

# Ranveer Aggarwal

VISUAL COMPUTING · SOFTWARE ENGINEERING

Mumbai, India

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## Education

### IIT Bombay

Mumbai, India

B.TECH. (HONS) IN COMPUTER SCIENCE AND ENGINEERING

2016

CGPA: 7.39/10.00

## Internships

### Package Install for Third-Party Plugins

KDE

GOOGLE SUMMER OF CODE STUDENT

Summer 2015

- Designed and developed interfaces in Qt5 to install third party plugins, platform-independently across five KDE applications by querying for plugins using Appstream and then installing using PackageKit
- Ported KDE applications and libraries like Network-Filesharing and language-plugins from KDELibs4 to KF5
- Additionally fixed bugs where required, learnt software packaging and packaged PackageKit-Qt for launchpad

### Rest-API Controller for Legacy Applications

Citicorp, Pune, India

SOFTWARE DEVELOPMENT INTERN

Summer 2015

- Initiated and lead a project to future-proof legacy custodian applications by building a REST API controller
- Built on NodeJS and Express, the controller is modular, re-programmable and uses ORM to connect to databases
- Developed a prototype application using AngularJS and Materialize to prove that the controller works
- Received a Pre-Placement Offer (PPO) for exceptional performance over the internship

## Research Experience

### Tracking and Reconstruction of a Human Body

Guide: Prof. Parag Chaudhuri

UNDERGRADUATE DISSERTATION

Ongoing

- Co-Designed a novel method to reconstruct human body using noisy point cloud data in real-time from a single Kinect
- Currently implementing the method in OpenFrameworks using OpenNI and NiTE
- Investigating methods to render the reconstructed model in virtual reality, viewable on a head mounted display like Oculus

### Traffic Infraction Detection through Mobile Devices

Guide: Prof. Siddhartha Chaudhuri

RESEARCH AND DEVELOPMENT PROJECT

Ongoing

- Exploring ways to detect signal jumping and tailgating using a mobile phone mounted on the vehicle dashboard
- Crowdsourced data and object detection techniques will be employed to get data from videos in near real-time

## Key Academic Projects

### Image Quilting for Texture Synthesis and Transfer

Prof. Suyash Awate

MATLAB

Autumn 2015

- Implemented a pioneering algorithm by Efros and Freeman for generating textures by stitching together small image patches
- Further developed the extension of the algorithm to render an image with a texture taken from a different image

### Lightcuts

Prof. Parag Chaudhuri

C++ (PBRT)

Spring 2015

- Implemented a scalable framework for computing realistic illumination based on the research paper 'Lightcuts' [SIGGRAPH 2005]
- Significantly lowered the rendering time for several (>1000) uniformly distributed point light sources

### Rendering with Photorealistic Renderman

Prof. Parag Chaudhuri

RENDERMAN

Spring 2015

- Wrote shaders and rendered raytraced scenes using Pixar's rendering software PRMan
- The resultant scene elements produced effects like color bleeding, caustics, area lights and soft shadows

## Incremental Development of a Compiler

C++, FLEXC++, BISONC++

- Implemented a compiler for a subset of the C language using tools like FlexC++ and BisonC++
- Sethi-Ullman Algorithm was used to create a syntax tree and optimization was done for control statements

*Prof. Amitabha Sanyal*

*Spring 2015*

## Transformer Rendering and Animation

C++, OPENGL

- Modeled, textured and animated (via forward kinematics) a transformer robot from scratch with OpenGL
- Developed an interactive environment for the keyboard controlled bot with inter-object collisions
- Used motion captured data in the form of BVH inputs to animate the transformer (via reverse kinematics)

*Prof. Parag Chaudhuri*

*Autumn 2014*

## Movie Social Network

JAVA, HTML, BOOTSTRAP

- Developed a social network for movie enthusiasts similar to Goodreads using JSP, Java and PostgreSQL
- Optimised database schema and minimised redundancy after normalisation and ER modelling

*Prof. N.L. Sarda*

*Autumn 2014*

## Threading and Scheduling Implementation in GeekOS

C, C++

- Modified the existing scheduler of an experimental OS by adding Multi Level and Round-Robin scheduling
- Added support for kernel and user level threads and methods for deadlock handling

*Prof. D.M. Dhamdhare*

*Autumn 2014*

## 2D Simulation of an Orrery

C++, BOX2D

- Simulated a mechanical model of Solar System using gears instead of gravity
- Used Box2D, an open source physics engine for interaction between mechanical components

*Prof. Parag Chaudhuri*

*Spring 2014*

## Chess with Artificial Intelligence

SCHEME

- Developed a chess game in PLT Scheme using in-built GUI Toolkit in DrRacket
- Implemented the Minimax Algorithm with Alpha-Beta Pruning for the AI with a tree depth of 3

*Prof. Amitabha Sanyal*

*Spring 2013*

## Seminars

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### Bidirectional Lightcuts

ADVANCED COMPUTER GRAPHICS

**Abstract:** If real-world scenes are to be modeled, we need a fast, noise free rendering algorithm that handles all kinds of materials like glossy materials, and phenomenon like subsurface scattering. General unbiased algorithms like Path Tracing produce a lot of noise whereas specialized noise free algorithms like Instant Radiosity are biased, meaning several important illumination features might be missing. The paper, an extension of a previous paper titled 'Lightcuts', implemented by the same author extends support to a wider variety of materials and phenomenon, while maintaining scalability and low noise. It uses clever weighing strategies to lower the bias in VPL-based algorithms and demonstrates scalable, efficient, and low noise rendering of scenes with highly complex materials including gloss, BSSRDFs, and anisotropic volumetric models.

*Guide: Prof. Parag Chaudhuri*

*Spring 2015*

### Protecting Browser State from Web Privacy Attacks

PRINCIPLES OF DATA AND SYSTEMS SECURITY

**Abstract:** The web is a never-ending source of security and privacy problems. It is an inherently untrustworthy place, and yet users expect it to be safe, interactive and good looking. This often requires long-term state to be stored inside the browser client. Hiding state information from curious or malicious attackers is critical for privacy and security. The Same-Origin principle is a principle that prohibits websites from different domains from interacting with each other except in very limited ways. It is the failure to apply an appropriate adaptation of this principle to all persistent browser state that is the source of the most alarming web privacy leaks. Web-Content Caching and Visited Link Differentiation were discussed.

*Guide: Prof. RK Shyamasundar*

*Autumn 2015*

## Development Projects

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### IITB App - The Official IIT Bombay Application

ANDROID, DJANGO

- Co-developed web services to allow content retrieval and engagement for LDAP authenticated users
- The app, developed in a team of four, reached 1000+ installations in 12 days on Google Play Store
- Interviewed by and featured in the Times of India for taking up the first of its kind student initiative in India

*Spring 2015*

## Kapi - A Classroom Note Taker

Microsoft Code.Fun.Do

WINDOWS UNIVERSAL PLATFORM, JAVASCRIPT

Spring 2014

- Designed an app that, along with normal text, typesets math in LATEX format as well as facilitates drawing
- Worked in a team of 4 to develop a program that recursively breaks down the input chunks into smaller components (tokens), parses them into  $\LaTeX$  and displays them on the screen using MathJax
- The application won the 1<sup>st</sup> place at Microsoft Code.Fun.Do, 2014 and is currently live on the Windows App Store

## Bodhitree - E-Learning Academy

DJANGO, REACT.JS

Autumn 2014

- Developed plugins and fixed bugs for the existing web-platform built in Django
- Analysed user behaviour through data-logging and optimised parts of the existing code base

## Achievements

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- 2016 **Runner Up**, Microsoft Code.Fun.Do Hackathon
- 2015 **Runner Up**, Lenovo Game Jam
- 2015 **3rd Place**, Microsoft Build the Shield CTF Hacking Competition
- 2014 **3rd Place**, Microsoft HackCon CTF Hacking Competition
- 2014 **National Winner**, Microsoft Code.Fun.Do Hackathon
- 2012 **All India Rank 104**, National Level Science Talent Search Examination (NSTSE)
- 2009 **All India Rank 1**, International Olympiad of Science (IoS)

## Skills

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- Programming Languages** C/C++, Python, Java, JavaScript, PHP, VHDL
- Web Development** HTML, CSS, Bootstrap, Materialize, AngularJS, Django, NodeJS
- Miscellaneous** OpenGL,  $\LaTeX$ , Renderman, MATLAB, Qt5, MIPS-Assembly

## Campus Activities

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### Web and Coding Club

IIT Bombay

MANAGER

May 2014 - April 2015

- Led a two-tier team consisting of 9 co-ordinators to encourage programming as a hobby
- Mentored 15 freshmen teams under Institute Technical Summer Projects in Summer of 2014
- Co-organized several large events like Google IO Extended, Mini Debconf, Google Cloud Colloquium and Facebook Hackathon in collaboration with organizations like Google Developers Group Mumbai and Mozilla India

## Miscellaneous

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### Side Projects

PROJECTS AND CONTRIBUTIONS

- Contributor to several KDE projects including Plasma-Desktop, Krita and PlanetKDE; re-designed and re-developed PlanetKDE as a part of a Season of KDE project (Winter 2014)
- Developed an application, titled Rumor Roll! in PHP using Yahoo! Boss API and YQL that outputs rumours related to the given query at Yahoo! HackU 2013
- Built a JavaScript based game Fission, on the lines of popular game, Chain Reaction
- Elected as the web secretary of Hostel 3 for the year 2013-14; redesigned Hostel 3's website

### Interests

EXTRA-CURRICULAR ACTIVITIES

- Learning French as a third language through language classes at IIT Bombay
- Completed the year-long course by National Sports Organization in Squash in 2013