Yash Sanjay Bhalgat

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EDUCATION

University of Oxford — **Oct '21 - Ongoing**
DPhil (PhD), Autonomous Intelligent Machines and Systems @ Visual Geometry Group (VGG)

University of Michigan, Ann Arbor — **Sep '17 - Dec '18**
Masters, Computer Science and Engineering

Indian Institute of Technology, Bombay — **Jul '13 - May '17**
B.Tech. with *Honors* in Electrical Engineering and *Minor* in Computer Science

WORK EXPERIENCE

Qualcomm AI Research | *Senior Machine Learning Researcher* [Nov '20 - Jul '21]
Machine Learning Researcher [Jun '19 - Oct '20]

- My main role was algorithm and system design to develop efficient deep networks for computer vision use-cases
- Developed pipelines and published papers on low-bit quantization [LSQ+, QKD], structured [StructConv] and unstructured [LTP] pruning. Filed 12 inventions in FY2020 of which 5 ideas have been filed for patent protection.
- Led the ultra-low resource vision use-case development project from model design, quantization to final hardware mapping
- Led Qualcomm's team in the MicroNet Challenge at NeurIPS 2019, and achieved 3rd rank in ImageNet track [Code]
- Manager/mentor for intern John Yang (PhD @ SNU) working on the 3D hand-pose estimation problem

Voxel51, Inc., *Computer Vision & Machine Learning Engineer* [Feb '19 - May '19]

- Built production-level pipelines for vehicle detection + tracking for querying on large-scale video databases
- Researched and developed efficient action classification models based on C3D, I3D and TSN backbone networks
- Developed several engineering solutions to bring the FPS processing speed of our pipelines closer to real-time

PUBLICATIONS

Conference Publications * equal contribution

4. **Dynamic Iterative Refinement for Efficient 3D Hand Pose Estimation.**
John Yang, *Yash Bhalgat*, Simyung Chang, Fatih Porikli, Nojun Kwak.
*Winter Conference on Applications of Computer Vision (***WACV***), 2022*

3. **Structured Convolutions for Efficient Neural Network Design.** [Paper]
Yash Bhalgat, Yizhe Zhang, Jamie Lin, Fatih Porikli.
*Neural Information Processing Systems (***NeurIPS***), 2020*

2. **Teacher-Student Paradigm for Tri-training: An Efficient Method for Unlabeled Data Exploitation.** [Paper]
Yash Bhalgat, Zhe Liu, Pritam Gundecha, Jalal Mahmud, Amita Misra.
*Conference on Natural Language Processing (***KONVENS***), 2019*

1. **CatsEyes: Categorizing seismic structures with scattering wavelet networks.** [Paper] [Poster]
Yash Bhalgat, Laurent Duval, Jean Charlety.
*International Conference on Acoustics, Speech, and Signal Processing (***ICASSP***), 2018*

Unpublished Manuscripts

2. **Learned Threshold Pruning.** *arXiv:2003.00075 (***under review***)* [Paper]
Kambiz Azarian, *Yash Bhalgat*, Jinwon Lee, Tijmen Blankevoort.

1. **QKD: Quantization-aware Knowledge Distillation.** *arXiv:1911.12491* [Paper]
*Yash Bhalgat**, Jangho Kim*, Jinwon Lee, Chirag Patel, Nojun Kwak.

Workshops

2. **LSQ+: Improving low-bit quantization through learnable offsets and better initialization.** [Paper]
Yash Bhalgat, Jinwon Lee, Markus Nagel, Tijmen Blankevoort, Nojun Kwak.
CVPR Workshop on Efficient Deep Learning in Computer Vision, 2020

1. **Annotation-cost Minimization for Medical Image Segmentation using Suggestive Mixed Supervision Fully Convolutional Networks**. [Paper]
*Yash Bhalgat**, Meet Shah*, Suyash Awate. *Medical Imaging meets NeurIPS Workshop, 2018*

INTERNSHIPS & SELECTED PROJECTS

[Project] NeurIPS '19 MicroNet challenge - 3rd place, ImageNet track [Code] [Jul '19 - Oct '19]

- Developed fast evolutionary search algorithm for mixed precision quantization optimized for both param and MAC count
- Developed an end-to-end pipeline with quantization-aware training, knowledge distillation and unstructured pruning
- Achieved 8x compression on EfficientNet-B0 and MixNet-S on ImageNet with less than 1% drop in accuracy

[Internship] IBM Almaden Research Center, *Mentor - Zhe Liu, Pritam Gundecha* [Summer '18]

- Proposed teacher-student learning paradigm for task-agnostic classification in presence of label noise in training data
- Built neural network based ensemble frameworks to integrate weakly-labeled and high-quality training samples [Paper]

[Internship] IFP Energies nouvelles, Paris, *Mentor - Laurent Duval* [Summer '17]

- Proposed a method for extraction of deformation invariant features of geophysical images, followed by feature selection
- Exploited the sparse structure of data to process gigabyte-sized images in real time (ICASSP 2018) [Paper]

[Thesis] Scattering Wavelet Network based Robust Fingerprint Classification [Jul '16 - Apr '17]

- *Guide: Prof. Vikram Gadre*. Explored ScatNets based approaches for robust feature extraction combined with Local Non-linear Total Variation based texture enhancement. Awarded Undergraduate Research Award (URA02) for this work.

[Internship] IBM Research, Bangalore, *Mentor - Vikas Raykar* [Summer '16]

- Joint multi-modal representations for e-commerce catalog search by visual attributes *without* manual tagging
- Implemented autoencoder-based CorrNet in Theano achieving a query-search over 4 million images in 2-3 milliseconds

[Internship] Infurnia, Mumbai [Summer '15]

- Created a range of linear programming solvers in Python and C++ for an augmented reality based furniture startup

SKILLS

Languages	Python (proficient), C++ (moderate), Julia, MATLAB, Verilog, Bash, LaTeX
Frameworks	PyTorch (proficient), TensorFlow and Keras (basic), OpenAI gym, CUDA, Theano, OpenCV, git

RELEVANT COURSES

Machine Learning, Advanced Computer Vision, Reinforcement Learning, Estimation and Identification, Parallel Computing, Medical Image Processing, Advanced Signal Processing, Information Retrieval, Probability and Random Processes, Matrix Computations, Computational Data Science, Algorithms, Data Structures, Differential Equations, Complex Analysis

PROFESSIONAL RESPONSIBILITIES

Qualcomm AI Research	Currently sub-track lead for the Compute-Adaptive Perception track Led Computer Vision reading group with engagement from multiple Qualcomm teams Judge panel, Qualcomm Innovation Fellowship winner selection for ML proposals	
University of Michigan, *Graduate Student Instructor*	Computational Data Science, *Prof. Raj Nadakuditi* Introduction to Logic Design, *Prof. Matthew Smith*	[Fall '18] [Winter '18]
IIT Bombay, *Teaching Assistant*	Wavelets, *Prof. Vikram Gadre* Quantum Mechanics and Applications, *Prof. Siva Prasad*	[Fall '16, Winter '17] [Fall '14, Winter '15]

SCHOLASTIC ACHIEVEMENTS

- Awarded the Undergraduate Research Award (URA 02) for exceptional work during Bachelors Thesis
- Awarded Cargill Global Scholarship 2014-15 and 2015-16 for excellence in leadership and academic skills
- All India Rank **12** in IITJEE-Mains exam among 1,000,000 candidates
- All India Rank **155** in IITJEE-Advanced exam among 150,000 candidates
- All India Rank **60** in KVPY Scholarship by Govt. of India among 0.2 million candidates
- Selected in National Top 30 (for OCSC camp) for International Astronomy Olympiad '13
- Among top 300 in India in the Physics, Chemistry and Mathematics olympiads
- Visharad Degree (i.e. Bachelor of Music) in Indian Classical Music for playing Tabla