

# Ayush Raman, Ph.D.

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STATISTICAL EPIGENOMICS POSTDOC ASSOCIATE, BROAD INSTITUTE OF MIT AND HARVARD

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EDUCATION	<b>Broad Institute of MIT and Harvard</b> , Cambridge, MA <i>Statistical Epigenomics Postdoc Associate, Epigenomics Program</i>	<i>Dec' 18 - Present</i>
	<b>Baylor College of Medicine</b> , Houston, TX <i>Ph.D., Quantitative and Computational Biosciences</i> <i>Dissertation: Decoding Big Genomic Datasets: Biases, hypotheses &amp; regulation</i>	<i>Sept' 13 - Sept' 18</i>
	<b>Carnegie Mellon University</b> , Pittsburgh, PA <i>M.S., Computational Biology; Academic Achievement Fellowship</i>	<i>Aug' 07 - Dec' 08</i>
	<b>Vellore Institute of Technology</b> , Vellore, India <i>Bachelor of Technology, Bioinformatics; Distinction with highest honors</i>	<i>Aug' 02 - May' 06</i>

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RESEARCH INTERESTS Computational Biology, epigenetics and gene expression, single-cell (epi)-genomics, ONT long-read seq, multi-omic integration & analyses, machine learning

SELECTED PUBLICATIONS

- 📖 H Gu\*, AT Raman\* et al. [Smart-RRBS for single cell methylome and transcriptome analysis.](#) *Nature Protocols* (2021) (PMID: 34244697) [[Code](#)]
- 📖 V Kochat\*, AT Raman\* et al. [PRC2 loss-mediated epigenomic reprogramming induces an aggressive neural crest-like phenotype in malignant peripheral nerve sheath tumors.](#) *Acta Neuropathologica* (2021) (PMID: 34283254) [[Code](#)]
- 📖 E Orouji\*, AT Raman\*, AK Singh\* et al. [Chromatin state dynamics confers specific therapeutic strategies in enhancer subtypes of colorectal cancer.](#) *Gut* (2021) (PMID: 34059508)
- 📖 AT Raman. [A research parasite's perspective on establishing a baseline to avoid errors in secondary analyses.](#) *GigaScience* (2021) (PMID: 33710326)
- 📖 AT Raman\*, AE Pohodich\* et al. [Apparent bias towards long gene misregulation in MeCP2 syndromes disappears after controlling for baseline variations.](#) *Nature Communications* (2018) (PMID: 30104565) [[Code](#)]
- 📖 H Yi\*, AT Raman\* et al. [Detecting hidden batch factors through data-adaptive adjustment for biological effects.](#) *Bioinformatics* (2018) (PMID: 29617963) [[Code](#)]

\* denotes (co-) first authorship; All publications are listed in [Google Scholar](#)

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- SKILL-SET SUMMARY
- **Languages:** R (tidyverse & Bioconductor), Perl, Python, Bash, L<sup>A</sup>T<sub>E</sub>X, SQL
  - **Next Gen Data Analysis:** Bulk ATAC-/ChIP-/RNA-seq, single-cell ATAC-/RNA-seq, Long-read seq (1+ year), NanoString nCounter, Microarray, Detection & correction of Batch Effects
  - **Machine Learning Algorithms:** Clustering (*k*-means, hierarchical clustering, NMF, semi-NMF), Dimensionality reduction methods (PCA, ICA, t-SNE, UMAP, MDS), Classification Algorithms (Naive Bayes, Linear Discriminant Analysis, Decision Trees, Random Forest, SVM, Logistic Regression), Regression (Linear, GLM), Regularization (LASSO, Ridge, Elastic-net)
  - **High Performance Computing:** Load Sharing Facility (LSF), Condor
  - **Cloud Computing:** Google Cloud Computing, [Terra](#)
  - **Pipeline Development Tools:** Version control (Git), Workflow manager (Snakemake, WDL)
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WORK AND RESEARCH EXPERIENCE **Statistical Epigenomics Postdoc Associate, Broad Institute** **Cambridge, MA**  
*Martin Aryee, Alex Meissner and Andi Gnirke Labs* *Dec '18 - Present*

- Studying the dynamics of gene regulation using single-cell genomics (Published in *Nature Protocol* and *Nature Biotechnology*) and long read sequencing
- Studying the role of DNA methylation and its writers in diseases in development and aging
- Studied regulatory mechanisms of tumor suppressor genes in senescence (Calico project)

**Research Assistant, Baylor College of Medicine**

**Houston, TX**

*Zhandong Liu's Lab in collaboration with Huda Zoghbi's Lab, NRI*

*Sept '13 - Sept '18*

- Showed that the “preferential misregulation of long genes” observed in transcriptomic datasets of Rett syndrome can occur due to PCR amplification (Published in *Nature Communications*)
- Developed machine learning algorithm for detection of batch effects in transcriptomic datasets (Published in *Bioinformatics*)
- Illuminated the mechanism behind the effects of deep brain stimulation in Rett syndrome (Published in *eLife*)

**Research Assistant, MD Anderson Cancer Center**

**Houston, TX**

*Lynda Chin and Kunal Rai Lab, Genome Medicine*

*Sept '13 - Sept '18*

- Elucidated the epigenomic landscape in colorectal cancer (Published in *Gut*)
- Showed the oncogenic role of EZH2 in the pathogenesis of MPNST tumors (Published in *Acta Neuropathologica*)
- Showed the role of TRM28/KRAB repressors during development (Published in *Stem Cell Reports*)
- Estimated lymphocytic infiltration in melanoma heterogeneous tumors (Published in *Cell*)

**Bioinformatics Scientist, Institute for Systems Biology**

**Seattle, WA**

*Shmulevich Lab in collaboration with Alan Aderem's and Leroy Hood's Lab*

*Jul '10 - Jul '13*

- Enumerated gene expression similarities and differences between the rhinovirus and influenza viruses using time-course microarray datasets (P&G project)
- Analyzed different types of ChIP-seq datasets, including Pol-II, Transcription Factor & HDAC and performed integrative analyses with gene expression data to elucidate gene regulatory network that gets activated due to anti-viral or anti-bacterial responses (Published in *Nature*)

**Statistician/Research Programmer, University of Pittsburgh**

**Pittsburgh, PA**

*Computational Genetics Lab and Department of Biomedical Informatics*

*Apr '09 - Jul '10*

- Implemented genomic distance-based multivariate regression model for the estimation of Identity by Descent (IBD) in the haplotype datasets between the case and control pairs
- Performed computational prediction and accuracy of different types of discriminative and generative algorithms

**AWARDS & HONORS**

- Hechter Memorial Award, Broad Institute (2020)
- [Junior Research Parasite Award for Rigorous Secondary Data Analysis](#) (2020)
- MCBIOS Young Scientist Excellence Postdoc Award (2020)
- Gigascience Award for Pacific Symposium on Biocomputing (2020)
- GSBS Scholarship, Baylor College of Medicine (2013-2014)
- Academic Achievement Fellowship, Carnegie Mellon University (2007-2009)
- Undergraduate thesis awarded highest grade, Vellore Institute of Technology (2006)

**MISC. INFORMATION**

- **Peer Review (*ad hoc*):** Nature Communications, PLOS Computational Biology, IUBMB Life, Stem Cell Research & Therapy, Frontiers in Genetics, Frontiers in Immunology, Frontiers in Molecular Biosciences, Frontiers in Pharmacology (Guest Editor)
- **Professional Societies and Memberships:** Core RSG India Member, ISCB (2016-2017)
- **Soft-skills:** Communication, collaboration, honesty, adaptability, creativity, conflict management, punctuality, critical thinking, goal setting