

JISHNU MUKHOTI

DPhil (PhD) Candidate with Supervisors: Philip Torr and Yarin Gal, University of Oxford

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Research Experience

Scalable uncertainty quantification & robustness of neural networks; multi-modal foundation models.

Education

University of Oxford

Oct. 2019 - Present

DPhil(PhD) in Engineering Science (Focusing on Machine Learning)

Oxford, UK

- Supervisors: Prof. Philip Torr & Prof. Yarin Gal
- Thesis: Scalably Expanding a Neural Network's Ability to Recognize Visual Concepts
- Fully funded by a Research Studentship from the Department of Engineering Science, University of Oxford.

University of Oxford

Oct. 2017 - Sept. 2018

MSc in Computer Science (Focusing on Machine Learning)

Oxford, UK

- Supervisor: Prof. Yarin Gal
- Thesis: Benchmarks on Bayesian Deep Learning in Image Segmentation
- Graduated with distinction.

Jadavpur University

June 2012 - May 2016

BE (Bachelor of Engineering) in Computer Science & Engineering

Kolkata, India

- CGPA: 9.65/10, University Topper & Gold Medalist, Best Undergraduate Thesis Award.

Publications

1. **Jishnu Mukhoti**, Yarin Gal, Philip Torr, Puneet Dokania, *Fine-tuning can cripple your foundation model; preserving features may be the solution*, (arxiv:2308.13320, **under submission**).
2. **Jishnu Mukhoti**, Tsung-Yu Lin, Omid Poursaeed, Rui Wang, Ashish Shah, Philip Torr, Ser-Nam Lim, *Open Vocabulary Semantic Segmentation with Patch Aligned Contrastive Learning*, in **CVPR, 2023 (Highlight)**.
3. **Jishnu Mukhoti**^{1*}, Andreas Kirsch*, Joost van Amersfoort, Philip Torr, Yarin Gal, *Deep Deterministic Uncertainty: A New Simple Baseline*, in **CVPR, 2023 (Highlight)**.
4. **Jishnu Mukhoti***, Viveka Kulharia*, Amartya Sanyal, Stuart Golodetz, Philip Torr, Puneet Dokania, *Calibrating Deep Neural Networks using Focal Loss*, in **NeurIPS, 2020**.
5. **Jishnu Mukhoti**, Tsung-Yu Lin, Borchun Chen, Ashish Shah, Philip Torr, Puneet Dokania, Ser-Nam Lim, *Raising the Bar on the Evaluation of OoD Detection*, **ICCV 2023 Proceedings**, Workshop on Out Of Distribution Generalization in Computer Vision (**Oral**).
6. **Jishnu Mukhoti***, Viveka Kulharia*, Amartya Sanyal, Stuart Golodetz, Philip Torr, Puneet Dokania, *On using Focal Loss for Neural Network Calibration*, in **ICML 2020 Workshop on Uncertainty & Robustness in Deep Learning (UDL) (Spotlight)**.
7. **Jishnu Mukhoti**, Joost van Amersfoort, Philip Torr, Yarin Gal, *Deep Deterministic Uncertainty for Semantic Segmentation*, **ICML 2021 Workshop on Uncertainty & Robustness in Deep Learning (UDL)**.
8. Andreas Kirsch, **Jishnu Mukhoti**, Joost van Amersfoort, Philip Torr, Yarin Gal, *On Pitfalls in OoD Detection: Entropy Considered Harmful*, **ICML 2021 Workshop on Uncertainty & Robustness in Deep Learning (UDL)**.
9. **Jishnu Mukhoti**, Yarin Gal, *Evaluating Bayesian Deep Learning Methods for Semantic Segmentation*, arxiv:1811.12709.
10. **Jishnu Mukhoti**, Pontus Stenetorp, Yarin Gal, *On the Importance of Strong Baselines in Bayesian Deep Learning*, in **NeurIPS 2018 Workshop on Bayesian Deep Learning**.
11. **Jishnu Mukhoti**, Puneet Dokania, Philip Torr, Yarin Gal, *On Batch Normalisation for Approximate Bayesian Inference* in the 3rd **Symposium on Advances in Approximate Bayesian Inference**, 2021.
12. Diptendu Bhattacharya, **Jishnu Mukhoti**, Amit Konar, *Learning Regularity in an Economic Time-Series for Structure Prediction*, in **Elsevier, Applied Soft Computing**, 2019.
13. **Jishnu Mukhoti**, Pratyusha Rakshit, Diptendu Bhattacharya, Amit Konar, Atulya Nagar, *Knowledge Extraction from a Time-Series using Segmentation, Fuzzy Matching and Predictor Graphs*, in IEEE Conference on Fuzzy Systems, 2016.
14. **Jishnu Mukhoti**, Sukanya Dutta, Ram Sarkar, *Handwritten Digit Classification in Bangla and Hindi using Deep Learning*, in Taylor & Francis, Applied Artificial Intelligence, 2020.

^{1*}: equal contribution

Industry Experience

Meta AI Research

Jun 2022 - Sept 2022

Research Scientist Intern

New York City, USA

- Project: Open Vocabulary Semantic Segmentation (hosted by Tsung-Yu Lin & Ser-Nam Lim)
- Published and awarded a highlight in CVPR 2023.

Meta AI Research

Jun 2021 - Sept 2021

Research Scientist Intern

Remote

- Project: Raising the Bar on the Evaluation of OoD Detection (hosted by Tsung-Yu Lin & Ser-Nam Lim)
- Published in the Proceedings of ICCV 2023 OOD-CV workshop and awarded an Oral presentation.

FiveAI

Aug 2018 - Aug 2019

Research Scientist Intern

Oxford, UK

- Project: Calibration in deep neural networks (hosted by Stuart Golodetz & Puneet Dokania)
- Published in NeurIPS 2020, awarded a Spotlight presentation in ICML 2020, UDL Workshop.

Amazon

June 2016 - Aug 2017

Software Development Engineer (SDE)

Hyderabad, India

- Project: Real-time data transfer service from OLTP datastores (AWS RDS and DynamoDB) to OLAP datastores (AWS Redshift and Elasticsearch), designed layered architecture for services for modularity and fault tolerance.

Amazon

May 2015 - July 2015

Software Development Engineer (SDE) Intern

Hyderabad, India

- Project: Designed & implemented a real-time validation engine to automate the validation of critical records
- Reduced validation time of 2000 records from 1 week to under 10 seconds.

Featured Research Projects

Forgetting in Foundation Models (Ongoing)

Torr Vision Group & OATML

Oxford, UK

- Studied how most state-of-the-art end-to-end fine-tuning methods can lead to foundation models losing their pre-trained knowledge on most real-world concepts.
- Looked into simple ways by which this “concept forgetting” can be avoided during fine-tuning.
- Paper: **Fine-tuning can cripple your foundation model; preserving features may be the solution** (arxiv:2308.13320), under submission.

Open-Vocabulary Semantic Segmentation

Meta AI & Torr Vision Group

New York City, USA

- Designed a compatibility function for contrastive loss to achieve patch level alignment between multi-modal encoders.
- Resulting models can zero-shot transfer to semantic segmentation in an open-vocabulary setting without requiring any task-specific annotations.
- Paper: **Open Vocabulary Semantic Segmentation with Patch Aligned Contrastive Learning** (arxiv:2212.04994), published as highlight in CVPR, 2023.

Deep Deterministic Uncertainty (DDU)

OATML & Torr Vision Group

Oxford, UK

- Developed a way of quantifying epistemic and aleatoric uncertainty reliably from deterministic models.
- DDU can compete with state-of-the-art uncertainty quantification methods with a deterministic single-forward pass model.
- Paper: **Deep Deterministic Uncertainty: A New Simple Baseline** (arxiv:2102.11582), published as highlight in CVPR, 2023.
- Code: github.com/omegafragger/DDU

Focal Calibration

Oxford Research Group, FiveAI & Torr Vision Group

Oxford, UK

- Analysed NLL overfitting as the primary cause of miscalibration in deep neural networks.
- Studied properties of an alternative loss function, focal loss, which can be used to train well-calibrated neural networks as compared to the cross-entropy objective.
- Paper: **Calibrating Deep Neural Networks using Focal Loss** (arxiv:2002.09437), published in NeurIPS, 2020, spotlight in ICML 2020 UDL workshop.
- Code: github.com/torrvision/focal_calibration
- Blog: torrvision.com/focal_calibration

Talks

- **Oral Presentation**, *Raising the Bar on the Evaluation of Out-of-Distribution Detection*, ICCV 2023 Workshop on Out-of-Distribution Generalization in Computer Vision (OOD-CV)
- **Talk at FiveAI, Oxford**, *Open Vocabulary Semantic Segmentation with Patch Aligned Contrastive Learning*, 2023
- **Talk at École Polytechnique de Montréal**, *Scalable Uncertainty Quantification in Deep Neural Networks*, 2022
- **Talk at Jadavpur University (Alma Mater)**, *Simple, Fast and Practical Uncertainty Estimation in Deep Learning*, 2021: (link here)
- **Talk at Waymo**, *Deep Deterministic Uncertainty*, 2021
- **Spotlight Talk**, *On using Focal Loss for Neural Network Calibration*, ICML 2020 Workshop on Uncertainty and Robustness in Deep Learning (UDL): (link here)

Teaching

- **Advanced Machine Learning**: Tutored undergraduate students at Worcester College, University of Oxford during Trinity term (8 weeks), 2020.
- **Machine Learning**: Tutored undergraduate students at Worcester College, University of Oxford during Trinity terms, 2021 and 2023.

Honors & Awards

Scholarships

- **Oxford Research Studentship**, supports my ongoing DPhil (PhD) by fully covering my tuition and living expenses
- **Goa Education Trust Scholarship, British Council**, covered the tuition fee for my MSc in Computer Science in the University of Oxford
- **INSPIRE Scholarship**, awarded to the top 1% of the students in the 12th standard Board Examinations (Indian School Certificate Examinations)

Awards

- **Amazon Excellence Award (Deep-Dive, Learn & Be Curious, Ownership)**, awarded for independently designing and implementing a method for near real-time incremental data transfer from primary databases to a data warehouse
- **University Gold Medal**, awarded for securing the highest CGPA in Jadavpur University for the 2012-2016 batch
- **University Best Project Award** for best Bachelor's thesis in the 2012-2016 batch
- **Indu Bhusan Putatunda and Shanti Sudha Putatunda Memorial Award** awarded by the Alumni Association of Jadavpur University for securing the highest CGPA in the Department of Computer Science and Engineering
- **Top Reviewer** for ICML 2020.