

# Viet Anh Khoa Tran

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My research focuses on conceiving novel learning algorithms and architectures beyond end-to-end back-propagation and feedforward networks, that draw inspiration from - as well as contribute to - computational, cognitive and systems neuroscience.

## RESEARCH

### **Neuromorphic Software Ecosystems (PGI-15), Forschungszentrum Jülich**

2023 – present

*Doctoral Researcher*

- Building novel hypotheses on biological learning objectives, leading to energy- and data-efficient local machine learning algorithms.
- Conceived a cortically-inspired continual representation learning algorithm (TMCL) that continually integrates high-level information from sparse labels into a generalist representation space, while providing a novel hypothesis on how biological brains augment canonical predictive learning rules via top-down modulations.

### **Computation in Neural Circuits (INM-6), Forschungszentrum Jülich**

2022 – 2023

*Student research assistant*

- Demonstrated the efficacy of dendritic modulations in the context of task-incremental continual and layer-local learning by developing a modulation-aware learning rule, contributing to research published in PNAS.

### **Chair for Human Language Technology (i6), RWTH Aachen**

2018 – 2022

*Student research assistant*

- Demonstrated that joint training does not necessarily improve cascaded speech translation systems beyond domain adaptation effects.
- Analyzed absolute and relative positional encodings in the Transformer architecture, being one of the first works to demonstrate relative encodings generalize better to sequence lengths beyond those seen during training.
- Systematically analyzed and implemented sampling methods for approximating training losses of language models with large vocabularies, deriving correction terms under which these sampling methods perform equivalently.

## ACADEMICS

### **PhD Computer Science, Forschungszentrum Jülich (RWTH Aachen)**

2023 – present

- Subject: *Biologically Grounded Closed-Loop Visual Reasoning* (Supervisor: *Willem A. M. Wybo*)

### **MSc Data Science, RWTH Aachen**

2019 – 2023

- supported by a *Deutschlandstipendium*
- Thesis: *Towards Biologically Plausible Contextual Adaptation through Task-Modulated Contrastive Learning*
- Final grade: *1.0 (with distinction)*

### **Exchange Semester, University of Waterloo**

Fall 2019

- supported by a *PROMOS Study Abroad Scholarship*

### **BSc Computer Science, RWTH Aachen**

2016 – 2019

- Thesis: *Extensions to the Transformer Architecture for Neural Machine Translation*
- Final grade: *1.2 (with distinction)*

## PUBLICATIONS AND PREPRINTS

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- **V. A. K. Tran**, E. Neftci, W. A. M. Wybo (2025). *Contrastive Consolidation of Top-Down Modulations Achieves Sparsely Supervised Continual Learning*. NeurIPS 2025 [webpage, pdf]
- W. A. M. Wybo, M. Tsai, **V. A. K. Tran**, B. Illing, J. Jordan, W. Senn, A. Morrison (2023). *NMDA-driven dendritic modulation enables multitask representation learning in hierarchical sensory processing pathways*. Proceedings of the National Academy of Sciences, Volume 120, Issue 32 [pdf]
- **V. A. K. Tran**, D. Thulke, Y. Gao, C. Herold, H. Ney (2022). *Does Joint Training Really Help Cascaded Speech Translation?* EMNLP 2022 [pdf]
- Y. Gao, D. Thulke, A. Gerstenberger, **V. A. K. Tran**, R. Schlüter, H. Ney (2021). *On Sampling-Based Training Criteria for Neural Language Modeling*. Interspeech 2021 [pdf]
- J. Rosendahl, **V. A. K. Tran**, W. Wang, H. Ney (2019). *Analysis of Positional Encodings for Neural Machine Translation*. IWSLT 2019 [pdf]

## TEACHING EXPERIENCE

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- Teaching assistant for the course “Brain-inspired Computing and Engineering”** 2025  
*Forschungszentrum Jülich / RWTH Aachen*
- Conceived exercises from scratch, taught a weekly tutorial class, assisted in oral examinations.
- Student teaching assistant for the course “Data Structures and Algorithms”** 2018  
*RWTH Aachen*
- Assisted in exam and midterm corrections, tutored a weekly exercise class, corrected and graded weekly submissions.
- Student teaching assistant for the course “Programming”** 2017 - 2018  
*RWTH Aachen*
- Assisted in exam and midterm corrections, tutored a weekly exercise class, corrected and graded weekly submissions.

## SKILLS

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- Natural Languages** German (native), English (fluent, C2), French (advanced, B1), Vietnamese (Basic spoken knowledge)
- Programming Languages** Python, Java, Rust, C++, JavaScript, PHP
- Theory** Machine Learning, Natural Language Processing, Computer Vision, Systems Neuroscience, Theory of Computation, High-Dimensional Probability Theory
- Frameworks and Tools** PyTorch, NVIDIA DALI, JAX, NumPy, Pandas, scikit-learn, matplotlib, LaTeX, HTML, CSS, SQL, SLURM, Vim, Git
- SysAdmin** Docker, Linux (Networking, System Administration), Bash, MySQL (MariaDB), Nginx, Apache

## EXTRA-CURRICULAR

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- Student dormitory Am Weissenberg, Aachen** 2016 - 2023  
*Core member of the dormitory's network team*
- Responsible for the security as well as the reliability of the dormitory's network.
  - Implemented measures in order to streamline the dormitory's identity management and access point management.