




# AKHIL KUMAR

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## RESEARCH EXPERIENCE

**Perumal Lab:** *Research Fellow, School of Biological Sciences, Indian Institute of Technology Delhi* **Feb '21-Current**

- Investigated the changing dynamics of CpG depletion in SARS-CoV-2 genomes over time and role of various selection pressures
- Led the computational work, clearly defined the objectives beforehand, advocated the use of best-programming practices
- Successfully tested all custom written functions, classes by designing exhaustive test-cases for unit testing before using them
- Single-handedly refactored the code repository for our project to enhance execution speed, improve code design and readability
- Mastered the use of Python, attained proficiency in the use of regular expressions, version control, and test-driven development
- Identified the highly conserved stretches in the SARS-CoV-2 genome to improve our current widely used diagnostic assays
- Investigating the role of CpG dinucleotides and zinc-antiviral finger protein binding motifs in the evolution of influenza virus
- Lead-author on a publication, author for 2 more manuscripts in preparation (lead author on 1)

**Multiscale Modeling Group:** *Undergraduate Researcher, Indian Institute of Technology Delhi* **Fall '19**

- Assisted with the in-silico design of small ligand molecules to inhibit early-stage insulin aggregation nucleation
- Identified EGCG and polyoxometalates as the putative ligands through extensive literature review, programmed their structures
- Performed targeted docking of EGCG into a partially folded intermediate of insulin using Gray lab's ROSIE server

**Perumal Lab:** *Undergraduate Researcher, School of Biological Sciences, Indian Institute of Technology Delhi* **Fall '19**

- Inspected temporal evolution of mono- and dinucleotides in human mtDNA by analysing sequences dated back to 50k BC
- Developed boxplots for samples from earliest-, middle- and latest-period; conducted statistical tests to compare their medians
- Our findings suggested that lighter strand is becoming heavier, and a slight bias toward GC-rich sequences in ancient reads

**Biomolecular Computational Group:** *Research Intern, Indian Institute of Science Bangalore* **Summer '19**

- Investigated existing kinetic modelling approaches to translate metabolic networks of interest into a dynamic model
- Designed a convenience kinetics based dynamic model comprising 92 reactions, 110 species using complex pathway simulator
- Distributed the reactions across 4 compartments and simulated its dynamic characteristics; examined robustness of the model

**Srinivas Group:** *Research Intern, University of Oxford* **Summer '18**

- Analysed single-cell transcriptomic data collected from early mouse embryo mutant carrying a mutation in ASPP2 gene
- Processed sequence data files, mapped sequence reads, performed quality control on the individual cells, normalized the data
- Identified cell sub-types using an unbiased hierarchical clustering algorithm and expression values for biological marker genes

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## EDUCATION

**Indian Institute of Technology Delhi:** **Class of 2020**

- Awarded Bachelor of Technology in Chemical Engineering, GPA: 6.738/10 (First Class)
- Relevant coursework: Statistics, Epigenetics, Structural Biology, Computer science, Linear algebra and Differential equations, Calculus, Bioprocessing and Bioseparations, Industrial biotechnology, Numerical methods, Introduction to Biology for engineers

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## PUBLICATIONS

**Kumar, A., Goyal, N., Saranathan, N., Dhamija, S., Saraswat, S., Menon, M. B., and Vivekanandan, P. (2022).** The Slowing Rate of CpG Depletion in SARS-CoV-2 Genomes Is Consistent with Adaptations to the Human Host. *Molecular Biology and Evolution*, 39(3). msac029

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## AWARDS, HONORS, & FELLOWSHIPS

- 2021** Supported by an intramural grant (MI01798G) to conduct research on SARS-CoV-2 as a research fellow
- 2019** Award for outstanding contributions to SAC which is the apex student body of Indian Institute of Technology Delhi
- 2015** Kendriya Vidyalaya special recognition for best all round performance amongst the graduating batch of 300 students
- 2013** Award of Honor for scoring 10/10 CGPA in All India Secondary School examination
- 2013, 2012** Winner in Quizzing contests at regional and sub-regional level KVS Social Science Exhibition

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## SKILLS AND LANGUAGES

- Technical** Python, R, bash,  $\text{\LaTeX}$  2<sub>ε</sub>, package management systems, Markdown, unix, version control with git, regex
- Fun** Chess, Badminton, Tennis, Poker, Foosball, Ping Pong, Cricket, Watching movies and series, Reading, Music