

# JISHNU MUKHOTI

DPhil(PhD) Candidate in Torr Vision Group & OATML, University of Oxford

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## Research Interests & Experience

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1. Uncertainty quantification, and robustness of neural networks
3. Foundation models

## Education

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### University of Oxford

Oct. 2019 - Present

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

*Oxford, UK*

- **Thesis Supervisors:** Prof. Philip H.S. Torr & Prof. Yarin Gal
- 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*

- **Thesis 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, First Class with Honours

## Featured Research Projects

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### 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), *highlight and published 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), *highlight and published in CVPR, 2023.*
- Code: [github.com/omegafragger/DDU](https://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](https://github.com/torrvision/focal_calibration)
- Blog: [torrvision.com/focal\\_calibration](https://torrvision.com/focal_calibration)

## Publications

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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).
1. **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**).
2. **Jishnu Mukhoti\***, Andreas Kirsch\*, Joost van Amersfoort, Philip Torr, Yarin Gal, *Deep Deterministic Uncertainty: A Simple Baseline*, in CVPR, 2023 (**highlight**).
3. **Jishnu Mukhoti\***, Viveka Kulharia\*, Amartya Sanyal, Stuart Golodetz, Philip Torr, Puneet Dokania, *Calibrating Deep Neural Networks using Focal Loss*, in NeurIPS, 2020.
4. **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).
5. 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).
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**, 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 Workshop on Out Of Distribution Generalization in Computer Vision.
8. **Jishnu Mukhoti**, Yarin Gal, *Evaluating Bayesian Deep Learning Methods for Semantic Segmentation*, [arxiv:1811.12709](#).
9. **Jishnu Mukhoti**, Pontus Stenertorp, Yarin Gal, *On the Importance of Strong Baselines in Bayesian Deep Learning*, in NeurIPS 2018 Workshop on Bayesian Deep Learning.
10. **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.
11. Diptendu Bhattacharya, **Jishnu Mukhoti**, Amit Konar, *Learning Regularity in an Economic Time-Series for Structure Prediction*, in Elsevier, Applied Soft Computing, 2019.
12. **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 (FUZZ-IEEE), 2016.
13. **Jishnu Mukhoti**, Sukanya Dutta, Ram Sarkar, *Handwritten Digit Classification in Bangla and Hindi using Deep Learning*, in Taylor & Francis, Applied Artificial Intelligence, 2020.

## Industry Experience

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### Meta AI Research

Jun 2022 - Sept 2022

Research Scientist Intern

New York City, USA

- **Project:** Open Vocabulary Semantic Segmentation in Multi-Modal Foundation Models (hosted by Tsung-Yu Lin & Ser-Nam Lim)

### 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)

### FiveAI

Aug 2018 - Aug 2019

Research Scientist Intern

Oxford, UK

- **Project:** Calibration in deep neural networks with application in autonomous driving (hosted by Stuart Golodetz & Puneet Dokania)

### 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:** Real-time validation engine to automate the validation of critical database records, reduced validation time from 2000 records per week to less than 10 seconds.

## Honors & Awards

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### *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.

### *Conferences & Talks*

- **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](#))
- **Top Reviewer** for ICML 2020