

Le Duc Khai

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Research Interest

My current research spans all aspects of semi-supervised learning (speech/text/vision/time-series), in which I have been bringing research to real-world business scenarios. To provide cheap medical care for the poor, I am interested in developing machine learning algorithms that serve medical purposes, e.g. in medical imaging, bio-signals, tele-medicine, natural language processing, and so on.

Education

University of Toronto

Master of Applied Science in Biomedical Engineering

Toronto, Canada

January 2024 – Present

- The university was ranked 1st in Canada, 12th in the world in Computer Science, and 15th in Medicine (QS Rankings)
- Research area: Machine Learning for Multivariate Time-series
- Supervisor: **Prof. Shehroz Khan** (h-index 26)

RWTH Aachen University

Bachelor Thesis in Computer Science

Aachen, Germany

December 2022

- The university was ranked 2nd in Germany and 50th in the world in Computer Science (THE Rankings)
- Thesis supervisor: **Prof. Hermann Ney** (h-index 113), **Prof. Ralf Schlüter** (h-index 50)
- Thesis title: Unsupervised Pre-Training for Vietnamese Automatic Speech Recognition in the HYKIST Project [DOI]
- Thesis grade: 1.0/6.0 (German grade), 100/100 (International percentage)

FH Aachen University of Applied Sciences

Bachelor in Biomedical Engineering, taught-in-German program

Jülich, Germany

December 2022

- The university was ranked 1st among Universities of Applied Sciences in Germany in Engineering and Informatics (WiWo Ranking)
- Thesis supervisor: **Prof. Ilya Digel** (h-index 23)
- Overall grade: 2.2/6.0 (German grade), 80/100 (International percentage)

Vietnam National University Ho Chi Minh City

Bachelor in International Economic Relations

Ho Chi Minh City, Vietnam

October 2016

- The university was ranked 1st overall in Vietnam and 701-750th in the world (QS Rankings)
- Top 100 out of 354897 candidates (0.02%) with total scores of 27/30 in the Vietnamese National High School Graduation Examination 2015 in Mathematics, Physics and English
- Grade: 1st ranked - Valedictorian

Research Experience

University Health Network

Graduate Research Assistant

Toronto, Canada

January 2024 – Present

- University Health Network is ranked as the world's 5th best hospital (Newsweek 2023) and ranked 1st in rehabilitation.
- Research project: Predicting Agitation in People Living with Dementia

Machine Learning and Human Language Technology Group, RWTH Aachen University

Student Research Assistant

Aachen, Germany

May 2021 – Present

- Research supervisor: **Prof. Hermann Ney** (h-index 113, 63000+ citations, the most cited researcher and the highest h-index in the world in Speech Recognition and in Machine Translation)
- Research co-supervisor: **Prof. Ralf Schlüter** (h-index 50, 12000+ citations)
- Research topics: Semi-Supervised Learning for Medical Speech Recognition

FH Aachen University of Applied Sciences

Research Intern

Geilenkirchen, Germany

January 2016 – March 2016

- Research labs: Freshman Laboratory of Electrical Engineering, Laboratory of Molecular Medicine and Cell, Biophysics Lab, Chemistry Laboratory, and Freshman Biomedical Labor
- Received certificates for contribution

Publications

(*) Equal contribution

5. Real-time Speech Summarization for Medical Conversations

Khai Le-Duc*, Khai-Nguyen Nguyen*, Long Vo-Dang, Truong-Son Hy
Anonymity period, submitted to Interspeech 2024

4. VietMed-NER: Medical Named Entity Recognition from Speech

Khai Le-Duc, David Thulke, Hung-Phong Tran, Long Vo-Dang, Ralf Schlüter
Public preprint comes soon, submitted to ACL 2024

3. Dynamic Intermediate Loss for Fine-tuning Self-Supervised Models

Khai Le-Duc*, Christoph Lüscher*, Ralf Schlüter
Anonymity period, submitted to Interspeech 2024

2. VietMed: A Dataset and Benchmark for Automatic Speech Recognition of Vietnamese in the Medical Domain

Khai Le-Duc*, Christoph Lüscher*, Minh-Nghia Phan, Ralf Schlüter
Accepted at LREC-COLING 2024

1. Development of Hybrid ASR Systems for Low Resource Medical Domain Conversational Telephone Speech

Christoph Lüscher, Mohammad Zeineldeen, Zijian Yang, Peter Vieting, **Khai Le-Duc**, Weiyue Wang, Ralf Schlüter, Hermann Ney
ITG Speech Communication 2023

Awards & Honors

ORT Conference Participation Award <i>University Health Network</i>	2024 500 CAD
Top 12 HackerRank in Germany <i>HackerRank - the largest competitive programming platform in the world</i>	2020
Valedictorian Scholarship of Vietnam National University Ho Chi Minh City <i>Vietnam National University Ho Chi Minh City</i>	2015

Selected Open-Source Projects

Demo for Multilingual Speech Translation

- The first free-of-charge medical speech translation API in the world, being deployed on cloud in German medical centers to support conversations between German doctors and international patients without language barriers
- Co-contributor of the demo

Awesome Competitive Programming Problems

- Curated extensive library of Python data structures and algorithms specifically designed for competitive programming contests
- Solved various problems including String Manipulation, Graph Theory, Greedy, Dynamic Programming, Sliding Window, Mathematics and Recursion
- On GitHub top 1 trending, received 170+ stars

Other Experience

Mathnasium <i>Instructor - Part time</i>	October 2023 – November 2023 <i>Toronto, Canada</i>
<ul style="list-style-type: none">• Communicated with students in an understandable way about daily lessons• Developed automated teaching tools and methods to help students learn mathematics	
Techniker Krankenkasse <i>Volunteer - Full time</i>	March 2016 – June 2016 <i>Geilenkirchen, Germany</i>
<ul style="list-style-type: none">• The company is Germany's largest health insurance fund• Maintained business contacts with 1000+ student customers, organized and executed 3 events to advertise company's insurance packages, and created marketing concepts• Received certificate for contribution	

Technical Skills

Programming skills:

- Programming Languages: Python, MATLAB, Java (basic)
- Databases (basic): Snowflake, SQL, MongoDB
- Deep Learning Frameworks: Keras, Tensorflow, Pytorch, Fairseq, HuggingFace
- Data Science Libraries: NumPy, SciKit-Learn, Pandas, SciPy, Seaborn, Matplotlib
- Data Analysis and Statistical Tools (basic): SPSS, Excel
- Image Processing Libraries: OpenCV, scikit-image
- Operating Systems: Linux, Git
- Document Preparation: LaTeX, Markdown

Relevant coursework: Medical Statistics, Information Processing, Image Processing, Medical Computer Science, Introducing MATLAB, Introducing to Python.

Spoken languages: Vietnamese (Native), English (IELTS 7.0), German (C1)