

Yash Sanjay Bhalgat

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EDUCATION

University of Oxford

DPhil (PhD), Computer Vision and Machine Learning @ Visual Geometry Group (VGG)

Advisors: Andrea Vedaldi, Andrew Zisserman, Joao Henriques, Iro Laina

Oct '21 - Ongoing

University of Michigan, Ann Arbor

Masters, Computer Science and Engineering

Sep '17 - Dec '18

Indian Institute of Technology, Bombay

B.Tech. with Honors in Electrical Engineering and Minor in Computer Science

Jul '13 - May '17

WORK EXPERIENCE

Visual Geometry Group, Univ of Oxford, Student Researcher

[Oct '21 - Ongoing]

Advisors: Prof. Andrea Vedaldi, Prof. Andrew Zisserman, Joao Henriques, Iro Laina

- Open-sourced Pytorch version of NVIDIA's Instant Training of Neural Graphics primitives. 500 stars on github. [Project]
- Worked on 3D scene decomposition into static-vs-dynamic objects from a monocular video using dynamic view synthesis.
- Currently working on a new formulation of neural implicit surface rendering using VAEs and SDF-like sphere tracing.
- Currently also working on improving the performance of image instance retrieval by incorporating 3D priors.

Qualcomm AI Research

Senior Machine Learning Researcher

[Nov '20 - Jul '21]

Machine Learning Researcher

[Jun '19 - Oct '20]

- Notable works are 3D hand-pose estimation [DIR-Net], low-bit quantization [LSQ+, QKD], structured [StructConv] and unstructured [LTP] pruning. Filed 12 inventions in FY2020 of which 6 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 real-time 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

PUBLICATIONS

Conference Publications

* equal contribution

6. **A Light Touch Approach to Teaching Transformers Multi-view Geometry.** [Paper]
Yash Bhalgat, Joao Henriques, Andrew Zisserman.
Computer Vision and Pattern Recognition (CVPR), 2023
5. **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.
AAAI-International Joint Conference on Natural Language Processing (AAAI-IJCNLP), 2022
4. **Dynamic Iterative Refinement for Efficient 3D Hand Pose Estimation.** [Paper]
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

Workshop Publications

2. **LSQ+: Improving low-bit quantization through learnable offsets & better initialization.** Yash Bhalgat, Jinwon Lee, Markus Nagel, Tijmen Blankevoort, Nojun Kwak. *CVPRW Efficient Deep Learning in Computer Vision, 2020* [Paper]
1. **Annotation-cost Minimization for Medical Image Segmentation using Suggestive Mixed Supervision Fully Convolutional Networks.** Yash Bhalgat*, Meet Shah*, Suyash Awate. *Medical Imaging meets NeurIPS, 2018* [Paper]

Unpublished Manuscripts

2. **Learned Threshold Pruning.** Kambiz Azarian, Yash Bhalgat, Jinwon Lee, Tijmen Blankevoort. [arXiv:2003.00075]
1. **Quantization-aware Knowledge Distillation.** Yash Bhalgat*, Jangho Kim*, J. Lee, C. Patel, N. Kwak. [arXiv:1911.12491]

PATENTS

6 patents in Computer Vision, Machine (Deep) Learning and Edge Computing.

Patent IDs: US 17/653,855; US 17/175,487; US 17/336,048; US 17/168,101; US 17/067,233; US 16/451,693;

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 <1% accuracy drop

[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 train data [Paper]

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

- Proposed a method for extraction of deformation invariant features of geophysical images. 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 Scattering Wavelet Networks 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

SKILLS

Languages	Python (proficient), C++ (moderate), Julia, MATLAB, Verilog, Bash, L ^A T _E X
Frameworks	PyTorch (proficient), TensorFlow and Keras (basic), OpenAI gym, CUDA, Theano, OpenCV, git, slurm

TEACHING EXPERIENCE

University of Oxford, <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]
University of Michigan, <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]
IIT Bombay, <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: CVPR '23, ECCV '22; EMNLP '22, '21; Trans Multimedia; Trans 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