

Curriculum Vitae

Alex Rubinsteyn

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Personal Information

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Education

- PhD, New York University, January 2014, Computer Science
 - Thesis: *Runtime Compilation of Array-Oriented Python Programs*
 - Advisor: Dennis Shasha
- MSc, New York University, May 2009, Computer Science
- BSc, University of Illinois Urbana-Champaign, May 2006, Individual Plan of Study in Neuroscience, minor in Computer Science

Professional Experience

University of North Carolina - Chapel Hill

Assistant Professor (Genetics)

March 2020 — Present

- Working on rapid design of a peptide vaccine targeting linear B-cell epitopes detected from convalescent patient plasma, with secondary selection criteria focused on helper and cytotoxic T-cell epitopes.

Icahn School of Medicine at Mount Sinai School

Instructor (Genetics & Genomic Sciences)

January 2018 — February 2020

- Created new research group (OpenVax) focused on open source software for mutation-specific tumor antigen discovery and helping run phase I personalized cancer vaccine clinical trials at Mount Sinai.
- Responsible for all computational aspects of neoantigen vaccine trials at Mount Sinai, in addition to working with sequencing core and peptide manufacturer to identify and fix any problems that arise.
- Helped initiate neoantigen clinical trial (NCT03359239) in bladder cancer, which combines our existing protocol for personalized vaccination with an anti-PD-L1 checkpoint inhibitor (atezolizumab).
- Maintaining and improving immunogenomic software tools (e.g. improved filtering of somatic variants based on features determined from manual curation of previous patients).
- Ongoing research projects: evaluating concordance between different neoantigen prediction pipelines, convolutional neural network Class II MHC binding model, harmonizing immune response data across vaccine trials to create ground truth datasets, characterizing mutational signatures and neoantigen burden following treatments for glioblastoma (temozolomide and/or TTfields).

Research Scientist in the Hammer Lab*January 2014 — December 2017*

- Developed computational pipeline for ongoing personalized cancer vaccine trials at the Tisch Cancer Institute (NCT02721043, NCT03223103).
- Wrote sections of clinical trial protocol related to sequencing, bioinformatics, and neoantigen selection.
- Clinical trial operations between receipt of patient sequencing data up to ordering synthesis of personalized vaccine peptides, including detailed QC investigations of data anomalies and manual inspection of tumor mutations in IGV.
- Created open source Python libraries for working with genomic mutations, predicting their protein-level effects, and prioritizing them for synthesis as part of peptide-based vaccine.

- Developed neural network models for predicting steps of antigen processing, such as binding of peptides to Class I MHC molecules (MHCflurry) and Class II MHC molecules.
- Helped build models of response to checkpoint blockade based on cohort sequencing data from clinical trials.
- Worked with Neon Therapeutics on a sponsored research agreement to predict antigen processing from mass spectrometry MHC ligandome data.

Capital K Partners

Financial algorithm design & implementation

May 2011 — August 2012

- Created data collection pipeline which gathers currency market order books from multiple venues, extracts multi-scale time-varying features, and stores these efficiently in HDF5 files.
- Implemented data analysis framework which distributes time-series feature extraction, ad-hoc queries, and model estimation across remote servers.
- Implemented trading algorithms in Python by interfacing with distributed trading system via ZeroMQ.

Courant Institute

Tutor

January 2008 — May 2012

- Read printed course & research materials for blind Ph.D. student.
- Tutoring to cover gaps in math & computer science background.

Google Inc.

Software engineering intern

Summer 2009

- Wrote MapReduce pipeline to compute term similarity statistics from co-occurrence data in medical corpora.
- Created framework for fusing heterogeneous health taxonomy data sources.
- Wrote prototype of query-rewriting health search using Python and Django.

BIR Training Center

Consultant

Summer 2010

- Formalized business rules related to course scheduling in a vocational school with over 1000 students.
- Designed and implemented an automated scheduling system using discrete simulation of student registration.

Software Developer

May 2006 — June 2007

- Developed student and teacher portals for grading, scheduling and attendance.
- Created development standards for all new software projects including use of version control and templating.
- Hired Senior Graphic Designer and Junior Web Developer.

Honors and Awards

- Henning Biermann Prize for Teaching at NYU (2011-2012)

Bibliography

Journal Papers

1. Defining HLA-II Ligand Processing and Binding Rules with Mass Spectrometry Enhances Cancer Epitope Prediction. *Abelin JG, Harjanto D, Malloy M, Suri P, Colson T, Goulding SP, Creech AL, Serrano LR, Nasir G, Nasrullah Y, McGann CD, Velez D, Ting YS, Poran A, Rothenberg DA, Chhangawala S, Rubinsteyn A, Hammerbacher J, Gaynor RB, Fritsch EF, Greshock J, Oslund RC, Barthelme D, Addona TA, Arieta CM, Rooney MS.* Immunity 2019 Oct 15;51(4):766-779. DOI: 10.1016/j.immuni.2019.08.012. PubMed PMID: 31495665.

2. MHCflurry: Open-Source Class I MHC Binding Affinity Prediction. *O'Donnell TJ, Rubinsteyn A, Bonsack M, Riemer AB, Laserson U, Hammerbacher J*. Cell Systems 2018 Jul 25;7(1):129-132.e4. DOI: 10.1016/j.cels.2018.05.014. PubMed PMID: 29960884.
3. Computational Pipeline for the PGV-001 Neoantigen Vaccine Trial. *Rubinsteyn A, Kodysh J, Hodes I, Mondet S, Aksoy BA, Finnigan JP, Bhardwaj N, Hammerbacher J*. Frontiers in Immunology. 2018 Jan 18;8:1807. DOI: 10.3389/fimmu.2017.01807. PubMed PMID: 29403468.
4. Somatic Mutations and Neoepitope Homology in Melanomas Treated with CTLA-4 Blockade. *Nathanson T, Ahuja A, Rubinsteyn A, Aksoy BA, Hellmann MD, Miao D, Van Allen E, Merghoub T, Wolchok JD, Snyder A, Hammerbacher J*. Cancer Immunology Research. 2017 Jan;5(1):84-91. DOI: 10.1158/2326-6066.CIR-16-0019. PubMed PMID: 27956380.
5. Using a Machine Learning Approach to Predict Outcomes after Radiosurgery for Cerebral Arteriovenous Malformations. *Oermann EK, Rubinsteyn A, Ding D, Mascitelli J, Starke RM, Bederson JB, Kano H, Lunsford LD, Sheehan JP, Hammerbacher J, Kondziolka D*. Scientific Reports. 2016 Feb 9;6:21161. DOI: 10.1038/srep21161. PubMed PMID: 26856372.
6. Mutation-Derived Tumor Antigens: Novel Targets in Cancer Immunotherapy. *Finnigan JP Jr, Rubinsteyn A, Hammerbacher J, Bhardwaj N*. Oncology. 2015 Dec;29(12):970-2, 974-5. Review. PubMed PMID: 26676902.

Book Chapters

1. Bioinformatic methods for cancer neoantigen prediction. *Boegel S, Castle JC, Kodysh J, O'Donnell T, Rubinsteyn A*. Progress in Molecular Biology and Translational Science 2019;164:25-60. DOI: 10.1016/bs.pmbts.2019.06.016. PubMed PMID: 31383407.

Workshop Papers

1. Predicting Peptide-MHC Binding Affinities With Imputed Training Data. *Rubinsteyn A, O'Donnell T, Damaraju N, Hammerbacher J*. ICML Computational Biology Workshop (2016).

2. Predicting Patient Outcomes After Radiosurgery For Arteriovenous Malformation. **Rubinsteyn A**, Oermann E, Hammerbacher J, Kondziolka D. NIPS Workshop on Machine Learning for Clinical Data Analysis, Healthcare and Genomics (2014)
3. Learning Random Forests on the GPU. Liao Y, **Rubinsteyn A**, Power R, Li J. NIPS Workshop on Parallel and Large-scale Machine Learning (2013).
4. Parakeet: A Just-In-Time Parallel Accelerator for Python. **Rubinsteyn A**, Weinman N, Hielscher E, Shasha D. USENIX Workshop on Hot Topics in Parallelism (2012).
5. Mobile Braille: Making touch-screen typing accessible to visually impaired users. Paisios N, **Rubinsteyn A**, Subramanian L. Frontiers in Accessibility for Pervasive Computing (2012).
6. Recognizing currency bills using a mobile phone: an assistive aid for the visually impaired. Paisios N, **Rubinsteyn A**, Vyas V, Subramanian L. ACM Symposium Adjunct on User Interface Software and Technology (2011).

Poster Abstracts

- Molecular and cellular properties of neoantigen-specific CD8+ T-cells on interaction with B16F10 melanoma in situ. Finnigan JP, Ishizuka AS, Lynn GM, **Rubinsteyn A**, Seder RA, Bhardwaj N. CRI-CIMT-EATI-AACR International Cancer Immunotherapy Conference (2019).
- Phase I study of in situ autologous vaccination for prostate cancer in a neo-adjuvant setting. Nair SS, Weil R, Gonzalez-Gugel E, Meseck M, **Rubinsteyn A**, Kodysh Y, Gupta A, Sadanala K, Schlussel K, Bhatt K, Reddy A, Patel R, Thawte T, Farkas A, Dzedzik S, Haines K, Wagner J, Robison M, Knauer C, Salazar A, Galsky M, Bhardwaj N, Tewari A. AACR Annual Meeting (2019).
- A Phase I study of the safety and immunogenicity of personalized mutation-derived tumor vaccine and treatment fields in patients with newly diagnosed glioblastoma. Hormigo A, **Rubinsteyn A**, Kodysh Y, Blazquez AB, Bhardwaj N. AACR Annual Meeting (2019).

- Evaluation of tools for predicting mutated tumor antigens from exome and RNA sequencing. *Kodysh J, Finnigan JP, Rubinsteyn A*. CRI-CIMT-EATI-AACR International Cancer Immunotherapy Conference (2018).
- Improved neoantigen vaccine selection by combining prediction of pMHC presentation and T-cell epitopes. *Kodysh J, O'Donnell T, Blazquez AB, Finnigan JP, Bhardwaj N, Rubinsteyn A*. CRI-CIMT-EATI-AACR International Cancer Immunotherapy Conference (2018)
- PhIP-seq assessment of the serum antibody repertoire before and after immune-related adverse events in four melanoma patients treated with checkpoint blockade immunotherapy. *O'Donnell TJ, Shan M, Merritt E, Gonzalez-Gugel E, Blasquez AB, Meseck M, Friedlander PA, Rubinsteyn A, Horowitz A, Bhardwaj N, Laserson U*. CRI-CIMT-EATI-AACR International Cancer Immunotherapy Conference (2018).
- Computational pipeline for a personalized genomic vaccine trial. *Rubinsteyn A, Hodes I, O'Donnell T, Mondet SF, Finnigan JP, Friedlander P, Sabado R, Bhardwaj N, Hammerbacher J*. CRI-CIMT-EATI-AACR International Cancer Immunotherapy Conference (2016)
- Patient-Specific Mutation-Derived Tumor Antigens As Targets for Cancer Immunotherapy in Multiple Myeloma. *Perumal D, Lagana A, Rubinsteyn A, Finnigan JP, Kuo P, Leshchenko VV, Chari A, Cho HJ, Jagannath S, Dudley J, Hammerbacher J, Schadt E, Bhardwaj N, Parekh S*. American Society for Hematology (2015).

Research Presentations

Invited Conference Talks

- *Computational selection of personalized cancer vaccines*, GSK Autumn Biostatistics Annual Conference, 2019
- *Personalized cancer vaccines*, Midwest Computational Biology Workshop, 2019

- *Personalized Cancer Vaccine Trials at Mount Sinai and Ongoing Research in Neoantigen Identification*, Molecular Medicine Tri-Conference, 2019
- *Open Source Tools and Models for Neoantigen Prediction*, Neoantigen Summit, 2017
- *Personalized Therapeutic Vaccines Against Mutated Tumor Antigens*, Annual Workshop at Bellairs - Cancer and the Immune System, 2017

Submitted Conference Talks

- *Machine Learning For Personalized Cancer Vaccines*, Data Science Salon, 2018
- *Python Libraries for Deep Learning with Sequences*, PyData NYC, 2015
- *Analyzing Genomic Data with PyEnsembl and Varcodes*, SciPy, 2015
- *CudaTree: Training random forests on the GPU*, GTC, 2014
- *Array Oriented Python on the GPU with Parakeet*, GTC, 2014
- *Python on the GPU with Parakeet*, PyData Boston, 2013
- *Parakeet: A Runtime Compiler for Numerical Python*, PyData Boston, 2013
- *Parakeet: A Just-in-Time Parallel Accelerator for Numerical Python*, HotPar, 2012

Teaching

- Teacher at cSplash, a day-long festival of math and science for high school students held at the Courant Institute (2008, 2009, 2014, & 2019).
- Individual tutoring of NYU students in calculus, undergraduate and Masters-level algorithms, and machine learning (Fall 2007 — Fall 2013).
- Teaching assistant with weekly recitation for a Masters-level Programming Languages course at NYU (Fall 2011).
- Weekly GED / Basic Math class at Fortune Society, which provides services and education to formerly incarcerated adults (October 2009 — June 2011).

Grants

AACR, Novocure Career Development Award for Tumor Treating Fields Research *2019 — 2022*

- Title: *Impact of Tumor Treating Fields on neoantigen burden and T cell function.*
- Amount: \$225,000.
- Role: PI.
- Effort: 10%.

Professional Service

Conference Organizing

PyData Miami *January 9th-11th, 2019*

- Lead organizer of a machine learning and data science conference in Miami which brought together researchers from industry and academia with practitioners and students.

PLDI: ARRAY *June 13th, 2014*

- Started and co-chaired the ACM SIGPLAN International Workshop on Libraries, Languages, and Compilers for Array Programming, which is now hosted annually at the Programming Language Design and Implementation (PLDI) conference.

Conference Reviewer

- International Conference on Machine Learning (2020)
- International Conference on Learning Representations (2018, 2019, 2020)
- Neural Information Processing Systems (2018)

Journal Reviewer

- Nature Communications (2019)
- iScience (2019)
- Journal of Proteome Research (2019)
- Bioinformatics (2017, 2018, 2019)
- Scientific Reports (2017)
- OncoImmunology (2014)