Basic Information  $5^{th}$  Year Dual Degree Student Phone: +91-7418276077 Department of Electrical Engineering Email: ee11b087@ee.iitm.ac.in

Indian Institute of Technology Madras Webpage: www.ee.iitm.ac.in/~ee11b087/

RESEARCH INTERESTS My research interests include Electronic Design Automation tools and Computer-aided design for VLSI systems. I also have a keen interest on topics of Computer Architecture and Data Structures & Algorithms.

EDUCATION

Indian Institute of Technology Madras, Chennai, India

July 2011 - Present

Dual Degree, Department of Electrical Engineering Bachelor of Technology, Electrical Engineering Master of Technology, Microelectronics & VLSI

- Cumulative Grade Point Average (CGPA): 9.23/10
- $\bullet$  Class Rank  $\mathbf{5}$  / 77
- Junior-Senior years (GPA: 9.55/10)
- Minor: Industrial Engineering (GPA: 9.33/10)

City Vocational Public School, Meerut, India All India Senior School Certificate Examination Apr 2009 - Mar 2011

• Secured 97% (Physics, Chemistry & Mathematics)

Publications

Aman Goel, Chaitanya Peddawad, Dheeraj B, and Nitin Chandrachoodan, "iitRACE: A Memory Efficient Engine for Fast Incremental Timing Analysis and Clock Pessimism Removal", in *Proceedings of the IEEE/ACM International Conference on Computer-Aided Design*, November 2015, pp. 903-909 [Link]

Aman Goel, "Solar Charger for Rechargeable Batteries Used in Hearing Aid Devices", in *International Journal of Engineering Science and Innovative Technology* Volume 2, Issue 5, September 2013, pp. 109-113 [Link]

RESEARCH EXPERIENCE Incremental Timing and Common Path Pessimism Removal (CPPR) Analysis
TAU 2015 Contest

Dec 2014 - Mar 2015

Prof. Nitin Chandrachoodan

- The project included developing a unified academic tool for timing verification to analyze and ensure slack integrity and timing closure in VLSI design flow.
- Developed a timer that supported incremental changes to a circuit (in standard industrial formats), performed fast timing analysis to the affected regions and removed pessimism due to common data and clock paths (CPPR) using least time and resources.
- Developed novel techniques to identify and report worst slack paths in a circuit.
- The timer won international 3<sup>rd</sup> place in TAU 2015 contest and was presented at ICCAD 2015.

# iitRACE: Incremental Timing Analysis Engine

Jun 2015 - Present

Master Thesis Project

Prof. Nitin Chandrachoodan

- The project includes developing a multi-threaded implementation for incremental timing framework.
- Developed effective pruning techniques to make timing analysis faster without compromising on memory usage.
- Currently working to include gate-sizing and threshold-voltage swap for leakage power optimization in the tool.

## Radiation Pattern Measurement System for Automotive Radar May - July 2014

Chethan Kumar Y B, Wireless Connectivity Solutions, Texas Instruments

- Developed an automatic radar positioning system for radar modules testing
- The module provides easy control of radar position in 3D space with angular position error less than 1° in both horizontal and vertical plane and range error less than 1 mm
- It is now used to test characteristics of automotive radars used for automatic car parking

### Solar Charger for Hearing Aid Devices

May - July 2013

R.S. Hiremath, Flexitron India

- Developed a pocket solar charger for R13 size batteries used in BTE Hearing aid.
- Designed energy efficient circuits for dual mode charging (AC as well as Solar).
- The product won National Award for the Empowerment of Persons with Disabilities 2013.
- The product is now produced in mass volumes and supplied to health organizations all over India.

Academic Honors

- Branch Position 2 in Electrical Engineering (Microelectronics & VLSI) out of 28 students at IIT Madras
- Recipient of **Electronics for You** prize for **best academic performance** in Microelectronics & VLSI in 4<sup>th</sup> year
- Class rank 5 out of 77 students in my batch in Electrical Engineering at IIT Madras
- Secured All India Rank 608 among 500,000 candidates in IIT Joint Entrance Exam 2011
- Secured All India Rank 1372 among over 1 million candidates in All India Engineering Entrance Examination 2011
- Secured perfect grade (S) in all four courses taken at Computer Science department.

KEY COURSE PROJECTS

#### Systolic Arrays in Bluespec

Aug - Nov 2015

Guide: Prof. V. Kamakoti (CAD for VLSI Systems)

- Designed and analysed different architectures of matrix-matrix multiplication using systolic arrays and implemented using Xilinx ISE
- Characterised pareto optimal nature of different solutions based on throughput and clock frequency

# Hardware modeling and FPGA Implementation

Jan - May 2015

Guide: Prof. Nitin Chandrachoodan (VLSI Design Lab)

- Implemented 8-bit MIPS with 9 instructions and 3 instruction formats on Spartan 3E FPGA board
- Implemented a complete ADC-FIR-DAC design

#### Standard Cell Design and Layout

Aug - Nov 2014

Guide: Prof. Vinita Vasudevan (Digital IC Design)

- Designed layouts of digital logic gates in MAGIC and simulated using Spice Opus
- Characterised standard cells for different input slews and load capacitance

#### String Matching Problem & Variants - Review Paper

Mar - May 2014

Guide: Prof. Nitin Chandrachoodan (Data Structures & Algorithms)

- Reviewed the historical Knuth-Morris-Pratt (KMP) algorithm and other similar variants to find all occurrences of a given pattern string in a text
- Analysed the complexity of the algorithms and significance in real world applications

# IC Design of a two stage fully differential operational amplifier Mar - Apr 2014 Guide: Prof. S. Aniruddhan (Analog IC Design)

• Designed and simulated a two stage fully differential op-amp based on 180 nm technology

# **SPICE Circuit Simulator**

Aug - Nov 2012

Guide: Prof. Harishankar Ramachandran (CAD Lab)

• Developed a circuit solver in C similar to SPICE for solving linear circuits

Yahoo Hack U 2013

• Developed software that converts voice input in a language to text field in other chosen language using available softwares of Google Voice Recognition and Google Translate

#### TEACHING EXPERIENCE

#### **Graduate Teaching Assistant**

EE5311: Digital IC Design Prof. Nitin Chandrachoodan

Aug - Nov 2015

- Assisted the professor in grading (assignments and quizzes) and other logistics
- Held office hours to help the students with the assignments and cater their queries

EE5332: Mapping Signal Processing Algorithms to DSP Architectures Jan - May 2016

### Relevant Courses

#### **Electrical**

Computer Organisation & Microprocessors, Mathematical Methods in Circuit Analysis, Mapping Signal Processing Algorithms to DSP Architectures, Digital IC Design, Analog IC Design, Digital Systems, VLSI Technology

#### Computer Science

CAD for VLSI Systems, Digital Design Verification, Digital Systems Testing & Testable Designs, Data Structures & Algorithms, Computational Engineering

### Mathematics & Others

Combinatorial Optimization, Fundamentals of Operational Research, Decision Modelling, Probability Foundations for EE, Linear Algebra & Numerical Analysis, Calculus, Complex Variables and Transform Techniques

#### Labs

VLSI Design Lab, Microprocessor Laboratory, Advanced Microelectronics Lab, CAD Lab, Digital Circuits Lab, Analog Circuits Lab

#### HARDWARE AND SOFTWARE SKILLS

#### Languages

- Good knowledge of C++, C, Verilog, Python, Bluespec
- Working knowledge of Java, Shell Scripting and HTML

# Packages and Tools

- Eclipse, MATLAB, Xilinx ISE, PlanAhead, Vivado, Spice, Magic, LATEX
- Working knowledge of ARM, MSP430, ModelSim, Keil

### CO-CURRICULAR AND EXTRA CURRICULAR ACTIVITIES

- Won First prize at Pan IIT Research Expo 2014 among participants from all IITs
- Won Second prize at National Level Student Competition on Renewable Energy 2014 organized by TEDA<sup>1</sup> & IEEE SIGHT
- Won Third prize in Paper & Poster Presentation at Shaastra<sup>2</sup> 2014
- Member of Mandakini hostel Water Polo team
- Regular voluntary blood donor to TTK VHS Blood Bank

#### OTHERS

- Alumni Affairs Secretary of Mandakini hostel, 2013-14
- Member of Sustainability Network (S-Net) team 2011-12 for National Service Scheme (NSS), IIT Madras
- $\bullet$  Contraptions event team member for Shaastra 2011 and Hospitality team member for Saarang  $^3$  2012
- Student member of ACM and ACM SIGDA

 $<sup>^{1}</sup>$  TEDA - Tamil Nadu Energy Development Authority

<sup>&</sup>lt;sup>2</sup> Shaastra is the annual technical festival of IIT Madras

<sup>&</sup>lt;sup>3</sup> Saarang is the annual cultural festival of IIT Madras

#### References

# Professor Nitin Chandrachoodan

Department of Electrical Engineering Indian Institute of Technology Madras  $http://www.ee.iitm.ac.in/\sim nitin$ 

### Professor V. Kamakoti

 $\label{eq:computer Science} \begin{tabular}{l} Department of Computer Science \\ Indian Institute of Technology Madras \\ $http://rise.cse.iitm.ac.in/people/faculty/kama/kama.html \end{tabular}$ 

# Professor Nandita DasGupta

Department of Electrical Engineering Indian Institute of Technology Madras  $http://www.ee.iitm.ac.in/\sim nand$ 

# Professor Vinita Vasudevan

Department of Electrical Engineering Indian Institute of Technology Madras  $http://www.ee.iitm.ac.in/\sim vinita$