Le Duc Khai

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Research Interest

My current research focuses mainly on semi-supervised learning for medical speech processing, in which I try to increase accuracy performance, reduce model size, use data efficiently and minimize real-world/simulation mismatch. Just imagine a day when a simple brain, like that of a hamster, could learn in just 10 minutes but become smarter than a medical doctor.

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, telemedicine, natural language processing, and so on.

Education

RWTH Aachen University Aachen, Germany
Bachelor thesis in Computer Science *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 (Final year grade): 1.0/6.0 (German grade), 100/100 (International percentage)

FH Aachen University of Applied Sciences Jülich, Germany
Bachelor in Biomedical Engineering, taught-in-German program *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 Ho Chi Minh City, Vietnam
Bachelor in International Economic Relations *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 in Mathematics, Physics and English
- Grade: Rank 1 of the university - Valedictorian

Research Experience

Machine Learning and Human Language Technology Group, RWTH Aachen University Aachen, Germany
Student Research Assistant *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 Geilenkirchen, Germany
Research Intern *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

Selected Publications

(*) Equal contribution
Full list of publications on **Google Scholar**

1. **VietMed-NER: Medical Named Entity Recognition from Speech**
   <u>Khai Le-Duc</u>*, David Thulke*, Hung-Phong Tran, Long Vo-Dang, Ralf Schlüter
   Anonymity period, submitted to NAACL 2024

2. **Dynamic Intermediate Loss for Fine-tuning Self-Supervised Models**
   <u>Khai Le-Duc</u>*, Christoph Lüscher*, Ralf Schlüter
   Submitted to ICASSP 2024

3. **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, Hermann Ney
   Anonymity period, submitted to LREC-COLING 2024

4. **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

Top 12 HackerRank in Germany   2020
HackerRank - the largest competitive programming platform in the world

Valedictorian Scholarship of Vietnam National University Ho Chi Minh City   2015
Vietnam National University Ho Chi Minh City

Selected Open-Source Projects

Demo for Multilingual Speech Translation

- The first free-of-charge medical speech translation API in the world, being deployed 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

Segment White Blood Cell Nuclei

- Implemented an algorithm in MATLAB to leverage digital signal processing for white blood cell nuclei segmentation
- Enabled doctors to save time in diagnostic process by outperforming ML-based techniques, ensuring fast deployment in business production
- Received 10 stars on GitHub

Other Experience

Mathnasium   October 2023 – Present
Instructor - Part time   *Toronto, Canada*

- Communicated with students in an understandable way about daily lessons
- Developed automated teaching tools and methods to help students learn mathematics
- Massively created and graded learning projects and tests for students

Techniker Krankenkasse   March 2016 – June 2016
Volunteer - Full time   *Geilenkirchen, Germany*

- 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

Skills

Technical 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 courseworks: Medical Statistics, Information Processing, Image Processing, Medical Computer Science, Introducing MATLAB, Introducing to Python.

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