Apurva Gupta

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Educational Qualification

Integrated Masters in Mathematics and Scientific Computing from IIT Kanpur 2006-11

Current Self Motivated Work

Robotics : Made a small 4 wheeled robot which detects a ball and navigates towards it. All the computations are done on the onboard chip. Learning RL to teach the robot navigation amongst objects. Youtube Link

Open Source :

- **Deep network to color black and white images (without GAN): https://github.com/4g/unet-color**
- **Reinforcement Learning : https://github.com/4g/reinforce**

Employment

Bloomreach Data Sciences(Bengaluru, India) Staff Engineer (2016-2018) / MTS (2013-2016)

Partially responsible for improving relevance and ranking on search websites powered by Bloomreach. Worked on analysis of clickstream data and design of algorithms and systems. A few highlighted projects were :

- **Learning to match text and images using Deep Networks :** Working on eliminating manual work required to tune relevance on search engines by using deep networks. Current network can learn similarity of phrases of different grammars (e.g. queries & documents). To improve relevance when text data is noisy, it also uses image information of product. Network is implemented in Keras,Tensorflow and scales to 100k similarity queries/s.
- **Transfer learning of ranking :** Mine associations such as (keyboard, logitech) from traffic associations and use them for different purposes such as restricting recall or ranking products on websites with no user data.
- **Synonym Generation :** Designed, implemented and patented an algorithm to automatically resolve recall issues by mining feedback from click through logs. (Blog) (Patent)
- **Technology and Languages**: Python, Java, Spark, Tensorflow, Keras

PayPal R&D Labs, Software Engineer, (Chennai, India) 2012-13

Design and develop future products relevant to payments using state of art in technology

- **Card-io** (Detect debit and credit cards numbers from their images) : Developed an algorithm that made **Card-io 87% more robust** to rotation and translation of cards. **Designed a card and distortion simulator** to measure improvement in accuracy
- **Face recognition and verification :** Designed and implemented a face verification and recognition system **for web browsers**. Used **LBPH features classified by SVM's** chosen on basis of light, noise and color of face.
- Conceptualized and implemented a **new way to create captchas motivated by crease in crumpled clothing**
- In a team of 4, **developed call/sms based payment solution** for phones using PayPal public APIs

Entrepreneurship

Co-Founder at **Computer Human Interaction Labs** 2011–12

- Co-founded a company that **designs and prototypes devices enabling people with physical disability**
- **Designed 2 products**(Eye Mouse and Customizable Keyboard) utilizing **computer vision, machine learning**
- **Led a team of 9 students** for 6 months, trained them in programming and image processing
- **Conceptualized low cost design** of Eye Mouse targeted at Indian Markets
- Won **1st prize in IBM Web Contest 2011** for paper on development of a **cost efficient Eye Mouse**

Summer Internships

Simplifix Automations and Solutions (SIDBI, IITK) May – July 2009

- Design and implementation of portable machine to **check genuineness of Indian currency notes**
- Built software in to determine serial number, correct orientation, verify RBI thread and other features
- Reported processing rate of 30 currency notes per second with **accuracy > 90%**
- **Techniques used**: Template matching, haar detection, hough circles, character recognition

Newgen Software Technologies Limited (IP Lab , New Delhi) June – July 2008

- Worked on Document processing & Mobile image acquisition with Image processing R&D group
- Developed a **character recognition module** using Matlab to convert filled forms into databases

Publication

Human-Computer interaction via head and eye movements by A.Gupta, R.Shanker, M.Nawhal
Accepted for presentation at **IBM Collaborative Academia Research Exchange (ICARE-2011)**

- Proposes a faster technique to detect eye ball location in real time with low resolution cameras
- Suggests a new bi-level approach to control cursor movements in response to head and eye position

Master's Project

Proof Search and Tableaux 2010–11
Supervisor : Dr. Mohua Banerjee, Faculty , Department of Mathematics, IITK
Designed and implemented algorithms to search for proofs of theorems expressed in Rough Temporal Languages
Implementation : https://code.google.com/archive/p/roughsetlib/, A Java library to simulate Rough Sets and Dynamic Information Systems

Key Academic Projects

Algorithms for Breaking Cryptographic Encryptions (Course Project – Cryptology) Aug – Nov 2011

- Studied various techniques in Cryptography, Secret sharing, Digital Signatures and algorithms to exploit weakness
- Implemented algorithms in JAVA for breaking DES, AES and RSA encryption under special circumstances

nD Computational Geometry Library (Course Project - Algorithms Jan – Apr 2011

- **Programmed a Java library** of functions for n-dimensional computational geometry
- Implemented algorithms for Closest points, Minimum spanning tree, Convex hull with 3D **visualization tools**

Image Enhancer (Sun Club IITK) May – Jun 2007

- Built a **Java** software for **editing, enhancing, encrypting and analyzing images** with low resource usage
- Implemented various image processing functions - Segmentation, Gamma correction, Median and conservative noise filters, Sobel edge, Gaussian blur, Sharpen, Histogram equalization, Embossing, Contrast enhancement
- Designed a fast encryption algorithm using Trigonometric Permutation function to work on images

Indic Transliteration for Mobile (Sun Club IITK)

- **J2ME** based Mobile software for **English-Hindi real time transliteration with low memory footprint**
- **Technique**: Syllable based mapping from Devanagari to English and weighed user inputs
- Created a 4000+ word index of commonly used English-Hindi words to minimize memory usage

Term Papers

Parallel Optimization Techniques (Optimization MTH 506*)*

- Presented a brief account of algorithmic and structure based parallelization.
- Compared performance of parallel and sequential Nelder-Mead Simplex Conjugate Gradient Method.

Fuzzy and Rough Decision Making (Set Theory And Logics MTH677)

- Studied methods of data reduction and derivation of decision algorithms from information systems.
- Presented single and multiperson decision making using Fuzzy and Rough Sets

Copenhagen Meet: Impact of Carbon rules on Indian Economy (International Economics)

- Studied RICE model for simulation of carbon rules as environmental investments
- Determined impact on Indian Economy and a low carbon infrastructure

Achievements And Extra Curricular Activities

- Secured All India Rank **1675** out of 4,00,000 candidates in **IIT-JEE 2006**
- Held **21st world rank** in **Microsoft Imagine Cup Campus Algorithm Contest**
- **Taught computer** to underprivileged children of Nankari village as a member of **Shiksha Sopan**
- **Yellow Belt in Tae-ko-wondo** martial art , avid underwater swimmer and cyclist

Conferences and Workshops

- **Yahoo Multimedia Winter School** (IISC 2012)
- **Indian School on Logic and its Applications** (ISLA)
- **IBM Collaborative Academia Research Exchange** (ICare-2011)