

Natalie Davidson PhD.

PhD Conferral May 2019
Anschutz Postdoctoral Fellow Nov. 2020

Greene Lab
University of Colorado, Anschutz
Denver, Colorado

www.natalie-r-davidson.com
natalie.davidson@cuanschutz.edu

Education

Weill Medical College, Cornell University, Memorial Sloan-Kettering Cancer, Tri-Institutional Program in Computational Biology and Medicine

PhD. Computational Biology and Medicine

Advisor: Dr. Gunnar Rätsch

PhD research performed at MSKCC and ETH Zürich

2013 - 2019

University of California, Los Angeles

M.S. Computer Science, focus: Computational Biology

Advisor: Dr. Jason Ernst

2011 - 2013

University of California, Santa Barbara

B.S. Computer Science and a Minor in Mathematics

2006 - 2011

Post Doc Research (2019-Current)

CU Anschutz / Greene Lab / Post Doctoral Research Nov 2020 - Current

My research will focus on methods development for joint analysis of bulk and single cell expression data. The goal is to identify changes in cell type proportions even in cases of confounded or missing reference data.

ETH Zürich / Biomedical Informatics Lab / Post Doctoral Research May 2019 - Oct 2020

My research has focused on quantifying aberrant pathway activation from RNA-Seq and benchmarking available pathway scoring methods.

PhD Research (2014-2019)

MSKCC, Weill Cornell Medical, ETH Zürich / Rätsch Lab / PhD Research June 2014 - May 2019

My research has focused on using and extending statistical models to understand transcriptional dysregulation in cancer and participated in the International Cancer Genome Consortium where I integrated multiple transcriptional aberrations in over 1,000 samples to identify cancer relevant genes and alteration patterns.

M.S Research (2011-2013)

UCLA / Ernst Lab / Master's Student June 2011 - June 2013

My master's thesis focused on creating a method to predict transcription factor binding patterns. The method utilized LASSO regression (glmnet), motif finding (MEME), and chromatin states (ChromHMM).

Selected Publications Ordered by Topic

* denotes first authorship

^ denotes corresponding authorship

Pathway Estimation from Transcriptomic Observations

Gut, G.* Stark, S. G.* Rätsch, G.^, & **Davidson, Natalie R.**^ (2021). pmVAE: Learning Interpretable Single-Cell Representations with Pathway Modules. ICML Computational Biology Workshop. ([link](#))

PCAWG Transcriptome Core Group*, **Davidson, Natalie R.***, et al. "Genomic basis for RNA alterations in cancer" Nature 578 (2020):129–136. ([link](#))

Cancer Transcriptome Analyses

Markolin, P.* **Davidson, Natalie R.***, Hirt, C. K., Chabbert, C. D., Zamboni, N., Schwank, G., ... & Rätsch, G. (2021). Identification of HIF-dependent alternative splicing in gastrointestinal cancers and characterization of a long, coding isoform of SLC35A3. Genomics, 113(2), 515-529. ([link](#))

Simmler, P.* Cortijo, C., Koch, L. M., Galliker, P., Angori, S., Bolck, H. A., ... **Davidson, Natalie R.**... & Schwank, G. (2020). SF3B1 promotes tumor malignancy through splicing-independent co-activation of HIF1α. bioRxiv. ([link](#))

Krishnamoorthy, G.* **Davidson, Natalie R.**, et al. "EIF1AX and RAS mutations cooperate to drive thyroid tumorigenesis through ATF4 and c-MYC". Cancer discovery 9.2 (2019): 264-281. ([link](#))

Immune Response

Salloum, D.* **Davidson Natalie R** ... Rätsch, G, Wendel, HG. "A Rapid Translational Immune Response Program in CD8 Memory T Lymphocytes." (under review)

Algorithmic Advancements

Davidson, Natalie R.*, et al. "DISTING: A web application for fast algorithmic computation of alternative indistinguishable linear compartmental models." Computer methods and programs in biomedicine 143 (2017): 129-135.

Science Journalism Analysis

Davidson, Natalie R.*, and Greene, Casey S. (2021) Analysis of science journalism reveals gender and regional disparities in coverage. bioRxiv. ([link](#))

Consortium Papers

Irmisch, A.* Bonilla, X., Chevrier, S., Lehmann, K. V., Singer, F., Toussaint, N. C., ... & Levesque, M. P. Tumor Profiler Consortium members: ... **Davidson, Natalie R.**, ... (2021). The tumor profiler study: integrated, multi-omic, functional tumor profiling for clinical decision support. Cancer cell. ([link](#))

The ICGC/TCGA Pan-Cancer Analysis of Whole Genomes Consortium*, ... **Davidson, Natalie R.**, et al. "Pan-cancer analysis of whole genomes" Nature 578 (2020):82–93. ([link](#))

Segal, E.* Zhang, F., Lin, X., King, G., Shalem, O., Shilo, S., ... **Davidson, Natalie R.**, ... & Wilmes, P. (2020). Building an international consortium for tracking coronavirus health status. Nature medicine, 26(8), 1161-1165. ([link](#))

Presentations

BuDDI: Bulk Deconvolution with Domain Invariance ([Best Poster Award](#))

ISCB Rocky Mountain Bioinformatics Conference (Poster)

Dec 2021

Invited Panel Speaker: Crowdsourcing your Research

Open Innovation in Life Sciences

September 2020

Anonymous Survey System and Methodology to Enable COVID-19 Surveillance

ICML Machine Learning for Global Health (Talk)

July 2020

ssPATHS: Single Sample PATHway Score

ISMB TransMed (Poster)

July 2019

Identification and Characterization of hypoxia-inducible Factor (HIF) -Dependent Alternative Splicing Events in Pancreatic Cancer

ISMB Student Council Symposium (Talk), RegSys (Poster)

July 2018

Integrating Diverse Transcriptomic Alterations to Identify Cancer-Relevant Genes ([Best Student Talk](#))

ISMB HiTSeq and Student Council Symposium (Talk)

July 2017

RECOMB Computational Cancer Biology (Talk)

April 2018

Differential Expression Method for Related Samples ([3rd best student talk](#))

ISMB Student Council Symposium (Talk), Integrative RNA Biology (Poster)

April 2016

Integrative Analysis of Transcriptome Variation in Uterine Carcinosarcoma and Comparison to Sarcoma and Endometrial Carcinoma

The Cancer Genome Atlas' 4th Scientific Symposium (Poster)

May 2015

Honors

2021 ISCB Rocky Mountain Bioinformatics Conference, Best Poster

2020 Swiss Institute of Bioinformatics Remarkable Outputs for the publication "Genomic basis for RNA alterations in cancer"

2017 ISMB Student Council, Best Student Talk

2016 ISMB Student Council, 3rd Best Student Talk

2016 Selected to Participate in the Leena Peltonen School of Human Genetics

Skills

Programming

High proficiency in R.

Proficient in Bash scripting and Python.

Some experience with Java, C/C++, VB.NET.

Extensive experience in high performance computing, primarily LSF clusters.

Bioinformatics

Experienced with bulk and single cell RNA-seq processing software for QC, alignment, quantification, and downstream analyses.

Mentorship

Co-Advisor Master Student / 9 months

Thesis Title: Auto-Encoding Regulatory Processes in Cancer. (2020)

Work led to first authorship publication in ICML CompBio Workshop.

Co-Advisor Master Student / 6 months

Thesis Title: Detection of epithelial to mesenchymal transition using expression data. (2019)

Student won best presentation at ISCB Student Council

Co-Advisor Semester Student / 2 months

Project Title: Joint estimation of pathway disruption. (2019)

Co-Advisor Semester Student / 3 months

Project Title: Identifying hypoxic, RAS, and P53 pathway activation in TCGA data and predicting drug resistance in external cohorts. (2018)

Co-Advisor Master Student / 6 months

Thesis Title: Identifying subpopulations of cancer cells and their interactions using proteomic single-cell data. (2017)

New York Hall of Science Mentor / 6 months

Mentored bachelor's students from underserved backgrounds. (2015)

Teaching

Computational Biomedicine

Lecturer

Taught methods and techniques to MS students for utilizing bulk and single-cell data.

Designed and graded exam questions.

Digital Medicine

Lecturer

Taught methods and techniques to medical students for utilizing health related data.

Learning and Intelligent Systems

Teaching Assistant

Taught a session on probabilistic modeling.

Designed and graded homework and exam questions.

Intro to Machine Learning

Teaching Assistant

Taught a session on probabilistic modeling and kernels.

Designed and graded homework and exam questions.

Service

2022 - Aurora Science and Tech, Seminar Speaker

2020 - Science Ambassador Scholarship, Advisory Board Member & Judge

2018 - 2020 Zürich City Roller Derby, Coach and Team Captain

2015 - 2016 Yoga Club Organizer, Weill Cornell Graduate School

2014 - 2015 Social Chair, Tri-I Computational Biology and Medicine

2013 - 2014 GRASSHOPR Mentor, Cornell University