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Shashank Shekhar

Education

University of Guelph — Guelph, Canada
Masters, Electrical & Computer Engineering: Artificial Intelligence — Sep 2019 - Present
• Percentage: 87.4/100 (GPA: 3.9/4)

Indian Institute Of Technology (ISM) — Dhanbad, India
Bachelors, Electronics & Communication Engineering — Jul 2013 - May 2017
• GPA: 8.17/10

Research Experience

Machine Learning Research Lab, University of Guelph — Guelph, Canada
Graduate Research Assistant | Advisor: Prof. Graham Taylor — Jan 2020 - Present

• Implemented dynamic neural nets to determine the cognitive science measure of Response Time and analyzed it to explain visual representations [https://youtu.be/OeTPUjbQads]
• Prepared and delivered Probabilistic Programming tutorial using Pyro
• External talks: Explainability in AI at DSC IIT-Dhanbad, Reasoning in neural nets at UWaterloo
• Ongoing research: Using program inference to perform abstract visual reasoning (individual), Scene graph generation using Transformers (industrial collaboration)

Visual Computing Lab, Indian Institute of Science — Bangalore, India
Research Assistant | Advisor: Prof. Anirban Chakraborty — Jan 2018 - April 2019

• Built a large-scale scene-text and knowledge graph based VQA dataset using Google's image search API and Wikidata [https://ocr-vqa.github.io/]. Implemented text and scene recognition ConvNet models for our graph neural net based approach to multi-modal VQA [https://textkvqa.github.io/]
• Implemented a PyQT based visual demo to perform human operator experiments for operator-in-the-loop AI research [IEEE Xplore link]
• Worked with industrial partners on customer video analysis and 3D volumetric image segmentation (refer Professional experience)

Professional Experience

deeplearning.ai — Palo Alto, USA
Deep Learning Content Engineer (remote) — April 2019 – June 2019

Developed Tensorflow assignments & Docker based auto-graders for the Stanford CS230 and Coursera Deep Learning courses.

Shell R&D, Hyperworks Imaging — Bangalore, India
Research Associate (collab with IISc Bangalore) — March 2018 – April 2019

• Implemented image denoising, contrast enhancement, and segmentation algorithms for large scale 3D μ-CT digital rock images in MATLAB and C++ and verified results using downstream CFD analysis.
• Implemented person detection in real-world videos using Faster R-CNN followed by re-identification using Harmonius Attention Network. Developed a GUI for human operators to verify results manually.

Samsung Research Institute — New Delhi, India
Software Development Engineer — July 2017 – Jan 2018

Developed middleware and integrated with DPIs for video streaming applications (Netflix, Amazon Prime Video) for Samsung Smart TV's Linux OS using gstreamer in C++.

Technical skills

• **Languages:** Python, C++, C (proficient) MATLAB, Julia (beginner)
• **Frameworks:** PyTorch, TensorFlow, OpenCV
• **Dev Tools:** Scientific Python Stack, Jupyter, Vim
• **DevOps Tools:** Docker, AWS, Slurm, Git, JIRA

Publications

(* equal contribution)

Response Time Analysis for Explainability of Visual Processing in CNNs [link]
Eric Taylor*, **Shashank Shekhar***, & Graham Taylor
CVPR 2020 Minds vs Machines workshop *(Among 3 oral presentations)*

From Strings to Things: Knowledge-Enabled VQA Model That Can Read And Reason [link]
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 [link]
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 [link]
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 [link]
Shashank Shekhar* & Janpreet Singh*
IEEE BigData 2018 Challenge

Relevant Projects

Nand2Tetris *(HDL, Assembly)*
Built a 16-bit computer from scratch by implementing logic gates, adders, ALU, program counter, memory, CPU & assembler based on two op-code instruction set

implicit MAML *(Python: PyTorch, Torchmeta, Higher)*
Performed meta learning with implicit gradients for few-shot image recognition on Ominglot dataset

microBLAS *(C)*
Wrote efficient linear algebra routines for vector, matrix and sparse matrix operations such as QR factorization, least squares, Gaussian elimination, Cholesky factorization, Eigen vector/value calculation, SVD, etc.

RBDoom *(Python: PyTorch, VizDoom)*
Implemented RAINBOW algorithm for deep reinforcement learning (which combines Deep-Q learning, Double Deep-Q learning, Prioritized Experience Replay, Dueling networks and distributional learning) to play FPS game Doom using only image pixels

cmGAN *(Python: PyTorch)*
Wrote a Cross-Modal GAN to perform adversarial learning for visual re-identification across RGB and Infrared images

Kaggle Projects
• Implemented "Bi-Linear CNNs for Fine-grained Visual Recognition" to perform image classification of fashion products and home goods (Top 10% of 638 participants)
• Implemented LSTM, GRU, Attention Networks using word embeddings from Glove and FastText to perform toxic comment classification (Top 25% of 4539 participants)

Awards

• Vector Institute Research Grant 2020-21
• Conference on Neural Information Processing Systems (NeurIPS) 2019 Travel Grant
• International Conference on Computer Vision (ICCV) 2019 Student Volunteer Award & Travel Grant
• JN Tata Endowment for Higher Education of Indians & Travel Grant 2019
• Vector Institute Scholarship in Artificial Intelligence 2019
• Machine Learning Summer School (MLSS) London 2019 full scholarship

Teaching

GTA, ENGG 3130: Modelling Complex Systems, University of Guelph	Winter 2021
Lecturer, LearnAI: Intro to Artificial Intelligence, University of Toronto	Fall 2020
GTA, ENGG 3700: Optimization, University of Guelph	Fall 2020
GTA, ENGG 1500: Engineering Analysis, University of Guelph	Winter 2020
Community TA, Machine Learning, Coursera	Fall 2018, Winter 2019