Rebecca A. Hutchinson

CONTACT INFORMATION

Kelley Engineering Center 2071
School of Electrical Engineering and Computer Science (EECS)
Dept. of Fisheries, Wildlife, and Conservation Sciences (FWCS)
Oregon State University
Corvallis, OR 97331-5501 USA
E-mail: rah@eecs.oregonstate.edu
WWW: `http://web.engr.oregonstate.edu/~rah`

EDUCATION

Carnegie Mellon University, Pittsburgh, Pennsylvania USA

Ph.D., Computer Science Department, December, 2009

- Dissertation Title: "Hidden Process Models"
- Advisor: Dr. Tom M. Mitchell

Bucknell University, Lewisburg, Pennsylvania USA

B.S.E., Computer Science and Engineering, May, 2002

- Summa Cum Laude

POSITIONS HELD

Oregon State University, Corvallis, Oregon USA

Assistant Professor *July 2015 - present*
Joint appointment in the School of Electrical Engineering and Computer Science (70%) and the Department of Fisheries, Wildlife, and Conservation Sciences (30%).

Postdoctoral Fellow *July 2012 - June 2015*
Developed semi-parametric ecological latent variable models by combining non-parametric techniques like boosted regression trees with hierarchical models. Worked on methods for analyzing the structure of pollination networks. Analyzed large citizen science datasets (eBird and eButterfly). Funded by a SEES (Science, Engineering, and Education for Sustainability) Fellowship from the National Science Foundation; advised by Dr. Thomas G. Dietterich and Dr. Matthew G. Betts.

Postdoctoral Scholar *January 2010 - June 2012*
Conducted research at the intersection of machine learning and ecology as a postdoc with Dr. Thomas G. Dietterich. Developed semi-parametric modeling techniques to extend traditional species distribution models to leverage large citizen science databases.

Faculty Research Assistant *January 2009 - December 2009*
Started work with Dr. Thomas G. Dietterich while completing Ph.D. work remotely.

Carnegie Mellon University, Pittsburgh, Pennsylvania USA

Graduate Student *September 2002 - December 2009*
Conducted Ph.D. research as a member of the Brain Image Analysis Research Group (led by Dr. Tom M. Mitchell). Completed Ph.D. coursework, writing/speaking requirements, thesis proposal and defense.

HONORS AND AWARDS

National Science Foundation CAREER Award, 2021.

National Science Foundation Graduate Research Fellowship, 2002-2005.

Selected Research Grants

National Science Foundation CAREER Award, 2021-2026. "CAREER: Machine Learning Methods for Spatial Data with Applications in Ecology." $564,037

National Aeronautics and Space Administration FINESST Fellowship with Future Investigator Laurel Hopkins, 2020-2023. "Developing Habitat Summaries with Deep Learning-Based Methods for Advancing Wildlife Conservation." $135,000

National Science Foundation, 2019-2022. "III: Small: Statistical Low-Rank Factorization Tools for Ecological Network Link Prediction." $500,000

National Science Foundation SEES Postdoctoral Fellowship (Science, Engineering, and Education for Sustainability), 2012-2016. "SEES Fellows: Developing Semi-parametric Models, Algorithms, and Tools for Ecological Analysis of Species Biodiversity." $430,390

Refereed Journal Publications

1. Bates, A. Primack, R.B., PAN-Environment Working Group (345 co-authors), and Duarte, C.M. (2021). Global COVID-19 lockdown highlights humans as both threats and custodians of the environment, Biological Conservation, in press.
2. Wilson, J.K., Casajus, N., Hutchinson, R.A., McFarland, K.P., Kerr, J.T., Berteaux, D., Larrivee, M., and Prudic, K.L. (2021) Climate change and local host availability drive the northern range boundary in the rapid expansion of a specialist insect herbivore, Papilio cresphontes, Frontiers in Ecology and Evolution, 9, in press.
3. Robinson, W.D., Hallman, T.A., and Hutchinson, R.A. (2021). Benchmark Bird Surveys Help Quantify Counting Accuracy in a Citizen-Science Database. Frontiers in Ecology and Evolution, 9, in press.
4. Fu, X., Seo, E., Clarke, J. , and Hutchinson, R.A. (2019). Link Prediction Under Imperfect Detection: Collaborative Filtering for Ecological Networks. IEEE Transactions on Knowledge and Data Engineering, doi: 10.1109/TKDE.2019.2962031.
5. Jones, J.A., Hutchinson, R.A., Moldenke, A.R., Pfeiffer, V.W., Helderop, E., Thomas, E. , Griffin, J. , & Reinholtz, A. (2018). Landscape patterns and diversity of meadow plants and flower-visitors in a mountain landscape. Landscape Ecology, 34, pp. 997-1014.
6. Prudic, K. L., McFarland, K. P., Oliver, J. C., Hutchinson, R. A., Long, E. C., Kerr, J. T., & Larrivée, M. (2017). eButterfly: Leveraging Massive Online Citizen Science for Butterfly Consevation. Insects, 8(2), 53.
7. Valente, J.J. , Hutchinson, R.A., & Betts, M.G. (2017). Distinguishing distribution dynamics from temporary emigration using dynamic occupancy models. Methods in Ecology and Evolution, 8(12), pp. 1707-1716.
8. Stephens, P.R., Altizer, S., Smith, K.F., Aguirre, A.A., Brown, J.H., Budischak, S., Byers, J.E., Dallas, T.A., Davies, J.T., Drake, J.M., Ezenwa, V., Farrell, M., Gittleman, J.L., Han, B., Huang, S., Hutchinson, R.A., Johnson, P., Nunn, C.L., Onstad, D., Park, A., Vazquez-Prokopec, G.M., Schmidt, J.P., & Poulin, R. (2016). The macroecology of infectious diseases: a new perspective on global-scale drivers of pathogen distributions and impacts, Ecology Letters, 19(9), pp. 1159-1171.
9. Hutchinson, R.A., Valente, J.V., Emerson, S.C., Betts, M.G., & Dietterich, T.G. (2015). Penalized Likelihood Methods Improve Parameter Estimates in Occupancy Models, Methods in Ecology and Evolution, 6(8), pp. 949-959.
10. Shirley, S., Yang, Z., Hutchinson, R.A., Alexander, J., McGarigal, K., & Betts, M.G. (2013). Species distribution modeling for the people: Unclassified Landsat TM imagery predicts bird distributions at fine resolutions in forested landscapes, Diversity and Distributions, 19(7), pp. 855-866.

11. Hochachka, W., Fink, D., Hutchinson, R.A., Sheldon, D., Wong, W-K., & Kelling, S. (2012). Project and Analysis Design for Broad-Scale Citizen Science, Trends in Ecology and Evolution, 27(2), pp. 130-137.
12. Hutchinson, R.A., Niculescu, R.S., Keller, T.A., Rustandi, I.,& Mitchell, T.M. (2009). Modeling fMRI data generated by overlapping cognitive processes with unknown onsets using Hidden Process Models, NeuroImage, 46(1), pp. 87-104.
13. Mitchell, T.M., Hutchinson, R.A., Niculescu, R.S., Pereira, F., Wang, X., Just, M., & Newman, S. (2004) Learning to Decode Cognitive States from Brain Images, Machine Learning, 57(1-2), pp. 145-175.

Refereed Conference Publications

1. Seo, E., Hutchinson, R.A., Fu, X., Li, C. , Hallman, T., Kilbride, J., Robinson, W.D. StatEcoNet: Statistical Ecology Neural Network for Species Distribution Modeling. Proceedings of the Thirty-Fifth Conference on Artificial Intelligence (AAAI), held virtually, February 2021, pp. 513-521. (acceptance rate 21%)
2. Seo, E., & Hutchinson, R.A. (2018). Predicting Links in Plant-Pollinator Interaction Networks using Latent Factor Models with Implicit Feedback, Proceedings of the Thirty-Second Conference on Artificial Intelligence (AAAI), New Orleans LA, February 2018, pp. 808-815. (acceptance rate 25%)
3. Hutchinson, R.A., He, L., & Emerson, S.C. (2017). Species Distribution Modeling of Citizen Science Data as a Classification Problem with Class-conditional Noise, Proceedings of the Thirty-First Conference on Artificial Intelligence (AAAI), San Francisco CA, February 2017, pp. 4516-4523. (acceptance rate 25%)
4. Yu, J., Hutchinson, R.A., & Wong, W-K. (2014). A Latent Variable Model for Discovering Bird Species Commonly Misidentified by Citizen Scientists, Proceedings of the Twenty-Eighth Conference on Artificial Intelligence (AAAI), Quebec City CAN, July 2014, pp. 500-506. (acceptance rate 28%)
5. Hutchinson, R.A., Liu, L-P., & Dietterich, T.G. (2011). Incorporating Boosted Regression Trees into Ecological Latent Variable Models, Proceedings of the Twenty-Fifth Conference on Artificial Intelligence (AAAI), San Francisco CA, August 2011, pp. 1343-1348. (acceptance rate 25%)
6. Yu, J., Wong, W-K., & Hutchinson, R.A. (2010). Modeling Experts and Novices in Citizen Science data for Species Distribution Modeling, The 10th IEEE International Conference on Data Mining (ICDM), Sydney AUS, December 2010, pp. 1157-1162. (acceptance rate 20%)
7. Hutchinson, R.A., Mitchell, T.M., & Rustandi, I. (2006). Hidden Process Models, Proceedings of the 23rd International Conference on Machine Learning (ICML), Pittsburgh PA, June 2006, pp. 443-440. (acceptance rate 26%)
8. Wang, X., Hutchinson, R.A., & Mitchell, T. M. (2003). Training fMRI Classifiers to Detect Cognitive States across Multiple Human Subjects, Proceedings of Advances in Neural Information Processing Systems (NIPS) 16, Vancouver CAN, December 2003, pp. 709-716. (acceptance rate 28%)
9. Mitchell, T., Hutchinson, R.A., Just, M., Niculescu, R.S., Pereira, F., & Wang, X. (2003). Classifying Instantaneous Cognitive States from fMRI Data, Proceedings of the American Medical Informatics Association (AMIA) Symposium, Washington DC, November 2003, pp. 465-469. (acceptance rate unknown)
10. Brown, R., Hutchinson, R.A., Bennett, P., Carbonell, J. G., & Jansen, P. (2003). Reducing Boundary Friction Using Translation-Fragment Overlap, Proceedings of the Machine Translation Summit IX, New Orleans LA, September 2003, pp. 24-31. (acceptance rate unknown)

Technical Reports and Lightly Reviewed Papers

1. Hopkins, L., Zaragoza, U., and Hutchinson, R.A. Predicting Bird Occurrences from High-resolution Aerial Images. KDD workshop for Data Mining and AI for Conservation, Anchorage, AK, August 2019, 6 pages
2. T.G. Dietterich, E. Dereszynski, R.A. Hutchinson, and D. Sheldon, Machine Learning for Computational Sustainability, International Green Computing Conference (IGCC), San Jose CA, June 2012, 6 pages.
3. J. Yu, W-K. Wong, and R.A. Hutchinson. (2010) Modeling Experts and Novices in Citizen Science data for Species Distribution Modeling, OSU EECS Technical Reports.
4. R.A. Hutchinson. (2009) Hidden Process Models, CMU Technical Report CMU-CS-09-179.
5. T.M. Mitchell, R.A. Hutchinson, and I. Rustandi. (2006) Hidden Process Models, CMU Technical Report CS-CALD-05-116.
6. R.A. Hutchinson, P.N. Bennett, J. Carbonell, P. Jansen, and R. Brown. (2003) Maximal Lattice Overlap in Example-Based Machine Translation, CMU Technical Report CMU-CS-03-138.

Software

Contributor to the open-source `unmarked` R package (December 2014). Added methods for estimating the parameters of occupancy models using penalized likelihoods.

Courses Taught

CS 331: Introduction to Artificial Intelligence — *Oregon State University*

Elective computer science course in the undergraduate curriculum.

- Spring 2021: 155 students
- Spring 2020: 140 students
- Spring 2019: 110 students
- Spring 2018: 116 students
- Spring 2017: 93 students
- Spring 2016: 49 students

FW 599: Machine Learning Topics in Species Distribution Modeling — *Oregon State University*

Elective special topics course in the graduate curriculum.

- Fall 2020: 6 students
- Fall 2018: 8 students
- Fall 2017: 5 students
- Spring 2016: 9 students

BDS 211: Use and Abuse of Data: Critical Thinking in Science and Everyday Life — *Oregon State University*

Required course in the Biological Data Science major.

- Spring 2021: 27 students
- Spring 2019: 6 students
- Spring 2018: 5 students

CS 325: Analysis of Algorithms — *Oregon State University*

Required theoretical computer science course in the undergraduate curriculum.

- Summer 2013: 16 students

Advising

Graduate Advisor (Ph.D.)

1. Nahian Ahmed (Spring 2021 - present)
2. Jing Wang (September 2019 - present)
3. Laurel Hopkins (September 2018 - present)
4. Eugene Seo (September 2016 - present)

Graduate Advisor (M.S.)

1. Mark Roth (Winter 2020 - present)
2. Laurel Hopkins (September 2016 - December 2018)
   next appointment: PhD program at Oregon State University
3. Liqiang He (September 2015 - May 2017)
   next appointment: PhD program at Oregon State University

Undergraduate Advising :

1. Chelsea Li (June 2020 - May 2021)
2. Skyler Har (June 2020 - September 2020)
3. Ulises Zaragoza (February 2018 - March 2019)
   STEM Leaders program for underrepresented students.
4. Justin Clarke (February 2018 - February 2019)
5. Mentor in the Eco-Informatics Summer Institute REU program (Summers 2012-2018)
   Mentored summer REU students on projects, including field work, data analysis, lectures, and final presentations. Presented R tutorials and lectures on research topics.
6. Joshua Griffin (June 2017 - January 2018)
   Co-author on *Landscape Ecology* publication above.
7. Kylie Havemann (June 2016 - August 2016)
8. Sneha Krishna Kumaran (September 2013 - June 2015)
   Honors thesis: "Identifying a Ranking of Plant Preferences for a Pollinator"
   (co-advised with Dr. Thomas G. Dietterich; next appointment: PhD student at University of Illinois at Urbana-Champaign)
9. Vinay Bikkina (January 2013 - June 2014)
   Honors thesis: "A Comparison of Machine Learning Methods for Predicting Bird Distributions"
   (co-advised with Dr. Thomas G. Dietterich; next appointment: Amazon)

Graduate Committee Member - Current

1. Rachel Brunner, PhD (Botany & Plant Pathology)
2. Ladd Irvine, PhD (FWCS)
3. Erich Merrill, PhD (EECS)
4. Meghamala Sinha, MS/PhD (EECS)

Graduate Committee Member - Past

1. Brent Barry, MS, 2018 (FWCS)
2. Adam Bouche, MS, 2020 (Forest Ecosystems & Society)
3. Jenna Curtis, PhD, 2019 (FWCS)
4. Josee Rousseau, PhD, 2020 (Forest Ecosystems & Society)
5. Satpreet Singh, MS, 2017 (EECS)
6. Majid Taleghan, PhD, 2017 (EECS)

7. Chuan Tian, PhD, 2020 (Statistics)
8. Steve Whitlock, PhD, 2019 (FWCS)
9. Lauren Zatkos, MS, 2019 (FWCS)

Graduate Council Representative (GCR)

1. Bryce Frank, MS, current, (Forest Engineering, Resources, and Management)
2. Cheyenne Jarman, PhD, current, (Integrative Biology)
3. Kara Leimberger, PhD, current, (Forest Ecosystems in Society)
4. William Hunter Harrison Neally, MS, 2020 (Mechanical, Industrial, and Manufacturing Engineering)
5. Frieda Fein, MS, 2018 (Geography)
6. Ku-Huan Chien, MS, 2016 (Biological and Ecological Engineering)

Professional Activites and Service

Member of the eButterfly Scientific Advisory Panel (December 2014 - present).

Participant in the National Science Foundation Research Coordination Network (NSF-RCN): "The Macroecology of Infectious Disease." (September 2013 - April 2016).

Participant in the National Socio-Environmental Synthesis Center (SESYNC) Venture: "Models to unleash the power of citizen-science insect data for science, policy, education, and conservation." (May 2014 - May 2015)

Grant proposal reviews for: *National Science Foundation* 2013, 2017, 2019.

Guest editor for: *Ecological Applications* 2016.

Journal reviews for: *Landscape Ecology* 2021; *Ecosphere* 2011; *Ecology* 2011, 2014, 2018; *Computational Neuroscience* 2010; *NeuroImage* 2009.

Co-organizer for: AAAI Workshop on Computational Sustainability 2015, 1st annual *NorthEast Student Colloquium on Artificial Intelligence* (NESCAI) 2006.

Conference reviews for: *National Conference on Artificial Intelligence* (AAAI) 2014, 2017, 2018, 2021; *International Joint Conference on Artificial Intelligence* (IJCAI) 2018; *Neural Information Processing Systems (NeurIPS)* 2020; *International Conference on Machine Learning* (ICML) 2007, 2010, 2012, 2014; *NorthEast Student Colloquium on Artificial Intelligence* (NESCAI) 2006; *Women in Machine Learning* Workshop (WIML) 2006, 2010.

Senior Program Committee: *National Conference on Artificial Intelligence* (AAAI) 2018; *International Joint Conference on Artificial Intelligence* (IJCAI) 2019, 2021.

University Service

School of Electrical Engineering and Computer Science committee service: AI Program Committee (AY 2020-2021); Graduate Student Development Committee (AY 2019-2020); Tiger Team on Faculty Mentoring (chair; AY 2018-2019, 2017-2018); Graduate Committee (AY 2015-2016), Research Thrusts Committee (Spring 2016) (spring 2016).

Department of Fisheries, Wildlife, and Conservation Sciences committee service: Diversity, Equity, and Inclusion Committee (AY 2020-2021), Graduate Committee (AY 2015-2016), Computing Resources Committee (AY 2019-2020, 2018-2019, 2017-2018, 2016-2017, 2015-2016).

University service: Center for Genome Research and Biocomputing Spring Conference Organizing Committee (AY 2017-2018), Biological Data Science Curriculum Committee (AY 2020-2021, 2019-2020, 2018-2019, 2017-2018, 2016-2017)

Oregon State University Postdoctoral Association (OPA) President, 2013-2014.

Oregon State University Postdoctoral Association (OPA) Executive Board member (Committee Coordinator), 2012-2013.

Invited Talks

"Genetic and environmental influence on fitness variation in threatened spring Chinook salmon (*Oncorhynchus tshawytscha*)," Center for Genome Research and Biocomputing Users Group Seminar, December 2017.

"Fitting Occupancy Models for Rare Species with Penalized Likelihood Methods," Center for Genome Research and Biocomputing Spring Conference, Oregon State University, April 2016.

"An Exploration of Penalized Likelihood Estimation for Occupancy Modeling," Computational Ecology and Epidemiology Study Group, Odum School of Ecology, University of Georgia, Athens, GA. May 14, 2014.

"Machine Learning for Ecological Science and Environmental Policy," with T.G. Dietterich and D. Sheldon, a tutorial at the *International Conference on Machine Learning* (ICML), Bellevue, WA. June 28, 2011.

"Machine Learning Problems in Species Occupancy Modeling," SCHARP Brown Bag Series, Fred Hutchinson Cancer Research Center, Seattle, WA. March 25, 2010.

"Hidden Process Models with Applications to fMRI Data," Biostatistics and Biomathematics Seminar, Fred Hutchinson Cancer Research Center, Seattle, WA. March 24, 2010.

"Hidden Process Models with Applications to fMRI Data," Topic Contributed Session, *Joint Statistical Meetings* (JSM) 2009, Washington, DC. August 2, 2009.

Selected Other Talks and Posters

"Deep Learning Methods for Extracting Habitat Summaries from Remotely Sensed Data for Species Distribution Modeling," (presented by L. Hopkins with co-authors U. Zaragoza and W-K. Wong), *American Geophysical Union (AGU) Fall Meeting*, held virtually, December 2020.

"Harnessing big citizen science data: climate change and local host availability drive the northern range boundary in the rapid northward expansion of the eastern giant swallowtail butterfly," (poster presented by J.K. Wilson with co-authors N. Casajus, K.P. McFarland, J. Kerr, D. Berteaux, M. Larrivé, and K.L. Prudic), *Meeting of the Ecological Society of America (ESA)*, held virtually, July 2020.

"Link Prediction Under Imperfect Detection: Collaborative Filtering for Ecological Networks," June 2020 (presented by E. Seo with co-authors X. Fu, J. Clarke, A.R. Moldenke, and J.A. Jones), *International Statistical Ecology Conference (ISEC)*, Sydney, Australia, June 2020.

"Developing habitat covariates from remotely sensed data with deep learning," (poster presented by L. Hopkins with co-authors U. Zaragoza and W-K. Wong), *International Statistical Ecology Conference (ISEC)*, Sydney, Australia, June 2020.

"Estimating Occupancy and Recovery Trajectories of an Imperiled Carnivore By Integrating Camera Traps, Detection Dogs, and Reaction-Diffusion Models," (presented by B. Barry with co-authors K. Moriarty, D. Green, and T. Levi), *American Fisheries Society The Wildlife Society Joint Annual Conference*, Reno NV, September 2019.

"The impacts of temporary emigration on colonization and extinction estimates in dynamic occupancy models," (presented by J. Valente with co-authors V. Jirinec, M. Leu, and M.G. Betts), *American Ornithological Society Meeting*, Anchorage AK, June 2019.

"Real time massive online citizen science biodiversity programs: Lessons from butterflies," (presented by K.L. Prudic, with K.P. McFarland, J.C. Oliver, J. Kerr, M. Larrivee, and E.C. Long), *Entomology Society of America*, Denver, CO, November 2017.

"Penalized Likelihood Methods for Occupancy Models," (with J. Valente, S. Emerson, M.G. Betts, T.G. Dietterich), *ISEC 2016*, Seattle, WA, June 29, 2016.

"Count data collected using a robust design: models, results and recommendations," (E. Matechou, K. Winner, R.A. Hutchinson, J. Pippen, L. Ries), *ISEC 2016*, Seattle, WA, June 29, 2016.

"Posterior Regularization for Occupancy Models," (poster with T.G. Dietterich), *NIPS 2013 Workshop: Machine Learning for Sustainability*, Lake Tahoe, NV, December 10, 2013.

"Modeling Misidentification of Bird Species by Citizen Scientists," (poster with J. Yu and W-K. Wong), *NIPS 2013 Workshop: Machine Learning for Sustainability*, Lake Tahoe, NV, December 10, 2013.

"Incorporating Boosted Regression Trees into Ecological Latent Variable Models," (poster with T.G. Dietterich), *Women in Machine Learning Workshop* (WiML), Lake Tahoe, NV, December 10, 2013.

"Site occupancy models with regression trees (OD-BRT): A comparison with standard site occupancy models (OD) and boosted regression trees (BRT)", *Ninety-seventh Annual Meeting of the Ecological Society of America (ESA)*, Portland, OR, August 9, 2012.

"Incorporating Boosted Regression Trees into Site Occupancy Models," *AVES Seminar*, Department of Fisheries and Wildlife, Oregon State University. November 17, 2011.

"Combining Boosted Regression Trees and Hierarchical Species Occupancy Models," (talk and poster), *International Conference on Computational Sustainability* (ICCS), Massachusetts Institute of Technology, Cambridge, MA. June 27, 2010.

"Parameter Estimation in a Hierarchical Model for Species Occupancy," (poster with T.G. Dietterich), *Neural Information Processing Systems* (NIPS) Workshops: The Generative and Discriminative Learning Interface, Whistler, BC. December 12, 2009.

"Modeling fMRI data generated by overlapping cognitive processes with unknown onsets using Hidden Process Models," (poster with T.M. Mitchell), *Statistical Analyses of Neuronal Data* (SAND) Workshop 2008, Pittsburgh, PA. May 30, 2008.

"Hidden Process Models: Decoding Overlapping Cognitive States with Unknown Timing," *Neural Information Processing Systems* (NIPS) Workshops: New Directions on Decoding Mental States from fMRI Data, Whistler, BC. December 8, 2006.

"Hidden Process Models," *Women in Machine Learning* (WiML) Workshop, San Diego, CA. October 4, 2006.

"Learning to Identify Overlapping and Hidden Cognitive Processes from fMRI Data," (poster with T.M. Mitchell and I. Rustandi), *Human Brain Mapping* (HBM) 2005, Toronto, ON. June 2005.

"Using Hidden Process Models to Decode Cognitive States from fMRI Data," Brain Science Seminar, Carnegie Mellon Univerity. April 2005.

"Hidden Process Models for Body Monitoring Data," BodyMedia, Inc., Pittsburgh, PA. March 2005.