Yash Sanjay Bhalgat

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EDUCATION

University of Michigan, Ann Arbor, MI   **Sep '17 - Dec '18**
Masters, Computer Science and Engineering, **GPA**: 3.64/4.0

Indian Institute of Technology, Bombay,   **Jul '13 - May '17**
B.Tech. with *Honors* in Electrical Engineering and *Minor* in Computer Science, **GPA**: 9.35/10.0

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

WORK EXPERIENCE

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

- My main role has been 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 10 IDFs 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]
- Current research focuses: (1) Conditional Compute, (2) AR/VR use-cases, (3) Efficient Training of deep networks

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 action classification models based on C3D, I3D and TSN networks
- Developed several engineering solutions to bring the FPS processing speed of our pipelines closer to real-time

PUBLICATIONS

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

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

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

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

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

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

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

SKILLS

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

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

Other Projects
- **Convolutional Neural Network from scratch**, Advanced Computer Vision [Code]
- **Emotion from Speech (CNNs, HMMs)**, DSP Poster presentation [Code]
- **Automated Stellarium Laser Pointing device**, Electronic Design Lab [Demo]
- **Multicycle RISC15** - Verilog implementation of 16-bit multi-cycle RISC15 processor [Code]

PROFESSIONAL RESPONSIBILITIES

Qualcomm AI Research	Manager/Mentor, summer intern John Yang (last year PhD student @ SNU) (Ongoing)
	Judge panel, Qualcomm Innovation Fellowship winner selection for ML proposals

University of Michigan, *Graduate Student Instructor*	Computational Data Science, *Prof. Raj Nadakuditi*	[Fall '18]
	Introduction to Logic Design, *Prof. Matthew Smith*	[Winter '18]

IIT Bombay, *Teaching Assistant*	Wavelets, *Prof. Vikram Gadre*	[Fall '16, Winter '17]
	Quantum Mechanics and Applications, *Prof. Siva Prasad*	[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 Classical Indian Music for Tabla