HASSAN HAMAD

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Los Angeles ⋄ California

EDUCATION

University of Southern California (USC), USA *August 2019 - Present*
Pursuing PhD in Electrical and Computer Engineering Current GPA: 4.0/4.0

Technical University of Munich (TUM), Germany *September 2016 - May 2019*
M.S. in Communications Engineering GPA: 1.2/1.0 (German Grading System)

Notre Dame University-Louaize (NDU), Lebanon *September 2012 - June 2016*
B.E. in Computer and Communications Engineering, With Honors. GPA: 3.90/4.0

RESEARCH INTERESTS

TLDR; I'm interested in methods to reduce data budgets and computational costs needed for training neural networks, especially on NLP tasks.

During my Bachelors and Masters studies, I did a lot of research in the area of digital communications and Information Theory. In August 2019, I started my PhD at USC and have switched my field to deep learning. I'm interested in making the training of deep learning algorithms more efficient, both from the data side and the computational cost side. Although this idea holds for general deep learning problems and model architectures, I'm more focused on tasks in Natural Language Processing (specifically Relation Extraction) and on models of the transformer architecture.

Computational Efficiency: I explore alternative node processing to the standard sum-product. Specifically, I'm interested in the *max-sum* family of nodes being that these operations are multiply-free. I coded my own C++ bit-true simulation for deep learning training using the Logarithmic Number System (LNS) to study it as a candidate.

Data Efficiency: I explore techniques to incorporate the idea of curriculum learning in the semi-supervised and active learning pipelines. For that end, I'm developing NLP-specific metrics to judge both the difficulty and confidence of a sample. My end goal is to be able to reach the best performance with the smallest data budget possible. My techniques are being tested on the task of Relation Extraction.

Dataset Creation: During my work, I was also lucky to have the opportunity to create a new dataset from scratch, called FIRE: FInancial Relation Extraction. The dataset is comprised of named entity and relation labels extracted from financial documents (e.g. 10-K and 10-Q) and financial news articles (e.g. Yahoo Finance news). The intended task is called Supervised Relation Extraction, a multi-label multi-class classification problem. In addition to defining the class labels, I developed detailed annotation guidelines and supervised the development of a labeling tool to speed up the labeling process. The dataset is expected to be released soon.

As of Fall 2022, my research is still in progress and I plan to publish the first of my results starting Spring 2023.

PAPERS IN PREPARATION

Training Convolutional Neural Networks using Quantized Logarithmic Computations
H. Hamad, M. Conn, P. Berel and K.M. Chugg
In preparation for 2023 International Conference on Machine Learning (ICML).

FIRE: a FInancial Relation Extarction Dataset
H. Hamad, A. Thakur and K.M. Chugg
In preparation for 2023 Conference on Neural Information Processing Systems (NeurIPS), Datasets and Benchmarks track.

Combined SSL-ACL paradigm to Train Relation Extraction Models on a Low Data Budget
H. Hamad, A. Thakur and K.M. Chugg
In preparation for 2023 Conference on Empirical Methods in Natural Language Processing (EMNLP).

PUBLISHED PAPERS

Approximation Capabilities of Neural Networks using Morphological Perceptrons and Generalizations
W. Chang, H. Hamad, and K.M. Chugg
2022 Asilomar Conference on Signals, Systems, and Computers.

Joint State Sensing and Communication over Memoryless Multiple Access Channels
M. Kobayashi, H. Hamad, G. Kramer and G. Caire
2019 IEEE International Symposium on Information Theory (ISIT).

Performance Analysis of Convolutional Codes over the Bernoulli-Gaussian Impulsive Noise Channel
H. Hamad and G. M. Kraidy
2017 15th Canadian Workshop on Information Theory (CWIT).

Small-signal analysis of ultra-high-speed 30 GHz VCSELs using an advanced multi-mode approach
W. Hamad, M. Bou Sanayeh, H. Hamad, M. Hamad, S. Georges, and W. Hofmann
2017 Proceedings of the Integrated Optics: Physics and Simulations III conference.

TECHNICAL STRENGTHS

Programming Languages	Python, C, C++, VHDL
Software Basic Knowledge	Linux, HFSS, Cadence
Software Intermediate Knowledge	Matlab, LATEX, MS office, CCSTUDIO, Xilinx ISE

WORK EXPERIENCE

Fraunhofer Research Organization, Munich, Germany   Feb. 2019 - June 2019
Working Student - Machine Learning

- Predicting the latency of V2V communication link from various channel measurement data using RNN architectures.

Intel Germany, Munich   May 2017 - May 2018

Working Student - LTE physical layer system engineer

· - Worked on a physical layer concept to implement the V2X feature defined in 3GPP.

  - Worked on the Interface between Protocol Stack and Physical Layer.

  - Developed a Matlab GUI to produce visualizations from LTE trace files.

Ericsson, Lebanon   Summer 2015

Internship - 3GPP Mobile Standards

· - With the Mobile Broadband department (MBB) at Ericsson Communications Lebanon, I got to study the different 3GPP mobile standards (GSM/UMTS/LTE) and the different software tools used by Ericsson for network monitoring.

TEACHING EXPERIENCE

Lab Assistant for Communications Lab   Winter 2018

Technical University of Munich (TUM), Germany

· Introduction to communication systems based on experiments and computer simulations.

ACADEMIC ACHIEVEMENTS

Annenberg Fellowship recipient at USC   *August 2019 - August 2020*

SLK America Fellowship recipient   *August 2020-Present*

EXTRA-CURRICULAR

2012- Member of the Institute of Electrical and Electronics Engineers (IEEE)

2014- Worked as a private tutor for university and high school students

Hobbies : Football, Table Tennis, Reading

LANGUAGES

Arabic	Mother tongue
English	Fluent
German	Basic