

# John P. Lalor

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## Research Interests

My research is in machine learning and natural language processing. I am particularly interested in model evaluation and quantifying uncertainty, as well as applications in biomedical informatics.

## Education

- 2019 **Ph.D. Computer Science**, University of Massachusetts, Amherst, MA.  
(expected) Advisor: Hong Yu
- 2015 **M.S. Computer Science**, DePaul University, Chicago, IL.  
Graduated with Distinction
- 2011 **B.B.A. IT Management**, University of Notre Dame, South Bend, IN.  
Minor: Irish Language and Literature Graduated Cum Laude

## Professional Experience

- 2018 **Applied Scientist Intern**, Amazon Alexa, Cambridge, MA.  
Supervisors: Bill Campbell and Eunah Cho  
I investigated ways to incorporate paraphrases as training data for semi-supervised machine learning models. I developed an embedding model for customer utterances that embeds paraphrase information. Analysis of these embeddings showed that they could be used to identify training data in both semi-supervised and active learning frameworks.
- 2015 - present **Research Assistant**, BioNLP Group, Amherst, MA.  
Supervisor: Hong Yu  
In the BioNLP lab I conduct research on improving patient health literacy and Electronic Health Record (EHR) note understanding. I developed the ComprehENotes test, the first test of EHR note comprehension available, using de-identified patient notes and Sentence Verification Technique to generate questions, and Item Response Theory to determine which questions to include in the test. I have used the ComprehENotes test to validate a previously self-reported results that EHR note comprehension is improved when patients are given the NoteAid tool to define medical terminology in the EHR note. I am also developing a machine learning model for identifying cases of hypoglycemia in patient secure messages with their health care providers.
- 2017 **Applied Scientist Intern**, Amazon Alexa, Cambridge, MA.  
Supervisors: Imre Kiss and Francois Mairesse  
I implemented a new internal metric to predict whether a customer request would be actioned correctly by Alexa. Using this metric I developed new regression tests for production model development, and developed a new semi-supervised technique for identifying appropriate unlabeled data for inclusion in training sets.
- 2016 **Intern**, ESPN Advanced Technology Group, Bristol, CT.  
Supervisor: Zvi Topol  
I developed a text summarization model to extract short summaries from ESPN articles that could be presented as smartphone notifications or social media posts.
- 2015 **Teaching Assistant**, Introduction to Computer Science, Amherst College, Amherst, MA.  
Professor: Crystal Valentine  
As TA I held weekly office hours, assisted students during weekly lab session, and graded weekly lab programming assignments. I also prepared and gave two lectures during the semester.

- 2013 - 2015 **Software Developer**, Eze Software Group, Chicago, IL.  
I designed and built a notification system to alert customers when trade orders are completed via email and text message. I also designed and built an administrative dashboard for our case management system that filtered and displayed case information for 1000+ cases across 30+ clients. I was the team lead for updating code and fixing bugs for internal case management, account management, and incident resolution systems.
- 2011 - 2013 **Advisory Sr. Associate**, KPMG, Philadelphia, PA, Chicago, IL.  
I coordinated and performed General IT Control and application control testing for large and mid-size companies across various industries as part of IT Financial Statement Audit Support teams. I also developed an automated user access testing application to identify terminated employees across application access lists.

## Honors and Awards

- 2018 UMass CICS Travel Grant recipient  
2015 DePaul University Graduate Assistantship  
2015 Inducted into the Upsilon Pi Epsilon computer science honor society, DePaul chapter  
2007 - 2011 Dean's List 4 semesters at Notre Dame

## Publications

### Manuscripts Under Review

- 15 J. Chen, **J.P. Lalor**, W. Liu, E. Druhl, H. Yu. Detecting Hypoglycemia Incidents Reported in Patients' Secure Messages: Using Cost-sensitive Learning and Oversampling to Reduce Data Imbalance. *JMIR Preprints*. 21/08/2018:11990 DOI: 10.2196/preprints.11990

### Journal and Conference Publications

- 14 **J.P. Lalor**, B. Woolf, H. Yu. Improving EHR Note Comprehension with NoteAid: A Randomized Trial of EHR Note Comprehension Interventions with Crowdsourced Workers. *J Med Internet Res (forthcoming)*. doi:10.2196/10793.
- 13 **J.P. Lalor**, H. Wu, T. Munkhdalai, H. Yu. Understanding Deep Learning Performance through an Examination of Test Set Difficulty: A Psychometric Case Study. To appear in *EMNLP 2018: Conference on Empirical Methods in Natural Language Processing*, 2018.
- 12 **J.P. Lalor**, H. Wu, L. Chen, K. Mazor, H. Yu. CompreHENotes, an Instrument for Assessing Patient Electronic Health Record Note Reading Comprehension: Development and Validation. *J Med Internet Res* 2018;20(4):e139. doi:10.2196/jmir.9380
- 11 T. Munkhdalai, **J.P. Lalor**, H. Yu. Citation Analysis with Neural Attention Models. *LOUHI 2016 : The Seventh International Workshop on Health Text Mining and Information Analysis*, Austin, TX, USA, November 2016.
- 10 **J.P. Lalor**, H. Wu, H. Yu. Building an Evaluation Scale using Item Response Theory. *EMNLP 2016: Conference on Empirical Methods in Natural Language Processing*, Austin, TX, USA, November 2016.
- 9 C. Miller, A. Settle, **J.P. Lalor**. Learning Object-Oriented Programming in Python: Towards an Inventory of Difficulties and Testing Pitfalls. *SIGITE 2015: The Special Interest Group for Information Technology Education Conference*, Chicago, IL, October 2015
- 8 A. Settle, **J.P. Lalor**, T. Steinbach. Evaluating a Linked-Courses Learning Community for Development Majors. *SIGITE 2015: The Special Interest Group for Information Technology Education Conference*, Chicago, IL, October 2015
- 7 A. Settle, **J.P. Lalor**, T. Steinbach. A Computer Science Linked-Courses Learning Community. *ITiCSE 2015: The 20th Annual Conference on Innovation and Technology in Computer Science Education*. Vilnius, Lithuania, July 2015
- 6 A. Settle, **J.P. Lalor**, T. Steinbach. Reconsidering the Impact of CS1 on Novice Attitudes. *SIGCSE 2015: The ACM Special Interest Group on Computer Science Education*. Kansas City, MO, March 2015

## Workshop Papers, Posters, and Abstracts

- 5 J. Chen, **J.P. Lalor**, H. Yu. Detecting Hypoglycemia Incidents from Patients' Secure Messages. *American Medical Informatics Association (AMIA) Annual Symposium* Poster, 2018
- 4 **J.P. Lalor**, H. Wu, H. Yu. Soft Label Memorization-Generalization for Natural Language Inference. *Workshop on Uncertainty in Deep Learning. Uncertainty in Artificial Intelligence (UAI)*, 2018.
- 3 **J.P. Lalor**, H. Wu, H. Yu. Modeling Difficulty to Understand Deep Learning Performance. *Northern Lights Deep Learning Workshop (NLDL)*, 2018.
- 2 **J.P. Lalor**, H. Wu, H. Yu. CIFT: Crowd-Informed Fine-Tuning to Improve Machine Learning Ability. *Human Computation and Crowdsourcing (HCOMP) Works-in-Progress*, 2017.
- 1 **J.P. Lalor**, H. Wu, L. Chen, K. Mazar, H. Yu. Generating a Test of Electronic Health Record Narrative Comprehension with Item Response Theory. *American Medical Informatics Association (AMIA) Annual Symposium* Podium Abstract, 2017.

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## Tutorials and Invited Talks

- 11/2018 Evaluation and Interpretability in Deep Neural Networks. *American Medical Informatics Association (AMIA) Annual Symposium* Instructional Workshop, 2018. With A. Jagannatha and H. Yu.
- 10/2018 ComprehENotes: A New Test of EHR Note Comprehension. *University of Notre Dame Mendoza College of Business*.
- 09/2018 Leveraging Uncertainty for Better DNN Training and Evaluation. *UMass Lowell Data Science Lecture Series*.
- 09/2017 Building Better Evaluations using Item Response Theory. *University of Notre Dame Natural Language Processing Group*.
- 12/2016 Building Evaluation Scales for NLP using Item Response Theory. *UMass CICS Machine Learning and Friends Lunch series*.

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## Teaching and Mentoring Experience

- Fall 2018 **Instructor**, UMass Lowell Data Science Lecture Series, University of Massachusetts Lowell.  
Prepared and gave three lectures on evaluation and interpretability in deep neural networks
- Fall 2018 **Instructor**, CICS First Year Seminar, University of Massachusetts Amherst.  
Seminar for first year students on Artificial Intelligence in Healthcare. I am the sole instructor for this course, and designed the syllabus, lectures, and assignments.
- 2018 **Research Mentor**, Long Le, B.S. in Computer Science, University of Massachusetts Amherst.  
Project: Analysis of Easy/Difficult Images for CNN Models
- 2017-2018 **Research Mentor**, Nikhil Titus, M.S. in Computer Science, University of Massachusetts Amherst.  
Project: Neural Question Generation
- 2018 **Research Mentor**, UMass CICS Industry Mentor Program.  
Project: Analyzing Users within Organizations with NLP
- 2014 - 2015 **Graduate Ambassador**, DePaul University.  
Spoke with prospective graduate students about DePaul and the MS program.
- 2014 - 2015 **Tutor**, DePaul University.  
Tutor for masters and undergraduate students in Computer Science on courses involving Python, SQL, and web development

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## Service

- 2018 - present **Co-organizer**, UMass CICS Machine Learning and Friends Lunch..
- 2018 **Reviewer**, American Journal of Preventative Medicine (AJPM), American Medical Informatics Association (AMIA) Annual Symposium, Journal of Medical Internet Research (JMIR).

2017 **Reviewer**, Journal of Medical Internet Research (JMIR).