Yash Sanjay Bhalgat

PHONE: +1 928-409-6998 ◇ EMAIL: *yashbhalgat95@gmail.com* • *yashsb@umich.edu*

GITHUB: *github.com/yashbhalgat* ◇ LinkedIn: *yashbhalgat* ◇ WEBPAGE: *yashbhalgat.github.io*

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

WORK EXPERIENCE

[Full-time] Qualcomm AI research, Deep Learning Systems Engineer [06/10/2019 - Ongoing]
- Main role is algorithm development and system design to build efficient deep networks for computer vision use-cases
- Previously developed SOTA algorithms for low-bit quantization, structured and unstructured pruning on deep networks
- Previously led Qualcomm's team in MicroNet Challenge at NeurIPS 2019. Achieved 3rd rank in ImageNet track [github]

[Full-time] Voxel51, Inc., Computer Vision & Machine Learning Engineer [02/18/2019 - 05/31/2019]
- Built production-level pipelines for vehicle detection + tracking for querying on large-scale video databases
- Researched and developed action classification architectures based on C3D, I3D and TSN networks
- Developed several methods to bring the frames-per-second speed of our video processing pipelines closer to real-time

[Internship] IBM Almaden Research Center, *Mentor - Zhe Liu* [Summer '18]
- Proposed teacher-student learning paradigm for task-agnostic classification in presence of label noise in training data
- Built deep learning and ensemble frameworks to integrate weakly-labeled and high-quality training samples

[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)

[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 ms

[Internship] Infurnia, Mumbai [Summer '15]
- Software module development in Python and C++ for an augmented reality based furniture startup
- Created a range of linear programming solvers by modifying functions in the open-source software FreeCAD

[Internship] Mars Society of India, IIT Bombay [Aug '14 - Mar '15]
- Worked in the Navigation and Vision subsystem of a team aimed at building a prototype Mars Rover
- Implemented a video-guided navigation system in ROS (Robotic Operating System) using the A-star algorithm

SKILLS

Languages Python, C/C++, Julia, SQL, MATLAB, Java, Verilog, R, Bash, LaTeX
Packages PyTorch, TensorFlow, Keras, OpenAI gym, CUDA, Theano, OpenCV, git

PUBLICATIONS

- **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 Compute Vision, 2020* (accepted) [Paper]
- **Learned Threshold Pruning**, Kambiz Azarian, *Yash Bhalgat*, Jinwon Lee, Tijmen Blankevoort. arXiv preprint [Paper]
- **QKD: Quantization-aware Knowledge Distillation**, *Yash Bhalgat**, Jangho Kim*, et. al.. arXiv preprint [Paper]
- **Annotation-cost Minimization for Medical Image Segmentation using Suggestive Mixed Supervision Fully Convolutional Networks**, *Yash Bhalgat**, Meet Shah*, et.al., *Medical Imaging meets NeurIPS 2018* (accepted) [Paper]

- **Teacher-Student Learning Paradigm for Tri-training: An Efficient Method for Unlabeled Data Exploitation**, *Yash Bhalgat*, Zhe Liu, Pritam Gundecha, et. al., *KONVENS 2019* (accepted) [Paper]
- **CatsEyes: Categorizing seismic structures with scattering wavelet networks**, *Yash Bhalgat*, Laurent Duval, Jean Charlety, *ICASSP 2018* [Paper] [Poster]
- **Stamp Processing with Examplar Features**, *Yash Bhalgat*, Mandar Kulkarni, Shirish Karande, Sachin Lodha, *DAS 2016* [Paper]

KEY PROJECTS

NeurIPS 2019 MicroNet challenge - 3rd rank in ImageNet track [github] [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

Content based Video Relevance Prediction - ACMMM Challenge [github] [May '18 - Jun '18]
- Implemented Triplet Net in PyTorch combining *video-level* and *frame-level* features with a BiLSTM + 3D CNN model
- Video-embeddings obtained from a dense layer were used to make relevance predictions on unseen videos

Scattering Wavelet Network based approach to Fingerprint Classification [Jul '16 - Apr '17]
Undergraduate Thesis, *Guide: Prof. Vikram Gadre*
- Used ScatNets and Local Non-linear Total Variation model to enhance texture components in fingerprints
- Extended version of this work on Iris classification/recognition submitted to the International Journal of Biometrics

Convolutional Neural Network from scratch, Advanced Computer Vision [github] [Fall '16]
- Implemented a CNN from scratch, with forward/backward pass for Conv/Linear/BatchNorm layers in Python

Sarcasm detection in sentences, Machine Learning (CS 725) [github] [Fall '16]
- Built features based on n-grams, sentence polarity (incongruity), punctuation and emojis with feature selection
- Compared several classifiers and developed meaningful insights on feature relevance to sarcasm detection

Other Projects
- **Emotion from Speech (CNNs, HMMs)**, DSP Poster presentation [github]
- **Segmentation of MRI images using Expectation Maximization**, Estimation and Identification
- **Automated Stellarium Laser Pointing device**, Electronic Design Lab [youtube-demo]
- **Multicycle RISC15** - Verilog implementation of 16-bit multi-cycle RISC15 processor [github]

RELEVANT COURSES

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

TEACHING EXPERIENCE

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

IIT Bombay
Teaching Assistant, Wavelets, *Prof. Vikram Gadre* [Fall '16, Winter '17]
Teaching Assistant, Quantum Mechanics and Applications, *Prof. Siva Prasad* [Fall '14, Winter '15]

SCHOLASTIC ACHIEVEMENTS

- Awarded the Undergraduate Research Award (URA 02) for exceptional work during my Bachelors Thesis.
- All India Rank **12** in IITJEE-Mains exam among 1.5 million students
- All India Rank **155** in IITJEE-Advanced exam among 0.15 million students
- All India Rank **60** in KVPY Scholarship by Govt. of India among 0.2 million candidates

- Featured in National Top 30 for the International Astronomy Olympiad, 2013
- Among top 300 in India to compete in the Physics, Chemistry and Mathematics olympiads.
- Awarded Cargill Global Scholarship 2014-15 and 2015-16 for excellence in leadership and academic skills
- Winner of IMATATHON - Image Processing Hackathon held by Electronics Club, IIT Bombay

REFERENCES

Available on request.