KSHITIZ SHARMA

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RESEARCH INTERESTS

- Deep Learning
- Machine Learning
- Computer Vision
- Object Detection & Tracking
- Machine Reading Comprehension
- Generative Models

EDUCATION

Indian Institute of Technology (IIT) Delhi, India *Jul'14 - May'18 (Expected)*
B.Tech. in Mathematics and Computing GPA: 6.8/10

D.A.V. School, Kota, India *Apr'14*
All India Senior School Certificate Examination Marks: 92.8/100

Mayoor School, Ajmer, India *Apr'12*
All India Secondary School Examination Marks: 95/100; Grade: A+

AWARDS AND SCHOLASTIC ACHIEVEMENTS

2014 All India Rank 485 in IIT - Joint Entrance Examination (amongst 1.4 million candidates).
2012 Secured 11^{th} position in Rajasthan's State Science Talent Search Examination (SSTSE).
2010 Awarded the prestigious National Talent Search Examination (NTSE) Scholarship.

RESEARCH EXPERIENCE

Object Detection and Tracking for driverless cars *Jun'16 - Present*
Research project supervised by Prof. Subhashis Banerjee at IIT Delhi *New Delhi, India*

The task was to tackle the problem of object detection and tracking using machine learning techniques. We explored slower region proposal based classification models (R-CNN and its variants - Fast, Faster R-CNN), and faster end-to-end regression based models (such as YOLO) for detection. Subsequently, we are using detection models for feature extraction and generating detection heatmaps along with LSTMs (Long Short Term Memory) to capture temporal information in sequences/videos for robust tracking and occlusion handling.

Media Engagement Prediction *May'17 - Jul'17*
Research Intern at Artifacia Inc. *Bangalore, India*

Given an Instagram user handle and a query image, the task was to predict the engagement(number of likes) over a time interval. Using image features from a ConvNet and hand-crafted features from user profile (followers count, average engegement during a recent brief time interval, profile data for tagged users, following count, date posted), I developed the entire pipeline systematically; from data collection, data preprocessing to training the model, evaluation and deployment for a real-time production system.

Image-Tagging (Multi-Label Classification) *May'17 - Jul'17*
Research Intern at Artifacia Inc. *Bangalore, India*

The task was to identify all the tags/labels relevant to an image on an NUS-WIDE dataset of 269,648 images. I implemented an LSTM-based recurrent model for modelling label dependencies and for label prediction. I used VGG16 ConvNet for extracting image features. The model was capable of identifying both the co-occurrence of labels, and the attention regions in images. Also implemented Beam-Search algorithm for decoding at test time.

KEY ACADEMIC PROJECTS

VQA - Visual Question Answering *Oct'16 - Nov'16*
Course project supervised by Prof. Subhashis Banerjee at IIT Delhi *New Delhi, India*

The task of open-ended VQA, given an image and a natural language question about it, the task is to generate an accurate natural language response. I used CNN(VGG16/InceptionV3) for extracting image features and encoded questions and answers using a 1-layer LSTM based recurrent network over the word embeddings.

Computer Vision Assignments *Aug'16 - Sep'16*
Course taught by Prof. Subhashis Banerjee at IIT Delhi *New Delhi, India*

Implemented Lucas-Kanade for optical flow estimation and used it for stabilizing video.
Implemented single-view metrology based algorithim for comparing heights of two objects in the same vertical plane in an image using cross ratio invariance of projective transformations.
Worked on scalable image retrieval system using hierarchical vocabulary tree with SIFT-Descriptors.

Parallel Programming Assignments *Aug'17 - Nov'17*
Course taught by Prof. Subodh Kumar at IIT Delhi *New Delhi, India*

Implemented LU decomposition with OpenMP and OpenMPI (shared and distributed memory model) .
Implemented parallel Merge Sort with Cuda Programming.
Worked on Highly-Parallel DBSCAN algorithm for density-based clustering (OpenMP/MPI implementation).

Operating Systems Assignments *Aug'17 - Nov'17*
Course taught by Prof. B.S. Panda at IIT Delhi *New Delhi, India*

Implemented IO library supporting read/write/append modes with buffering using UNIX system calls.
Worked on a client/server based chatting system that uses UNIX message queue for message passing.
Implemented copy using n processes to share the load of copying a file and using semaphores for synchronization.

2D Multiplayer Pong Game *Apr'16*
Course project supervised by Prof. Vinay Ribeiro at IIT Delhi *New Delhi, India*

Developed Pong Game using Java Swing library for GUI and UDP Datagram Socket as underlying p2p programming. Supported upto 4 Player game with different bot AI difficulty levels and featured lobby for multi-player. The project was completed following proper design practices including a detailed design document proposal covering the scope of game, physics, design, network communication details before actually programming.

TECHNICAL SKILLS

Programming Languages	Python, C, C++, CUDA, Java, OpenMP/MPI, OCaml
Machine Learning	Tensorflow, Keras, Caffe, Darknet, OpenCV, MATLAB
Web Programming	PHP, HTML, CSS, JavaScript, MySQL

LINKS

Website	`http://www.kshitizsharma.in/profile.html`
GitHub	`https://www.github.com/kshitiz38/`
LinkedIn	`https://www.linkedin.com/in/sharmakshitiz/`
Kaggle	`https://www.kaggle.com/zitihsk/`

EXTRA-CURRICULAR ACHIEVEMENTS

2015	Our 5-member team stood 1^{st} in Split Painting competition at IIT Delhi; Theme: Paradigm Shift
2015	Our 5-member team stood 4^{th} in Wall Painting competition at IIT Delhi;
2012	1^{st} position - Documentary making Competition on theme 'Life in Mayoor' at Mayoor School
2011	1^{st} position - Product Advertisement Making Competition at Mayoor School Cultural Festival
2010	1^{st} position - Movie Promo making Competition at Mayoor School
2009	1^{st} position - Story making through Adobe Flash Competition at Mayoor School Cultural Festival
2010	Received Best Artist in Secondary School award at Mayoor School Cultural Festival

COURSEWORK DONE RELEVANT TO RESEARCH INTERESTS

- MTL100: Calculus
- MTL101: Linear Algebra & Differential Equations
- MTL102: Differential Equations
- MTL103: Optimization Methods & Applications
- MTL104: Linear Algebra & Applications
- MTL105: Algebra
- MTL106: Probability & Stochastic Processes
- MTL107: Numerical Methods & Computation
- MTL180: Discrete Mathematical Structures
- MTL342: Analysis & Design on Algorithms
- MTL390: Statistical Methods
- MTL458: Operating System
- MTL783: Theory of Computation
- MTL782: Data Mining
- ELL305: Computer Architecture
- COL106: Data Structures and Algorithms
- COP290: Design Practices in Computer Science
- COL334: Computer Networks
- COL730: Parallel Programming
- COL780: Computer Vision

POSITIONS OF LEADERSHIP AND RESPONSIBILITY

Indian Institute of Technology (IIT) Delhi *Apr'16 - Apr'17*
Web Management Coordinator, Alumni Affairs & International Programmes (AAIP) *New Delhi, India*

I was responsible for the development and maintenance of IIT Delhi's AAIP's website and portal, which has handled more than 8000 alumni, students, and faculty registrations. I also contributed in organizing AAIP events as a Coordinator.

Indian Institute of Technology (IIT) Delhi *Jul'15 - May'16*
House Fine Arts Club (FAC) Representative *New Delhi, India*

I managed and conceptualized various events (House Day, Board for Hostel Management Night), and various competitions (inter/intra house). I held a workshop for juniors, managed events for the FAC during cultural festivals, at the university level as FAC Representative. Our house finished in the top-3 positions at two events.

MACHINE LEARNING COMPETITIONS

HackerEarth — Deep Learning Challenge #1 **Rank: 28/4528 (Top 1%)**
`https://www.hackerearth.com/challenge/competitive/deep-learning-challenge-1/leaderboard`
- Build a powerful image classifier to categorize products for a retail company.
- Competition evaluated entries on weighted F1 score.

HackerEarth — IndiaHacks 2017 **Rank: 67/6973 (Top 1%)**
`https://www.hackerearth.com/challenge/competitive/machine-learning-indiahacks-2017/leaderboard`
- Task 1: Identify each road geometry on which the road sign is applicable i.e. predicting where the sign is actually facing with respect to the vehicle given sign dimensions, aspect ratio, angle.
- Task 2: Build predictive models to identify which target segment users belong to based on their previous watch patterns on dataset from Hotstar.

HackerEarth — Machine Learning Challenge #4 **Rank: 250/4518 (Top 6%)**
`https://www.hackerearth.com/challenge/competitive/machine-learning-challenge-4/leaderboard`
- Given an anonymised sample dataset of server connections, the task was to predict the type of attack

Kaggle — Leaf Classification (Ongoing) **Rank: 210/1598 (Top 14%)**
`https://www.kaggle.com/c/leaf-classification`

Kaggle — Statoil/C-CORE Iceberg Classifier Challenge (Ongoing) **Rank: 453/2350 (Top 20%)**
`https://www.kaggle.com/c/statoil-iceberg-classifier-challenge`

Kaggle — Invasive Species Monitoring (Ongoing) **Rank: 283/513**
`https://www.kaggle.com/c/invasive-species-monitoring`