Chadi Helwe

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Education

July 2024 — ***Doctor of Philosophy in Artificial Intelligence*** - Institut Polytechnique de Paris
2021 — Ph.D.'s Thesis: Evaluating and Improving the Reasoning Abilities of Language Models
Advisors: Prof. Fabian Suchanek and Prof. Chloé Clavel

2017 — ***Master of Science in Computer Science*** - American University of Beirut — GPA: 3.68/4
2015 — Master's Thesis: Arabic Named Entity Recognition via Deep Co-learning
Advisor: Prof. Shady Elbassuoni

2014 — ***Bachelor of Science in Computer Science*** - Notre Dame University - Louaize — GPA: 3.63/4
2010 — Final Year Project: Educaly - An Educational Social Network
Advisor: Prof. Marie Khair

Selected Research Work Experience

Now — ***Postdoctoral Researcher*** - INRIA, France
Oct 2024

- **Bias in Large Language Models**
  - A project in collaboration with CWI Amsterdam (Netherlands).
  - Working on detecting biases in large language models and developing techniques to mitigate these biases.

July 2024 — ***Graduate Research Assistant*** - Institut Polytechnique de Paris, France
Jan 2021

- **MAFALDA: A Benchmark and Comprehensive Study of Fallacy Detection and Classification [1]:**
  - Designed a novel taxonomy of fallacies.
  - Proposed an annotation framework customized for fallacy classification and introduced an evaluation metric to address subjectivity within fallacy classification.
  - Built a benchmark to assess the performance of language models in detecting and categorizing fallacies.
- **TINA: Textual Inference with Negation Augmentation [2]:**
  - Proposed a probabilistic definition of Textual Entailment (TE) and used it to augment TE datasets with new entailment relationships automatically.
  - Explored various models fine-tuned with augmented datasets using an unlikelihood loss to enhance language model robustness in Textual Entailment tasks, particularly those involving negation examples.
- **LogiTorch: A PyTorch-based Library for Logical Reasoning on Natural Language [3]:**
  - Developed a Python library on top of Pytorch for logical reasoning with diverse benchmarks, models, and utility functions, simplifying dataset utilization and model training.
- **Reasoning with Transformer-based Models: Deep Learning, but Shallow Reasoning [4]:**
  - Wrote a survey paper on the performance of Transformers on various reasoning tasks, highlighting both their successes and limitations, including empirical and theoretical aspects.

Aug 2020 — ***Research Assistant*** - American University of Beirut, Lebanon
Oct 2017

- **Retrieving Textual Evidence for Knowledge Graph Facts using Deep Learning:**
  - A project in collaboration with Aalborg University (Denmark) and Hacettepe University (Turkey).
  - Investigated Transformer-based models trained with a dataset generated using distant supervision to rank passages based on their relevance to a given fact in the form of a Resource Description Framework (RDF) triple.
- **Predicting Arabic Blog Credibility using Deep Co-learning [5]:**
  - Implemented and evaluated a novel semi-supervised learning approach based on an algorithm called Co-training, which was adapted to the context of deep learning for the task of Arabic blog's credibility prediction, which can be trained using a small labeled dataset and a large unlabeled dataset.
- **Automated Detection and Measurement of Corneal Haze and Demarcation Line in OCT Images [6, 7, 8, 9, 10]:**
  - A project in collaboration with the Department of Ophthalmology (American University of Beirut Medical Center) and the ELZA Institute in Zurich (Switzerland).
  - Redesigned an outdated software to detect and measure corneal haze and demarcation line in different types of Optical Coherence Tomography (OCT) images and added new features to it.
  - Proposed and implemented a semi-weakly supervised learning approach to segment the area between the top boundary of a cornea and the demarcation line in OCT images.
  - Developed a SegNet neural network to detect the boundaries of a cornea in OCT images and a VGG-16 neural network to detect artifacts in OCT images.
  - Supervised two undergrad students who annotated a large dataset of OCT images.
  - Developed an image segmentation tool for labeling.
  - Developed OCTAnalysis.com, a web interface of the software in Django/Python and Postgres SQL.

Sept 2017 – June 2016 ***Graduate Research Assistant*** **-** American University of Beirut, Lebanon

- **Arabic Named Entity Recognition via Deep Co-learning [11, 12]:**
  - Built a supervised deep learning model that infers the name entities' class in a Wikipedia article by classifying their Wikipedia pages into one of four classes: person, location, organization, or miscellaneous.
  - Generated a large dataset of partially annotated Wikipedia articles for the task of Arabic Named Entity Recognition (NER).
  - Proposed a novel semi-supervised learning approach based on an algorithm called Co-training, which was adapted to the context of deep learning for the task of Arabic NER and which can be trained using a small fully annotated dataset and a large partially annotated dataset.
  - Evaluated our proposed Deep Co-learning algorithm approach on three Arabic NER datasets.
- **ICD and CCS Coding using Deep Learning [13]:**
  - A project in collaboration with the Department of Emergency Medicine (American University of Beirut Medical Center).
  - Designed and implemented a deep neural network architecture to predict the International Classification of Diseases (ICD) code and Clinical Classifications Software (CCS) single-level code of a discharge diagnosis.
- **Methodical Evaluation of Arabic Word Embeddings [14]:**
  - A project in collaboration with Qatar University.
  - Built the first word analogy benchmark designed specifically for Arabic word embeddings.
  - Implemented different Long Short-term Memory recurrent neural network architectures to evaluate Arabic word embeddings on two NLP tasks: Document Classification and Named Entity Recognition.
- **Adaptive QoS for Spark Applications [15]:**
  - Developed an adaptive quality management/selection method for Spark applications.
  - Implemented different QoS policies in Java.

Teaching Experience

Aug 2023 – July 2021 ***Teaching Assistant*** **-** Institut Polytechnique de Paris, France

- **Bases de données**
- **Données du Web**
- **Mise en pratique Données du Web**
- **Mining of Large Datasets**

May 2020 – Feb 2015 ***Teaching Assistant*** **-** American Univerisity of Beirut, Lebanon

- **Artificial Intelligence**
- **Introduction to Programming**
- **Compiler Construction (graduate course)**
- **Machine Learning (graduate course)**

June 2013 – Feb 2013 ***Teaching Assistant*** **-** Notre Dame University - Louaize, Lebanon

- **Program Design and Data Abstraction I**
- **Program Design and Data Abstraction II**

Talks

Oct 2024 "Evaluating the Reasoning Abilities of Language Models", *CWI Amsterdam, Amsterdam, Netherlands*

July 2024 "Evaluating and Improving the Reasoning Abilities of Language Models", *Télécom Paris, DIG Team, Paris, France*

June 2024 "MAFALDA: A Benchmark and Comprehensive Study of Fallacy Detection and Classification", *NAACL, Mexico City, Mexico*

May 2024 "MAFALDA: A Benchmark and Comprehensive Study of Fallacy Detection and Classification", *University of Groningen, Groningen, Netherlands*

Nov 2023 "Neuro-Symbolic Methods for Textual Logical Reasoning", *DGA - Ministère des Armées, Rennes, France*

Feb 2021 "A Semi-Supervised BERT Approach for Arabic Named Entity Recognition", *Télécom Paris, DIG Team, Paris, France*

Dec 2020 "A Semi-Supervised BERT Approach for Arabic Named Entity Recognition", *Arabic Natural Language Processing Workshop, Barcelona, Spain*

July 2017 "CCS Coding of Discharge Diagnoses via Deep Neural Networks", *International Conference on Digital Health, London, United Kingdom*

Open Source Projects

PRESENT – DEC 2021 ***LogiTorch* -** Creator and Maintainer

LogiTorch [3] is a PyTorch-based library that includes different logical reasoning benchmarks, different models, as well as utility functions such as co-reference resolution. The library allows researchers and developers to easily use a logical reasoning dataset and train logical reasoning models with just a few lines of code.

Skills

Python, Java, C++, PyTorch, Pandas, Numpy, Keras, LaTeX

Reviewer

AI Review, NAACL 2024, ACL 2023, EMNLP 2022, EACL 2022 (External Reviewer)

Awards

2024 Recipient of the INRIA Postdoctoral Fellowship, awarded through INRIA's competitive postdoc campaign.
2018 Recipient of the Best Computer Science Graduate Student Award from the American University of Beirut.
2015 Awarded a full graduate assistantship from the American University of Beirut.
2014 Graduated from Notre Dame University - Louaize with high distinction.
2013 Awarded a scholarship from Notre Dame University - Louaize.
2013 Dean's List for the Spring semester.
2012 Dean's List for the Spring and the Fall semesters.

Summer Schools Attended

2023 Oxford Machine Learning Summer School (OxML), Oxford, United Kingdom.
2021 Machine Learning Summer School (MLSS), Taipei, Taiwan.
2021 4th Advanced Course on Data Science and Machine Learning (ACDL), Tuscany, Italy.

Publications

[1] Chadi Helwe, Tom Calamai, Pierre-Henri Paris, Chloé Clavel, and Fabian Suchanek. "MAFALDA: A Benchmark and Comprehensive Study of Fallacy Detection and Classification". In: *Annual Conference of the North American Chapter of the Association for Computational Linguistics (NAACL)*. 2024.

[2] Chadi Helwe, Simon Coumes, Chloé Clavel, and Fabian Suchanek. "TINA: Textual Inference with Negation Augmentation". In: *Findings of the Association for Computational Linguistics: EMNLP 2022*. 2022.

[3] Chadi Helwe, Chloé Clavel, and Fabian Suchanek. "LogiTorch: A PyTorch-based library for logical reasoning on natural language". In: *Proceedings of the 2022 Conference on Empirical Methods in Natural Language Processing (EMNLP): System Demonstrations*. 2022.

[4] Chadi Helwe, Chloé Clavel, and Fabian M Suchanek. "Reasoning with Transformer-based Models: Deep Learning, but Shallow Reasoning". In: *3rd Conference on Automated Knowledge Base Construction*. 2021.

[5] Chadi Helwe, Shady Elbassuoni, Ayman Al Zaatari, and Wassim El-Hajj. "Assessing Arabic Weblog Credibility via Deep Co-learning". In: *Proceedings of the Fourth Arabic Natural Language Processing Workshop*. Association for Computational Linguistics, 2019.

[6] Shady Awwad, Lily Chacra, Chadi Helwe, Ahmad Dhaini, Farhad Hafezi, Emilio Torres, and Madeleine Yehia. "Accelerated Corneal Cross-linking Using 20 Minutes Riboflavin With Hydroxypropyl Methylcellulose Soaking Time Versus Conventional Cross-linking". In: *International CXL Experts Meeting 2019*. 2019.

[7] Shady Awwad, Lily Chacra, Chadi Helwe, Ahmad Dhaini, Farhad Hafezi, Emilio Torres, and Talar Telvizian. "Corneal Haze After Cross-linking for Keratoconus Eyes With and Without Mitomycin C Application". In: *International CXL Experts Meeting 2019*. 2019.

[8] Chadi Helwe, Shady Elbassuoni, Ahmad Dhaini, Lily Chacra, and Shady Awwad. "A Deep Learning Approach to Detect the Demarcation Line in OCT Images". In: *Annual Conference on Medical Image Understanding and Analysis*. Springer. 2020.

[9] Shady T Awwad, Lily M Chacra, Chadi Helwe, Ahmad R Dhaini, Talar Telvizian, Julien Torbey, Maamoun Abdul Fattah, Emilio A Torres-Netto, Farhad Hafezi, and Rohit Shetty. "Mitomycin C application after corneal cross-linking for keratoconus increases stromal haze". In: *Journal of Refractive Surgery* (2021).

[10] Lily M Chacra, Chadi Helwe, Jad F Assaf, Madeleine Yehia, Serge Baroud, Emilio A Torres-Netto, Farhad Hafezi, and Shady T Awwad. "Accelerated corneal crosslinking with 20-soaking hydroxypropyl methyl cellulose/riboflavin vs conventional crosslinking with 30-soaking dextran/riboflavin". In: *Journal of Cataract & Refractive Surgery* 50.3 (2024), pp. 236–243.

[11] Chadi Helwe and Shady Elbassuoni. "Arabic named entity recognition via deep co-learning". In: *Artificial Intelligence Review* (2019).

[12] Chadi Helwe, Ghassan Dib, Mohsen Shamas, and Shady Elbassuoni. "A Semi-Supervised BERT Approach for Arabic Named Entity Recognition". In: *Proceedings of the Fifth Arabic Natural Language Processing Workshop*. Association for Computational Linguistics, 2020.

[13] Chadi Helwe, Shady Elbassuoni, Mirabelle Geha, Eveline Hitti, and Carla Makhlouf Obermeyer. "CCS coding of discharge diagnoses via deep neural networks". In: *Proceedings of the 2017 International Conference on Digital Health*. 2017.

[14] Mohammed Elrazzaz, Shady Elbassuoni, Khaled Shaban, and Chadi Helwe. "Methodical evaluation of arabic word embeddings". In: *Proceedings of the 55th Annual Meeting of the Association for Computational Linguistics (Volume 2: Short Papers)*. 2017.

[15] Bilal Abi Farraj, Wael Al Rahal Al Orabi, Chadi Helwe, Mohamad Jaber, Mohamad Omar Kayali, and Mohamed Nassar. "Reconfigurable and Adaptive Spark Applications". In: *Proceedings of the 7th International Conference on Cloud Computing and Services Science*. 2017.