

Daniel R. Kick, PhD

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Education

2015–2021	PhD: Biological Sciences	University of Missouri
	Coursework Included: Machine Learning Methods for Biomedical Informatics, Quantitative Methods in the Life Sciences, and Grant Writing	
2011–2015	BS: Biology	Truman State University
	Coursework Included: Next Generation Sequence Data and Analysis, Bioinformatics, Statistics, and Economic & Medicinal Botany. Leadership role in the biological honors society Tri-Beta.	

Professional and Research Experience

2021–Pres. Research Geneticist

USDA ARS

Scientific & Technical

- Secured \$225,000 to develop “Environmentally Aware Deep Learning Based Genomic Selection And Management Optimization For Maize Yield” (NIFA [Grant 2023-67012-39485](#)).
- Initiated and led a multi-institutional research collaboration to evaluate deep learning for trait prediction in corn, soy, fruit fly, and cattle.
- Developed python library and command line tools to train biologically informed deep neural networks.
- Published manuscripts on trait prediction with deep learning, machine learning, statistical modeling, and ensembles of the above.
- Designed and implemented machine learning system for identifying viruses with potential for cross-species infection in collaboration with domain experts.
- Contributed to development of internally used tools

Communication, Development, & Service

- Communicated with stakeholders via **21 presentations** including invited presentations at **University of Michigan, Truman State University, Iowa State University, and University of Georgia’s AI in Plant Breeding Symposium**.
- Codified and collected protocols and tacit technical knowledge by creating a methods focused lab webpage (See [Washburn Lab Resources](#))
- Authored technical blog posts (~60 available [here](#) and at danielkick.com).
- Developed conference website on behalf of the Maize Genetics Cooperation. Demonstration site using 2024 data is [here](#).
- Provided statistical and programming support to collaborators.

- Initiated and coordinated group of deep learning practitioners and learners and designed and led technical and professional trainings.
- Mentored 4 students.
- Designed and completed a professional development curriculum through the Bayer–University Mentoring Program and the Maize Genetics Mentoring Program.

2015–2021 Graduate Researcher

University of Missouri

Scientific & Technical

- Author on 6 publications, one in Proceedings of the National Academy of Sciences.
- Developed novel analytical methodologies to solve intractable research questions.
- Provided statistical consulting to collaborators including biologists, physiologists, and engineers.

Communication, Development, & Service

- Communicated results through 18 presentations (6 national, 6 regional, 6 outreach).
- Led 4 teaching assistants in adapting teaching laboratory curriculum during COVID-19 pandemic.
- Developed statistics web application used by more than 700 students as of 2021 with shiny ([source](#), [deployed](#)) for data visualization, testing assumptions, and fitting frequentist, non-parametric, and Bayesian models.
- Mentored 5 students, peer mentored 3 PhD students in reproducible data analysis.

2011–2015 Undergraduate Researcher

Various

2014–2015	Undergraduate Research Assistant	Truman State University
	Development of hydroponic growth chamber for maize root phenotyping	
2014	NSF Research Experience for Undergraduates	Univ. of Connecticut
	Measurement of minor spliceosome upregulation implicating role in postponing retinal cell death	
2013	Research Experience for Undergraduates	Univ. of Missouri
	Assessed motor function in mouse model of spinal muscular atrophy with and without oligonucleotide treatment	
2011	Laboratory Volunteer	Missouri State University
	Performed a set of genetics labs to check feasibility for a course.	

Teaching & Mentoring Experience

Teaching

2020–2021	Lead Teaching Assistant	University of Missouri Coordinated and led 4 Teaching Assistants during COVID-19 pandemic in adaptation lab materials to accommodate remote learning. Developed statistics web application used by more than 700 students as of 2021 with shiny (source , deployed) for data visualization and fitting frequentist, non-parametric, and Bayesian models.
2018–2020	Teaching Assistant	University of Missouri Tested additional curriculum alterations, tested grade distributions to identify and adjust for grader effects.
2018	Curriculum Consultant	University of Missouri Updated curriculum and redesigned experiments placing a greater focus primary literature and data analysis
2015–2016	Teaching Assistant	University of Missouri Provided weekly lectures on relevant background, ensured experiments were conducted safely, provided timely feedback on assignments.

Mentoring

2024	Andrew Diaz	Pilot Mentorship Program (USDA) Undergraduate
2024	Henry Bloch	University of Missouri Student Researcher
2022–2024	Madi Michell	University of Missouri Student Researcher
2021–2024	Grace Sidberry	University of Missouri Student Researcher
2016–2019	Abby Beckerdite	University of Missouri Student Researcher
2019	Ayla Ross	NSF Research Experience for Undergraduates Student

2018	Katlyn Sullivan	NSF Research Experience for Undergraduates Student
2017	Kelly Hiersche	NSF Research Experience for Undergraduates Student
2016	Rody Kingston	Post baccalaureate Research Student

Honors & Awards

2023-2025	NIFA AFRI EWD: \$225,000 awarded (Grant # 2023-67012-39485) to create and environmentally aware deep learning genomic selection models.
2022	First Place Poster Competition , MU Plant Research Symposium
2019	J. Perry Gustafson Award for Outstanding Graduate Research in the Life Sciences: \$2,000 award granted for research quality and academic achievements.
2016-2018	NIH T32 Training Grant Recipient: \$27,000 yearly stipend awarded to facilitate excellence in graduate research.
2015	Cum Laude & President's Recognition , Truman State University

Professional Activities

Associations

2023-2025	Maize Genetic Cooperation Member
2016-2019	Society for Neuroscience Member

Workshops & Trainings Conducted

2024-Pres.	Coordinator: Deep Learning Community of Practice Developed curriculum, lectures, and website to develop community of USDA and University deep learning practitioners and learners.
2023	Creator: Preparing for Interviews: Behavioral, Technical, and Job Search Preparation. Internal professional development workshop attended by ungraduated, graduate, postdoctoral researchers and technicians.
2022	Assistant: Software Carpentries Data Management with SQL 1 , 2
2022	Instructor: Software Carpentries R for Reproducible Scientific Analysis 1 , 2
2022	Creator: Tools and Techniques for a Jupyter Based Scientific Workflow

2022 Created and delivered a workshop on data visualization in Python for University of Missouri [Bioinformatics in Plant Science](#).
[Software Carpentries](#) Certified Instructor
 Received theoretical and practical instruction on leading computational workshops.

Other Professional Activities

2025 **Designed** and built the **website for the 2025 Maize Genetics Meeting**.
 Contacted and proposed meeting companion website to the Maize Genetics Cooperation. Demonstration site using 2024 data is [here](#).

2020-Pres. Authored **over 60 technical blog posts** to capture and communicate technical knowledge. See this [listing](#) and [danielkick.com](#). For a sample, consider this post on [using simulation to assist statistical intuition](#).

2023-Pres. Developed static webpage to codify and share protocols and provided internal training on git and quarto for the same. See [Washburn Lab Resources](#).

2023 Panel Member, Non-academic research careers,
 MU Summer Undergraduate Research Program: Professional Dev. Mini-Conference

2023 Panel Member, Working with your Mentor,
 MU Summer Undergraduate Research Program: Summer Intern Orientation

2022 Next-Generation Omics Panel Member
 University of Missouri Division of Biological Sciences Retreat

2017 Workshop Assistant: Computational Neuroscience Models and Neurobiology
 NIH BRAIN Initiative Short Course University of Missouri

2016 Workshop Assistant: Computational Neuroscience Models and Neurobiology
 NIH BRAIN Initiative Short Course University of Missouri

2016 Scientific Poster Judge
 Undergraduate Research Forum University of Missouri Division of Biological Sciences

Professional Development

Workshops & Training

2024	MaizeGDB: Pan-genome and AI resources, Maize Genetics Cooperation
2024	Gramene Workshop, Maize Genetics Cooperation
2023	Applications of AlphaFold2 for Studying Proteins, University of Missouri
2023	APSIM Training Course, Iowa State University
2020	Software Carpentry: Python, University of Missouri
2016	Big Data in Biology, University of Austin

Mentoring

2024	Maize Genetics Mentoring Program (Mentee)
2022	MU-Bayer Mentoring Program (Mentee)

Publications

Published

1. Washburn JD, Varela JI, Xavier A, Chen Q, Ertl D, Gage JL, et al. Global Genotype by Environment Prediction Competition Reveals That Diverse Modeling Strategies Can Deliver Satisfactory Maize Yield Estimates. *Genetics*. 2024 Nov 22;iyae195.
2. Ruppel M, Nelson SK, Sidberry G, Mitchell M, Kick D, Thomas SK, et al. RootBot: High-throughput root stress phenotyping robot. *Appl Plant Sci*. 2023 Nov;11(6):e11541.
3. Kick DR, Washburn JD. Ensemble of best linear unbiased predictor, machine learning and deep learning models predict maize yield better than each model alone. *Silico Plants*. 2023 Jul 1;5(2):diado15.
4. Kick DR, Wallace JG, Schnable JC, Kolkman JM, Alaca B, Beissinger TM, et al. Yield prediction through integration of genetic, environment, and management data through deep learning. *G3 GenesGenomesGenetics*. 2023 Apr 3;13(4):jkdoo6.
5. Kick DR, Schulz DJ. Timing-Dependent Potentiation and Depression of Electrical Synapses Contribute to Network Stability in the Crustacean Cardiac Ganglion. *J Neurosci*. 2022 Aug 31;42(35):6751–60.

6. Northcutt AJ, Kick DR, Otopalik AG, Goetz BM, Harris RM, Santin JM, et al. Molecular profiling of single neurons of known identity in two ganglia from the crab *Cancer borealis*. *Proc Natl Acad Sci*. 2019 Dec 26;116(52):26980–90.
7. Kick DR, Schulz DJ. Studying gap junctions with PARIS. *eLife*. 2019 Mar 1;8:e45207.
8. Lane BJ, Kick DR, Wilson DK, Nair SS, Schulz DJ. Dopamine maintains network synchrony via direct modulation of gap junctions in the crustacean cardiac ganglion. *eLife*. 2018 Oct 16;7:e39368.
9. Kick DR, Schulz DJ. Variability in neural networks. *eLife*. 2018 Jan 18;7:e34153.
10. Willenbrink AM, Gronauer MK, Toeppen LF, Kick DR, Wells M, Zhang B. The Hillary Climber trumps manual testing: an automatic system for studying *Drosophila* climbing. *J Neurogenet*. 2016 Oct 1;30(3–4):205–11.

In Review

1. Sangjan W, Kick DR, Washburn JD. Improving Plant Breeding Through AI-Supported Data Integration. Expected 2025.
2. Dopp D, Samarth P, Wang J, Kick DR, Schulz DJ, Nair SS. Interaction of conductances across compartments that shape output in a model of a bursting neuron in the crustacean cardiac ganglion. Expected 2025

In Preparation

1. Mitchell M, Sidberry G, Mathison M, DeSalvio A, Kick DR, Washburn JD. Drone-Based Identification of Flood-Tolerant Maize via Multispectral Imaging: A Real-World Case Study. Expected 2025
2. Thomas SK, Abrahams RS, Walden N, Arias T, Kick DR, McAlvay A, Harkess A, McKain MR, Al-Shehbaz IA, Lens F, Hendriks K, Koch MA, Pires JC, Washburn JD. The Mustard Mayhem: Phylogenetically localizing and dating the mesohexaploidy of the tribe *Brassiceae*. Expected 2025

Published Data

Accessed December 30th 2024

Views /
Downloads

2023	Genomes to Fields Genotype by Environment Prediction (2022) (Zenodo)	148 / 498
2023	Ensemble BLUP, Machine Learning, and Deep Learning Models Predict Maize Yield Better Than Each Model Alone (Zenodo)	707 / 174
2022	Yield Prediction Through Integration of Genetic, Environment, and Management Data Through Deep Learning: Computational Artifacts (Zenodo)	190 / 137
2022	Yield Prediction Through Integration of Genetic, Environment, and Management Data Through Deep Learning: Cleaned Data (Zenodo)	724 / 275

Presentations

Invited Seminars

- 2024 Using AI and ensembling methods to improve plant yield predictions across
diverse environments
Daniel Kick*
University of Georgia, AI in Plant Breeding Symposium, Athens GA
- 2024 The Promises and Pitfalls of Deep Learning Methods for Plant Phenotype
Prediction
Jacob Washburn* and Daniel Kick*
Iowa State University Department of Agronomy Plant Breeding Seminar,
Invited Seminar, Ames IA
- 2024 Greater than the Sum of Its Parts:
Better Phenotypic Prediction across Environments by Combining Deep
Learning and Statistical Models
Daniel R Kick* and Jacob D Washburn
Truman State University Biology Department Invited Seminar, Kirksville MO
- 2024 The Promises and Pitfalls of Deep Learning Methods for Plant Phenotype
Prediction
Jacob Washburn* and Daniel Kick*
Michigan State University Department of Epidemiology and Biostatistics
Invited Seminar, East Lansing MI

National Meetings: Presentations

- 2023 Maize yield prediction accuracy increased by inclusion of genetics,
environment, and management interactions with deep learning
Daniel R Kick*, Jacob D. Washburn
Maize Genetics Meeting

- 2022 Improving Maize Yield Prediction through Genetic, Environmental, and Management Factor Interactions with Deep Learning
Daniel R Kick*, Jacob D. Washburn
ASA, CSSA and SSSA International Annual Meetings, Baltimore MD
- 2022 Yield Prediction Accuracy is Improved Through Incorporating Genetic, Environmental, and Management Interactions with Deep Learning,
Daniel R Kick*, Jacob D. Washburn
University of Missouri Interdisciplinary Plant Group Symposium, Columbia MO
- 2020 Effects of blockade of K⁺ currents on membrane conductance and channel expression at 1 hour and 24 hours in motor neurons of the cardiac ganglion.
Daniel R Kick*, Brian J. Lane, David J Schulz.
Dynamic Neural Networks: The Stomatogastric Nervous System, Virtual
- 2019 Asynchronous voltage activity regulates electrical synapse plasticity.
Daniel R Kick*, David J Schulz.
Dynamic Neural Networks: The Stomatogastric Nervous System, Chicago IL
- 2017 Variability from mRNAs to network output in the *C. borealis* cardiac ganglion.
Daniel R Kick*, David J Schulz.
Dynamic Neural Networks: The Stomatogastric Nervous System, Washington D.C

National Meetings: Posters

- 2024 Leveraging Biological Theory in Phenotypic Prediction Models
Daniel R Kick*, Jacob D. Washburn
National Association for Plant Breeding
- 2024 Ensembles of deep learning, machine learning, and linear models outperform individual models for maize yield prediction in diverse environments
Daniel R Kick*, Jacob D. Washburn
Maize Genetics Meeting
- 2023 Maize Yield Prediction Accuracy Increased By Inclusion of Genetics, Environment, and Management Interactions With Deep Learning
Daniel R Kick*, Jacob D. Washburn
Plant and Animal Genetics (PAG), San Diego CA
- 2022 Improving Maize Yield Prediction through Genetic, Environmental, and Management Factor Interactions with Deep Learning
Daniel R Kick*, Jacob D. Washburn
ASA, CSSA and SSSA International Annual Meetings, Baltimore MD

- 2019 Loss of synchronous activity across gap junctions results in a phase-dependent change in coupling conductance magnitude.
Daniel R Kick*, David J Schulz.
Neuroscience, Chicago IL
- 2017 Variation across network output, excitatory post synaptic potentials, ionic conductances, and ion channel and receptor mRNAs within motor neurons of the crustacean cardiac ganglion.
Daniel R Kick*, Brian J Lane, Joseph L Ransdell, Satish S Nair, David J Schulz.
Neuroscience, Washington D.C.
- 2016 What crustaceans can teach us about the workings of the nervous system.
Virginia Garcia, Daniel R Kick*, Cindy Kyi, Brian J Lane*, Kwasi M Lett, Adam J Northcutt, Joseph L Ransdell, Simone Temporal, and David J Schulz.
Animal Behavior Society, Columbia MO

Local Meetings: Presentations

- 2024 Lightning Talk: Deep Learning Community of Practice
Daniel Kick*
University of Missouri MU Biology Retreat, Columbia MO
- 2024 Lightning Talk: Biologically Informed Modeling
Daniel Kick*
University of Missouri MU Biology Retreat, Columbia MO
- 2024 The Quick and Easy Way to Predict Phenotypes More Accurately
Daniel R Kick*, Jacob D. Washburn (2023)
University of Missouri MU Plant Research Symposium, Columbia MO
- 2024 Environmentally Aware Deep Learning: Overcoming Gene by Environment Effects and Enhancing Biological Interpretability
Daniel R Kick*, Jacob D Washburn
University of Missouri DBL Group Meeting, Columbia MO
- 2022 Maize Yield Prediction is Improved by Modeling Interactions between Genetic, Environmental, and Management Factors with Deep Learning
Daniel R Kick*, Jacob D Washburn
Interdisciplinary Plant Group Seminar "Plant Talks", Columbia MO
- 2019 Classifying neurons from molecular data
Daniel R Kick*, David J Schulz
University of Missouri [DataPhiles](#), Columbia MO
- 2017 The Cancer borealis Cardiac Ganglion: a Window into Variability and Activity Dependent Regulation
Daniel R Kick*, David J Schulz
NIH-T32 progress seminar, Columbia MO

Local Meetings: Posters

- 2024 Ensembles of deep learning, machine learning, and linear models outperform individual models for maize yield prediction in diverse environments
Daniel R Kick*, Jacob D. Washburn
University of Missouri MU Plant Research Symposium, Columbia MO
- 2023 Maize Yield Prediction Accuracy Increased By Inclusion of Genetics, Environment, and Management Interactions With Deep Learning
Daniel R Kick*, Jacob D Washburn
University of Missouri MU Plant Research Symposium, Columbia MO
- 2022 Yield Prediction Through Integration of Genetic, Environment, and Management Data by Deep Learning
Daniel R Kick*, Jacob D Washburn
University of Missouri MU Plant Research Symposium, Columbia MO
- 2018 Voltage Dependent Modification of Electrical Synapses and Ionic Conductances
Daniel R Kick*, David J Schulz
University of Missouri-Columbia Life Sciences Week, Columbia MO
- 2015 Upregulation of the Minor Spliceosome in Mouse Retinae due to Zaprinst Exposure
Daniel R Kick*, Marybeth Baumgartner, Christopher Lemoine, Devi Krishna Priya Karunakaran, Nikita Sturrock, Amye Black, Rahul Kanadia
Truman State University Student Research Conference, Kirksville MO
- 2014 Upregulation of the Minor Spliceosome in Mouse Retinae due to Zaprinst Exposure
Daniel R Kick*, Marybeth Baumgartner, Christopher Lemoine, Devi Krishna Priya Karunakaran, Nikita Sturrock, Amye Black, Rahul Kanadia
University of Connecticut Summer Undergraduate Research Conference, Storrs CT
- 2013 Effective Gene Therapy in Spinal Muscular Atrophy: Utilizing Antisense Oligonucleotides Targeting Intronic Repressor Element1
Daniel R Kick*, Eric Osman, Christian Lorson
University of Missouri Summer Undergraduate Research Conference, Columbia MO

Outreach & Miscellaneous: Presentations

- 2023 Rootbot, Rover, Drones, and Deep Learning
Daniel R Kick*, Shawn Thomas*
University of Missouri Biology DataBlitz, Columbia MO
- 2022 Maize Yield Prediction is Improved by using Deep Learning to Incorporate Interactions between Genetic, Environmental, and Management Factors.
Daniel R Kick*, Jacob D Washburn
USDA-ARS AgriCulture Series, Virtual
- 2022 From Neurobiologist to Research Geneticist
Daniel R Kick*
Beyond the PhD (beyond-the-phd.com), Virtual
- 2019 Spare the synapse, spoil the circuit, Public presentation
Daniel R Kick*
Science on Tap, Columbia MO
- 2019 Can mRNA expression recapitulate neuron cell types
Daniel R Kick*
Truman State University Alumni Research Presentation, Kirksville MO
- 2018 Gap Junction Conductance Modulation Via Voltage
Daniel R Kick*
Truman State University Alumni Research Presentation, Kirksville MO
- 2017 Please mind the gap: Network homeostatic plasticity in the *Cancer borealis* cardiac ganglion
Daniel R Kick*
Truman State University Alumni Research Presentation, Kirksville MO
- 2016 The Tell-Tale Heart: Applying crustacean neurogenic hearts to basic neurosciences questions
Daniel R Kick*
Truman State University Alumni Research Presentation, Kirksville MO

Outreach & Miscellaneous: Posters

- 2023 Maize Yield Prediction Accuracy Increased By Inclusion of Genetics, Environment, and Management Interactions With Deep Learning
Daniel R Kick*, Jacob D. Washburn
University of Missouri Graduate Student Recruitment, Columbia MO
- 2019 Voltage Dependent modification of Electrical Synapses
Daniel R Kick*
University of Missouri Biological Sciences Recruitment, Columbia MO

