

Erkin Ötleş

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Interests

I am interested in designing technology to enhance health and harnessing machine learning to solve problems in medicine. I am a MD & PhD candidate at the University of Michigan. Methods I am interested in include: Machine Learning, Artificial Intelligence, Operations Research, Bioinformatics, and Biostatistics.

Education

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| 2016 - 2024 | Medical Scientist Training Program Fellow (MD-PhD Trainee)
University of Michigan - Ann Arbor |
| 2024 | Doctor of Medicine , years 1-3 complete
currently completing year 4. |
| 2022 | Doctor of Philosophy (AI Lab & Industrial Engineering)
Dissertation: <i>Machine Learning for Healthcare: Model Development Implementation in Longitudinal Settings</i>
Advisors: Brian Denton (Industrial & Operations Engineering),
Jenna Wiens (Computer Science & Engineering) |
| 2013 - 2016 | Masters of Engineering , Industrial & Systems Engineering
University of Wisconsin - Madison
Decisions Science & Operations Research (Concentration: Computer Science) |
| 2007 - 2011 | Bachelors of Science , Industrial & Systems Engineering
University of Wisconsin - Madison
Dean's Honor List |

Work

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| 2018 - Current | Researcher , University of Michigan
Developing & studying machine learning methods for clinical problems. Methodologically focused on optimizing performance of human-ML model teams over time. Notable projects: early warning systems for hospital acquired infections & deterioration, personalized models for cancer risk, dynamic outcome prediction utilizing deep learning. Led and maintain the deployment of two ML models in Michigan Medicine's Epic EHR (utilized Epic Cognitive Computing Platform & designed and developed an in-house ML model service platform). |
| 2015 - 2016 | Lead Healthcare Data Scientist , MetaStar
Led early formation of the data science division. Transitioned organization from SAS based report distribution to self-service reporting using Tableau dashboards and Python for ML. Drove transition to ML & advanced analytics. Designed data-driven regional & statewide healthcare quality improvement efforts. |

- 2011 - 2013 **Solutions Engineer & Tech Coordinator**, Epic Systems Corporation
 Designed and developed analytics tools for Accountable Care Organizations. Worked with customers to design & validate patient tracking and quality measurement methods. Led technical support of two customer implementations. Managed and resolved install issue escalations often managing teams containing internal developers, customer technical and clinical teams. Certified on Ambulatory Clinical Documentation, MyChart, and Clinical Analytics Infrastructure (Cogito).
- 2011 **Health Systems Engineering**, UW Hospital
 Led design of next generation of inpatient rooms. Managed teams consisting of clinicians, administrators, and vendors. Developed data mining tools & processes to analyze quality of care as well as patient satisfaction.
- 2007 - 2010 **Engineering Co-ops**
 Boston Scientific (Cardiac Pacing Division) & Electronic Theatre Controls

Development Projects ([GitHub](#))

- 2019 - Present T-Square - Longitudinal data transformer for RNNs (Python & TensorFlow)
 2018 - Present Wave - Apple Watch app to assess hydration status using orthostatic heart rate measurements. (currently in beta testing)
 2017 **M is for Medicine** - iMessage sticker pack ([Appstore link](#))

Manuscripts ([Google Scholar](#))

- 2022 Ötles E, Seymour J, Wang H, Denton BT. **Dynamic prediction of work status for workers with occupational injuries: assessing the value of longitudinal observations.** *Journal of the American Medical Informatics Association.*
- 2022 Kamran F, Tang S, Ötles E, McEvoy DS, Saleh SN, Gong J, Li BY, Dutta S, Liu X, ..., Donnelly JP, Shenoy E, Ayanian J, Nallamothe K, Sjoding MW, Wiens J. **Early Identification of Hospitalized Patients with COVID-19 at Risk of Clinical Deterioration: A Model Development and Multi-Site External Validation Study.** *bmj.*
- 2022 Ötles E, Denton B, Qu B, Murali A, Merdan S, Auffenberg G, Hiller S, Lane BR, George AK, Singh K. **Development and Validation of Models to Predict Pathologic Outcomes of Radical Prostatectomy in Regional and National Cohorts.** *The Journal of Urology.*
- 2021 Ötles E, Oh J, Li B, Bochinski M, Joo H, Ortwine J, Shenoy E, Washer L, Young VB, Rao K, Wiens J. **Mind the Performance Gap: Examining Dataset Shift During Prospective Validation.** *Machine Learning for Healthcare Conference. PMLR.*
- 2021 Wong A, Ötles E, Donnelly JP, Krumm A, McCullough J, DeTroyer-Cooley O, Pestrue J, Phillips M, Konye J, Penozza C, Ghous M, Singh K., 2021. **External Validation of a Widely Implemented Proprietary Sepsis Prediction Model in Hospitalized Patients.** *JAMA Internal Medicine.*
- 2021 Solano QP, Hayward L, Chopra Z, Quanstrom K, Kendrick D, Abbott KL, Kunzmann M, Ahle S, Schuller M, Ötles E, George BC. **Natural Language Processing and Assessment of Resident Feedback Quality.** *J Surg Educ.*

- 2021 Abbott KL, George BC, Sandhu G, Harbaugh CM, Gauger PG, Ötles E, Matusko N, Vu JV. **Natural Language Processing to Estimate Clinical Competency Committee Ratings.** *Journal of Surgical Education.*
- 2021 Ötles E, Kendrick D, Solano QP, Schuller M, Ahle SL, Eskender MH, Carnes E, George BC. **Using Natural Language Processing to Automatically Assess Feedback Quality: Findings From Three Surgical Residencies.** *Academic Medicine.*
- 2021 Singh K, Valley TS, Tang S, Li BY, Kamran F, Sjoding MW, Wiens J, Ötles E, Donnelly JP, Wei MY, ... Singh K. **Validating a Widely Implemented Deterioration Index Model Among Hospitalized COVID-19 Patients.** *Annals of the American Thoracic Society.* (medRxiv)
- 2020 Beasley JW, Holden RJ, Ötles E, Green LA, Steege LM, Wetterneck TB. **It's time to bring human factors to primary care policy and practice.** *Applied Ergonomics.*
- 2017 Gorski JK, Batt RJ, Ötles E, Shah MN, Hamedani AG, Patterson BW. **The impact of emergency department census on the decision to admit.** *Academic Emergency Medicine.*
- 2016 Patterson BW, Batt RJ, Wilbanks MD, Ötles E, Westergaard MC, Shah MN. **Cherry picking patients: examining the interval between patient rooming and resident self-assignment.** *Academic Emergency Medicine.*

Under Review

- 2023 Measuring and Optimizing for Rank-Based Compatibility When Updating Risk Stratification Models
- 2022 Teaching Artificial Intelligence as a Fundamental Toolset of Medicine: A Trainee's Perspective

Abstracts

- 2021 **Comparative Assessment of a Machine Learning Model and Rectal Swab Surveillance to Predict Hospital Onset Clostridioides difficile**
IDWeek
- 2020 **A NLP Approach for Assessment of Surgical Trainee Feedback Quality,**
Association for Surgical Education Annual Meeting
- 2019 **Return to Work After Injury: A Sequential Prediction & Prescription Problem,**
Machine Learning for Healthcare
- 2017 **Immune Genomic Expression Correlates with Discharge Location & Poor Outcomes in Trauma Patients,** *Academic Surgical Congress*
- 2016 **Cues for PE Diagnosis in the Emergency Department: A Socio-technical Systems Approach for Clinical Decision Support,** *JAMLA*

Works in Progress

2020 Michigan Covid-19 Utilization & Risk Evaluation System (M-CURES)
2019 Digital Scribes: Enabling Clinical Artificial Intelligence & NLP

Books & Chapters

2016 **Human Factors**, *WHO Technical Series on Safer Primary Care*

White Papers & Other Works

2011 - Ongoing [YouTube Channel: Simulation Tools](#) (90k views)
2017 [A Community Pharmacy Initiative to Decrease Hospital Readmissions by Increasing Patient Adherence and Competency of Therapy](#), *MetaStar*
2012 [Improving the Quality and Efficiency of Primary Care through Industrial and Systems Engineering - A White Paper](#), *I-PrACTISE*

Peer Review

2022 AMIA Annual Symposium
2021-2022 Gut
2022 JAMIA
2020 - 2022 Machine Learning for Healthcare Conference

Selected Press

2021 [Forbes: Trust The AI? You Decide](#)

2021 [The Washington Post: Sepsis prediction tool used by hospitals misses many cases, study says. Firm that developed the tool disputes those findings.](#)

2021 [The Verge: A hospital algorithm designed to predict a deadly condition misses most cases](#)

2021 [WIRED: An Algorithm That Predicts Deadly Infections Is Often Flawed](#)

2021 [STAT News: A popular algorithm to predict sepsis misses most cases and sends frequent false alarms, study finds](#)

Presentations

2021 Engineering Machine Learning for Medicine
Georgia Tech, ISyE 8803 - Virtual.

2021 Medical Decision Making with Machine Learning: Model Development, Validation, and Updating
INFORMS 2021 - Virtual.

2021 High-confidence machine learning: A clinical decision-making case study
INFORMS 2021 - Virtual.

2021 [Engineering Machine Learning for Medicine: Developing, Deploying, and Evaluating Dynamic Prediction Models](#)

CHEPS Seminar Fall 2021 - Ann Arbor, MI.

- 2021 Comparative Assessment of a Machine Learning Model and Rectal Swab Surveillance to Predict Hospital Onset *Clostridioides difficile*
IDWeek - Virtual.
- 2021 Characterizing the Performance Gap.
Machine Learning for Healthcare Conference - Virtual.
- 2021 Considerations When Updating Models Used in Clinical Settings.
INFORMS Healthcare Conference - Virtual.
- 2020 Dynamic Machine Learning for Medical Practice.
INFORMS Annual Conference - Virtual.
- 2020 Prediction & Prevention: Powering Precision Health.
University of Michigan Precision Health Symposium - Virtual.
- 2020 Dynamic Prediction of Patient Outcomes.
University of Michigan Medical Scientist Training Program - Virtual.
- 2020 Friday Night AI: AI & COVID-19.
Ann Arbor District Library - Virtual.
- 2020 “You Did Great, Now Do Better” - NLP for Operative Feedback Quality.
University of Michigan - Department of Surgery Grand Rounds (Scrubs Surgery Olympics)
- 2020 A NLP Approach for Assessment of Surgical Trainee Feedback Quality.
Association for Surgical Education
- 2020 A NLP Approach for Assessment of Surgical Trainee Feedback Quality.
University of Michigan - Department of Surgery Moses Gunn Research Day
- 2019 Dynamic Prediction of Patient Outcomes: A Deep Learning Approach.
INFORMS Annual Conference - Seattle, WA.
- 2019 Dynamic Prediction of Patient Outcomes.
CHEPS Symposium - Ann Arbor, MI.
- 2019 Return to Work After Injury: Sequential Prediction & Decision.
Machine Learning for Healthcare - Ann Arbor, MI.
- 2019 Occupational Injury: Dynamic Prediction.
University of Michigan Medical Scientist Training Program - Roscommon, MI.
- 2019 Looking to the Future: Digital Scribes.
American Academy of Family Physicians Commission on Quality & Practice - Kansas City, MO.
- 2018 Shamu: Bringing Your Health Plan to Life.
Gupta Health Hackathon - Ann Arbor, MI.
- 2017 Augmenting Cancer Surveillance with Machine Learning.
CHEPS Symposium - Ann Arbor, MI.

2017	Machine Learning in Primary Care. <i>I-PraCTISE Annual Meeting - Madison, WI.</i>
2016	<u>Primary Care & Predictive Analytics.</u> <i>I-PraCTISE Colloquia - Madison, WI.</i>
2015	Forecasting Emergency Department Admissions. <i>INFORMS Healthcare Conference - Nashville, TN.</i>
2015	FlexSim Emergency Room Simulation Competition. <i>Society for Health Systems Annual Conference - Orlando, FL.</i>
2014	Industrial Engineering in Primary Care. <i>NAPCRG Annual Meeting - New York, City NY.</i>
2014	2013 I-PraCTISE Conference Review. <i>I-PraCTISE Annual Meeting - Madison, WI.</i>

Policy

2016	<u>Integration of Drug Price Information into Electronic Medical Records.</u> <i>AMA.</i>
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Grants

2018 - 2019	Innovation Fellowship, <u>Developing AI assistants for Physicians.</u> <i>AAPF.</i>
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Awards & Honors

2021	Kass Award (excellence in research in infectious diseases) - IDWeek
2020	University of Michigan Surgery Olympics Mentor (1 st place)
2020	MSTP Program Activities Committee
2017	University of Michigan Surgery Olympics (1 st place)
2017	Michigan SlingHealth's Innovation Demo Day Competition (1 st Place)
2013	SHS FlexSim Emergency Room Simulation Competition (1 st Place)
2011 - Present	Alpha Pi Mu (Industrial Engineering Honor Society)
2011 - Present	Tau Beta Pi (Engineering Honor Society)
2007 - 2011	Dean's Honor List
2007 - 2011	Colbeck Scholarship
2007 - 2011	Thomas Engineering Scholarship
2007 - 2011	WV Distinguished Scholarship

Teaching

2015	Lecturer , Industrial & Systems Engineering University of Wisconsin - Madison Health Systems Engineering (ISyE 417)
2013 - 2015	Teaching Assistant , Industrial & Systems Engineering University of Wisconsin - Madison Health Systems Engineering (ISyE 417) Simulation Modeling Lab (ISyE 321)

Leadership

2020 - 2022	Program Advisory Committee , University of Michigan MSTP
2020 - 2021	External Relations Chair , INFORMS University of Michigan Student Chapter
2016 - 2017	President , Medical Innovation Group UMMS
2015 - 2016	Communications Chair , INFORMS UW - Madison
2012 - Present	National Advisory Council , I-PrACTISE
2009 - 2011	Industry Chair , Engineering Expo 2011
2010 - 2011	External Relations Officer , Institute of Industrial Engineers
2010 - 2011	College of Engineering Rep. , Associated Students of Madison
2010 - 2011	Engineering Student Council Rep. , Polygon
2009 - 2010	Fundraising Chair , Institute of Industrial Engineers

Service

2021	University of Michigan MSTP Scientific Retreat Co-Chair
2019 - Present	University of Michigan MSTP Journal Editor
2019	IOE Coding Club
2015 - 2016	Health IT Thread Designer , UW - Madison, SMPH Curriculum Redesign
2015 - 2016	EMS Volunteer , Cross Plains EMS
2011	Organizing Volunteer , Wisconsin Science Olympiad
2009 - 2010	STEM Mentoring , Young Scientists of America
2009 - 2010	Emergency Department Volunteer , United Hospital

Mentorship

2020 - 2021	Max Klaben - IOE Undergrad
2020 - 2021	Isabelle Miner - IOE Undergrad

Professional Memberships

American Medical Association, INFORMS, I-PrACTISE, IISE

Skills

Docker, Java, Keras, Matlab, MUMPS (Caché), Python, PyTorch, R, SQL, Swift, TensorFlow, Unix