Amir Hussein

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Research Interests

Conversational long-form speech translation, multilingual and code-switching, self-supervised learning, neural audio codecs, multimodal representation learning.

Education

2021–present **PhD, Electrical & Computer Engineering**, *Johns Hopkins University*.
Courses: Natural Language Processing, Audio Signal Processing, Machine Translation, Information Extraction from Speech and Text, Speech and Audio Processing by Humans and Machines

2018–2020 **Master of Engineering, Electrical & Computer Engineering**, *American University of Beirut*.
Thesis: Domain Adaptation with Representation learning for Time Series.
Courses: System Identification, Numerical Optimization , Advanced Data Mining Applications, Biomedical Signals and Image Processing

2012–2017 **Bachelor of Engineering, Electrical & Computer Engineering**, *University of Khartoum*.
Thesis:: Autopilot Design for a Quadcopter.
Core courses: Digital Signal Processing, Microcomputer System Design, Linear Control, Digital Image Processing, Artificial Intelligence

Publications

2025 **Hussein A**, Khurana S, Germain F, Le Roux J. Disentangling Acoustic and Semantic Representations in Pretrained Speech Models. Preparing for Interspeech.

2024 **Hussein A**, Yan B, Anastasopoulos A, Watanabe S, Khudanpur S. Enhancing End-to-End Conversational Speech Translation Through Target Language Context Utilization. ICASSP.

2024 **Hussein A**, Raj D, Wiesner M, Povey D, Garcia P, Khudanpur S. Enhancing Neural Transducer for Multilingual ASR with Synchronized Language Diarization. Interspeech.

2024 **Hussein A**, Zeinali D, Klejch O, Wiesner M, Yan B, Chowdhury S, Ali A, Watanabe S, Khudanpur S. Speech collage: code-switched audio generation by collaging monolingual corpora. ICASSP.

2023 **Hussein A**, Xiao C, Verma N, Thebaud T, Wiesner M, Khudanpur S. JHU IWSLT 2023 Dialect Speech Translation System Description. Proceedings of the 20th International Conference on Spoken Language Translation (IWSLT), 2023

2022 Yang J, **Hussein A**, Wiesner M, Khudanpur S. JHU IWSLT 2022 Dialect Speech Translation System Description. In Proceedings of the 19th International Conference on Spoken Language Translation (IWSLT 2022) 2022 May (pp. 319-326).

2022 **Hussein A**, Chowdhury SA, Abdelali A, Dehak N, Ali A, Khudanpur S. Textual data augmentation for Arabic-English code-switching speech recognition. In2022 IEEE Spoken Language Technology Workshop (SLT) 2023 Jan 9 (pp. 777-784). IEEE.

2022 **Hussein A**, Watanabe S, Ali A. Arabic speech recognition by end-to-end, modular systems and human. Computer Speech & Language. 2022 Jan 1;71:101272.

2021 Chowdhury SA, **Hussein A**, Abdelali A, Ali A. Towards one model to rule all: Multilingual strategy for dialectal code-switching Arabic Asr. In Interspeech, 2021.

2021 Ali A, Chowdhury SA, **Hussein A**, Hifny Y. Arabic Code-Switching Speech Recognition Using Monolingual Data. In Proc. Interspeech 2021, pages 3475–3479, 2021.

Research Experience

Research Assistant at Johns Hopkins

Aug, 2021 – present ***Conversational ST/Code-switched ASR***.

- Developed bridged back-translation to reduce covariate shift from Standard Arabic to Tunisian dialect.
- Utilized pretrained ASR and MT models in speech translation by finetuning them in E2E fashion. Employed a system combination approach utilizing Minimum Bayes-Risk decoding.
- Introduced a context-aware E2E-ST framework that leverages context in the target language improving translation relevance and coherence.
- Developed novel data augmentation approaches for code-switching speech recognition using monolingual resources, addressing the challenge of data scarcity.

Advisor : **Sanjeev Khudanpur**, (*Personal Web-page*)

Mitsubishi Electric Research Laboratories (Internship)

May,2024 – Sep,2024 ***Disentangling Acoustic and Semantic Representations in Neural Audio Codecs***.

- Developed a novel framework combining self-supervised learning (SSL) with reconstruction objectives to learn disentangled and discretized acoustic and semantic representations in neural audio codecs.).

Mentor : **Sameer Khurana**, (*Personal Web-page*)

Qatar Computing Research Institute

June,2020 – Aug,2021 ***ASR modeling for multidialectal Arabic and Arabic-English Code-switching***.

- Pioneered the development of the first E2E transformer-based ASR for Arabic language with a novel VAD pipeline to handle long-form speech setting a new benchmark in performance.
- Worked on developing techniques for Arabic-English code-switching ASR utilizing monolingual data (multigraph WFST with Kleene closure, multilingual-multidialectal code-switching).

Mentor : **Ahmed Ali**, (*Personal Web-page*)

Research Assistant at American University of Beirut

Feb,2018 – May,2020 ***Transfer learning approaches for the Internet of Things (IoT) and sensing analytics***.

- Developed machine learning models for emotion recognition from physiological signals (ECG, EEG, GSR).
- Developed a novel domain adaptation approach utilizing semi-supervised learning to adapt to unlabeled data with a different distribution
- Proposed a novel EEG data augmentation with adversarial training for Seizure prediction.

Advisor : **Hazem Hajj**, (*Personal Web-page*)

Zaka.ai

July,2020 – Dec,2020 ***AI Education Instructor***.

Developed online education material for Artificial Intelligence

Mentor : **Christophe Zoghbi**, (*Personal Web-page*)

Fellowships & Awards

2024-2025 ***JHU+Amazon AI2AI fellowship,*** PhD fellowship that supports innovative research in Artificial Intelligence

2018-2020 ***AI Ghurair Graduate STEM Scholarship Award,*** full scholarship as outstanding student in Arab region covering Masters degree

Jan, 2019 ***Big Data AI Hackathon,*** first place in multi-class song genre classification sponsored by Anghami

Oct, 2019 ***Qatar International Fake News Detection,*** first place in fake news detection from low resource text sponsored by Qatar Airways. *link*

June, 2021 ***Indic code-switching challenge,*** third place in code-switched ASR. *link*

Languages

Bilingual	Arabic/Ukrainian
Proficient	English

Skills

Programming:	Python, PyTorch, Tensorflow, Shell scripting, Matlab
Toolkits:	Espnet, Kaldi, Git, Next-gen Kaldi (K2 Lhotse, Icefall), Fairseq