

Le Duc Khai

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Research Statement

I'm an AI researcher with a business mindset. My research is not limited to a single topic but rather spans most aspects of AI, e.g. speech recognition, natural language processing, computer vision, time-series analysis, large language models, multi-modality, data-centric AI, and semi-supervised learning. Most of my works focused on bringing theoretical AI to real-world applications that serve business needs. **Hire me and get 21 AI researchers.**

Education

University of Toronto

Master of Applied Science in Biomedical Engineering, fully-funded program

Toronto, Canada

January 2024 – Present

- The university was ranked 1st in Canada, 9th in the world in AI (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

Industry Experience

FPT Software AI Center, FPT Corporation

AI Researcher

Remote

March 2024 – Present

- Leader of 20 AI residents, engineers and PhD students
- Research project: Research and Product Development of Multimodal Multilingual Large Language Models

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 topic: Semi-Supervised Learning for Medical Domain 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

Awards & Honors

SGS Research Travel Grant <i>University of Toronto (950 CAD for LREC-COLING 2024 - the highest amount ever)</i>	2024
ORT Conference Participation Award <i>University Health Network (500 CAD for LREC-COLING 2024)</i>	2024
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

Non-Technical 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)

Collaboration

List of co-authors I actively engage with

- Mentee:

1. **Khai-Nguyen Nguyen** (11.2023 – Present): PhD student at College of William & Mary, research intern at FPT Corporation
2. **Long Vo** (11.2023 – Present): Bachelor student at University of Cincinnati
3. **Ryan Zhang** (02.2024 – 06.2024): Undergraduate thesis student at University of Toronto, now at Johns Hopkins University

- Peer Collaborators:

1. **Trang Nguyen**: PhD student at Stanford University
2. **Jerry Ngo**: Researcher at MIT CSAIL
3. **Ngo Ba Hung**: Postdoc Fellow at Chonnam National University

- Senior Collaborators:

1. **Truong Son Hy**: Professor at Indiana State University, AI Scientist at FPT Corporation
2. **Anh Totti Nguyen**: Professor at Auburn University, h-index 21, 11000+ citations

Publications

All publications are peer-reviewed/submitted at top-tier venues in AI

(*) Equal contribution

Work to be submitted: Preprints are available in Overleaf

12. **Predicting Agitation with Motion Sensors placed in the Homes of People living with Dementia**
Khai Le-Duc, Ali Abedi, Charlene Chu, Shehroz S. Khan
To be submitted to Gerontology Journal, Special Issue: AI-Driven Measurement in Gerontological Research
11. **MultiMed: Multilingual Medical Speech Recognition via Attention Encoder Decoder**
Khai Le-Duc, Phuc Phan, Tan-Hanh Pham Truong-Son Hy
To be submitted to EMNLP Industry track 2024
10. **wav2graph: A Framework for Supervised Learning Knowledge Graph from Speech**
Khai Le-Duc*, Quy Anh Dang*, Oanh Tran, Tan-Hanh Pham Truong-Son Hy
To be submitted to EMNLP Industry track 2024
9. **Speech Sentiment Reasoning for Healthcare**
Khai Le-Duc*, Khai-Nguyen Nguyen*, Bach Phan Tat, Duy Le, Jerry Ngo, Long Vo-Dang, Anh Totti Nguyen, Truong-Son Hy
To be submitted to EMNLP Industry track 2024
8. **Large Vision-Language Model for Joint Chest X-ray Localization and Classification Task**
Khai Le-Duc*, Ryan Zhang*, Ngoc Son Nguyen*, Tan-Hanh Pham, Anh Dao, Ba Hung Ngo, Anh Totti Nguyen, Truong-Son Hy
To be submitted to EMNLP Industry track 2024

Under anonymized period: Preprints are privately available in **GitHub repo**

7. **A Wearable Device Dataset for Mental Health Assessment Using Laser Doppler Flowmetry and Fluorescence Spectroscopy Sensors**
Khai Le-Duc*, Tan-Hanh Pham*, Minh Ngoc Nguyen*, Trang Nguyen, Quang Minh Luu, Ba Kien Tran, Truong-Son Hy, Viktor Dremin, Sergei Sokolovsky, Edik Rafailov
Triple-blind period, submitted to ICDM 2024, 63 pages
6. **Domain-Shift in Medical Machine Translation**
Khai Le-Duc, Hung-Phong Tran, Long Vo-Dang, Khai-Nguyen Nguyen, Truong-Son Hy, Shehroz Khan
Triple-blind period, submitted to ICDM 2024
5. **Dynamic Intermediate Loss for Fine-tuning Self-Supervised Models**
Khai Le-Duc, Christoph Lüscher, Ralf Schlüter
Triple-blind period, submitted to ICDM 2024

Preprint

4. **Medical Spoken Named Entity Recognition**

Khai Le-Duc, David Thulke, Hung-Phong Tran, Long Vo-Dang, Ralf Schlüter
Overall 3-3-3-3/5 at ACL 2024 (A*-ranked conference), 40 pages

Peer-reviewed

3. **Real-time Speech Summarization for Medical Conversations**

Khai Le-Duc*, Khai-Nguyen Nguyen*, Long Vo-Dang, Truong-Son Hy
Interspeech 2024 (A-ranked Conference by CORE, #1 Conference in Speech Processing)

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

Khai Le-Duc
LREC-COLING 2024 (A-ranked Joint Conference by CORE, acceptance rate 52%), 27 pages

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 (#5 ASR Conference by Research.com)