Pranav Kumar

Junior Undergraduate
Department of Electrical Engineering
Indian Institute of Technology, Kanpur

E-mail: pranavk@iitk.ac.in
Phone: +91-9984250087
Website: home.iitk.ac.in/~pranavk

EDUCATION

- **Indian Institute of Technology, Kanpur, India** Expected: May 2017
  Bachelors of Technology - **Electrical Engineering**
  Minor - **Computer Systems** (Computer Science and Engineering)
  Cumulative Performance Index (CPI) of **9.4/10** (in major, **9.8/10**, at the end of 5^{th} semester)
- *Class XII - Indian School Certificate (ISC)* - **95.2%** May 2012
  St. John's School, Varanasi, India
- *Class X - Indian Certificate of Secondary Education (ICSE)* - **94.8%** May 2010
  St. John's School, Varanasi, India

SCHOLASTIC ACHIEVEMENTS

- Selected to visit and **explore research at the Dept. of Electronic Systems, Aalborg University, Copenhagen**.
- Awarded **Institute Academic Excellence Award** for outstanding performance in the term 2013-14.
- Secured an **All India Rank 520** in **IIT-JEE (Advanced)-2013** among **1.4 million candidates**.
- Secured an **All India Rank 1** in **SCRA-2013** and **Rank 5** in **UPSEE-2012**.
- Entitled to the **Indra Dhanush Donors' Scholarship**.
- Secured an **All India Rank 17** in **National Level Science Talent Search Examination-2012**.
- Secured an **International Rank 24** in the **International Mathematics Olympiad**, **128** in the **National Science Olympiad** and **201** in the **National Cyber Olympiad**, conducted by the **Science Olympiad Foundation**.

INTERNSHIP AND RESEARCH EXPERIENCE

- ***New York University*** – **An improved Virtual-source based transport model for quasi-ballistic transistors, MIT Virtual Source Model (V2).**
  Mentored by Prof. Shaloo Rakheja, Dept. of ECE, Polytechnic Institute of NYU May 2015 - July 2015
  - Implemented **MIT Virtual Source model (V2)** in industry standard modelling language Verilog-A and gained an **in-depth knowledge of semiconductor device physics**.
  - Used MATLAB and the simulation tool nextnano for **solving coupled Schrödinger-Poisson equation for III-V High electron mobility transistors (HEMTs)**.
  - Successfully **implemented a quantum well InGaAs heterostructure device** and simulated the same in nextnano to **study the role of gate voltage and carrier confinement** in low effective mass materials.
  - Following this, **simulated MVS 1.0.1 in Spectre**, and verified the same by **running various HSPICE netlists like invertor, ring oscillators etc**.
  - Completed the task by **implementing MVS 2.0.0 in Verilog-A**.
  - This open-source compact model is **published on NEEDS (Nano-Engineered Electronic Devices Simulation), nanoHUB-U**.
- ***University of Chicago*** – **Understanding and quantitatively evaluating Soft-Error Injection Techniques for Robust System Design.**
  Mentored by Prof. Yanjing Li, Dept. of Computer Science, University of Chicago Jan 2016 - present
  - Did literature survey on **understanding soft errors**, **rethinking error injection for effective resilience** and **quantitative evaluation** of such techniques.
  - Wrote simple programs, **cross-compiled them to Machine code of LEON3 processor** of **SPARC architecture** and **simulated in TSIM**.
  - Currently working on running open benchmarks like **Dhrystone, Stanford** and **Mibench**.

SELECTED PROJECTS

- **FPGA Implementation of an 8-bit Microprocessor** Nov 2015 - Jan 2016
  Mentored by Prof. S. Qureshi, Dept. of Electrical Engineering, IIT Kanpur
  - Implemented an **8-bit simple microprocessor on FPGA**. The system was realized on **Xilinx Virtex-II Pro using ISE 10.1 and Verilog**.

- The **Control Unit, Arithmetic Logic Unit and Memory** were designed and tested separately.
- The Control Unit is modeled as a **Finite State Machine**, ALU as a **digital circuit** and Memory as a **16-word 8-bit**. **Each bit** of the memory in an SRAM cell is **implemented with an AND gate, a D-latch, and a tri-state buffer**.

- **Computer Vision: 3D Display and User Interface** Dec 2014 - Oct 2015
  Mentored by Prof. K.S. Venkatesh, Dept. of Electrical Engineering, IIT Kanpur
  - Developed a **desktop/mobile application** for e-commerce companies **for exhibiting a 3D rendered view of their products**.
  - The user's eye orientation with respect to the product displayed on screen is estimated using algorithms that work with the help of **face detection and distance estimation**.
  - The actual image expected to be seen by a viewer is **displayed in real-time giving an almost real life 3D experience**.
  - The project prototype was selected among the **top 5 ideas** in the **ERICSSON Innovation Awards 2014-15** among more than 100 teams selected nationwide from all IITs and awarded INR 25000 for the same.
  - Programmed in C++; OpenGL, OpenCV and Android graphics libraries have been used in the application.

- **Network Simulation** Apr 2014 - July 2014
  Mentored by Prof. Ketan Rajawat, Dept. of Electrical Engineering, IIT Kanpur
  - Learnt the basics of **Network Simulation software, NS2**, a discrete event simulator and **NAM, Network Animator**.
  - Simulated **complex topologies**, **recording data** in output files and displayed them using xgraph.

- **Udghosh-2014 Website** July 2014 - Aug 2014
  - Created the website for the Inter-College Sports Festival of IIT Kanpur, Udghosh-2014.
  - Made use of **HTML**, **CSS**, **JS**, **jQuery**, **Go** and **Git**. Visit: portal.udghosh.org

- **Google Developer Groups DevFest-2013** and **Microsoft Code.Fun.Do 2014**
  - Awarded a **Special Mention** in **GDG DevFest-2013**, a 24-hour coding competition.
  - Designed **BookMyTee, a shopping website** using HTML, CSS and JS.
  - Built a **Computer vision** based **Windows Desktop application** in Code.Fun.Do.
  - Visit: `home.iitk.ac.in/~pranavk/BookMyTee/store.htm`

- **Working Model of a Tornado** July 2014 - Nov 2014
  Course Project, Mentored by Prof. Shashank Shekhar, IIT Kanpur
  - Made an accurate **scaled down model of a tornado** in the vicinity of a village for the Manufacturing Process course (TA201) using basic metal forming techniques like casting, brazing, welding and sheet metal cutting. Prior **Computer simulation** was done on **Autodesk Inventor**.
  - Were awarded the **Section Best** and the **overall Runner-up** among 70 such projects.

- **Semi-Automatic Gift Wrapper** Dec 2014 - Apr 2015
  Course Project, Mentored by Prof. V.K. Jain, IIT Kanpur
  - Made an accurate **working model of a gift wrapper**, using the Geneva mechanism.
  - Made use of processes like lathe, milling, drilling, fitting and welding.

- **Turtle Terror, Robo-Pirates**
  Competition under Techkriti-2014, IIT Kanpur
  - **Designed a Ground Bot and an Amphibian Bot** and competed in Robo-Pirates, a Robotics event in the Inter-College Technical and Entrepreneurship Festival of IIT Kanpur, Techkriti-2014.

SOCIAL INITIATIVE

Quizzare *(Jun 2014 - present)* – A social initiative under which we, a group of five, **conduct school-level quizzes** in various cities of India, in a wide range of genres **to enhance analytical thinking and interactive learning among school students.**

RELEVANT COURSES

Digital Electronics	Digital Signal Processing*	Nanoscale Transistors (nanoHUB-U)
Computer Architecture	Data Structures and Algorithms	Control Systems Analysis
Microelectronics	Signals, Systems and Networks	Principles of Communication
Power Systems	Electromagnetic Theory*	Solid-State Devices
Information Theory*	Probability and Statistics	Fundamentals of Computing
Introduction to Electronics	Complex Variables	Ordinary, Partial Differential Equations
Electrodynamics and Mechanics	Engineering Graphics	Calculus and Linear Algebra

*Ongoing courses

TECHNICAL SKILL SET

- **Programming Languages**: Verilog, Verilog-A, C, C++, Java, HTML, CSS, jQuery, MySQL, PHP and Javascript
- **Software Experience**: Xilinx ISE, ModelSim, MATLAB, nextnano, AIM/HSPICE, Microcap, GNU Octave, Spectre, OpenCV, NS2, NAM, Git, AutoCAD, Inventor, LaTeX, OpenGL, vim, Visual Studio and LabVIEW
- **Operating Systems**: Linux/Unix Systems, Windows
- **Imaging Systems**: Microsoft Kinect

POSITIONS OF RESPONSIBILITY

- **Secretary, Programming Club**: Helped instill a culture of programming on campus by conducting workshops and lectures for students. Guided students in various intra- and inter-college technical festivals, for example WebDev, Kodefest in Takneek'14.
- **Member, Google Developer Groups**: Conducted lectures on various aspects of Web Development, particularly Client and Server side coding.
- **Academic Mentor, Introduction to Electrodynamics**: Took remedial classes for the course, Introduction to Electrodynamics, and did individual mentoring for academically deficient students.
- **Student Guide, Counselling Service**: Organized the Orientation Programme for the freshmen batch and given the responsibility of six students to help them settle in the campus and provide them with emotional and academic help throughout.