

# Shashank Shekhar

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## EDUCATION

**University of Guelph**  
*Masters, Electrical & Computer Engineering: Artificial Intelligence*  
**Thesis:** Inductive Biases For Higher-Order Visual Cognition

Guelph, Canada  
Sep 2019 - Jan 2022

**Indian Institute Of Technology**  
*Bachelors, Electronics & Communication Engineering*

Dhanbad, India  
Jul 2013 - May 2017

## SKILLS

- **Languages:** Python, C++, C (advanced) MATLAB (intermediate), Julia, JavaScript (beginner)
- **ML Frameworks:** PyTorch, PyTorch Lightning, TensorFlow, OpenCV, VISSL
- **Dev tools:** VS-Code, Jupyter Notebook, Jupyter Lab, Hydra
- **DevOps:** Git, JIRA, Travis CI, GitHub Actions
- **Cloud:** AWS Sagemaker, AWS Rekognition, AWS Lambda, Google Vision OCR, Google Doc AI
- **High Performance Computing:** SLURM, SubmitIt, Numba
- **Web Development:** Jekyll, Hugo, Bootstrap, Flask (all beginner)

## PUBLICATIONS

(\* DENOTES LEAD AUTHOR)

Understanding Contrastive Versus Reconstructive Self-Supervised Learning of Vision Transformers\*  
**Shashank Shekhar**, Florian Bordes, Pascal Vincent & Ari Morcos  
*NeurIPS 2022 Self-Supervised Learning - Theory and Practice Workshop*

Beyond Neural Scaling Laws: Beating Power Law Scaling Via Data Pruning [\[paper\]](#)  
Ben Sorscher, Robert Geirhos, **Shashank Shekhar**, Surya Ganguli & Ari Morcos  
*NeurIPS 2022 (Spotlight, Outstanding Paper Award - 0.4% of accepted, 0.1% of submitted papers)*

Neural Structure Mapping For Learning Abstract Visual Analogies\* [\[paper\]](#)  
**Shashank Shekhar** & Graham Taylor  
*NeurIPS 2021 Shared Visual Representations in Humans and Machines Workshop*

Context-aware Scene Graph Generation with Seq2Seq Transformers [\[paper\]](#) [\[code\]](#)  
Yichao Lu, Himanshu Rai, Cheng Chang, Boris Knyazev, Guangwei Yu, **Shashank Shekhar**, Graham Taylor, & Maksims Volkovs  
*ICCV 2021*

Neural Response Time Analysis: XAI Using Only a Stopwatch\* [\[paper\]](#)  
Eric Taylor\*, **Shashank Shekhar**\*, & Graham Taylor  
*Applied AI Letters*

Response Time Analysis for Explainability of Visual Processing in CNNs\* [\[paper\]](#) [\[video\]](#)  
Eric Taylor\*, **Shashank Shekhar**\*, & Graham Taylor  
*CVPR 2020 Minds vs Machines workshop (Oral presentation - 21% of submitted papers)*

From Strings to Things: Knowledge-Enabled VQA Model That Can Read And Reason [\[paper\]](#) [\[webpage\]](#)  
Ajeet K Singh, Anand Mishra, **Shashank Shekhar**, & Anirban Chakraborty  
*ICCV 2019 (Oral: 4.3% acceptance rate)*

OCR-VQA : Visual Question Answering By Reading Text In Images [\[paper\]](#) [\[webpage\]](#)  
Anand Mishra, **Shashank Shekhar**, Ajeet K Singh & Anirban Chakraborty  
*ICDAR 2019*

Operator-In-The-Loop Deep Sequential Multi-camera Feature Fusion for Person Re-Id [\[paper\]](#)  
Navaneet KL, Ravi Kiran, **Shashank Shekhar**, R Venkatesh Babu, & Anirban Chakraborty  
*IEEE TIFS (volume 15)*

Road Damage Detection & Classification In Smartphone Images Using Mask R-CNN\* [\[paper\]](#) [\[code\]](#)  
**Shashank Shekhar**\* & Janpreet Singh\*  
*IEEE BigData 2018 Challenge*

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## EXPERIENCE

### Meta (Facebook) AI

*AI Resident | Advisor: Dr. Pascal Vincent, Dr. Ari Morcos*

Montreal, Canada

29 Aug 2022 - Present

- Ongoing research as primary investigator on self-supervised learning in computer vision models.

### Meta (Facebook) AI

*AI Resident | Advisor: Dr. Ari Morcos*

Menlo Park, California

27 Sep 2021 - 28 Aug 2022

- Scaled up theoretical research on data pruning for large-scale training and evaluation on image classification datasets with 10M+ images.

### NEXT AI

*Scientist in residence (consultant)*

Guelph, Canada (remote)

29 March 2021 – 21 Sep 2021

- Prototyped an OCR and object detection framework for CAD designs which improved detection accuracy by 50% on commercial data.
- Developed Python wrappers for a RESTful API to ingest large (100+ GB) geo-spatial image data.

### Machine Learning Research Lab, University of Guelph

*Graduate Research Assistant | Advisor: Prof. Graham Taylor*

Guelph, Canada

6 Jan 2020 - 31 Dec 2021

- Conceived, led, and published a research project on using modular neural networks for abstract visual reasoning tasks.
- Implemented and Profiled Convolution Neural Networks with a dynamically inferred graph for each batch sample using Pytorch's DataParallel API and low-level tensor operations.

### University of Guelph

*Graduate Teaching Assistant*

Guelph, Canada

6 Jan 2020 - 30 April 2021

- Teaching Assistant for three undergraduate courses in engineering.

### deeplearning.ai

*Deep Learning Content Engineer (consultant)*

Bangalore, India (remote)

29 March 2019 – 30 June 2019

- Maintained Tensorflow assignments & Docker based auto-graders for the Stanford CS230 and Coursera Deep Learning specialization taken by over 1.2 million students and rated 4.8/5.

### Shell R&D

*Research Associate (collaboration through IISc Bangalore)*

Bangalore, India

1 Oct 2018 – 30 April 2019

- Implemented image de-noising, contrast enhancement, and segmentation algorithms for 3D  $\mu$ -CT digital rock images in MATLAB, C++ which increased analysis speeds by over 3X.

### Hyperworks Imaging

*Research Associate (collaboration through IISc Bangalore)*

Bangalore, India

1 March 2018 – 30 Sep 2018

- Developed a video person detection and re-identification system using Faster R-CNN and Attention networks across 6 cameras, delivering over 80% accuracy in highly congested urban indoor environments.

### Visual Computing Lab, Indian Institute of Science

*Research Assistant | Advisor: Prof. Anirban Chakraborty*

Bangalore, India

15 Jan 2018 - 30 April 2019

- Prepared, released, and developed multi-modal models for the first large-scale dataset (250k images, 1.3M Q-A pairs) on Visual Question Answering with a knowledge graph and scene text OCR.
- Developed a PyQt based GUI for ranking image retrieval results for labelling and human validation.

### Samsung Research Institute

*Software Development Engineer*

New Delhi, India

5 July 2017 – 5 Jan 2018

- Wrote middle-ware and DPI integration for video streaming applications (Netflix, Amazon Prime Video) for Samsung Smart TV's Linux OS using gstreamer in C++.
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AWARDS	<ul style="list-style-type: none"> <li>• Conference on Neural Information Processing Systems (NeurIPS) 2022 Outstanding Paper Award</li> <li>• Nominated For Canadian AI Association Best Master's Thesis Award from University of Guelph</li> <li>• Class Of OAC'60 Award for Outstanding Teaching Assistant</li> <li>• Highlighted Reviewer, International Conference On Learning Representations (ICLR) 2022</li> <li>• Vector Institute Research Grant 2020-21</li> <li>• Conference on Neural Information Processing Systems (NeurIPS) 2019 Travel Grant</li> <li>• International Conference on Computer Vision (ICCV) 2019 Student Volunteer Award &amp; Travel Grant</li> <li>• JN Tata Endowment for Higher Education of Indians &amp; Travel Grant 2019</li> <li>• Vector Institute Scholarship in Artificial Intelligence 2019</li> <li>• Machine Learning Summer School (MLSS) London 2019 full scholarship</li> <li>• Indian Academy of Sciences Summer Research Fellowship 2015</li> </ul>
INVITED TALKS	<ul style="list-style-type: none"> <li>• <b>University of Guelph Machine Learning Research Group:</b> Beyond Neural Scaling Laws and other Research Overview November 2022</li> <li>• <b>Analogical Minds Seminar:</b> Implementing structure mapping as a prior in deep learning models for abstract reasoning <a href="#">[video]</a> March 2022</li> <li>• <b>University of Toronto Machine Intelligence Group:</b> Breaking into AI: Industry Speaker Panel <a href="#">[video]</a> November 2021</li> </ul>
TEACHING, MENTORING & SERVICE	<p><b>Scholarly Peer Review</b> for scientific research in machine learning and computer vision</p> <ul style="list-style-type: none"> <li>• <b>Conferences:</b> ICLR 2022, CVPR 2022, ECCV 2022, NeurIPS 2022, CVPR 2023, AISTATS 2023</li> <li>• <b>Workshops:</b> NeurIPS SVRHM Workshop 2022, NeurIPS SSL Workshop 2022</li> <li>• <b>Journals:</b> Applied AI Letters</li> </ul> <p><b>Mentor</b>, ProjectX: Student Competition, Cornell University Fall 2021, Winter 2022</p> <ul style="list-style-type: none"> <li>• Team won the grand \$25,000 prize for predicting spread of COVID-19 misinformation from tweets</li> </ul> <p><b>GTA</b>, ENGG 3130: Modelling Complex Systems, University of Guelph Winter 2021</p> <ul style="list-style-type: none"> <li>• Coursework on graph theory, automata, game theory, agent-based models. Labs in Python (Jupyter Lab, NetworkX, Numpy) and course notes development using Restructured Text.</li> </ul> <p><b>Lecturer</b>, LearnAI: Intro to Artificial Intelligence, University of Toronto Fall 2020</p> <ul style="list-style-type: none"> <li>• Coursework on scientific python, data analysis, machine learning, computer vision, natural language processing. Labs in Python (Numpy, Pandas, Scikit Learn, Keras).</li> </ul> <p><b>GTA</b>, ENGG 3700: Optimization, University of Guelph Fall 2020</p> <ul style="list-style-type: none"> <li>• Coursework on linear optimization. Labs in Excel Solver.</li> </ul> <p><b>GTA</b>, ENGG 1500: Engineering Analysis, University of Guelph Winter 2020</p> <ul style="list-style-type: none"> <li>• Coursework on introduction to linear algebra. Labs in MATLAB.</li> </ul> <p><b>Community TA</b>, Machine Learning, Coursera Fall 2018, Winter 2019</p> <ul style="list-style-type: none"> <li>• Coursework on introduction to machine learning. Labs in MATLAB.</li> </ul>
RELEVANT COURSEWORK	<ul style="list-style-type: none"> <li>• <b>UoGuelph:</b> Machine Learning, Computational Thinking For AI, Scientific Computing, Optimization, Computational Statistical Inference, Natural Language Processing, Information Theory</li> <li>• <b>Online:</b> Deep Learning, Mathematics for Machine Learning, Reinforcement Learning</li> <li>• <b>Summer Schools:</b> Machine Learning Summer School London 2019, DeepBayes 2019: Bayesian Methods for Deep Learning, CIFAR Deep Learning and Reinforcement Learning 2020, MIT-Harvard Brains, Minds and Machines 2020</li> </ul>