinComplete and implemented parallelized AltMinComplete in Spark to compare with ALS.
- **Kernels for Graph Similarity:** Implemented and compared the running times of Shortest Path Kernels and Random Walk Kernels on chemical molecules and protein graphs after exploring ways of efficiently finding similarity between graphs using graph kernels.

OTHER UNDERGRADUATE PROJECTS

- **Semantic Compositionality through Recursive Matrix-Vector Spaces:** Worked on Recursive Neural Networks to get semantic relation between nominals of sentence. Model learnt on SemEval 2010 Task8 was tested for domain adaptation using similar dataset: SemEval 2007 Task4
- **IMDB sentiment analysis:** Worked on various methods of feature extraction and various classifiers for sentiment analysis of movie reviews from IMDB Kaggle dataset and compared them.
- **Course Recommender:** Created a web-app for course recommendation using Collaborative Filtering Algorithm. It can be used for rating the courses, fixing meetings and automatic grading.
- **Knowledge sharing App:** Created a Question-answering platform where students can ask questions and professors can conduct survey. NLTK library was used to avoid spamming of questions.
- **Kinect Controlled Bot:** Programmed ATmega32 to control the arm and bot motion. Implemented inverse Kinematics in C++ to direct the bot to reach a location or move arm to target.
- **Oz Interpreter:** Created the functional language interpreter where declarative sequential model included features such as variable binding, records, pattern recognition, conditionals, procedures and recursion and it was extended to deal with concurrency with feature of Threads.

- **Java Compiler:** Implemented Java to MIPS compiler in C++ which supports loops, expressions, type checking, primitive datatypes, 1D arrays and recursion.
- **NachOS Operating System:** Extended NachOS by implementing system calls, page replacement algorithms and job scheduling algorithms.

POSITIONS OF RESPONSIBILITY

- **Secretary, Oxford Union Salsa Society, University of Oxford:** Helped disseminate events' information and smoothly conducted organizing team meetings
- **Secretary, Association of Computing Activities, IIT Kanpur:** Created a central website which includes the schedule and description of upcoming events. Worked to conduct events like fresher's night, Microsoft code.fun.do and Yahoo! HackU
- **Mentor, PClub Summer Project, IIT Kanpur:** Mentored a team of 4 students to develop Programming Club website using MVC framework.

SKILLS

• Computer Vision • Deep Learning • Machine Learning
• Python • PyTorch • Tensorflow • C • C++
• SQL • Shell Script • LaTeX • R • Octave • Matlab
• JavaScript • C# • GNUPlot