

# 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 (4<sup>th</sup>, 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 Baltaci) | 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 Yenikapi-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 Aydin University (IAU) | Istanbul, Turkiye

2012-17

### BBA in Business Administration, Anadolu University| Eskisehir, 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, ACM MM, 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.

<b>Visually-Grounded Text-Video Prompting (Main - AAAI25 Conference)</b>	<i>Oct 2023 - Nov 2024</i>
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.	
<b>GazeVQA &amp; AssistGaze (Main - EMNLP23 Conference)</b>	<i>Sep 2022 - Dec 2023</i>
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).	
<b>FPGA-Based Re-Programmable Circuits (Journal of Engineering Science &amp; Technology)</b>	<i>Jan 2019 - Jun 2020</i>
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.	
<b>Safety of Driverless Autonomous Train Systems and Stations</b>	<i>Jan 2017 - June 2017</i>
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

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<b>President, NUS Graduate Student Society (NUS-GSS) 39. Executive Committee</b> ,   Singapore	<i>Aug 2024 - Aug 2025</i>
• 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 40 <sup>th</sup> ExCo.	
<b>General Secretary, NUS Graduate Student Society 38. Executive Committee</b> ,   Singapore	<i>Aug 2023 - Aug 2024</i>
• 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.	
<b>Vice President-Strategy Team, Istanbul Metropolitan Municipality Youth Assembly</b>   Turkiye	<i>Oct 2014 - Feb 2019</i>
• 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.	
<b>Volunteer - Tour Guide, Dolmabahce Palace, (Directorate of National Palaces)</b> ,   Turkiye	<i>Jul 2013 - Jun 2016</i>
• 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

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2022	<b>Introduction to Statistics</b> , Stanford University	Coursera-Online
2018	<b>System Engineering Program</b> , HAVELSAN	Turkiye
2017	<b>Engineering Economics, Total Quality Management, and Multi-Criteria Decision Making</b> , Istanbul Aydin Uni.	Turkiye

## ACHIEVEMENTS

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2024	<b>Second Rank at Best-Poster Award, SINGA</b> , A*GA - A*STAR	Singapore
2021-2025	<b>SINGA Scholarship</b> , A*STAR & National University of Singapore	Singapore
2020-21	<b>Project Scholarship, 119F133 TUBITAK Project</b> , TUBITAK & Mimar Sinan Fine Arts University	Turkiye
2018-20	<b>Project Scholarship, Coordinators of Scientific Research Projects</b> , Istanbul Technical University	Turkiye
2017	<b>Erasmus Internship Scholarship</b> , Istanbul Aydin University – ALTU Technology	Bristol, UK
2017	<b>Merit-based Scholarship &amp; Awarded second rank - High Honour Student</b> , Istanbul Aydin University	Turkiye
2006-08	<b>First Rank</b> , Table Tennis Tournament, Bagcilar Municipality	Turkiye

## PUBLICATIONS

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- 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.