

HASSAN HAMAD

(+1) 714-7338225 \diamond hhamad@usc.edu

<https://www.hassanhamad.com>

Los Angeles \diamond California

EDUCATION

University of Southern California (USC), USA
Pursuing PhD in Electrical and Computer Engineering

August 2019 - Present
Current GPA: 4.0/4.0

Technical University of Munich (TUM), Germany
M.S. in Communications Engineering

September 2016 - May 2019
GPA: 1.2/1.0 (German Grading System)

Notre Dame University-Louaize (NDU), Lebanon
B.E. in Computer and Communications Engineering, With Honors.

September 2012 - June 2016
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 architectures, I'm more focused on tasks in Natural Language Processing (specifically Relation Extraction) and on transformer architectures (specifically encoder-only models such as Bert).

Computational Efficiency: I explore alternative node processing than 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: Relations in Financial Documents. 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 had a student code up a *labeling tool* to speed up the labeling process. The dataset is not public yet.

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

PUBLICATIONS

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
SLK America Fellowship recipient

August 2019 - August 2020
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