Imran Ibrahimli

Hamburg, Germany · Google Scholar · iibrahimli.github.io

Research interests: compositional and length generalization in neural networks; learning algorithms with neural networks; depth-recurrent (looped) transformers; adaptive computation; mechanistic interpretability.

Education

M.Sc. Intelligent Adaptive Systems Oct 2021 – Feb 2025
University of Hamburg
- Final grade **1.43** (sehr gut); thesis grade **1.0**
- Selective programme: admission rate ∼**5%**
- Fully funded by a **DAAD scholarship** (German Academic Exchange Service)
- Thesis: *Length Generalization on Multi-Digit Integer Addition with Transformers*; supervisors: Prof. Dr. Stefan Wermter, Dr. Jae Hee Lee

B.Sc. Computer Science Sep 2016 – Aug 2020
University of Strasbourg
- Final grade **16.3/20** (mention très bien); thesis grade **19.78/20**
- Fully funded by **Azerbaijani Government Scholarship** (state-funded place by competitive entrance exam)
- Thesis: *Greenhouse Segmentation on Multispectral Satellite Imagery using Convolutional Neural Networks*, with the Space Agency of the Republic of Azerbaijan

Scholarships and Awards

DAAD Study Scholarship for Master's Studies 2021 – 2024
Full funding of the M.Sc. by the German Academic Exchange Service, awarded by an independent academic selection committee. **About 25 awards per year in Azerbaijan**, one of the programme's top-three applicant countries (5,000+ applications worldwide in the 2021 round).

Azerbaijani Government Scholarship 2016 – 2020
Full funding of the B.Sc. **One of about 30 state-funded places in Computer Science**, awarded by an entrance exam open only to applicants scoring at least 500/700 on the national university admission exam.

Human-Aligned AI Summer School, Prague 2024
Selected participant; attendance funded by an organizer scholarship.

Programming Competitions 2018 – 2019
ICPC Northern Eurasia Regional Contest (Semi-final) · Google Hash Code, **1st** among teams in Azerbaijan · CTF Azerbaijan, **1st place**.

Publications

Adaptive Recurrence as Algorithmic Time for Length Generalization in Addition
I. Ibrahimli, S. Wermter, J. H. Lee
ICML 2026 Workshop on Compositional Learning: Safety, Interpretability, and Agents (CompLearn)

SatDM: Synthesizing Realistic Satellite Image with Semantic Layout Conditioning using Diffusion Models
O. Baghirli, H. Askarov, I. Ibrahimli, I. Bakhishov, N. Nabiyev
74th International Astronautical Congress (IAC), 2023

Greenhouse Segmentation on High-Resolution Optical Satellite Imagery using Deep Learning Techniques
O. Baghirli, I. Ibrahimli, T. Mammadzada
Preprint, 2020

Research Experience

Length Generalization with Looped Transformers 2025 – present
Knowledge Technology Group, University of Hamburg · with Dr. Jae Hee Lee and Prof. Dr. Stefan Wermter

Question How do recurrence and adaptive computation relate to length generalization in Transformers?

Result Looped Transformer with adaptive halting, trained on operands of <20 digits, **generalizes to 40-digit addition (2× training length)** *without* position coupling, index hints, or specialized digit embeddings.

Output **First-author paper** at the ICML 2026 CompLearn workshop.

M.Sc. Thesis: Length Generalization in Transformers 2024

Knowledge Technology Group, University of Hamburg, grade 1.0

Question Why do small autoregressive Transformers fail to length-generalize on integer addition?

Method Compared positional encodings, data formats, and multi-task training; analysed models with attention maps, logit entropy, and Logit Lens.

Finding Out-of-distribution failures trace to one **brittle mechanism: positional alignment of operand digits**.

M.Sc. Research Projects

University of Hamburg

- **Universal Transformer** (with Dr. Jae Hee Lee): depth-recurrent Transformer implemented from scratch in PyTorch; trained and evaluated on WMT-14 German–English translation.
- **Persistent advice in interactive RL** (with Dr. Francisco Cruz): bisimulation metrics to generalize human advice to unseen states.
- **Eye fixation prediction**: U-Net with ResNeXt-50 backbone for saliency prediction; **highest test score** in the Computer Vision II course.

Industry Experience

Data & ML Consultant Nov 2024 – present

Netlight Consulting, Hamburg

Data platforms, ML model training, LLM-powered tooling development for multiple enterprise clients.

MLOps Engineer (Working Student) Feb 2023 – Aug 2024

Merantix Momentum, Berlin

Infrastructure for geospatial annotation and for a public diffusion-model installation at the World Economic Forum.

Research Engineer Intern Jul 2022 – Sep 2022

Nuance Communications (Microsoft), Central Research, Aachen

Migrated speech recognition training workflows to AzureML.

Founding Engineer Aug 2020 – Nov 2021

WeType Inc., Baku

Trained and deployed BERT- and GPT-2-based models for grammar correction and academic essay grading.

ML Engineer, R&D Jul 2019 – Aug 2021

Space Agency of the Republic of Azerbaijan (Azercosmos), Baku

Satellite imagery segmentation with U-Net (0.85 F1), substantially outperforming the team's previous pixel-wise methods.

Skills

Research	PyTorch, TensorFlow, Hugging Face Transformers, Scikit-Learn, nltk, spaCy, GPU training
Programming	Python, C, C++
Infrastructure	Docker, Kubernetes, Terraform, Cloud: AWS, GCP, Azure
Data engineering	Databricks, Snowflake, dbt, Airflow
Languages	Azerbaijani & Russian (native), English (fluent), German (conversational), French (basic)