Yerdauit Torekhan

Almaty, Kazakhstan |
er_torekhan@kbtu.kz | yerdauit.vercel.app | Google Scholar | GitHub | LinkedIn

Research Interests

NeuroAI: how brains and AI models represent the world, and when our measurements of that can be trusted — model–brain alignment of vision and vision–language models, representational geometry, and spatial codes in learned world models.

Education

Kazakh-British Technical University (KBTU) **Sep 2025 – Jun 2027 (expected)**
M.Sc. in Data Science — GPA 3.67 / 4.00 *Almaty, Kazakhstan*

Kazakh-British Technical University (KBTU) **Sep 2021 – Jun 2025**
B.Sc. in Computer Information Systems — GPA 3.46 / 4.00 *Almaty, Kazakhstan*
Minors: Machine Learning; Data Science

Relevant coursework: Linear Algebra; Probability & Statistics; Optimization; Machine Learning; Deep Learning; Computer Vision; Data Structures & Algorithms.

Publications

Manuscripts

Torekhan, Y., & Gutoreva, A. (2026). Rogue dimensions mask a learned cortical trajectory of visual tokens in vision–language decoders. *Under review at ICLR 2027.*

Torekhan, Y., & Gutoreva, A. (2026). How blind is a topological probe? Detection bounds for toroidal grid-cell codes in learned representations. *Manuscript, 2026.*

Peer-reviewed conference papers

Torekhan, Y., Altynbekov, N., & Shamoi, P. (2025). Aesthetic index for art paintings using visual features. *IEEE 5th International Conference on Smart Information Systems and Technologies (SIST)*, Astana, Kazakhstan, 1–6. [DOI]

Kadyrgali, E., Yerkin, A., **Torekhan, Y.**, & Shamoi, P. (2024). Group movie selection using multi-channel emotion recognition. *2024 IEEE AITU: Digital Generation*, 85–91. **Best Paper Award.** [IEEE]

Journal articles and preprints

Shamoi, P., Toganas, N., Muratbekova, M., Kadyrgali, E., Yerkin, A., Igali, A., Ziyada, M., Adilova, A., Karatayev, A., & **Torekhan, Y.** (2025). COLIBRI fuzzy model: Color linguistic-based representation and interpretation. *IEEE Access*, 13, 205932–205956. [arXiv]

Igali, A., Abdrakhman, A., **Torekhan, Y.**, & Shamoi, P. (2024). Tracking emotional dynamics in chat conversations: A hybrid approach using DistilBERT and emoji sentiment analysis. *arXiv:2408.01838*. [arXiv]

Yerkin, A., Kadyrgali, E., **Torekhan, Y.**, & Shamoi, P. (2024). Multi-channel emotion analysis for consensus reaching in group movie recommendation systems. *arXiv:2404.13778*. [arXiv]

Research Experience

Vision–Language Models and Human Visual Cortex **2026 – Present**
First-author project, under review at ICLR 2027

- Traced the representational geometry of image tokens through every decoder block of 13 open vision–language models (256M–10B parameters) and compared it with seven visual-cortex regions in 8 NSD participants, replicated on 9 participants of the independent NOD dataset.
- Found that lateral-stream alignment rises over the first three quarters of the decoder under a frozen protocol and three feature-scaling controls, and is absent from depth-matched untrained decoders.
- Showed that the apparent final-layer change is a measurement effect: three channels carry a median 83% of the mean image token's energy, and standardizing features shrinks the final lateral gain from $+0.030$ to $+0.005$.

Topological Probes of Grid-Cell Codes in World Models **2026 – Present**
First-author project, manuscript in preparation for resubmission

- Measured detection bounds for persistent-homology probes by injecting an analytic grid-cell code into a DreamerV3 world model and a path-integration RNN: the torus goes undetected at 60% of total variance in the learned latent, versus 15% in isotropic noise.
- Showed that projection dimension, temporal subsampling and smoothing each flip the topological verdict, and proposed a cheap recipe for reporting a detection bound.

Time Perception in Spaceflight Environments **2025 – Present**
Research Collaborator — Mentor: Dr. A. Gutoreva, Cognitive Neuroscience

– Study how time perception is distorted under spaceflight conditions, starting from grid-cell accounts of shared space–time coding; secured research approval from the aerospace department for the study protocol.

FLIS Lab, KBTU (PI: Prof. P. Shamoi) **Feb 2024 – Present**
Research Engineer — Fuzzy Logic and Intelligent Systems Lab *Almaty, Kazakhstan*

– Designed the visual-feature extraction pipeline and evaluation protocol for a first-author study on painting aesthetics (IEEE SIST 2025).
– Co-authored 4 further papers on multimodal emotion modeling and fuzzy color representation, contributing experiment design, model implementation, and manuscript writing.
– Drafted methodology and results sections of funded grant proposals submitted by the lab; mentor undergraduate researchers on experimental design, reproducibility, and paper writing.

Teaching

Kazakh-British Technical University **Fall 2026**
Tutor — Introduction to Machine Learning (CSCI3237) *Almaty, Kazakhstan*

– Run the practical sessions for five lab groups (120 students), from linear-algebra and probability foundations through regression, classification, clustering and model evaluation.

Kazakh-British Technical University **Spring 2026**
Practice Instructor — Object-Oriented Programming (CSCI2106); Web Development (INFT2205) *Almaty, Kazakhstan*

– Taught weekly practical sessions and assessed student code and projects.

Professional Experience

Qoima Automation **Apr 2026 – Present**
Lead Computer Vision Researcher *Almaty, Kazakhstan*

– Lead the design of an industrial computer-vision platform from scratch — real-time multi-object detection, tracking, and structured video understanding — directing a small engineering team.
– Architected a prediction-error-driven event-segmentation pipeline in which salient moments trigger VLM analysis of video clips, feeding a queryable knowledge graph.

OZ Forensics **Aug 2025 – Apr 2026**
Computer Vision Researcher — Face Anti-Spoofing *Almaty, Kazakhstan*

– Shipped an end-to-end face anti-spoofing pipeline (collection, training, evaluation, deployment) into a production system processing 100M+ identity verifications per month.
– Benchmarked and fine-tuned vision backbones across attack types and demographic slices, identifying where learned representations degrade under distribution shift.

BTS Digital **Sep 2024 – Aug 2025**
Junior Computer Vision Engineer *Almaty, Kazakhstan*

– Developed face anti-spoofing models (ISO/IEC 30107-3 evaluation) and a RAG question-answering system.

Adata **Apr 2024 – Sep 2024**
Data Engineer — ETL pipelines in Talend and Python *Almaty, Kazakhstan*

Awards & Honors

Best Paper Award, 2024 IEEE AITU: Digital Generation — for *Group Movie Selection using Multi-channel Emotion Recognition*.

Technical Skills & Languages

Programming	Python, C/C++, SQL, R
ML / DL	PyTorch, TensorFlow, scikit-learn, NumPy, pandas, SciPy, HuggingFace Transformers
Analysis	RSA (rsatoolbox), encoding models, nilearn, nibabel; persistent homology; bootstrap and mixed-effects inference
Vision	OpenCV, detection and tracking, vision–language models
Infrastructure	Docker, Kubernetes, Linux, Git, gRPC
Languages	Kazakh (native), Russian (fluent), English (professional working proficiency)