Dhaivat Bhatt

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EDUCATION BACKGROUND

Mila - Quebec AI Institute, University of Montreal   **Montreal, Canada**
Research masters - Deep learning   *Sept. 2019 - Aug 2021*
Related courses: Probabilistic graphical models, Representation learning, Autonomous vehicles, Continual learning

Robotics research center, IIIT Hyderabad   **Hyderabad, India**
MS by research, Computer science and engineering   *Aug. 2016 - Nov. 2018*
Related courses: Digital image processing, Mobile robotics, Computer vision, Statistical methods in AI

BITS Pilani Hyderabad campus   **Hyderabad, India**
BE(Hons.), Electronics and Instrumentation   *Aug. 2012 - Jun. 2016*

PROFESSIONAL EXPERIENCE

Samsung AI center   **Toronto, Canada**
Deep learning research engineer, Multimodal learning group   *September 2021 - Present*

- **Custom Multimodal representations** (Tech used: Pytorch, HF transformers) : Finetuned BLIP2 using prompt-tuning to build custom image-representations with non visual information (name/place/event etc). Used it to build image retrieval system with personalized queries.
- **Custom LLM for QA:** (Tech used: PyTorch, PeFT, transformers) Led a project to build a custom LLM, appropriate for Question-answering in cooking domain. Used LoRA (low rank adaptation) with 100 datapoints to finetune Llama-7B on consumer grade GPU.
- **Strategized QA Dataset Development:** (Tech used: Prompt engineering (Llama-13b), Transformers) Led a team to build an extensive question-answering dataset for custom domain (over 12000 QA pairs), similar to SquadV2 dataset, through prompt engineering. Built an end-to-end novel QA system using this dataset that served as a baseline QA system.
- **Edge Deployment:** (Tech used: Pytorch, torchscript, Android studio) Spearheaded effort to deploy CLIP/ALBEF for edge inference, built trace friendly implementation of CLIP/ALBEF in PyTorch, employed quantization, ported and validated performance on Samsung galaxy S23-ultra.
- **Evaluation framework for image retrieval:** (Tech used: Python, pytorch, transformers) Developed and implemented a robust evaluation framework for text-based image retrieval systems, it was adopted globally across Samsung's AI centers, and is used to evaluate and benchmark more than 25 different models.
- **End to end graph Parsing Architecture:** (Tech used: Transformers, AllenNLP, accelerate) Pioneered end-to-end differentiable recipe-to-flow graph parsing. Achieved 6-point F1 score advancement using semi-supervised learning. This was used in ECCV 2022 publication. Full work accepted to LREC-COLING 2024.

University of Montreal   **Montreal, Canada**
Visiting researcher, MILA - Quebec AI institute   *November 2018 - July 2019*

- Implemented and tested Deep active localization[link] on a real robot(turtlebot). Successfully ported model trained in simulation to real world setup
- Trained and tested Sparseconvnet models to perform road segmentation in a pointcloud data for Maplite[link]

SELECTED PUBLICATIONS

- *Reviewer:* ICML, CVPR, ICRA, RAL, RO-MAN
- *End-to-end Parsing of Procedural Text into Flow Graphs*[LREC-COLING 2024] : **Dhaivat Bhatt***, Ahmad Pourihosseini*, Federico Fancellu and Afsaneh Fazly
- *f-Cal: Aleatoric uncertainty quantification for robot perception via calibrated neural regression*[ICRA 2022] : **Dhaivat Bhatt***, Kaustubh Mani*, Dishank Bansal, Krishna Murthy Jatavallabhula, Hanju Lee, Liam Paull
- *Probabilistic object detection: Strenghts, Weaknesses, and Opportunities* [ICML AIAD 2020 Workshop] : **Dhaivat Bhatt***, Dishank Bansal*, Gunshi Gupta*, Hanju Lee, Krishna Murthy Jatavallabhula, Liam Paull
- *Have I reached the intersection: A deep learning-based approach for intersection detection from monocular cameras*[IROS 2017]: **Dhaivat Bhatt***, Danish Sodhi*, Arghya Pal, Vineeth Balasubramanian, Madhava Krishna
- *Probabilistic obstacle avoidance and object following: An overlap of Gaussians approach*[RO-MAN 2019]: **Dhaivat Bhatt***, Akash Garg*, Bharath Gopalakrishnan, K. Madhava Krishna
- *MapLite: Autonomous intersection navigation without detailed prior maps*[RAL + ICRA 2020]: Teddy Ort,Krishna Murthy, Rohan Banerjee, Sai Krishna Gottipati, **Dhaivat Bhatt**, Igor Gilitschenski, Liam Paull, Daniela Rus
- *Flow Graph to Video Grounding for Weakly-Supervised Multi-step Localization*[ECCV 2022 (oral)] : Nikita Dvornik, Isma Hajdi, Hai Pham, **Dhaivat Bhatt,** Brais Martinez, Afsaneh Fazly, Allan D. Jepson

ACADEMIC PROJECTS

Out of distribution detection in object detection   **Montreal, Quebec**
Prof. Liam Paull, Denso Corporation   *Jan 2020 - August 2020*

- Researched and analyzed existing OOD detection methods in context of object detection
- Identified a background class problem that severely impacts applicability of typical OOD detection techniques

Principled evaluation of probabilistic object detectors   **Montreal, Quebec**
Prof. Liam Paull, MITACS research training   *July 2020 - November 2020*

- Designed Mahalanobis distance based criteria for identifying true positives
- Integrated proposed criteria in mAP, PDQ and LRP to fairly evaluate Probabilistic object detectors

Incremental learning of object detector through knowledge distillation   **Montreal, Quebec**
Continual learning - Course project   *Jan 2020 - April 2020*

- Designed and implemented incremental learning pipeline for object detection in detectron2
- Identified a design flaw in existing state of the art object detectors that fuels catastrophic forgetting in Object detection
- Employed knowledge distillation to alleviate issue of catastrophic forgetting

Evaluating Robustness of Generative Classifiers Against Adversarial Examples   **Montreal, Quebec**
Probabilistic graphical models - Course project   *Sept 2019 - Dec 2020*

- Built and implemented robust Generative classifier to circumvent issue of adversarial attacks.
- Ascertained robustness of generative classifiers to adversarial perturbations

AWARDS AND HONORS

- May 2020: Our paper, Maplite, was given best paper award for RAL 2019 at awards ceremony, ICRA 2020.
- Sept 2019: Fully funded research masters position at MILA - Quebec AI institute
- Aug 2019: Type C scholarship, which exempted me from paying international fees at University of Montreal(7,179 CAD per trimester)
- June 2020: MITACS research training fellowship(Amount: 6000 CAD)
- Aug 2017: Microsoft research travel grant for traveling to IROS 2017(Amount: 70,000 INR (1000 USD of 2017))
- Jul 2017: RAS travel grant to cover expenses partially for IROS 2017(Amount: 694 USD)
- Aug 2016: Research fellowship at IIIT Hyderabad, to cover tuition fees and living expenses(Amount: 350,000 INR (5000 USD of 2017))

Skills

- **Programming Languages:** Python, Bash Scripting, Java, C++
- **Python Frameworks and Tools:** PyTorch, transformers, AllenNLP, OpenCV, detectron2, FiftyOne
- **Framework and Tools:** Git, GitHub, AWS, Anyscale Ray, Torchscript