Elan Ness-Cohn

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github.com/nesscoder linkedin.com/nesscohn

Education

Ph.D. (Biology)

Northwestern University, Evanston 08/2017–12/2021 (Anticipated)

Dissertation: *Topology Inspired Methods for the Design and Analysis of Transcriptomic Time-Series Data in Circadian Biology Research*

Advisor: Prof. R. Braun, Molecular Biosciences (Comp. Bio and Applied Math Group)

Graduate Certificate in Teaching

Northwestern Searle Center for Advancing Learning and Teaching 2020–2021

B.Sc. (Biology), Concentration (Education)

Massachusetts Institute of Technology, Cambridge 2017

Thesis: *Regenerative Medicine and Synthetic Biology: Working Toward the Clinic*

Research Advisor: Prof D. Kim, Biology (Genetics Group)

Research Advisor: Prof R. Jaenisch, Biology (Stem Cell Group)

Experience

Braun Lab

Ph.D. Candidate, Northwestern University 08/2017–date

Topology Inspired Methods for the Design and Analysis of Transcriptomic Time-Series Data in Circadian Biology Research

⋆ Created a user-friendly, web-based platform for circadian researchers to optimize the design and analysis of *omic time-series experiments.

⋆ Developed a novel reference-free, non-parametric method using principles from dynamical system theory and topological analysis to identify cycling genes in circadian transcriptomic time-series data.

⋆ Formulated a novel reference-free, non-parametric method using principles from dynamical system theory and inferential statistics to identify differentially cycling genes across experimental conditions in circadian transcriptomic time-series data.

Jaenisch Lab

Undergraduate Research Assistant, Massachusetts Institute of Technology 2016–2017

Engineering Human Pluripotent Stem Cells With Insulin Reporter to Model Type 1 Diabetes

⋆ Utilized previously acquired laboratory techniques to designed/cloned fusion gene plasmid and accompanying CRISPR/Cas9 guide RNAs for targeted tagging of gene of interest

⋆ Supported in the *in vitro* differentiation of pluripotent stem cells to insulin producing beta-like cells

Kim Lab

Undergraduate Research Assistant, Massachusetts Institute of Technology 2015–2016

Regulation of Stress Physiology and Longevity by the EIF3 Tanslation Inititation Complex in C. Elegans

⋆ Designed/cloned fusion gene plasmid and accompanying CRISPR/Cas9 guide RNAs for targeted tagging of gene of interest

⋆ Generated CRISPR/Cas9 transgenic lines of *C. Elegans* through microinjection

Computational & Technical Skills

Programming: R • Python • Bash • R Shiny • LaTeX• git • SQL • HPC (SLURM)
Data Mining: statistical analysis • dimensionality reduction • clustering • visualization
Modeling: dynamical systems • topological analysis • toy model development
Machine Leaning: practical experience with classification & regression methods
Research: algorithm & pipeline development • inter-disciplinary collaboration • software development
Laboratory: CRISPR/Cas-9 genome editing • plasmid design • molecular cloning • qPCR
Languages: English • Hebrew

Software (Highlights)

TimeCycle - R Package

A non-parametric method that leverages results from dynamical systems theory and topology to test whether a dynamical variable (gene expression) exhibits cycling dynamics.

R Package Website: [Link] • **Video Tutorial:** [Link]

TimeTrial - R Shiny Web Application

An interactive software suite that enables circadian researchers to perform head-to-head comparisons of four leading cycle detection methods using both synthetic and biological data.

R Shiny Synthetic Data: [Link] • **R Shiny Biological Data:** [Link] • **Video Tutorial:** [Link]

Additional work can be found on my GitHub profile: github/nesscoder

Publications

[1] **Ness-Cohn, Elan**, Ravi Allada, and Rosemary Braun. Comment on "Circadian rhythms in the absence of the clock gene Bmal1". *Science*, 372(6539), 2021.

[2] **Ness-Cohn, Elan**, Marta Iwanaszko, William L Kath, Ravi Allada, and Rosemary Braun. TimeTrial: An interactive application for optimizing the design and analysis of transcriptomic times-series data in circadian biology research. *J Biol Rhythms*, 35:439–451, 2020.

[3] Douglas J. Cattie, Claire E. Richardson, Kirthi C. Reddy, **Ness-Cohn, Elan**, Rita Droste, Mary K. Thompson, Wendy V. Gilbert, and Dennis H. Kim. Mutations in nonessential eIF3k and eIF3l genes confer lifespan extension and enhanced resistance to ER stress in caenorhabditis elegans. *PLoS Genetics*, 12(9):e1006326, 2016.

Manuscripts submitted / in preparation

[1] **Ness-Cohn, Elan** and Rosemary Braun. TimeCycle: Topology Inspired MEthod for the detection of cycling transcripts in circadian time-series data. *bioRxiv*, page 2020.11.19.389981, 2020 (**in Review at Bioinformatics**).

[2] **Ness-Cohn, Elan** and Rosemary Braun. TimeChange: Topology Inspired MEthod for the detection of differential cycling dynamics in circadian transcriptomic time-series data. *In Preparation*, 2021.

[3] **Ness-Cohn, Elan** and Rosemary Braun. Fasano–Franceschini test: an implementation of a 2-dimensional Kolmogorov–Smirnov in R. *In Preparation*, 2021.

Presentations

Topological Strategies for the Analysis of Rhythmic Dynamics in Transcriptomic Time-Series Data
Talk, International Conference on Intelligent Systems for Molecular Biology (ISMB), Virtual 2021

TimeCycle: Topology Inspired MEthod for the Detection of Cycling Transcripts In Circadian Time-Series Data
Microtalk, 3rd Annual Conference on Quantitative Approaches in Biology, Northwestern 2020

TimeCycle: Topology Inspired MEthod for the Detection of Cycling Transcripts In Circadian Time-Series Data (Canceled Covid-19)
Minisymposium, Conference on the Life Sciences (LS20), California 2020

TimeCycle: Topology Inspired MEthod for the Detection of Cycling Transcripts In Circadian Time-Series Data
Poster, 3rd Annual Southeaster Center for Mathematics & Biology Symposium, Georgia Tech 2020

TimeCycle: Topology Inspired MEthod for the Detection and Direct Comparison of Cycling Transcripts Across Conditions
Poster, 2nd Annual Conference on Quantitative Approaches in Biology, Northwestern 2019

TimeTrial: Interactive Application for the Design and Analysis of Transcriptomic Time-Series Data in Circadian Biology Research
Poster, Chicago Biomedical Informatics Data Jam, Chicago 2019

TimeCycle: Topology Inspired MEthod for the Detection and Direct Comparison of Cycling Transcripts Across Conditions
Poster, Chicago Biomedical Informatics Data Jam, Chicago 2019

TimeCycle: Topology Inspired MEthod for the Detection and Direct Comparison of Cycling Transcripts Across Conditions
Poster, 1st Annual Conference on Quantitative Approaches in Biology, Northwestern 2018

Teaching

Northwestern University – Searle Teaching Certificate Program 2020 – 2021
A year long sequence of seminars, special-topics workshops, and guidance provided by peer and faculty mentors focused on improving student learning and inclusion in their disciplines.

⋆ Designed/developed an *Intro to Data Science Lab Course* complete with a course outline, sample lesson plan, sample assessments, grading scheme, evaluation plan, and interpretation of teaching effectiveness.

Northwestern University

What Do Your Data Say? (DataScience Bootcamp), Teaching Assistant Spring 2020
IGP 486: Advanced Bioinformatics/Genomics, Teaching Assistant Winter 2020
Collabrative Learning & Intergrated Mentoring in the BioSciences (CLIMB)
IGP 405: Cell Biology, Teaching Mentor Winter 2021
IGP 484: Biostatitics, Teaching Mentor Fall 2020
IGP 484: Biostatitics, Teaching Mentor Fall 2019

Massachusetts Institute of Technology

7.012: Introductory Biology, Teaching Assistant Spring 2017
18.05: Introduction To Probability and Statistics, Teaching Assistant Spring 2016
Department of Biology Tutoring Program, Tutor 2016–2017
Introductory Biology, Introductory Experimental Biology and Communication, Genetics, Biochemistry, Cell Biology

Mentorship

Kelly Paquin, Undergraduate Research Assistant
Quantitative Biology Undergraduate Summer Research Program — Summer 2020
Automating the Detection of Circadian Genes from Luciferase Reporter Construct in Drosophila

Carolina Clark, Ph.D. Candidate
DGP Student Assisted Mentoring Program (STAMP) — 2020–date

Samuel Hamilton, Ph.D. Candidate
DGP Student Assisted Mentoring Program (STAMP) — 2019–date

Awards

NSF-Simons Center for Quantitative Biology Training Grant
Northwestern University — 2018

Boit Prize for Engineering Writing
Massachusetts Institute of Technology — 2017
Senior Thesis - *Regenerative Medicine and Synthetic Biology: Working Toward the Clinic*

Service

Professional Memberships and Leadership Roles
Driskill Graduate Program In the Life Sciences, Student Council Rep — 2020–date
NSF-Simons Center for Quantitive Biology Leadership Team, Graduate Student Rep — 2019–date