Vivek Rai

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Education

04-2022 (exp) **University of Michigan**
Doctor of Philosophy, Bioinformatics
Master of Arts, Statistics

2017 **Indian Institute of Technology, Kharagpur**
Bachelor & Master of Technology (Dual Degree), Biotechnology & Biochemical Engineering

Research Experience

2018–now **University of Michigan** | Research Assistant
Mentor: Stephen CJ Parker, Ph.D.

- Collaborated with multi-institution and inter-disciplinary research teams on multiple research projects to investigate epigenetic mechanisms underlying regulatory genetic variation in type 2 diabetes (T2D).
- Co-led projects integrating multi-omics datasets (RNA, ATAC, Imaging) at bulk and single-cell resolution using statistical and machine learning approaches to identify disease defining features of T2D.
- Contributed to open-source bioinformatics tool design and development; and created sequencing data processing pipelines using workflow-programming languages.

2018 (Jan-Apr) **University of Michigan,** Research Assistant
Mentor: Cristen Willer, Ph.D.

- Programmatically mined the GWAS catalog data to identify genomic loci associated with cardiovascular disease markers to prioritize candidate drug targets.
- Built a polygenic risk score (PRS) predictive model to identify individuals at the risk of cardiovascular diseases using LDL-cholesterol data in UK Biobank (UKBB).

2015–2017 **IIT Kharagpur,** Master's Thesis
Mentor: Amit K Das, Ph.D.

- Systematically profiled protein structures from Protein Data Bank (PDB) to using knot finding algorithms in Python and identified structural and functional patterns that characterize a knotted-protein structure.

2016 (May-Jun) **Institute for Systems Biology,** Research Intern
Mentor: Gustavo Glusman, Ph.D.

- Analyzed >2000 individual whole-genome coverage profiles to characterize technical biases in the downstream analyses due to errors in sequencing mapping pipeline.
- Showed that sex-specific biases in whole-genome analysis resulted from mapping biases due to segmental duplication between chromosomes.

2016 (May-Aug) **Google Summer of Code,** Developer
Mentors: Bastian Greshake, Ph.D. and Philip Bayer, Ph.D.

- 1 of the only 3 proposals to be selected for the Google Summer of Code 2016 by OpenSNP.
- Wrote and conceived the proposal to enhance the user-experience of OpenSNP portal by allowing the users to see phenotypes linked to their variants of interest.
- Designed the database schema and Ruby-on-Rails backend API to link SNPs ("Genotypes") to Phenotypes based on trait-variant association data mined from literature.

2015 (May-Jul) **Indian Institute of Science Bangalore,** Research Intern

Mentor: Sandhya S Visweswariah, Ph.D.

- Studied the assembly mechanism of Cytolysin-A (ClyA), a bacterial pore-forming toxin, and demonstrated a lipid phase and C-terminal domain dependent kinetic behavior using synthetic lipid vesicles and calcein leakage assays.

2015–2016 **DEVELOPER** — WIKIMEDIA (INDIVIDUAL ENGAGEMENT GRANT)

Team Leader: Maximilien Klein

- Contributed to development of "Wikidata Human Gender Indicators" (WHGI), an open source, longitudinal dataset that helped quantify gender disparities in the representation of women across multiple language Wikipedias.
- Developed interactive visualizations and co-wrote manuscript that showcased WHGI as a suitable index for monitoring gender disparities across time, space, culture, occupation and language.

FELLOWSHIPS & GRANTS

2019 **Rackham Student Research Grant**, Pre-candidate ($1,500) — Univ. of Michigan
2017 Simons-NCBS Travel Fellowship for Physics of Life ($100) — NCBS, Bangalore
2016 Simons Foundation Travel and Registration Fellowship ($600) — ISMB, Orlando, Florida
2016 Research Scholarship ($2,500) — University Grants Commission, MHRD, India

PUBLICATIONS*

2021 Walker JT†, Saunders CD†, **Rai V**†, et al. *RFX6-mediated dysregulation mediates human β cell dysfunction in early type 2 diabetes.* BiorXiv (In review at **Nature**).

2021 Currin WA, Erdos RA, Narisu N, **Rai V**, Vadlamudi S, et al. *Genetic effects on liver chromatin accessibility identify disease regulatory variants.* The American Journal of Human Genetics.

2021 Orchard P, Manickam N, Varshney A, **Rai V**, Kaplan J, et al. *Human and rat skeletal muscle single-nuclei multi-omic integrative analyses nominate causal cell types, regulatory elements, and SNPs for complex traits.* Genome Research.

2020 Nielsen JB, Rom O, Surakka I, Graham SE, ..., **Rai V,** et al. *Loss-of-function genomic variants highlight potential therapeutic targets for cardiovascular disease.* Nat Commun 11: 6417.

2020 **Rai V**†, Quang DX†, Erdos MR, Cusanovich DA, Daza RM, Narisu N, et al. *Single-cell ATAC-Seq in human pancreatic islets and deep learning upscaling of rare cells reveals cell-specific type 2 diabetes regulatory signatures.* Molecular Metabolism 32: 109–121. (featured on **Cover Page**)

2019 Priyam A, Woodcroft BJ, **Rai V**, Moghul I, Munagala A, Ter F, et al. *Sequenceserver: A Modern Graphical User Interface for Custom BLAST Databases.* Mol Biol Evol. 36(12), 2922-2924.

2018 Grüning B, Dale R, Sjödin A, Chapman BA, Rowe J, Tomkins-Tinch CH, Köster J, & **The Bioconda Team**. *Bioconda: sustainable and comprehensive software distribution for the life sciences.* Nature Methods. 15(7), 475-476.

2017 O'Neill K, **Rai V**, Kilpatrick AM. *The International Society for Computational Biology and WikiProject Computational Biology: celebrating 10 years of collaboration towards open access.* Bioinformatics.

† Co-first authors

2016	Klein M, Gupta H, **Rai V**, Konieczny P, Zhu H. *Monitoring the Gender Gap with Wikidata Human Gender Indicators.* Proceedings of the 12th International Symposium on Open Collaboration - OpenSym '16. Berlin, Germany: ACM Press; 2016 p. 1–9.
2015	Rideout JR, Caporaso G, ..., **Rai V,** ... Jennifer Fouquier. *scikit-bio: First beta release at SciPy 2015! (0.4.0).* Zenodo.

Technical Skills

domains	**Multi-Omics Bioinformatics • Functional Genomics • Results-Oriented Research**
languages	Python • R • Shell • Scripting (Bash) • Ruby • SQL
web	HTML/CSS • ReactJS • JavaScript • Static-site Development
tools	Git • Snakemake • Nextflow • Unix CLI • Singularity/Docker
computing	HPC (Slurm) • Google Cloud Platform • Amazon Web Services (AWS) • Azure DevOps
open-source	Bioconda • conda-forge • scikit-bio • Afra • SequenceServer • makebio • awesome-biology

Honors & Awards

2016	First Place ($300), Wikidata Competition — ISCB (iscb.org)
2016	Third Place ($200), Wikipedia Competition — ISCB (iscb.org)
2012–2016	[**4x**] Tuition Scholarship ($4,000) — IIT Kharagpur, India
2012–2016	[**4x**] Tuition Scholarship ($2,000) — Harsh and Payal Foundation, India

Conference Presentations

2021	(**Oral**, Midwest Islet Club 2021, Virtual) — *Integrative Multi-omic Approaches Define a RFX6 Network Module as Critical for Human β cell Dysfunction in Type 2 Diabetes.*
2019	(**Oral**, Midwest Islet Club 2019, Ann Arbor) — *Single-Nuclei ATAC-Seq in Human Pancreatic Islets Reveals Cell-Type Specific Type 2 Diabetes Regulatory Signatures.*
2019	(**Poster**, MIDAS Annual Symposium, Ann Arbor) — *Single Cell ATAC-Seq In Human Pancreatic Islets And Deep Learning Upscaling Of Rare Cells Reveals Cell-Specific Type 2 Diabetes Regulatory Signatures.*
2019	(**Oral**) *Single-Nuclei ATAC-Seq in Human Pancreatic Islets Reveals Cell-Type Specific Type 2 Diabetes Regulatory Signatures* — Midwest Islet Club 2019, Ann Arbor
2019	(**Poster**) *Single Cell ATAC-Seq In Human Pancreatic Islets And Deep Learning Upscaling Of Rare Cells Reveals Cell-Specific Type 2 Diabetes Regulatory Signatures* — MIDAS Annual Symposium, Ann Arbor

Other Presentations

2021	(**Oral**, BISTRO, Virtual) — *RFX6-mediated dysregulation mediates human β cell dysfunction in early type 2 diabetes.*
2020	(**Oral**, BISTRO, Virtual) — *Using pancreatic islet single-cell chromatin accessibility profiling and imaging data to dissect diabetes GWAS signals and islet biology.*
2020	(**Oral**, Single-cell Genomics in Obesity and Diabetes Journal Club, Virtual) — *Using single-cell chromatin accessibility and islet imaging data to dissect T2D GWAS and islet biology.*
2019	(**Poster**, Department of Computational Medicine & Bioinformatics Retreat) — *Single cell ATAC-seq in human pancreatic islets and deep learning upscaling of rare cells reveals cell-specific type 2 diabetes regulatory signatures.*

2018	(**Poster**, Department of Human Genetics Retreat) — *Single-nucleus ATAC-seq reveals cell-specific diabetes regulatory signatures in human pancreatic islets.*
2018	(**Poster**, Department of Computational Medicine & Bioinformatics Retreat) — *Single-nucleus ATAC- seq reveals cell-specific diabetes regulatory signatures in human pancreatic islets.*
2015	(**Oral**, B.E.S.T Summer Internship Symposium, IISc Bangalore) — *Fluorescent Labeling of Cytolysin-A Pore Forming Toxin and Assessing Lipid Phase Dependent Activity.*
2015	(**Oral**, Department Journal Club, IIT Kharagpur) — *Protein Knots: A Tangled Story.*

Professional Development

2022	Advancing Career Targets (ACT) Program — Univ. of Michigan
2021	Introduction to SQL (Online Course), Coursera
2020–now	**Reviewer** - Journal of Open-Source Software (JOSS)
2020	**ComSciCon-MI** (Communicating Science Workshop), Michigan — Online
2019	Fellow — AAAS/Science Program for Excellence in Science
2017	5th Simons-NCBS Monsoon School, Physics of Life 2017 — NCBS, Bangalore
2018	**Course Reviewer**, Python Tips, Tricks and Techniques Course — Packt Publishing
2016	Python and Git Assistant, Software Carpentry Workshop 2016 — Univ. of Washington Field
2016	Intelligent Systems for Molecular Biology (ISMB) — Orlando, Florida, US
2016	Workshop on Mathematical and Computational Biology (WMCB 2016) — IISER Kolkata, India
2015	ICTP-ICTS Winter School on Quantitative Systems Biology (QSB) — ICTS, Bangalore, India
2014	Short Term Course on Computational Systems Biology — IIT Kharagpur, India

Service & Volunteer Activities

2020	Lead Host (Ph.D. recruitment weekend) — PIBS, Univ. of Michigan
2019–2020	Student Representative, Bioinformatics Seminar Committee — DCM&B, Univ. of Michigan
2019–2020	**[2x]** Peer Mentor — Bioinformatics, Univ. of Michigan
2019	Peer Mentor — Program in Biomedical Sciences (PIBS), Univ. of Michigan
2018–2019	**[2x]** Student Host (Ph.D. recruitment weekend) — DCM&B, Univ. of Michigan
2018–now	President, **Michigan Argentine Tango Club** (MATC) — Univ. of Michigan
2018–now	Office Hours Assistant, Girls Who Code – DCM&B, Univ. of Michigan
2018–2019	**[2x]** Juror (India), Wiki Science Competition — Wikimedia
2018	Contributor, Women in Science 2018 Editathon — AWIS, Univ. of Michigan
2012–2018	Contributor (**40+ articles** and 1800+ edits) — English Wikipedia
2016	Co-organizer and Contributor, Wikipedia Editathon — ISMB, Orlando, Florida
2016	Co-founder and Co-maintainer, MetaKGP (metakgp.github.io) — IIT Kharagpur
2015–2016	Captain, OpenSoft — LBS Hall, IIT Kharagpur
2014–2015	Core Team Member, iGEM Sythetic Biology Team — iGEM IIT Kharagpur
2014	Core Team Member, Google Students Club — IIT Kharagpur, India
2013	Literary (English) Team Member, Technology Literary Society (TLS) — IIT Kharagpur, India
2013	Product Design Team Member, ProDex — IIT Kharagpur