Ronilo Ragodos

210-284-5792 | roniloragodos57@hotmail.com | LinkedIn/Google Scholar

EDUCATION

Ph.D. in Business Analytics, University of Iowa, Iowa City, IA **Fall 2020 - present**
Minor Area: Statistics
Dissertation: "**On the Application, Design, and Usage of Explanations of Machine Learning Models**"
Co-Advisor: Dr. Tong Wang, Department of Marketing, Yale University
Co-Advisor: Dr. Nick Street, Department of Business Analytics, University of Iowa

M.Sc. in Mathematics, University of Iowa, Iowa City, IA **Fall 2017 - Spring 2019**
Area: Analysis (Dynamical Systems)
Advisor: Dr. Palle Jorgensen, Department of Mathematics, University of Iowa

B.Sc. in Applied Mathematical Sciences and Computational Sciences, Texas A&M University, College Station, TX **Fall 2012- Spring 2016**
Dual Majors: Computer Science and Applied Mathematics

RESEARCH INTERESTS

- Designing interpretable machine learning models that support decision-making and data analysis in business problems

EXPERTISE

- Solving problems using techniques from supervised learning, reinforcement learning, inverse reinforcement learning, and self-supervised learning
- Working with video, image, text, tabular, and spatio-temporal data

PUBLICATIONS

Published Works **(Total: 3)**

1. **Ragodos, R.**, Wang, T., Lin, Q., and Zhou, X. ProtoX: Explaining a reinforcement learning agent via prototyping. *Advances in Neural Information Processing Systems(NeurIPS)* 35 (2022), 27239–27252.
(NeurIPS is the top 1 publication outlet under Engineering & Computer Science -> Artificial Intelligence category by h5-index on Google Scholar)
2. **Ragodos, R.**, Wang, T., Padilla, C., Hecht, J. T., Poletta, F. A., Orioli, I. M., Buxó, C. J., Butali, A., Valencia-Ramirez, C., Muñeton, C. R., et al. Dental anomaly detection using intraoral photos via deep learning. *Scientific reports* 12, 1 (2022), 13541.2022.
3. **Ragodos, R.**, and Wang, T. Disjunctive rule lists. *INFORMS Journal on Computing* 34, 6 (2022), 3259–3276.

Preprints **(Total: 4)**

1. **Ragodos, R.**, Wang, T., Feng, L., and Hu, Y. J. From model explanation to data misinterpretation: Uncovering the pitfalls of post hoc explainers in business research. *Management Science* (under review).
2. **Ragodos, R.**, Nukunu-Attachey, M., and Street, W. N. SRRL: Statistically relevant rule lists for explanation of data generation processes. In *19th INFORMS Workshop on Data Mining and Decision Analytics (2024).*

3. **Ragodos, R.**, Zhou, X., Wang, T., Pan, Y., and Luo, J. ConProGAIL: Interpretable policy learning via conceptual prototyping for human spatiotemporal decision understanding. *31st ACM SIGKDD International Conference on Knowledge Discovery & Data Mining* (under review).
4. Bang, A., Zhou, X., Zhou, Z., **Ragodos, R.**, Xu, Z., and Luo, J. GeoPro-Net: Learning interpretable spatiotemporal prediction models through statistically-guided geo-prototyping. *AAAI Conference on Artificial Intelligence* (under review).

In Preparation **(Total: 3)**

1. **Ragodos, R.**, Wang, T., He, C., and Hu, Y. J. Can your toothpaste shopping predict mutual funds purchasing? transferring knowledge from consumer goods to financial products via machine learning.
2. **Ragodos, R.*,** Gurung, R.*, Chen, C., and Wang, T. PR-Net: A prototype-based deep neural network architecture for regression and reinforcement learning.

RESEARCH EXPERIENCES

SRRL: Statistically relevant rule lists for explanation of data generation processes

Department of Business Analytics, University of Iowa, Iowa City, IA **April 2024 - present**

- Designed novel rule-based classifier (Statistically Relevant Rule Lists (SRRL)) which is better at extracting ground truth rules from synthetic data than classic decision trees and modern optimal rule lists
- Utilized theory of Rashomon sets and a rigorous model of explanation from the philosophy of science literature to conceive the design of SRRL
- Wrote Python implementation of SRRL and tested used it to compare predictive performance and interpretability with SHAP, CART, XGBoost, and CORELS

PR-Net: A prototype-based deep neural network architecture for regression and reinforcement learning

Department of Business Analytics, University of Iowa, Iowa City, IA **January 2024 – present**

- Developed interpretable prototype-based deep neural network architecture for which can be used to train reinforcement learning agents with image-based state spaces and continuous action spaces, as well as supervised learning regressors on image-data
- Implemented the architecture in Python using PyTorch
- Tested our method in a car-racing environment
- Designed a user study to test how well our method can explain decisions compared to competing models

From model explanation to data misinterpretation: Uncovering the pitfalls of post hoc explainers in business research

Department of Business Analytics, University of Iowa, Iowa City, IA **August 2022 - present**

- Showed how and why popular ML methods for extracting business insights are often incorrect
- Proved convergence properties of LIME's ridge regression using random matrix theory and the theory of concentration of measure
- Tested the efficacy of the popular Python implementations of SHAP and LIME using real and synthetic data
- Designed and tested strategies for improving the efficacy of SHAP and LIME

ConProGAIL: Interpretable policy learning via conceptual prototyping for human spatiotemporal decision understanding

Department of Business Analytics, University of Iowa, Iowa City, IA **June 2022 - present**

- Designed first intrinsically interpretable GAN model for learning human behavior policies from spatiotemporal data (ConProGAIL)
- Synthesized ideas from prototype-based and concept bottleneck models to design interpretable GAN architecture for generative adversarial imitation learning (GAIL) algorithms
- Evaluated performance of ConProGAIL on real trajectory data from taxi drivers
- Used ConProGAIL to explain the taxi drivers' decisions

ProtoX: Explaining a reinforcement learning agent via prototyping

Department of Business Analytics, University of Iowa, Iowa City, IA **October 2021 – August 2022**

- Designed first method for explaining black box reinforcement learning agents whose state spaces consist of images (ProtoX)
- Implemented ProtoX in Python using PyTorch
- Tested ProtoX on OpenAI Gym Atari tasks (Super Mario Bros. and Seaquest)
- Benchmarked ProtoX against other inverse reinforcement learning algorithms

Disjunctive rule lists

Department of Business Analytics, University of Iowa, Iowa City, IA **April 2020 - August 2022**

- Designed rule-based regression algorithm called Disjunctive Rule Lists (DisRL)
- Implemented DisRL in Python
- Conducted experiments showing DisRL models are more concise and well performing than comparable baselines (e.g., CART, M5)

Graduate Research Assistant **May 2019 - October 2019**

Department of Mathematics, University of Iowa, Iowa City, IA

- Advised by Dr. Palle Jorgensen and Dr. Sergey Bezuglyi
- Worked on characterizing ergodic and invariant measures on Bratteli diagrams

Dental anomaly detection using intraoral photos via deep learning

Department of Business Analytics, University of Iowa, Iowa City, IA **October 2018 - July 2022**

- Collaborated with professors in College of Dentistry to design a way to aid dentists in diagnosis of dental anomalies from orofacial images, reducing the need for time-intensive intra-oral exams
- Designed multi-class CNN classifier for ten dental anomalies (with extreme class imbalance)
- Implemented our method in Python using PyTorch
- Used saliency methods to explain the model's decisions to engender trust among dentists and aid them in locating the teeth that have anomalous features

Graduate Research Assistant **January 2018 - May 2018**

Department of Business Analytics, University of Iowa, Iowa City, IA

- Designed and mixed integer program formulation of rule-based classifier
- Implemented design using CPLEX with Python API

Undergraduate Researcher **August 2016 – September 2016**

Department of Mathematics, Cornell University, Ithaca, NY

- Advised by Dr. Robert Strichartz and worked with two other undergraduate researchers
- Identified properties of fractal graphs using Python's NetworkX library
- Wrote and deployed website displaying our findings (link here)

CONFERENCE PRESENTATIONS

Oral Presentations **(Total: 10)**

1. **Ragodos, R.** (**2024**). "The Illusion of Interpretation: Post Hoc Explanations Aren't a Silver Bullet for Business Research," oral presentation at INFORMS Annual Meeting, Seattle, WA, October 20-23.
2. **Ragodos, R.** (**2024**). "SRRL: Statistically Relevant Rule Lists for Explanation of Data Generation Processes," oral presentation at INFORMS Data Mining and Decision Analytics (DMDA) Workshop, Seattle, WA, October 19.
3. **Ragodos, R.** (**2024**). "The Illusion of Interpretation: Post Hoc Explanations Aren't a Silver Bullet for Business Research," oral presentation at Conference on Information Systems and Technology (CIST), Seattle, WA, October 19-20.
4. **Ragodos, R.** (**2024**). "On the Incorrectness and Inconsistency of Post Hoc Explanations for Business Research," oral presentation at Production and Operations Management Society (POMS), Minneapolis, MN, April 25-29
5. **Ragodos, R.** (**2023**). "On the Incorrectness and Inconsistency of Post Hoc Explanations for Business Research," oral presentation at Workshop on Information Technologies and Systems (WITS), Hyderabad, India, December 13-15.
6. **Ragodos, R.** (**2023**). "On the Incorrectness and Inconsistency of Post Hoc Explanations for Business Research," oral presentation at INFORMS Annual Meeting, Phoenix, AZ, October 15-18.
7. **Ragodos, R.** (**2023**). "On the Incorrectness and Inconsistency of Post Hoc Explanations for Business Research," oral presentation at INFORMS Workshop on Data Mining & Decision Analytics, Phoenix, AZ, October 14.
8. **Ragodos, R.** (**2022**). "ProtoX: Explaining a Reinforcement Learning Agent via Prototyping," oral presentation at INFORMS Annual Meeting, Indianapolis, IN, October 16-19.
9. **Ragodos, R.** (**2019**). "Dental anomaly detection using intraoral photos via deep learning," poster presentation at the International Association for Dental, Oral, and Craniofacial Research General Session, Vancouver, BC, CA, June 19-22.
10. **Ragodos, R.** (**2019**). "Dental anomaly detection using intraoral photos via deep learning," poster presentation at the Iowa AADR research day, Iowa City, IA, February 12.

Poster Presentation **(Total: 2)**

1. **Ragodos, R.** (**2022**). "ProtoX: Explaining a Reinforcement Learning Agent via Prototyping," poster presentation at the Thirty-sixth Annual Conference on Neural Information Processing Systems, New Orleans, LA, November 28-December 5.
2. **Ragodos, R.** (**2016**). "Percolation Clusters on Products of Fractal Graphs," poster presentation at the Texas A&M Undergraduate Research Expo, College Station, TX, January 8.

Webinar Presentation **(Total: 1)**

1. **Ragodos, R.**, Ho, E. (**2021**). "Data Science and Machine Learning - An Intern's Perspective," webinar presentation for Verif.AI, April 8.

TEACHING EXPERIENCES

Head Teaching Assistant **Fall 2021– Spring 2023**

Department of Business Analytics, University of Iowa, Iowa City, IA

- BAIS 3500: Data Mining, ~90 undergraduate students (Fall 2022 – Spring 2023)
- BAIS 3000: Operations Management and BIAS 3005: Information Systems, 6 TAs and ~180 students (Fall 2021– Spring 2022)

Teaching Assistant **Fall 2020 – Spring 2021**

Department of Business Analytics, University of Iowa, Iowa City, IA

- BAIS 3000: Operations Management, ~25 undergraduate students (Fall 2020 – Spring 2021)

- MSCI 2800: Foundations of Business Analytics, ~30 undergraduate students (Spring 2020)

Teaching Assistant **Fall 2019 – Spring 2019**

Mathematics Department, University of Iowa, Iowa City, IA

- MATH 1460: Calculus for the Biological Sciences, ~25 undergraduate students (Fall 2019)

Head Teaching Assistant **Spring 2019**

Mathematics Department, University of Iowa, Iowa City, IA

- MATH 1440: Math for the Biological Sciences, ~30 undergraduate students (Spring 2019)
- One-on-one math tutoring for undergraduate students on a walk-in basis

Teaching Assistant **Fall 2017 – Fall 2018**

Mathematics Department, University of Iowa, Iowa City, IA

- MATH 1440: Math for the Biological Sciences, ~30 undergraduate students (Fall 2017, Fall 2018)
- One-on-one math tutoring for undergraduate students on a walk-in basis

Undergraduate Grader **Fall 2015 – Fall 2016**

Mathematics Department, Texas A&M University, College Station, TX

- *Graded homework and exams for linear algebra, differential equations, and engineering calculus I*

WORK EXPERIENCE

Machine Learning Intern **May 2020 - July 2020**

Verif.AI, Palo Alto, California

- Designed and implemented multi-armed bandit and reinforcement learning algorithms that identify CPU instruction sequences that induce failure states
- Performed database management for one of the largest data storage corporations
- Automated building, testing, and deployment of company code using Jenkins
- Wrote documentation for company software using Read the Docs
- Interviewed another intern and worked with CEO to make hiring decisions

SKILLS

- **Online Platforms**
  - Zoom, Canvas, Blackboard
- **Programming Languages and Markup Languages**
  - Python, C, C++, C#, Java, Haskell, PROLOG, LaTeX, Markdown, HTML
- **Mathematical Packages**
  - MATLAB, CPLEX, LINDO, quantum computing with Amazon Braket and IBM Qiskit
- **Computing Skills**
  - HPC (Sun Grid Engine (SGE)), GitHub, Jenkins, Read the Docs, Raspberry Pi, Arduino
- **Computer-Aided Design**
  - Tableau, Microsoft Office, pgfplots, TikZ, matplotlib, seaborn
- **Operating Systems**
  - Debian and Arch based GNU/Linux Distributions, Windows, MacOS
- **Cybersecurity-Related Skills**
  - Wireshark, Unix command line, cryptography, VPNs, OpenWRT

HONORS & AWARDS

University of Iowa Graduate College Summer Fellowship **Summer 2024**
University of Iowa Business Analytics Post-Comp Fellowship **Fall 2023**
University of Iowa Business Analytics Best Ph.D. Student Paper Award **Spring 2023**
University of Iowa Graduate College Summer Fellowship **Summer 2023**
University of Iowa Business Analytics Summer Merit Fellowship **Summer 2022**
University of Iowa Business Analytics Summer Merit Fellowship **Summer 2021**
University of Iowa AMCS Summer Merit Fellowship **Summer 2019**
University of Iowa AMCS Summer Merit Fellowship **Summer 2018**

TRAVEL GRANTS

Graduate Student Travel Grant for "INFORMS Annual Meeting" and "Conference on Information Systems and Technology (CIST)", Seattle, WA. ~$2,200 (October 2024)
Graduate Student Travel Grant for "Production and Operations Management Society (POMS)", Minneapolis, MN. ~$800 (April 2024)
Graduate Student Travel Grant for "INFORMS Annual Meeting, Phoenix, AZ. ~$1,800 (October 2023)
Graduate Student Travel Grant for "INFORMS Annual Meeting, Indianapolis, IN. $1,700 (October 2022)
Graduate Student Travel Grant for "Thirty-sixth Annual Conference on Neural Information Processing Systems," New Orleans, LA. ~$1,100 (November 2022)
Graduate Student Travel Grant for "International Association for Dental, Oral, and Craniofacial Research General Session," Vancouver, BC, CA. ~$1,100 (June 2019)

SERVICES & LEADERSHIPS

Professional Services

Reviewer for Conferences

NeurIPS Interpretable AI: Past, Present, and Future workshop **September 2024**
INFORMS Conference on Information Systems and Technology (CIST) **July 2024**
IEEE International Conference on Data Mining (ICDM) **June 2024**
ACM Conference on Fairness, Accountability, and Transparency (FACCT) **March 2023**

Institutional Services

Graduate Student Mentor **2024 – present**

- Worked with Dr. W. Nick Street in mentoring an MSBA student who wished to learn about interpretable machine learning
- Guided the student through process of designing and running experiments to evaluate baseline methods for our paper "SRRL: Statistically Relevant Rule Lists for Explanation of Data Generation Processes."
- Advised student on data mining methods and techniques to use in research project on learning what features of a mobile app for cancer patients are effective in reducing their symptom burden

PROFESSIONAL MEMBERSHIPS

- INFORMS Information Systems Society **2024 - present**
- Bertrand Russell Society **2024 - present**
- INFORMS **2020 - present**

OTHER ACADEMIC INTERESTS

- **Mathematics**
  - Dynamical systems, measure theory, probability theory, foundations of mathematics, logic, signal processing
- **Computer Science**
  - Formal language theory, quantum computing
- **Philosophy**
  - Philosophy of science, philosophy of mathematics, philosophy of language

REFERENCES ***

Dr. Tong Wang, Assistant Professor of Marketing
Department of Marketing
Yale University, New Haven, CT 06520
(617)851-5681; tong.wang.tw687@yale.edu

Dr. Nick Street, Tippie Children Professor in Business Analytics
Department of Business Analytics
University of Iowa, Iowa City, IA 52242
(319)335-1016; nick-street@uiowa.edu

Dr. Qihang Lin, Associate Professor of Business Analytics
Department of Business Analytics
University of Iowa, Iowa City, IA 52242
(319) 335-0988; qihang-lin@uiowa.edu

Dr. Palle Jorgensen, Professor of Mathematics
Department of Mathematics
University of Iowa, Iowa City, IA 52242
(319)335-0782; palle-jorgensen@uiowa.edu