

# Brian Lester

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## Education

### University of North Carolina

PH.D. STUDENT WORKING WITH COLIN RAFFEL

Chapel Hill, NC

2022–Present

### University of Pittsburgh

DOUBLE MAJOR, 3.51. **COMPUTER SCIENCE** WITH HONORS, 3.86. **NEUROSCIENCE**, 3.19.

Pittsburgh, PA

2012–2016

### Shanghai American School

HIGH SCHOOL

Shanghai, China

2008–2012

Advanced Placement Curriculum. Team lead for FIRST Robotics Competition.

## Selected Publications

**h-index: 6**

### The Power of Scale for Parameter-Efficient Prompt Tuning

**BRIAN LESTER**, RAMI AL-ROUF, NOAH CONSTANT

*EMNLP 2021*, Online. 623 citations

### Finetuned Language Models Are Zero-Shot Learners

JASON WEI, MAARTEN BOSMA, VINCENT Y ZHAO, KELVIN GUU, ADAMS WEI YU, **BRIAN LESTER**, NAN DU, ANDREW M DAI, QUOC V LE

*ICLR 2022*, Online. 341 citations

### SPoT: Better Frozen Model Adaptation through Soft Prompt Transfer

TU VU, **BRIAN LESTER**, NOAH CONSTANT, RAMI AL-ROUF, DANIEL MATTHEW CER

*ACL 2022*, Dublin, Ireland and Online. 74 citations

### An Effective Label Noise Model for DNN Text Classification

ISHAN JINDAL, DANIEL PRESSEL, **BRIAN LESTER**, MATTHEW NOKLEBY

*NAACL 2019*, Minneapolis, Minnesota. 35 citations

### Scaling Up Models and Data with $\text{t5x}$ and seqio

ADAM ROBERTS, HYUNG WON CHUNG, ANSELM LEVSKAYA, GAURAV MISHRA, JAMES BRADBURY, DANIEL ANDOR, SHARAN NARANG, **BRIAN LESTER**, ET AL. (8/42)

Preprint *arXiv:2203.17189*, 2022. 44 citations

### A Library for Rapid Modeling, Experimentation and Development of Deep Learning Algorithms targeting NLP

DANIEL PRESSEL, SAGNIK RAY CHOUDHURY, **BRIAN LESTER**, YANJIE ZHAO, MATT BARTA

*ACL 2018; NLP-OSS Workshop*, Melbourne, Australia. 15 citations

### Multiple Word Embeddings for Increased Diversity of Representation

**BRIAN LESTER**, DANIEL PRESSEL, AMY HEMMETER, SAGNIK RAY CHOUDHURY, SRINIVAS BANGALORE

Preprint *arXiv:2009.14394*, 2020. 6 citations

### Constrained Decoding for Computationally Efficient Named Entity Recognition Taggers

**BRIAN LESTER**, DANIEL PRESSEL, AMY HEMMETER, SAGNIK RAY CHOUDHURY, SRINIVAS BANGALORE

*EMNLP 2020; Findings*, Online. 6 citations

### iobes: Library for Span Level Processing

**BRIAN LESTER**

*ACL 2020; NLP-OSS Workshop*, Online. 2 citations

### Dynamically Adjusting a Voice Recognition System

**BRIAN LESTER**, SORIN M PANAINTE

*US Patent 9,984,688*, 2018. 1 citation

### Baseline: Strong, Extensible, Reproducible, Deep Learning Baselines for NLP

DANIEL PRESSEL, **BRIAN LESTER**, SAGNIK RAY CHOUDHURY, MATT BARTA, YANJIE ZHAO, AMY HEMMETER

*NuerIPS 2018; OSS Workshop*, Montreal Quebec. 2 citations

### Reducing Retraining by Recycling Parameter-Efficient Prompts

**BRIAN LESTER\***, JOSHUA YURTSEVER\*, SIAMAK SHAKERI, NOAH CONSTANT

Preprint *arXiv:2208.05577*, 2022. 1 citation

### Overcoming Catastrophic Forgetting in Zero-Shot Cross-Lingual Generation

TU VU, ADITYA BARUA, **BRIAN LESTER**, DANIEL MATTHEW CER, MOHIT IYER, NOAH CONSTANT

*EMNLP 2022*, 2022, Abu Dhabi, UAE and Online. 5 citations

### Intent Features for Rich Natural Language Understanding

**BRIAN LESTER**, SAGNIK RAY CHOUDHURY, RASHMI PRASAD, SRINIVAS BANGALORE

*NAACL 2021; Industry Track*, Online.

### Leader: Prefixing a Length for Faster Word Vector Serialization

**BRIAN LESTER**

Preprint *arXiv:2009.13699*, 2020.

# Work Experience

## Google Brain

SENIOR RESEARCH ENGINEER

Mountain View, California

2020–Present

Deep Learning research with a focus on Natural Language Processing, large pre-trained models, and zero-shot transfer.

- Prompt Tuning: an efficient method of controlling large frozen pre-trained language models based on T5. Matches performance of full fine-tuning using only 0.003% of the parameters. Open-sourced of our codebase and it has enabled 3 published papers, 1 product launch, and at least 5 in-flight papers.
- Flan: Multitask training for a 137 billion parameter transformer-based decoder-only language model to create a model that is more effective at zero-shot prompting and performs better using Prompt Tuning.
- SPoT: Using multitask prompts as strong initialization for Prompt Tuning resulting in increased performance. Also used prompt similarity to estimate task similarity and to predict transferability.
- Added partial network training, lazy loading, and pre-filling of the auto-regressive cache to t5x, the open-source reimplementation of T5 in Jax. This final change reduced inference latency from 30 seconds to 2.4.

## Interactions

MACHINE LEARNING ENGINEER

Ann Arbor, Michigan

2018–2020

Built production grade deep learning solutions and lead research efforts to push the boundaries of performance.

- Designed novel neural network architectures for calibrated intent detection, slot filling, and named entity linking using ConvNets, bLSTM-CRFs, ranking models, and transformer-based seq2seq models.
- Designed label space, annotation guidelines, and data collection method for NLU component of dialogue systems.
- Created a cloud-native model training platform based on declarative pipelines and kubernetes. Built a deployment platform that powers NLU for multiple production dialogue systems.
- Built efficient, batched implementations of complex neural network architectures such as Beam Search. My CRF implementation reduced training time by a factor of 10.

## Trove

LEAD MACHINE LEARNING RESEARCH ENGINEER

Ann Arbor, Michigan

2017–2018

Created a model training and serving platform that processed 200 million emails per day. Provided technical leadership to the ML team.

- Designed ConvNets for text classification to find sentences that contain questions. This powered a user-facing feature and was used to featurize the social graph created from email.
- Created neural ranking model was used to find coreferent mentions in the text and provide context to users.
- Used lexical features, as well as connectivity information in the email social graph, to identified bot accounts.

## Visteon Corporation

SOFTWARE ENGINEERING INTERN

Van Buren, Michigan

2015

Designed an adaptive system to minimize voice recognition errors based on ASR confidence scores. We patented this system and it is used in Mazda Cars.

# Presentations

## Prompt Tuning

DEEP LEARNING

University of Michigan

University of North Carolina

2021–2022

An overview of my work on Prompt Tuning, as well as our work—Flan and SPoT—directly built on Prompt Tuning. The talk includes a collection of insights about the behavior of soft prompts aggregated from others' followup work.

## NeurIPS Spotlight Talk on Mead-Baseline

DEEP LEARNING

NeurIPS OSS Workshop

December 2018

A spotlight talk, at the Open Source Software workshop at NeurIPS 2018, about our open-source toolkit, Mead-Baseline.

## Confidence and Calibration of Neural Network Models

DEEP LEARNING

EMU ML Conference

March 2020<sup>1</sup>

An overview of techniques used to adjust model calibration, evaluation of models that have the ability to “reject” decision with low confidence, and their uses in the NLU unit of a production dialogue system.

## Padding in Neural Networks for Natural Language Processing

NATURAL LANGUAGE PROCESSING

A2D-NLP

February 2020

A survey of NLP building blocks with a focus on correctness and the need for padding in complex situations as well as places it is unexpected, like max-pooling following a 1D convolution.

## Optimization via NumPy and Cython

NUMERICAL COMPUTATION

Michigan Python Meetup

January 2020

I use a series of optimizations for computing pairwise Manhattan distance to introduce core NumPy concepts and Cython to reduce the runtime from multiple hours to just seconds.

## Input Representations of Deep Neural Networks

DEEP LEARNING

PyData Ann Arbor

October 2017

Using learned character-compositional input representations to create Deep Neural Networks with an open vocabulary.

# Skills

## Deep Learning

Extensive experience building novel Neural Network architectures, generally for NLP. High-performance training with Data and Model Parallelism, including multihost distributed training on TPU.

## Infrastructure

Build and deploy with Kubernetes, Docker, Flux, MongoDB, Apache Nifi, Github Actions, and GitLab CI/CD. Experience training large neural networks on Google Cloud (GCP)

## Toolkits

Jax, Flax, PyTorch, Tensorflow, NumPy, Pandas, Faiss, SpaCy, NLTK, Tensorflow-Datasets, Seaborn, and Matplotlib.

## Languages

Python, Cython, Java, C, Javascript, C++, Lisp, and ~~TeX~~.

<sup>1</sup>Canceled due to COVID-19

## Service & Public Scholarship

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### REVIEWING

- 2022 IEEE Transactions on Affective Computing
- 2022 ARR: ACL Rolling Review
- 2022 NAACL
- 2020–2021 Computer Speech and Language
- 2019 CoNLL

### PUBLIC SCHOLARSHIP

- 2020 <sup>1</sup> **a<sup>2</sup>-dlearn**: Helped organize logistics, recruit speakers, and acquire funding through sponsorships