

Le Duc Khai

Last updated: July 15, 2024

Toronto, Canada
Permanent Resident in Canada

GitHub | LinkedIn | Google Scholar
duckhai.le@mail.utoronto.ca | (+1) 437 249 2462

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

FPT Software AI Center, FPT Corporation

AI Researcher

Experience

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

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

| <i>Awards</i> |  | <i>Honors</i> |
|--|---|---------------|
| 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 |

| <i>Selected</i> | <i>Open-Source</i> | <i>Projects</i> |
|---|--------------------|-----------------|
| Demo for Multilingual Speech Translation | | |
| <ul style="list-style-type: none"> 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 | | |
| <ul style="list-style-type: none"> 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 | | |

| <i>Non-Technical</i> | <i>Experience</i> |
|---|---|
| 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 | |

| <i>Technical</i> | <i>Skills</i> |
|--|---------------|
| <u>Programming skills:</u> | |
| <ul style="list-style-type: none"> 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 | |
| <u>Relevant coursework:</u> Medical Statistics, Information Processing, Image Processing, Medical Computer Science, Introducing MATLAB, Introducing to Python. | |
| <u>Spoken languages:</u> Vietnamese (Native), English (IELTS 7.0), German (C1) | |

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)