Wael Kabouk

MSc Software Engineer | **Computer Vision Specialist**

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RESEARCH INTERESTS

Computer Vision, Multi-Object Tracking (MOT), and Multimodal AI Systems. Specifically interested in developing robust, efficient fusion architectures for multi-camera networks and optimizing reasoning pipelines for autonomous agents.

EDUCATION

M.Sc. in Software Engineering (100% English) *Oct 2023 – Sep 2025*
Sakarya University, Turkey *GPA: 3.44/4.00*

- **Thesis:** *Virtual Context-Based Multi-Camera Vehicle Tracking*.
- **Advisor:** Prof. Dr. Ahmet Özmen.

B.Sc. in Computer Engineering (100% English) *Oct 2019 – Jul 2023*
Mugla Sitki Kocman University, Turkey *GPA: 3.62/4.00*

- **Capstone Project:** Developed a microservices-based multi-vendor e-commerce platform with a collaborative recommendation engine.

PUBLICATIONS

- **W. Kabouk**, A. Özmen. "Virtual Context-Based Multi-Camera Vehicle Tracking." *3rd International Ankara Scientific Research and Innovation Congress, International Science and Art Research Center*, Ankara, Turkey, July 2025, **pp. 413-429**.
  - Proposed a "Virtual Context Stacking" method that eliminates re-identification layer in multi-camera tracking pipeline achieving up to **81.3% cross-view identity consistency rate**.
- **W. Kabouk**, A. N. Alyahya, M. M. Alhusseini, M. A. Al shabaan. "Integrating Demographic and Clinical Features in Heart Attack Prediction using Machine Learning Models." *6th International Conference on Engineering and Applied Natural Sciences, All Sciences Academy*, Konya, Turkey, June 2025, **pp. 30-39**.
  - Validated Random Forest, KNN, and AdaBoost classifiers on clinical datasets, identifying high-risk cardiovascular patients with **71% accuracy**.

RESEARCH EXPERIENCE

Virtual Context Multi-Camera Tracking (MSc Thesis) *Sakarya University*

- **Problem:** Traditional multi-camera tracking relies on complex geometric calibration and heavy re-identification networks, limiting real-time deployment.
- **Methodology:** Developed "Virtual Context Stacking," a novel fusion strategy that normalizes Region-of-Interest (ROI) crops into a composite frame for single-pass inference with a unified processing pipeline rather than N processing pipelines.
- **Implementation:** Engineered a unified pipeline using **YOLO v11** and **ByteTrack**, bypassing the need for explicit re-identification networks or complex association heuristics.
- **Results:** Achieved **81.3% identity continuity accuracy** across overlapping views and sustained **30 FPS** performance on standard hardware.
- **Stack:** Built a modular evaluation tool using **PyQt5** and **OpenCV** for reproducible testing.

Hybrid Semantic-Governance Framework (HSGF) *Independent Research*

- **Problem:** Geometric-only trackers fail to maintain identity consistency during heavy occlusion and multi-camera handovers, leading to frequent "Identity Switches" when visual features are ambiguous.
- **Methodology:** Designed "Semantic Governance," a hierarchical control system that uses rigid linguistic attributes (e.g., "Silver Sedan") to audit track associations and **veto** erroneous merges during occlusion recovery.
- **Implementation:** Engineered a robust pipeline combining **OC-SORT** (for observation-centric occlusion handling) and **YOLO11** with a local **Microsoft Florence-2** VLM for attribute reasoning.
- **Results:** Established the **architectural feasibility** of the Semantic Veto mechanism, developing a functional **Proof-of-Concept** prototype capable of detecting identity conflicts in offline tests.
- **Stack: PyTorch**, **OpenCV**, **HuggingFace Transformers**, and **LanceDB** (Vector Store).

PROFESSIONAL EXPERIENCE

AI & Software Engineer *Oct 2023 – Present*
Self-Employed

- Designed and delivered scalable **AI-driven web applications** for clients using **Next.js** and **TypeScript**, implementing hexagonal architecture to decouple UI logic from inference APIs.
- Restructured database schemas for high-traffic platforms, reducing query latency by implementing advanced indexing strategies in **PostgreSQL**.

Associate Software Engineer *Jan 2023 – Jun 2023*
Kyber Tech *Mugla, Turkey*

- Developed feature-complete web modules and optimized frontend rendering using the MERN stack.

TEACHING & LEADERSHIP

Programming Instructor *Oct 2022 – Jul 2023*
Youth Center - Mugla *Mugla, Turkey*

- Designed curriculum and taught Python/C++ fundamentals, focusing on algorithmic problem-solving.
- Mentored students through the full software development lifecycle, from debugging to deployment.

Technical Lead *Oct 2023 – Oct 2024*
Syria Students Union *Remote*

- Led the development of an automated Telegram bot using Python to handle high-volume student inquiries.

HONORS & AWARDS

- **Honor Student (M.Sc.):** Academic Distinction (Criteria: GPA > 3.00). *2025*
- **High Honor Student (B.Sc.):** High Distinction (Criteria: GPA > 3.50). *2023*
- **1st Place, Poetry Recitation:** City-wide winner (Al-Kharj). *2019*
- **Top 1% Rank (GAT):** Score **99**/**100**, National Aptitude Test (Quant/Analytical). *2018*

TECHNICAL SKILLS

- **AI:** Python, C++, PyTorch, TensorFlow, OpenCV, YOLO (v11), ByteTrack, vLLM, LangGraph, LangChain, CLIP, FAISS, Scikit-learn, MLflow.
- **Full Stack:** React, Next.js, Flutter (Dart), PyQt, FastAPI, Express, Node.js, PostgreSQL, MongoDB, SQL.
- **DevOps &Tools:** Docker, Kubernetes, Git, AWS, Linux CLI.

LANGUAGES

Arabic (Native) · English (C1) · Turkish (B2)