Abhishek Kumar Singh

Doctoral Student
Department of Computer Science
Princeton Advanced Wireless Systems
Princeton University
aksingh@princeton.edu

EDUCATIONAL RECORDS:

Year	Degree	Institution/Board	CGPA (or %)
2019-	Ph.D. (Computer Science, Third Year)	Princeton University	3.9/4.0
2012-16	B. Tech (Major – Electrical Engineering, Minor – Algorithms, Computer Science)	Indian Institute of Technology, Kanpur, India	9.9/10.0
2012	Senior Secondary	Delhi Public School, Jodhpur (Central Board of Secondary Education, India)	94.8%
2010	Secondary	Delhi Public School, Jodhpur (Central Board of Secondary Education, India)	9.8/10.0

EDUCATIONAL ACHIEVEMENTS:

- **Completed B.Tech with department rank 1.**
- Winner of the "**Dr. Prateek Mishra Memorial Gold Medal**" for the **best academic performance** among graduating students in Department of Electrical Engineering, IIT Kanpur, India.
- Winner of **Academic Excellence Award** in **2012-2013, 2013-2014, 2014-2015** at IIT Kanpur, India.
- Awardee of "**Kishore Vigyanik Protsahan Yojana Scholarship**" (**KVPY - ALL INDIA RANK -12**) in the year 2012 (**Awarded by Department of Science & Technology, Government of India**).
- **National Talent Search scholar (NTSE)** in the year 2008, (**Awarded by National Council of Educational Research & Training, (NCERT) New Delhi, India**).

WORK EXPERIENCE @ Samsung R&D Institute India – Bangalore (June 2016 – July 2019):

1. **Pre-5G FPGA Based UE** design and development based on pre-5G specification by Verizon (V5G)
   I. Design and development of Medium Access Control, Radio Link Control and Packet Data Convergence Protocol based on pre-5G specification by Verizon (V5G) on a multicore platform.
      Involved design and implementation of specified layers as a multi-task software meant for multi-core platforms.
   II. Device Driver development for 1G, 10G, PCIe, Hardware Packet Classifiers, and Ciphering engines.
      Involved design of high-speed device drivers for mentioned interfaces and accelerators to support multi-Gbps throughput and highly efficient interaction with the software.
   III. Design and development of memory management procedures and Inter-core IPC between multiple cores operating in AMP mode.
   IV. Development of Various Networking Protocol Modules – ARP, UDP, DHCP, NAT.
   V. Worked on start-up and booting procedures for multiple cores operating in AMP mode.
   VI. Supported Block testing, End-to-end lab testing, and Field Testing.
2. Design and development of **RLC for 5G NR DU** (Distributed Unit of NR Base Station) based on 5G NR specification.
   I. Involved in design of RLC Layer for NR Base Station.
   II. Involved in study and analysis of Base station Platform and associated hardware accelerators.
3. **3GPP Standardization for NR Unlicensed** operation focussing on MAC and Physical Layer Procedures.
4. **3GPP Standardization for NR Aerial** (Non-Terrestrial Networks) operation focussing on MAC and Physical Layer Procedures.

TECHNICAL PAPERS:

1. A. K. Singh, K. Jamieson, P. L. McMahon, and D. Venturelli, "**Ising Machines' Dynamics and Regularization for Near-Optimal MIMO Detection**," in **IEEE Transactions on Wireless Communications**, 2022.
2. S. Kasi*, A. K. Singh*, D. Venturelli and K. Jamieson, "**Quantum Annealing for Large MIMO Downlink Vector Perturbation Precoding**," *ICC 2021 - **IEEE International Conference on Communications***, 2021.
3. Shyam Gadhai; A. K. Sah; A. K. Singh ; Rohit Budhiraja ; A. K. Chaturvedi, "**New Block-Based Spatial Modulation,**" **IEEE Communications Letters**, Year: 2018 , Volume: 22, Issue: 10
4. A. K. Singh, "**Fast inversion of positive definite Hermitian matrices using real inverse operations**," **2015 Annual IEEE India Conference** (INDICON), New Delhi, India, 2015, pp. 1-3.

PATENT FILINGS:

1. "**A method and system for enhanced PRACH transmission, random access procedure response, message3 transmission and contention resolution for LBT based LTE/NR unlicensed operation**", *Abhishek Kumar Singh ; Anil Agiwal ; Pravjyot Singh Deogun ; Anshuman Nigam, Patent Application: 201841029871*
2. "**Method and system for management of MAC timers for 5G Unlicensed operation**", *Abhishek Kumar Singh ; Anil Agiwal ; Pravjyot Singh Deogun, Patent Application: 201841022151*
3. "**Method and system for MCS selection for systems with large transmission or propagation delay**", *Abhishek Kumar Singh ; Ekansh Gupta ; Anshuman Nigam ; Anil Agiwal ; Pravjyot Singh Deogun, Patent Application: 201841039439*
4. "**Method and apparatus for optimizing packet delivery overhead in memory system**", *Mahantesh Mallikarjun Kothiwale ; Abhishek Kumar Singh ; Ekansh Gupta ; Manjunath Jayram ; Yunas Rashid, Patent Application: 201841037099*
5. "**Method for reducing CP and GT in cellular RACH preambles and optimizing random access procedure**", *Ekansh Gupta ; Abhishek Kumar Singh ; Youngbin Chang ; Anil Agiwal ; Anshuman Nigam, Patent Application: 201841020670*
6. "**Method and system for performing random access response reception for extended RAR Timer**", *Pravjyot Singh Deogun ; Anil Agiwal ; Abhishek Kumar Singh, Patent Application: 201841021102*
7. "**Method and system for supporting TDD-frame in high propagation delay cells using flexible frame structure**", *Ekansh Gupta ; Abhishek Kumar Singh ; Anshuman Nigam ; Anil Agiwal, Patent Application: 201841041100*

SUMMER INTERNSHIPS:

- Systems R&D Engineering Intern at Qualcomm.

  Investigate the use of machine learning to predict and optimize 5G connections for low-latency periodic traffic.
- Summer Research Intern at Universities Space Research Association (NAMS R&D Student Program).

  Numerical Models for Optimization Hardware: Analysis of Oscillator-based Ising Machines for wireless applications.
- Project on "**Ultra-Fast MIMO Detection for Next Generation Cellular Systems**" as a summer intern at Samsung R&D Institute – Bangalore.

  Research on highly optimized software implementation of MIMO Wireless systems for next-generation cellular systems on multi-core architecture with SIMD and VLIW support.
- Research project on "**Joint Distributions and Joint Measurements of Non-Commuting Observables**" at Homi Bhabha Centre for Science Education, (HBCSE) Mumbai (India).

  Study and analysis of pseudo phase space distributions, simultaneous measurements of conjugate variables in quantum mechanics, and quantum teleportation.

ACADEMIC PROJECTS:

- Undergraduate project (over a period of 2 semesters) on **Spatial Modulation MIMO** with Prof. Ajit Chautrvedi, Department of Electrical Engineering, IIT Kanpur

  Involved research on extending SM-MIMO to use a variable number of active transmit antennas with the receiver being unaware about it.
- "**Improved Speaker Age Group and Gender Detection using Multiple Classifiers**" as part of course-work in "Speech Signal Processing" under Prof. Rajesh Hegde, IIT Kanpur.

Implementation of a Speaker recognition system capable of detecting the age and gender group of the speaker via the use of multiple classifiers and regressors to achieve enhanced performance.

- Project on "**Improving Linearity of a Differential Pair Using Negative Resistance Compensation**" as part of the course "Analog VLSI Circuits" under Prof. S. Qureshi, IIT Kanpur

  Design a MOS differential pair compensated by an effective negative resistance topology.
  The complete layout of the compensated differential pair using Mentor Graphics.