

# Yash Sanjay Bhalgat

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## EDUCATION

<b>University of Oxford</b> <i>DPhil (PhD), Autonomous Intelligent Machines and Systems @ Visual Geometry Group (VGG)</i>	Oct '21 - Ongoing
<b>University of Michigan, Ann Arbor</b> <i>Masters, Computer Science and Engineering</i>	Sep '17 - Dec '18
<b>Indian Institute of Technology, Bombay</b> <i>B.Tech. with Honors in Electrical Engineering and Minor in Computer Science</i>	Jul '13 - May '17

## WORK EXPERIENCE

<b>Qualcomm AI Research</b>   <i>Senior Machine Learning Researcher</i> <i>Machine Learning Researcher</i>	[Nov '20 - Jul '21] [Jun '19 - Oct '20]
<ul style="list-style-type: none"><li>My main role was algorithm and system design to develop efficient deep networks for computer vision use-cases</li><li>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.</li><li>Led the ultra-low resource vision use-case development project from model design, quantization to final hardware mapping</li><li>Led Qualcomm's team in the MicroNet Challenge at NeurIPS 2019, and achieved 3rd rank in ImageNet track [Code]</li><li>Manager/mentor for intern John Yang (PhD @ SNU) working on the 3D hand-pose estimation problem</li></ul>	
<b>Voxel51, Inc., Computer Vision &amp; Machine Learning Engineer</b>	[Feb '19 - May '19]
<ul style="list-style-type: none"><li>Built production-level pipelines for vehicle detection + tracking for querying on large-scale video databases</li><li>Researched and developed efficient action classification models based on C3D, I3D and TSN backbone networks</li><li>Developed several engineering solutions to bring the FPS processing speed of our pipelines closer to real-time</li></ul>	

## PUBLICATIONS

### Conference Publications

\* equal contribution

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

- A Prompt Array Keeps the Bias Away: Debiasing Vision-Language Models with Adversarial Learning** [Paper]  
Hugo Berg, Siobhan Hall, Yash Bhalgat, Wonsuk Yang, Hannah Rose Kirk, Aleksandar Shtedritski, Max Bain.
- Learned Threshold Pruning.** *arXiv:2003.00075* [Paper]  
Kambiz Azarian, Yash Bhalgat, Jinwon Lee, Tijmen Blankevoort.
- QKD: Quantization-aware Knowledge Distillation.** *arXiv:1911.12491* [Paper]  
Yash Bhalgat\*, Jangho Kim\*, Jinwon Lee, Chirag Patel, Nojun Kwak.

## Workshop Publications

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

<b>Languages</b>	Python (proficient), C++ (moderate), Julia, MATLAB, Verilog, Bash, $\LaTeX$
<b>Frameworks</b>	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

## TEACHING EXPERIENCE

<b>University of Oxford,</b> <i>Tutor</i>	Computer Graphics, <i>with Dr. Jassim Happa, Stuart Golodetz</i>	[Hillary '22]
	Artificial Intelligence, <i>with Prof. Bernardo Cuenca Grau</i>	[Hillary '22]
<b>University of Michigan,</b> <i>Graduate Student Instructor</i>	Computational Data Science, <i>with Prof. Raj Nadakuditi</i>	[Fall '18]
	Introduction to Logic Design, <i>with Prof. Matthew Smith</i>	[Winter '18]
<b>IIT Bombay,</b> <i>Teaching Assistant</i>	Wavelets, <i>with Prof. Vikram Gadre</i>	[Fall '16, Winter '17]
	Quantum Mechanics and Applications, <i>with Prof. Siva Prasad</i>	[Fall '14, Winter '15]

## PROFESSIONAL SERVICE

**At Qualcomm AI Research:** Judge panel, Qualcomm Innovation Fellowship winner selection for ML proposals  
**Reviewer:** EMNLP '22, '21; ECCV '22; Transactions on Multimedia; Transactions on Neural Networks & Learning Systems  
**Website Chair** for BMVC 2022.

## SCHOLASTIC ACHIEVEMENTS

- Awarded the Undergraduate Research Award (URA 02) for exceptional work during Bachelors Thesis at IIT Bombay
- 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
- Selected among top 300 participants of India to compete in **all three national olympiads**: INPhO (Indian National Physics Olympiad), INChO (Chemistry), INAO (Astronomy)
- Visharad Degree (i.e. Bachelors in Music) in Indian Classical Music for playing Tabla