Vishal Agarwal

Curriculum Vitae

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Education

2012–2016 **Bachelor of Technology with Honors**, *Computer Science and Engineering*
Indian Institute of Technology Bombay (IIT Bombay)
CGPA: **9.39**/10.00

2012 **Higher Secondary Education**
Pace Junior Science College
Percentage: 92.7%

2010 **Matriculation**
Chatrabhuj Narsee Memorial School
Percentage: 96.6%

Interests

Computer Vision and Machine Learning

Research Projects

Ongoing **Image based CAPTCHAs**, *Undergraduate Thesis, IIT Bombay*
Guide: Prof. Ajit Rajwade

We have designed a new **point tracking** based image CAPTCHA which is robust against attacks based on motion estimation, **fundamental matrix** estimation and SIFT descriptor matching. Any attempt to solve the CAPTCHA boils down to estimating the out-of-plane motions of multiple objects in the scene. Currently, we are exploring the robustness of our CAPTCHA in the scenario where the hacker gains access to our database of 3D models. Whether one can leverage upon the principles of **object recognition** to solve the CAPTCHA in real time, is what we will explore next.

Ongoing **Diffusion MRI Reconstruction**, *R&D Project, IIT Bombay*
Guide: Prof. Suyash Awate

We have designed a new algorithm for efficient reconstruction given noisy and sub sampled diffusion MRI data of the brain. The algorithm is based on unsupervised dictionary learning and **sparse coding**. Currently, we are trying to use the spatial continuity of these diffusion signals to get even better reconstructions.

Key Academic Projects

Autumn 2015 **Star Wars Animation**, *Computer Graphics*

Guide: Prof. Parag Chaudhuri

- Used **hierarchical modelling** to create 3D models of the famous droid pair of R2D2 and C3PO in OpenGL 4.0
- Implemented camera movement along user specified Bezier curves and used keyboard control to generate **keyframed animation**

Spring 2015 **Text to Speech Converter**, *Artificial Intelligence*

Guide: Prof. Pushpak Bhattacharyya

- Used Baum Welch algorithm for training the underlying **HMM** and the Viterbi algorithm for determining the most probable phoneme sequence
- Identified the most frequent mismatch pairs through the confusion matrix

Spring 2015 **Compiler Implementation**, *Implementation of Programming Languages*

Guide: Prof. Amitabha Sanyal

- Developed a compiler for a C like language using Flex and Bisonc++
- Supported control statements, function calls and **function overloading**
- Implemented optimizations like **Sethi-Ullman algorithm** and **lazy evaluation**

Autumn 2014 **Toonification**, *Fundamentals of Digital Image Processing*

Guide: Prof. Ajit Rajwade

- Developed an application to **cartoonify** real life images using the **staircase effect** of the bilateral filter and **color quantization**
- Contrasted the results obtained with an alternative approach based on clustering jointly in 5D space (location and color) using **mean shift**

Internships

Summer 2015 **Amazon Development Centre**, *Enhancements to the Address Validation System*

Mentor: Abhay Dang, Software Development Manager

- Enhanced the **address labelling** algorithm to successfully identify all the localities from an address, this resulted in a **12% increase** in the validation rate
- Received a **Pre Placement Offer** after successful completion of the project

Summer 2015 **Google Summer of Code**, *Web Tracking Extension for CiviCRM*

Mentor: Kurund Jalmi, Core Team Member

- Integrated the web tracking features provided by **Google Analytics** with CiviCRM
- Designed and implemented Event tracking, **A/B testing** and E-Commerce tracking to reduce the number of user clicks, improve the conversion rate and identify the top revenue generating referral traffic sources respectively

Summer 2014 **Edelweiss Capital**, *Order Management System*

Mentor: Mudit Sharma, Senior Manager

- Designed and implemented a service to calculate the latency of the servers
- Parallelized the computation which reduced the running time by a factor of 10

Seminars

March 2015 **Applications of Genetic Algorithms**

Guide: Prof. Pushpak Bhattacharyya

We surveyed the wide range of problems which could be tackled using genetic algorithms. We also presented a research paper. The paper proposed a genetic algorithm to solve the generalized vertex cover problem.

Honours and Awards

- Ranked **9th** out of 96 students in the Department of CSE, IIT Bombay
- Awarded **AP grade** for exceptional performance in *Abstractions and Paradigms for Programming, Engineering Drawing and Psychology* at IIT Bombay

Teaching

Autumn 2015 **Teaching Assistant**, *Computer Architecture and Computer Architecture Lab*

- Conducted weekly tutorials and assisted students during the associated labs
- Involved in taking vivas for the lab and evaluating written examinations

Summer 2013 **Teaching Assistant**, *PACE Institute*

- Held daily sessions for assisting junior college students with physics and math

Other Experience

Autumn 2015 **Mentor**, *Institute Buddy Programme, IIT Bombay*

- Appointed mentor to **guide an international student** on an exchange programme
- Responsible for ensuring an easy transition to the culture of the institute

2009-2010 **Head Boy**, *C.N.M School*

- Involved in organizing events like the Sports Day, Annual Cultural Function, etc.