

Muhammet Furkan ILASLAN

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A researcher passionate about embedded systems and cognitive science, specializing in human-centered AI for improving human learning experience. Currently submitting his PhD thesis in computer vision applications at NUS-ECE (4th, QS Uni. Rank. 2025) under the supervision of **Dr. Mike Zheng Shou** in collaboration at the Institute for Infocomm Research-A*STAR with **Dr. Qianli Xu**. His research interests include developing assistive AI models empowered by LLMs and multimodal feature modeling to improve human-in-the-loop applications in AI. With experience in embedding systems and cognitive science, he bridges embedded intelligence with human-AI interaction.

WORK & RESEARCH EXPERIENCE

PhD Candidate, Show Lab-NUS & I2R-A*STAR, (Dr. Mike Zheng Shou & Dr. Qianli Xu) | Singapore Aug 2021 - Present

- Developed **PLUFFIN**, a holistic computational framework structuring multimodal procedural plans (MPPs), human-AI collaborative modeling, and retrieval-augmented mistake detection to support real-time human-centered learning from instructional videos (IVs).
- Invented **VG-TVP** and **VG-MPP** models, which process both curated and raw IVs into structured, visually-grounded procedural plans, significantly improving scalability and generalizability in MPP (up to 86% human preference rate).
- Collected **GazeVQA** industrial-based, and gaze-enhanced Video Question Answering (VQA) dataset & Developed **AssistGaze** multimodal AI-Assistant model: Pioneering the integration of eye-gaze and multimodal features (text, image, video) to advance collaborative interaction modeling and answer prediction in procedural tasks. (~40% increase)
- Created **RAMMP**, a Retrieval-Augmented Multimodal Mistake Predictor for real-time semantic mistake detection and context-aware feedback generation, substantially advancing online human-centered procedural learning support systems. (~5% higher than SOTA)

Visiting Researcher, MaVi Research Group, (Prof. Dima Damen & Dr. Michael Wray) | Bristol, UK Jun 2024 - August 2024

- Investigating user learning patterns to design feedback strategies for enhancing personalized learning experiences.
- Developing an AI model that analyzes users' execution performance (real-time) for detecting mistakes and feedback generation.

Teaching Assistant, Electrical Machines and Drives Lab., (Prof. Sanjib K. Panda) | Singapore Jan 2022 - May 2024

- Conducted hardware experiments-simulations in electric drives and power electronics, enhancing students' practical understanding.
- Delivered lectures on "Motion control, characteristics and sizing of power semiconductor controlled electric drives" (EE4502) and "Power electronic converter circuits" (EE4503), showcasing effective communication of complex engineering topics.

Researcher, TUBITAK, (Prof. Dr. Taylan Yetkin) | Turkiye March 2020 - March 2021

- TUBITAK-1001 funded project (119F133): "Determination of Interaction Depth of 511 keV Energized Gammas in Inorganic Crystals Using Fiber and Silicon Photomultipliers".
- Designed customized PCB circuits, and optimized software solutions by using Digilent Zedboard Zynq-7000.

Research Assistant, Cognitive Sys. Lab. Istanbul Technical Uni., (Prof. Tahir Ç. Akıncı) | Turkiye Feb 2018 - Feb 2020

- FPGA-based reprogrammable board circuits design and applications, focusing on EEG, information theory, and signal processing.
- Supported by Coordinatorship of Scientific Research Projects under Grant No. MYL-2019-41852

Engineering Intern, ALTU Technology LTD. (XAD Comm.), (Dr. Yusuf Baltacı) | Bristol, UK Jul 2017 - Oct 2017

- Working as an engineer in the R&D Department to research and design PCB cards by using the EASY PC Programme
- Designing electronic circuits by using FPGA SPARTAN3E and Coding by using VHDL Programming Language in Xilinx ISE Design Suite

Engineering Intern, ALSIM ALARKO Holding & Istanbul Metropolitan Municipality, | Turkiye Jul 2016 - September 2016

- Electrification operations in Yenikapı-Taksim Subway Line - Vezneciler Station Southern Concourse Construction.
- Making revision procedures in LV and Mid-V electrical projects using AutoCAD and electrical panel repair.

EDUCATION

4.20/5.0 **PhD in Electrical and Computer Engineering**, National University Singapore (NUS) | Singapore 2021-Present

3.44/4.0 **MSc in Electrical Engineering**, Istanbul Technical University (ITU) | Istanbul, Turkiye 2018-20

3.50/4.0 **BSc in Electrical and Electronics Engineering**, Istanbul Aydın University (IAU) | Istanbul, Turkiye 2012-17

BBA in Business Administration, Anadolu University | Eskişehir, Turkiye 2013-18

Achievements: Awarded second rank, High Honour Student, IAU | Honour Student, ITU | Honour Student, NUS

Scholarships: 119F133 Project TUBITAK | Coordinatorship of Scientific Research Projects, ITU | SINGA Scholarship, A*STAR & NUS

Courses: Statistics, Computational Nanoelectronics, ML, ANN, Operational Decision Making, Experiential Entrepreneurship

SKILLS

Programming Python, Pytorch, Tensorflow, OpenCV, Matlab, C, Git, Linux, Arduino, Xilinx, VHDL, Easy PC, Altium, LaTeX

Soft Skills Leadership, Communication, Problem-Solving, Time Management, Documentation, On-site Coordination

Hobbies Table Tennis, Archery, Gastronomy, Travelling

Reviewer ICCV, NeurIPS, ACMMM, AAAI, EMNLP

PROJECTS

Retrieval-Augmented Multimodal Mistake Predictor (Under review) Mar 2025 - Present

Mistake Detection and Feedback Generation for Human-Centered Procedural Knowledge Learning

Singapore

- RAMMP detects procedural mistakes in real time and generates adaptive feedback using multimodal embeddings and LLMs.
- Integration of video-text retrieval, action-object reasoning, mistake classification, and feedback generation, demonstrating expertise in supporting human-centered knowledge learning systems.

Visually-Grounded Multimodal Procedural Planning (HCM Workshop - AAAI26 Conference) Jan 2025 - November 2025

Procedural Planning from Unstructured and Raw Video Corpora

Singapore

- Proposed a scalable pipeline to structure procedural knowledge from uncurated IVs by combining visual-textual alignment with LLMs.
- Accurate MPP generation performance using video retrieval and multimodal alignment, validating the model on YouTube corpora.

Visually-Grounded Text-Video Prompting (Main - AAAI25 Conference)

Oct 2023 - Nov 2024

Procedural Planning from Structured Instructional Videos

Singapore

- Designed multimodal T2V and V2T bridge framework to generate accurate MPPs from curated IVs using diffusion and LLM backbones.
- Support the human learning experience by better capturing procedural knowledge, up to 85% preference rate across multiple tasks.

GazeVQA & AssistGaze (Main - EMNLP23 Conference)

Sep 2022 - Dec 2023

Gaze-enhanced VQA Dataset, & AI-Assistant Model

Singapore

- Collected a new multiview, industrial, and gaze-enhanced dataset (GazeVQA), capturing real human attention during task execution.
- Build a novel multimodal AI-Assistant to assist the user in completing industrial tasks (AssistGaze).

FPGA-Based Re-Programmable Circuits (Journal of Engineering Science & Technology)

Jan 2019 - Jun 2020

Low-cost, High-Performance, and Customizable Training Kit (MSc Thesis Project)

Turkiye

- Developed high-performance, low-cost, and customizable training board kit with a novel sandwich design.

Safety of Driverless Autonomous Train Systems and Stations

Jan 2017 - June 2017

Autonomous Train System and a Safer Station Design (BSc Thesis Project)

Turkiye

- Proposing a new safe and intelligent station design and novel braking system design for the autonomous train systems.

CO-CURRICULAR ACTIVITIES

President, NUS Graduate Student Society (NUS-GSS) 39. Executive Committee, | Singapore

Aug 2024 - Aug 2025

- Formulating the society's vision and mission in collaboration with the Executive Committee (ExCo).
- Facilitating communication and liaison with key university administrators and departments.
- Organized more than 15 events, ~40% increase in the number of members. (+2600 members)
- Will be served as an Honorary Auditor at the NUS-GSS 40th ExCo.

General Secretary, NUS Graduate Student Society 38. Executive Committee, | Singapore

Aug 2023 - Aug 2024

- Overseeing key responsibilities at the heart of graduate students' social and academic life. (+1800 members)
- Acting as a pivotal role between the graduate students and university authorities by voicing feedback from diverse cohorts.

Vice President-Strategy Team, Istanbul Metropolitan Municipality Youth Assembly | Turkiye

Oct 2014 - Feb 2019

- As a Parliament Member and Vice President in the Strategy Team, leading the team for working on youth-oriented strategies.
- Successfully coordinated and organized many events, for the welfare and development of the youth community.

Volunteer - Tour Guide, Dolmabahce Palace, (Directorate of National Palaces), | Turkiye

Jul 2013 - Jun 2016

- Successfully led and guided groups of over 50 individuals for each tour at Dolmabahce Palace.
- Provided accurate and engaging information about the historical significance and architectural marvels to international visitors.

CERTIFICATIONS

2022 **Introduction to Statistics**, Stanford University

Coursera-Online

2018 **System Engineering Program**, HAVELSAN

Turkiye

2017 **Engineering Economics, Total Quality Management, and Multi-Criteria Decision Making**, Istanbul Aydin Uni.

Turkiye

ACHIEVEMENTS

2024 **Second Rank at Best-Poster Award, SINGA, A*GA - A*STAR**

Singapore

2021-2025 **SINGA Scholarship**, A*STAR & National University of Singapore

Singapore

2020-21 **Project Scholarship, 119F133 TUBITAK Project**, TUBITAK & Mimar Sinan Fine Arts University

Turkiye

2018-20 **Project Scholarship, Coordinators of Scientific Research Projects**, Istanbul Technical University

Turkiye

2017 **Erasmus Internship Scholarship**, Istanbul Aydin University – ALTU Technology

Bristol, UK

2017 **Merit-based Scholarship & Awarded second rank - High Honour Student**, Istanbul Aydin University

Turkiye

2006-08 **First Rank**, Table Tennis Tournament, Bagcilar Municipality

Turkiye

PUBLICATIONS

Ilaslan, M. F., et. al. (2025). "Retrieval-augmented mistake detection in procedural planning via multimodal action-object reasoning", under review, 2025.

Ilaslan, M. F., et. al. (2025). "VG-MPP: Visually Grounded Multimodal Procedural Planning from Unstructured Instructional Videos", Association for the Advancement of Artificial Intelligence, Human-Computer Interaction (HCM-AAAI26), Singapore. AAAI Press.

Ilaslan, M. F., et. al. (2025). "VG-TVP: Multimodal Procedural Planning via Visually Grounded Text-Video Prompting". Association for the Advancement of Artificial Intelligence (AAAI25), pp. 3886–3894. Philadelphia, PA, USA. AAAI Press.

Ilaslan, M. F., et. al. (2023). "GazeVQA: A Video Question Answering Dataset for Multiview Eye-Gaze Task-Oriented Collaborations". Empirical Methods in Natural Language Processing (EMNLP23), pp. 10462–10479. Singapore. Assoc. for Computational Linguistics.

Ilaslan, M. F., et. al. (2020). FPGA-Based Reprogrammable Main Circuit Board and Auxiliary Circuit Board Design. Journal of Engineering Science and Technology, 15(6), 3955-3970.

Ilaslan M.F. (2018). "The Multiresolution Wavelet Analysis of the Brain Signals of Epilepsy Patients". The J. of Cog. Sys., 3(2), 30-33.