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Hardik Chauhan

Education

2018 **Indian Institute of Technology Roorkee**.
Electrical Engineering, Bachelor of Technology
GPA : 6.9/10

Research Experience

May 2017– July 2017 **MICROSOFT AI & RESEARCH, USA**, *Senior Data Scientist Anirudh Koul*.
Video Colorization
- Proposed a spatio temporal end to end module that effectively exploits temporal redundancies while maintaining real-time speed for video colorization task.
- Spatial Transformer Network was used to encode optical flow features for motion estimation and motion compensation to reduce flickering noise in the output.
- Early fusion, slow fusion and 3D convolutions were explored for the joint processing of multiple consecutive video frames.

May 2016– June 2016 **INDIAN INSTITUTE OF MANAGEMENT, CALCUTTA**, *Prof. Vivek Rajvanshi*.
Option Valuation and Analysis
- Volatility estimation using real time stock data of top five listed companies on NSE (National Stock Exchange) leading to in-depth study of stochastic calculus, elementary PDE and financial modelling.
- Options were priced using Black Scholes Model and comparative analysis was done with real time quoted option prices for any arbitrage opportunity that existed.

Major Projects

July 2017– Ongoing **TASK-ORIENTED LANGUAGE GROUNDING** , *Prof.Eugenio Culurciello*, Purdue University.
- Trained an agent using Asynchronous Advantage Actor-Critic (A3C) to learn task oriented language grounding by performing specific actions in a Doom game, through natural language commands;
- Proposed an end to end neural architecture to efficiently encode the visual temporal reception of agent's 3D environment.
- VizDoom API along with SLADE editor used to construct different environment for an agent.

July 2017– Ongoing **ITERATIVE ATTENTION BASED VISUAL QA**, *Prof. Gopinatha Pillai*, IIT Roorkee.
- Implemented a model for Visual Question Answering(VQA) which used iterative attention mechanism to produce a feature importance weighting vector on the VGG16 last Convolution layer features of the image using the question embedding as a query vector.
- Final model performed better than model which exercised single pass attention mechanism. We hypothesized that multiple steps of reasoning is required to answer questions about fine grained information in image.

Oct 2017– Nov 2017 **A REVIEW ON NEURAL NETWORKS ARCHITECTURE APPLIED IN VISUAL DIALOG** , Self-Motivated.
- This report proposes incorporation of attention and memory based components in basic architecture of Visual Dialog to reduce reliance of the embedding of an entire history.
- The role of choice of memory block in RNN and word-vector is explored for improving the performance of the model. [Report]

Dec 2016– Mar 2017 **OCR MODULE FOR REMITTANCE FORMS** , *Prof. Indra Gupta*, IIT Roorkee.

- Developed an end to end module using Faster RCNN in Pytorch trained on Unipen and IAM datasets;
- Developed an android demo application to post photograph to server, which is then processed by deployed model and details populated to a database.
- Notification system is implemented by using pyfcm, python wrapper for Google's firebase cloud messaging service. [Report]

Jan 2017– Feb 2017 **AUTOMATIC ESSAY GRADER**, *Self-Motivated*.

- Implemented LSTM based neural architecture to map essays to their respective grades.
- Used Bi-directional LSTM to deal with longer sequences and got 0.9245 kappa score on dataset released by Hewlett Foundation in Automatic Essay Scoring competition(2012) on Kaggle.
- It beats the mentioned competition winner by large margin by learning representation as opposed to hand crafted features like POS tags, Dependency parsing. [Code]

Minor Projects

Feb 2017 - Mar 2017 **PARAPHRASE CLASSIFIER** , *Self-Motivated*.

- Implemented Siamese Recurrent Neural Network to measure semantic similarity between two sentences.
- Used Quora 0.4 million sentence pair dataset , 100 dimensions GloVe word-vector as input to the network and got 0.74 accuracy on test dataset. [Code]

Feb 2017 **EMOTION BASED TONE GENERATOR**, *Code.Fun.Do*.

- Developed an app as an entry for Microsoft Code.Fun.Do competition which generates different message tones based on its sentiment.
- Used LSTM based architecture and ISEAR dataset containing six emotions. [Code]

Achievements

Dec 2017 **MICROSOFT GARAGE HACKATHON**, *Microsoft, India*.
3rd rank in AI theme based hackathon among 50 teams coming from all over india.
Concepts applied : Seq2Seq, Encoder-Decoder Attention, Intradecoder Attention, Beam Search

Sept 2017 **DEEP LEARNING CHALLENGE**, *Hackerearth*.
32th rank in Deep Learning Challenge(Image Classification) among 2200 teams with 92.64% accuracy.
Concepts applied : Transfer Learning, Spatial Transformer Network, Test Data Augmentation

Sept 2017 **CARVANA MASK CHALLENGE**, *Kaggle*.
146th rank in Carvana Mask Challenge(Image Segmentation) among 800 teams with 99.64% accuracy.
Concepts applied : Residual Dilated U-net CNN architecture, Weighted loss function, Batch-Renormalization

May 2016 **WORLDQUANT SUMMER TRAINING PROGRAMME**.
Selected among Top 100 in India. Objective was to identify and construct signals, make robust models from them with high Sharpe ratios and significant abnormal returns

Dec 2017 **SELECTED IN NIPS PAPER IMPLEMENTETION CHALLENGE**.

May 2014 **QUALIFIED JEE (Advance) 2014**.
Secured All India Rank 1710 in JEE-Advanced 2014 among 150,000 students

Relevent Coursework

E-Learning Convolutional Neural Networks for Visual Recognition, Deep Learning for NLP, Introduction to Reinforcement Learning, Introduction to Machine Learning

Classroom Optimization Techniques, Linear Algebra, Artificial Neural Network, Complex Analysis, Partial Differential Equations

Technical Proficiency

Advanced Python, Keras, Pytorch, OpenCV, NLTK

Intermediate C++, Tensorflow, Torch, SKLearn, Open AI Gym, LaTeX

Basic Theano, Lua, Caffe

Community

July 2017 **Founder**, *Research Paper Reading Group* , IIT Roorkee
Conduct discussions twice a week on application of Deep Learning in Computer Vision, NLP, Reinforcement Learning [Link] .

Mar 2016 **Senior Member**, *Data Science Group* , IIT Roorkee
Managing and conducting various events including Lectures, Workshops to provide hands-on experience to beginners in the field of Data Science [Link] .

Extra Curriculars

2016 Delivered talk on Fundamentals of Linear Algebra to 150+ students at IIT Roorkee.

2017 Organized workshop on Application of Deep Learning Techniques in Computer Vision at IIT Roorkee.

2016 Attended Workshop on Modeling and Optimization of Stochastic Systems organized by Prof. Madhu Jain, Department of Mathematics, IIT Roorkee.

2015 Completed Microsoft CODE.FUN.DO hackathon held in IIT Roorkee in October 2015 and March 2017.

References

1. **Anirudh Koul**
   Senior Data Scientist,
   Microsoft AI & Research, USA
   akoul@microsoft.com
   Letter of Recommendation

2. **Eugenio Culurciello**
   Associate Professor,
   School of Electrical and Computer Engineering,
   Purdue University,West Lafayette,USA
   euge@purdue.edu