Pankaj Gupta

Senior Undergraduate
Department of Mathematics & Statistics
IIT (Indian Institute of Technology) Kanpur, India

guptapankaj1993@gmail.com, pankajg@iitk.ac.in
+91-94534-25611, +91-89604-02155
http://home.iitk.ac.in/∼pankajg/

RESEARCH INTEREST

- Computer Vision
- Machine Learning Algorithms

- Artificial Intelligence
- Data Structure & Algorithms

ACADEMIC RECORD

- 2016 BS-MS Dual Degree in Mathematics & Scientific Computing, IIT Kanpur
- 2011 Intermediate ISC(Class 12th) 94.25%
- 2009 High School ICSE(Class 10th) 96.2%

INTERNSHIPS

Graduate Technical Intern for *Computer Vision* Profile

Internship done under Trimble Information Technology India Pvt. Lt (May '14 - July '14)

- Worked on Computer Vision based real-world projects.
- Given a measuring Scale in real environment, readings had to be found corresponding to a cross-wire. It had to work for 3 different types of scales.
- OpenCV library for Java was used and project was deployed as an Android App.
- Major divisions of project were: Noise Removal, Scale detection, Cross-wire detection, Finding readings, Verifying Readings and OCR for numbers
- Several mathematical optimizations were used to make the app work on smart-phone real-time.
- Worked on another side project based on geometry and camera-calibration

Android Apps for Special Children

Internship done under Svagatagami Association(NPO) under project name Abhilasha (July '13 - Nov '13)

- Worked as **Coordinator** of App Development team.
- Android Apps were developed for children with problems like mental retardation, autism, hyper-activity and Attention Deficit Disorder
- Apps were aimed at teaching them Numbers, improving their writing skills. Also a mosquito game was made for improving their hand-eye coordination
- Apps were tested on Akash Tablet with kids at Sankalp Day Care Center, Kanpur
- Apps won **1st** prize in SoCha, a social entrepreneurship competition of **E-Summit 13**, IIT Kanpur

Research Crawler

Project done as a Winter Internship under a Startup (Dec '13)

- Project had 2 major components :
    1. A script to crawl the web, download the papers given the keyword and convert it to text
    2. Discover appropriate number of **clusters** for the given papers using **Natural Language Processing**
- scikit, numpy, nltk, urlparse, urllib2, shutil, pylab, pickle modules of python were used
- Research papers were collected through crawling of Bing and **Spider-crawl**.
- Reference section of each research papers were recognized by the script. Papers and weblinks present there were recursively put for web-search using the script
- Algorithms used for NLP were TF-IDF, k-means and few others.
- Bash script was written to automate the complete code which consisted of several scripts

KEY PROJECTS

Connectomics

Project done under Prof. Amitabh Mukherjee, Dept. of Computer Science & Engineering, IIT Kanpur (Feb '14 - Apr '14)

- Connectivity in neural structures was predicted using techniques of **statistical causality**
- Data provided : **Time series** of neural activity through fluorescence imaging.
- Methods used were Cross-Correlation, Mutual Information, Granger Causality, Generalized Transfer Entropy, Information Gain and Combined Linear Model.
- Appropriate algorithms were used to tackle low-signal-to-noise ratio and collective synchrony in data

Blind Navigation App

Project under Prof. Vinay Namboodari, Dept. of Computer Science & Engineering, IIT Kanpur (Feb '14 - Apr '14)

– Android Application was made using which a **Visually-impaired** person can navigate a Indoor Environment.
– OpenCV library for Java was used.
– App detected **direction** markers placed on floor and interpreted directions from it.
– App also detected the **obstacles** in front of user and thus guiding him/her in order to avoid **collision**
– Implemented **pedometer** algorithm to count the number of steps that user has taken so that whenever user loses path, mobile may direct him/her to last recognized point.
– Appropriate Data Structures and Optimization algorithms were used in order to get **real- time** working prototype on smartphone processor.

OTHER PROJECTS

• Dropout Method of randomly omitting hidden nodes in neural networks to improve efficiency under *Prof. Arnab Bhattacharya, Dept. of CSE, IIT Kanpur*
• Analysis of new features of C++ 14(Polymorphic Allocators, C++ pipelines) and their comparison with existing contemporary languages under *Prof. Rajeev Kumar, Dept. of CSE, IIT Kanpur*
• Mathematical Modelling of Earth's Gravitational Field in Matlab using **EGM 2008** model under *Prof. Akash Anand, Dept of Maths & Stats, IIT Kanpur*
• Web-scraping based Model in python which gives the **connections**, between given two movie-personalities, in form of common movies, significant years or any other relation using dbpedia. Model was listed in **special** mentions in *Yahoo HackU '13.*
• Remote-system notepad(to mimic blacboard for teaching), ping-pong game and music player using UDP protocol of Socket Programming under *Electronics Club, IIT Kanpur*
• Electronic Calculator made on breadboard using basic **IC's** (4029, 555, 7447 etc) on **breadboard** which performed addition, subtraction and multiplication-division(by 2) under *Electronics Club, IIT Kanpur*
• Autonomous **wall following Robot** using IR sensors, PWM circuit along with motor drivers and Atmega8 as microprocessor under *Robotics Club, IIT Kanpur*
• Animated 3d model of Academic Affairs building of IIT Kanpur using 3ds-max under *MAAC Animation*
• Artificial Intelligence based Ping Pong Game with two paddles and a ball made using pygame module of Python under *Prof. Piyush Kurur, Dept of CSE, IIT Kanpur*
• Implementation of Intelligent Carrom game in Python using pygame module under *Prgoramming Club, IIT Kanpur*

RELEVANT COURSES

• Computer Vision & Image Processing
• Applied Game Theory
• Probability & Statistics
• Computational Geometry [1]
• Theory of Computation [1]
• Abstract Algebra
• Mathematical Logic
• Introduction to Economics
• Ordinary Differential Equations

• Artificial Intelligence Programming
• Mathematics for Machine Learning
• Data Structure & Algorithms
• Time Series Analysis [1]
• Several Variable Calculus & Differential Geometry [1]
• Analysis I
• Sampling Theory
• Topics in Object Oriented Language Implementation
• Partial Differential Equations

[1] To be completed by Nov '14

Some relevant courses which I have done on online sites :
– *Coursera*: Machine Leaning (Standford University)
– *Coursera*: Image and video processing: From Mars to Hollywood with a stop at hospital (Duke University)
– *Coursera*: Introduction to Mathematical Thinking (Standford University)
– *Coursera*: Internet History, Technology and Security (University of Michigan)

TECHNICAL SKILLS

Programming Languages : C, C++, Java, Python
Tools : MATLAB ®, R-language, GNU Octave, LaTeX, HTML, CSS, Javascript, Jquery,AutoCAD ®, Autodesk 3ds Max ®, Code Vision AVR, AVR Studio ®, Android App Development, Asp.net

SCHOLASTIC ACHIEVEMENTS

- Qualified **RMO** (Regional Mathematics Olympiad)in 2010(Class XI)and 2011(Class XII) with State Rank 13th and 5th respectively
- Recepient of **KVPY** (Kishore Vaigyanik Protshahan Yojana) by Department of Science and Technology, India
- Won **First** Prize in FossDev in **Takneek 12** (Intra IIT-K technical fest) for designing a Brick Game
- Won **First** Prize in **Ad-making** Competition in Sept 12 organised by Animation Club, IIT Kanpur
- Got **A*** in *Data Structure & Algorithms* course for being among top 1% of the class

EXTRA-CURRICULAR ACTIVITIES

- Worked as **Programming Coordinator** of Stamatics (Mathematics Hobby Group), IIT Kanpur
- Worked as **Head**, Web-development team of **POWER**(Promotion of Work Experience & Research), IIT Kanpur
- Worked as a **Secretary** of **Animation Club**, IIT Kanpur
- **Academic Mentor** in Counselling Service, IIT Kanpur for the year 2012-13

REFERENCES

- Prof. Vinay P. Namboodiri (vinaypn@iitk.ac.in), Department of Computer Science & Engineering, IIT Kanpur, India.