europass

Alaettin Uçan

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ABOUT ME

As an R&D Director and Assistant Professor, I bridge the gap between advanced academic research and scalable industrial applications. With a Ph.D. focused on Large Language Models, I lead multidisciplinary teams at Tiga Information Services to develop MDR-certified and FDA-approved health informatics solutions. My expertise lies in securing and managing high-budget international grants (Horizon Europe, Eurostars) and transforming cutting-edge technologies, from Generative AI to Edge Computing, into compliant, global-scale medical products. Dedicated to shaping the future of digital health through innovation, mentorship, and strategic academic-industry partnerships.

WORK EXPERIENCE

Tigahealth Inc., Cariahealth Inc., Mobithera Inc. – Ankara, Turkey

Website: www.tigahealth.com | **Email address:** alaettin.ucan@tigahealth.com | **Name of unit or department:** R&D - **Business or sector:** Professional, scientific and technical activities

R&D Director

[21/06/2023 – Current]

Spearhead the end-to-end R&D lifecycle of AI-driven health informatics solutions, transforming advanced research into scalable, global market products. Lead a multidisciplinary team of engineers and researchers in executing high-impact initiatives, including Digital Therapeutics (DTx), Generative AI, and Medical Imaging systems. Direct the strategic management of multi-million Euro international grants (Horizon Europe, Eurostars) and successfully navigate complex regulatory landscapes to secure MDR certification and FDA approvals, ensuring the clinical adoption of cutting-edge AI technologies.

Ufuk University – Ankara, Turkey

Assistant Professor

[12/04/2025 – Current]

Assistant Professor Serving as a faculty member in the Computer Engineering Department, delivering advanced coursework with a focus on Artificial Intelligence and Software Engineering. I bridge the academic-industrial divide by integrating real-world R&D challenges and case studies into the curriculum and actively mentoring undergraduate and graduate researchers in cutting-edge domains such as Large Language Models (LLMs) and Health Informatics, fostering the next generation of innovation-ready engineers.

Korkut Ata University – Osmaniye, Turkey

Website: https://akbis.osmaniye.edu.tr/@aucan | **Name of unit or department:** Computer Engineering - **Business or sector:** Education

Assistant Professor

[01/03/2021 – 20/06/2023]

Served as a key faculty member, combining academic research with administrative leadership. Successfully secured and executed a TUBITAK 3005 research grant, while actively developing proposals for TUBITAK 1001 and international bilateral cooperation programs. Contributed to the academic field through published book chapters

and conference proceedings. Beyond research, I took on active roles in departmental and university administration and provided strategic career coaching and internship guidance to foster students' professional development.

Hacettepe University – Ankara, Turkey

Website: http://cs.hacettepe.edu.tr/ | **Email address:** info@cs.hacettepe.edu.tr | **Name of unit or department:** Computer Engineering Dept. - **Business or sector:** Professional, scientific and technical activities

Research assistant in university

[31/01/2012 – 28/02/2021]

Served as a core researcher at the "Multimedia Information Retrieval Laboratory," actively contributing to multiple TUBITAK-funded projects focused on Natural Language Processing (NLP), Transfer Learning, and Optimization. Co-authored original research articles derived from these initiatives. Simultaneously, facilitated laboratory applications and provided academic mentorship for a wide curriculum of undergraduate and graduate courses, ranging from Machine Learning and Algorithm Design to Operating Systems and Software Engineering.

KarMed Software Ltd. – Mersin, Turkey

Website: https://kardelensw.com/en/ | **Name of unit or department:** R&D

Software developer

[31/05/2008 – 19/08/2010]

Contributed to the full-cycle development of a comprehensive Hospital Information Management System (HIMS) deployed in over 200 hospitals. Engineered scalable, n-tier software modules for critical operational units, including Surgery Management, Clinical Operations, Inventory, and Accounting, using robust Object-Oriented design principles. The system successfully supported thousands of concurrent users nationwide, establishing a strong foundation in large-scale health software architecture.

EDUCATION AND TRAINING

PhD in Computer Engineering

Hacettepe University [31/01/2015 – 13/12/2020]

City: Ankara | **Country:** Turkey | **Website:** http://cs.hacettepe.edu.tr/

MSc in Computer Engineering

Hacettepe University [31/01/2012 – 11/12/2014]

City: Ankara | **Country:** Turkey | **Website:** http://cs.hacettepe.edu.tr/

BSc in Computer Engineering

KTU Manas [11/09/2002 – 23/06/2007]

City: Bishkek | **Country:** Kyrgyzstan | **Website:** http://intl.manas.edu.kg/en

SKILLS

AI & Machine Learning

Human Pose Estimation / Synthetic Data Generation / DD-GANs / Generative AI / Object Detection / Multi-Agent systems / Medical imaging segmentation / LLMs / PyTorch / Keras / Real-time Motion Tracking / NumPy / Hugging Face Transformers / TensorFlow / Scikit-learn / Pandas / Matplotlib

Software Engineering & Cloud

N-Tier Architecture / Event-Driven Architecture / RESTful APIs / Kafka / Service-Oriented Architecture (SOA) / Docker / Kubernetes / RabbitMQ / Git / Java / C++ / Linux/Bash Scripting / C# / SQL / Python / JavaScript

Health Technology

ICD-10 / LOINC / GDPR / FDA 510(k) / SNOMED / MDR (CE Marking) / HIPAA / HL7 / FHIR

Research, Funding & Innovation Management

Horizon Europe & Eurostars / Idea-to-Product Lifecycle / Fundraising Strategy / Consortium Building / TUBITAK TEYDEB/ARDEB / R&D Roadmap Planning / R&D Productization / Cost-Benefit Analysis / MVP Development / Resource Allocation & Optimization / International Networking / Academic-Industry Collaboration / Grant Writing & Proposal Management

LANGUAGE SKILLS

Mother tongue(s): Turkish

Other language(s):

English

LISTENING C1 **READING** C2 **WRITING** C1

SPOKEN PRODUCTION B2 **SPOKEN INTERACTION** B2

Russian

LISTENING A2 **READING** A2 **WRITING** A1

SPOKEN PRODUCTION A2 **SPOKEN INTERACTION** A2

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

PUBLICATIONS

[2025]

Denoising diffusion-based anterior segment optical coherence tomography (AS-OCT) image generation This study aims to address the scarcity of annotated Anterior Segment Optical Coherence Tomography (AS-OCT) datasets in ophthalmology by using Denoising Diffusion Generative Adversarial Networks (DD-GANs) to generate synthetic AS-OCT images to produce predictive models. The goal is to produce high-quality, diverse, and realistic data supporting the training of predictive models without data imbalance issues.DD-GANs effectively generate realistic AS-OCT images, producing high-quality, balanced datasets that can address data scarcity and imbalance in ophthalmology. These synthetic datasets can enhance machine learning model development, advancing medical image analysis. Synthetic medical image generation provides significant advantages in protecting personal data privacy. By using artificially generated data instead of real data, patients' identities and confidentiality are safeguarded.

Authors: Berat Ersarı; Muhammed Görkem Kola; Emine Esra Karaca; Feyza Dicle Işık; Özlem Evren Kemer; Ali Seydi Keçeli; Aydın Kaya; Tuğba Gürgen Erdoğan; Alaettin Uçan

[2025]

Autonomym: Multimodal Anonymization of Health Data using Named Entity Recognition and Structured Medical Data Processing This paper introduces "Autonomym," a comprehensive multi-modal framework designed to anonymize sensitive health data across heterogeneous formats. The system integrates advanced Named Entity Recognition (NER) models to de-identify unstructured clinical text while employing specialized algorithms for structured medical data processing. The study demonstrates a robust methodology that ensures strict regulatory compliance (GDPR/KVKK) while preserving critical data utility for secondary research and analysis.

Authors: Hamdi Yalın Yalıç, Murat Dörterler, Alaettin Uçan, Ali Yaşar Yiğit, Adem Ali Yılmaz

[2025]

Real-time 3D Human Pose Estimation Model for Physiotherapy Exercises on Mobile Devices This study presents a highly optimized, lightweight **3D Human Pose Estimation** architecture designed specifically for mobile-based tele-rehabilitation. By implementing **Edge AI** principles, the model processes video data locally on the device to ensure low latency and strict patient data privacy. The proposed system provides real-time, precise biofeedback on exercise execution (angles, form), significantly improving treatment adherence and accessibility for remote physical therapy.

Authors: Hamdi Yalın Yalıç, Alaettin Uçan, Ali Yaşar Yiğit, Adem Ali Yılmaz

[2024]

The effect of CLOSER-computer-based exercise program in older adults with a history of falls: a pilot study CLOSER is a computer-based exercise program that aims to improve older adults' health, fitness and social lives. This pilot study aimed to examine the effect of CLOSER, the first computer-based exercise program developed for older adults on a national scale, on those with a history of falls. Forty-eight older adults (71.33 ± 7.47) with a history of falling at least once in the last year were included in the study. Older adults performed CLOSER exercises for (balance maintenance, neck rotation, rhythmic walking, knee flexion and trunk rotation) 2 sessions per week for eight weeks. All individuals were evaluated at baseline and the end of the eighth week. The primary outcome measures were the 30-s Chair-Stand Test ($p = 0.002$), the Berg Balance Scale ($p = 0.002$), the Falls Efficacy Scale International ($p = 0.003$), the Timed Up and Go Test ($p = 0.008$) and the motivation level ($p = 0.007$) statistically significant improvements were observed. The results show that a CLOSER-computer-based exercise program effectively increases balance and reduces the risk and fear of falling. In the future, CLOSER could significantly contribute to the healthcare system as an alternative aid for home-based exercise.

Authors: Degerli, Medine Nur Ozata; Sahin, Sedef; Altuntas, Onur; Uyanik, Mine; Yilmaz, Adem Ali; Yigit, Ali Yasar; Ucan, Alaettin; Yapar, Ilyas

[2024]

Predicting Success in Descemet Membrane Endothelial Keratoplasty Surgery Using Machine Learning This study aimed to predict early graft failure (GF) in patients who underwent Descemet membrane endothelial keratoplasty based on donor characteristics.This study shows a strong relationship between increased intensive care duration, DPT, and GF. Experimental results demonstrate that machine learning methods may effectively predict GF automatically.

Authors: Emine Esra Karaca; Ayça Bulut Ustael; Ali Seydi Keçeli; Aydin Kaya; Alaettin Uçan; Ozlem Evren Kemer

[2023]

Slime Mould Algorithm: A Comprehensive Survey of Its Variants and Applications Meta-heuristic algorithms have a high position among academic researchers in various fields, such as science and engineering, in solving optimization problems. These algorithms can provide the most optimal solutions for optimization problems. This paper investigates a new meta-heuristic algorithm called Slime Mould algorithm (SMA) from different optimization aspects. The SMA algorithm was invented due to the fluctuating behavior of slime mold in nature. It has several new features with a unique mathematical model that uses adaptive weights to simulate the biological wave. It provides an optimal pathway for connecting food with high exploration and exploitation ability. As of 2020, many types of research based on SMA have been published in various scientific databases, including IEEE, Elsevier, Springer, Wiley, Tandfonline, MDPI, etc. In this paper, based on SMA, four areas of hybridization, progress

Authors: Farhad Soleimanian Gharehchopogh, Alaettin Ucan, Turgay Ibrikci, Bahman Arasteh, Gultekin Isik

[2022]

A Study of Turkish Emotion Classification with Pretrained Language Models Emotion classification is a research field that aims to detect the emotions in a text using machine learning methods. In traditional machine learning methods, feature engineering processes cause the loss of some meaningful information, and classification performance is negatively affected. Additionally, the success of modeling using deep learning approaches depends on the sample size. More samples are needed for Turkish due to the unique characteristics of the language. However, emotion classification datasets in Turkish are quite limited. In this study, the pretrained language model approach was used to create a stronger emotion classification model for Turkish. Well-known pretrained language models were fine-tuned for this purpose. The performances of these fine-tuned models for Turkish emotion classification were comprehensively compared with the performances of traditional machine learning and deep learning methods in experimental studies. The proposed approach provides state-of-the-art performance for Turkish emotion classification.

Authors: Uçan A., Dörterler M., Sezer E. A.

[2021]

An Emotion Analysis Scheme Based on Gray Wolf Optimization and Deep Learning Automatic detection of emotions in textual data masses provides priceless opportunities for researchers and also it is inevitable for practitioners. The unfavorable factors involved in text data cause ambiguity and adversely affect the performances of emotion classifiers. Although deep learning approaches spark off significantly successive results, the obtained performances of the classifiers in the literature are commonly evaluated as the overall accuracy. This incomplete evaluation ignores inner class performance and overall accuracy can behave as a hopeful evaluator. In this study, we employed deep learning and meta-heuristic optimization methods together in order to resolve the ambiguity issue. Moreover, the decision mechanism of a conventional deep learning model is equipped with optimal emotion vectors obtained by optimization processes for each emotion class. Experimental results show that the proposed approach improves the inner class performance by maintaining the overall accuracy scores.

Authors: Uçan A., Dörterler M., Sezer E. A.

[2020]

Emotion analysis in Turkish computational linguistics studies Computational linguistics is an interdisciplinary field that aims to understand the verbal or written language, to express it mathematically and suggest methods, models and tools to achieve these goals. Emotion analysis, a research area of computational linguistics; is the process of finding which feelings taking place in what proportion in sound, image or text data. The developments such as the proliferation of the Internet, the increase of digital content, the increase of storage and computing power have both paved the way for automatic emotion analysis and made emotion analysis an important need. This study, which summarizes the subject of emotion analysis, aims to explain the history and importance of emotion analysis from a linguistic perspective, and briefly introduce the current application areas of emotion analysis.

Authors: UÇAN, A., SEZER, E. A.

[2019]

A New Approach on Emotion Analogy by Using Word Embeddings According to the Plutchik emotion classification, complex emotions consist of different combinations of eight basic emotions. The word embeddings in the literature are described as vector space where the word meanings are represented numerically. In this space, word analogies dealing with the similarities of vectors can be carried out. In this study, “emotion analogy” is proposed as a new method to create complex emotion vectors in case there is no learning data for complex emotions. In this respect, 12 complex feeling vectors were obtained by combining the word vectors of the basic emotions by the purposed method. The similarities between the obtained combinational vectors and the word vectors belonging to the complex emotions were investigated. As a result of the experiments performed on GloVe and Word2Vec word embeddings, it is found that the results of word analogy and emotion analogy are similar at 0.82 on average.

Authors: Uçan, A., & Sezer, E. A.

[2018]

HUMIR at IEST-2018: Lexicon-Sensitive and Left-Right Context-Sensitive BiLSTM for Implicit Emotion Recognition This paper describes the approaches used in HUMIR system for the WASSA-2018 shared task on the implicit emotion recognition. The objective of this task is to predict the emotion expressed by the target word that has been excluded from the given tweet. We suppose this task as a word sense disambiguation in which the target word is considered as a synthetic word that can express 6 emotions depending on the context. To predict the correct emotion, we propose a deep neural network model that uses two BiLSTM networks to represent the contexts in the left and right sides of the target word. The BiLSTM outputs achieved from the left and right contexts are considered as context-sensitive features. These features are used in a feed-forward neural network to predict the target word emotion. Besides this approach, we also combine the BiLSTM model with lexicon-based and emotion-based features. Finally, we employ all models in the final system using Bagging ensemble method. We achieved macro F-measure value of 68.8 on the official test set and ranked sixth out of 30 participants.

Authors: Naderalvojoud, B., Ucan, A., & Sezer, E. A.

[2016]

SentiWordNet for New Language: Automatic Translation Approach This paper proposes an automatic translation approach to create a sentiment lexicon for a new language from available English resources. In this approach, an automatic mapping is generated from a sense-level resource to a wordlevel by applying a triple unification process. This process produces a single polarity score for each term by incorporating all sense polarities. The major idea is to deal with the sense ambiguity during the lexicon transfer and provide a general sentiment lexicon for languages like Turkish which do not have a freely available machine-readable dictionary. On the other hand, the translation quality is critical in the lexicon transfer due to the ambiguity problem. Thus, this paper also proposes a multiple bilingual translation approach to find the most appropriate equivalents for the source language terms. In this approach, three parallel, series and hybrid algorithms are used to integrate the translation results. Finally, three lexicons are achieved for the target language with different sizes. The performance of three lexicons is evaluated in the lexicon-based sentiment classification task and compared with the results achieved by the supervised approach. According to experimental results, the proposed approach can produce reliable sentiment lexicons for the target language.

Authors: Ucan, A., Naderalvojoud, B., Sezer, E. A., Sever, H.

[2015]

Imbalanced text categorization based on positive and negative term weighting approach Although term weighting approach is typically used to improve the performance of text classification, this approach may not provide consistent results while imbalanced data distribution is available. This paper presents a probability based term weighting approach which addresses the different aspects of class imbalance problem in text classification. In this approach, we proposed two term evaluation functions called as PNF and PNF^2 which can produce more influential weights by relying on the imbalanced data sets. These functions can determine the significance of a term in association with a particular category. This is a crucial point because in one hand a frequent term is more important than a rare term in a particular category according to feature selection approach, and on the other hand a rare term is no less important than a frequent term based on idf assumption of traditional term weighting approach. Incorporation of these two approaches at the same time is the main idea that make them superior to other weighting methods. The achieved results from experiments which were carried out on two popular benchmarks Reuters-21578 and WebKB demonstrate that the probability based term weighting approach yields more consistent results than the other methods on the imbalanced data sets.

Authors: Naderalvojoud, B., Sezer, E. A., Ucan, A.

[2014]

Assessment of feature selection metrics for sentiment analyses: Turkish movie reviews Sentiment analysis systems pursuit the goal of detecting emotions in a given text with machine learning approaches. These texts might include three kinds of emotions such as positive, negative and neutral. Entertainment oriented texts, especially movie reviews, contain huge amount of possible emotional information. In this study, we aimed to represent each movie reviews by using small number of features. For this purpose, information gain, chi-square methods have been implemented to extract features for decreasing costs of calculations and increasing success rate. In experiments, employed corpus includes Turkish movie reviews, support vector machine and naïve bayes had been employed for classification and F1 score was used for performance evaluation. According to the experimental results, support vector machine achieved 83.9% performance value while classification of movie reviews in two (positive and negative) categories and also we obtained the 63.3% performance value while classification with support vector machine into three categories.

Authors: Akba, F., Uçan, A., Sezer, E. A., Sever, H.

PROJECTS

[01/11/2025 – Current]

NanoLoom NanoLoom aims to revolutionize drug discovery and molecular diagnostics by developing an imaging-based microfluidic platform that analyzes DNA-protein interactions at the single-molecule level. The platform combines Nanoimprint-based microfluidic chips for DNA stretching and imaging, TIRF microscopy for visualizing molecular dynamics, and AI-powered software tools for quantitative analysis of protein binding and drug effects.

Through this integration, NanoLoom provides a high-throughput, cost-efficient, and precise alternative to existing biochemical assays, accelerating drug discovery, reducing costs, and enabling new applications in molecular biology and personalized medicine. This project has received funding from the Eurostars-3 programme by Horizon Europe

[01/01/2025 – Current]

HIVEMIND: LLM-Based Multi-Agent Software Engineering Framework (Horizon Europe) Contributing to a cutting-edge Horizon Europe (CL4) initiative designed to revolutionize the Software Development Lifecycle (SDLC) through Agentic AI. The project introduces an adaptive LLM-based multi-agent framework that facilitates seamless collaboration between human developers and autonomous AI agents. By assigning distinct, role-based personas to AI (mirroring a traditional DevOps team), the platform advances responsible, human-centric software engineering, accelerating delivery pipelines while maintaining ethical oversight and code quality.

[01/01/2023 – Current]

AISym4MED: Synthetic Data Generation & Privacy Platform (Horizon Europe) Contributing to a major EU-funded initiative (Horizon Europe) designed to address data scarcity and privacy bottlenecks in medical AI. The project is developing a trustworthy platform that generates high-fidelity synthetic medical datasets via controlled data synthesis, enabling researchers to train robust AI models without compromising patient confidentiality. The system integrates novel anonymization pipelines, attribute-based privacy measures, and secure tracking mechanisms to provide a compliant, scalable data ecosystem for healthcare data engineers and practitioners.

[01/03/2025 – Current]

XRCycling: AI-supported personalized exercise bike game platform for fighting obesity Directing the R&D strategy for an immersive, technology-driven sports ecosystem designed to combat obesity and facilitate tele-rehabilitation. The platform transforms stationary cycling into an interactive experience by integrating Virtual Reality (VR) and gamification. It utilizes multi-modal AI to analyze real-time biometric data—fusing facial expression analysis (fatigue detection) with EMG muscle activity sensors—to drive a personalized "Sport Bot" that provides adaptive vocal coaching. The system also enables remote clinical monitoring, ensuring safe and effective exercise routines for users ranging from fitness enthusiasts to rehabilitation patients. Supported by the TUBITAK 1501 program.

[01/03/2025 – Current]

ExerNeck: AI-Driven Mobile Tele-Rehabilitation & Gamification Directing the R&D strategy for a sensor-less, mobile tele-rehabilitation platform designed to treat cervical musculoskeletal disorders caused by sedentary lifestyles. The solution leverages real-time Computer Vision (MediaPipe) to analyze patient movements via standard smartphone cameras, ensuring clinical safety and correct exercise form without wearable hardware. Innovatively integrates Promptable Game Models (PGM) to dynamically generate personalized gamification content, significantly boosting patient adherence and providing a scalable, remotely monitored therapeutic experience. Supported by the TUBITAK 1501 program.

[01/10/2024 – Current]

Sym2Clinic: Generative AI-based Patient Information and Guidance System Directed the R&D strategy for a Generative AI platform designed to revolutionize the pre- and post-examination patient journey. The system utilizes advanced Large Language Models (LLMs) to analyze natural language patient complaints, performing automated clinical triage to accurately route patients to the appropriate medical specialty and assess eligibility for telemedicine versus physical consultations. By optimizing appointment scheduling and automating post-treatment follow-ups, the platform minimizes incorrect referrals and significantly reduces the operational burden on healthcare facilities. Supported by the TUBITAK 1501 program.

[01/09/2024 – Current]

RAD-THERA: AI-Driven Precision Radiotherapy & Dosimetry Platform Directed the R&D strategy for a deep learning-based radiotherapy planning system designed to automate the precise segmentation of Target Tumor Volumes and Organs-at-Risk (OAR). Leveraging multi-modal imaging (CT/MRI), the platform optimizes radiation dose distribution to maximize therapeutic efficacy while minimizing toxicity to healthy tissues. The solution significantly reduces the manual contouring workload and inter-observer variability, democratizing access to high-precision cancer treatment by standardizing planning quality. Supported by the TUBITAK 1501 program.

[01/04/2024 – Current]

Fallower: Real-Time UWB Based Human Fall Detection and Tracking System Directed the R&D and AI strategy for "Fallower," a non-intrusive safety monitoring system utilizing Ultra-Wideband (UWB) radar technology. The project engineered a privacy-preserving alternative to camera-based or wearable solutions, employing advanced machine learning algorithms to classify human movement patterns and detect fall anomalies with high precision. The system ensures rapid intervention for at-risk individuals by triggering instant alerts to caregivers while maintaining strict user privacy. Supported by the TUBITAK 1501 program.

[01/04/2024 – Current]

My Health Coach: AI-Powered Personalized Health Notification and Risk Assessment System Spearheaded the R&D strategy to transform legacy, passive Personal Health Records (PHR) into a proactive, AI-driven health management ecosystem. The platform leverages Graph Machine Learning to model complex patient-disease relationships and family history for precise chronic disease risk stratification, while utilizing Reinforcement Learning to optimize the timing and content of personalized health interventions. This initiative establishes a dynamic, two-way preventive medicine model designed to enhance early detection rates and optimize healthcare resource utilization. Supported by the TUBITAK 1501 program.

[12/04/2023 – Current]

Mobithera: Remote Physiotherapy Platform Spearheaded the R&D and AI strategy for Mobithera, Turkey's first MDR-certified Digital Therapeutic (DTx) for remote physiotherapy. Engineered highly optimized, proprietary Edge-AI Human Pose Estimation models designed to run locally on mobile devices, ensuring real-time, privacy-centric (HIPAA/GDPR) biofeedback for patient exercises. The platform leverages Unity-based gamification to drive patient adherence and has achieved critical global regulatory milestones, including FDA Approval, EU MDR Certification, and NHS ORCHA validation, establishing it as an internationally recognized, insurance-reimbursable digital treatment. Supported by the TUBITAK 1501 program.

Link: https://mobithera.com

[01/03/2024 – 30/08/2025]

DMEK-Track: AI-Driven Corneal Transplant Monitoring System Led the development of a clinical decision support system designed to optimize post-operative follow-up for Descemet Membrane Endothelial Keratoplasty (DMEK). The project deployed advanced deep learning architectures, specifically Operational Neural Networks (ONNs) and CNNs, to analyze Anterior Segment OCT (AS-OCT) imagery. By automatically assessing graft health and triaging patients for advanced In Vivo Confocal Microscopy (IVCM), the platform empowers general ophthalmologists to manage follow-ups effectively, significantly reducing the operational burden on specialized transplant centers. Supported by the TUBITAK 1507 program.

[01/10/2023 – 30/03/2025]

Autononym: AI-Driven Data Privacy & Compliance Platform Directed the R&D strategy for a comprehensive automated anonymization solution designed to secure sensitive data across high-regulation sectors (Health, Banking, Public). Utilizing a multi-modal AI pipeline (Advanced NLP and Image Processing), the platform automatically classifies and de-identifies PII (Personally Identifiable Information) within unstructured text, tabular data, and images. The solution achieves a strategic balance between maintaining strict regulatory compliance (GDPR, KVKK) and preserving data utility, enabling the safe exploitation of valuable datasets for scientific and commercial research. Supported by the TUBITAK 1507 program.

[12/04/2023 – 31/12/2024]

Predis: Anomaly Detection, Early Warning and Forecast System Directed the R&D and AI strategy for an advanced predictive analytics platform designed to safeguard the pharmaceutical supply chain. The system leverages cutting-edge Time-Series Foundation Models (Amazon Chronos) for high-precision forecasting and unsupervised learning algorithms (Local Outlier Factor) to detect stock anomalies in real-time. By integrating these insights into GIS-enabled dashboards, the platform provides health authorities with critical early warning capabilities to proactively prevent supply shortages and mitigate irregularities. Supported by the TUBITAK 1501 program.

[12/04/2023 – 28/02/2024]

Cloud Based Health Information Hub & Exchange Spearheaded the Machine Learning and Analytics architecture for a major R&D initiative to transform legacy national-scale health solutions (EHR, Drug Tracking, e-Prescription) into a globally scalable, cloud-native ecosystem. Engineered a resilient microservices infrastructure orchestrated via Kubernetes and Apache Kafka, featuring automated horizontal scaling to ensure high adaptability for international markets. The system integrates a centralized Data Warehouse to drive high-performance unified analytics and data-driven decision-making. Supported by the TUBITAK 1501 program.

[12/04/2023 – 30/12/2023]

AI-Driven Robotic Chemotherapy Preparation System Directed the R&D and AI strategy for an indigenous robotic system designed to automate high-risk chemotherapy drug preparation. The solution engineered a cost-effective, high-precision alternative to imported models, mitigating critical safety risks, including contamination and foaming. Crucially, the system ensures end-to-end medication traceability by integrating directly with Turkey's national health ecosystems (ITS and e-Prescription), thereby optimizing clinical safety and operational efficiency from production to patient administration. Supported by the TUBITAK 1501 program.

[01/07/2021 – 01/07/2022]

AI-Driven Automated Assessment Generation Platform (OSYM) Spearheaded the development of an automated question generation system for OSYM (Student Selection and Placement Center). The project utilized a sophisticated NLP pipeline, fine-tuning BERT and T5 architectures for context-aware question generation and paraphrasing, while employing semantic word embeddings to engineer plausible multiple-choice distractors. Successfully delivered the solution as a scalable Machine Learning as a Service (MLaaS) API, orchestrating a robust tech stack including PyTorch, Transformers, Django, and PostgreSQL.

[30/04/2017 – 30/12/2021]

Automated Media Intelligence System for Turkish General Staff Designed and deployed a mission-critical media monitoring platform for the Turkish General Staff to automate the digitization and analysis of daily print media. Leveraging Abbyy FineReader API for advanced OCR processing and C#.Net for robust backend architecture, the system automatically detected and highlighted sensitive keywords within massive text data, significantly streamlining the workflow for operators to compile and generate daily intelligence briefings.

[30/06/2020 – 30/06/2021]

YZYap: AI-Enabled Educational Robotics Platform Engineered an interactive educational robotics platform designed to democratize AI and programming concepts for beginners. The system features a versatile dual-mode coding environment (supporting both Scratch and standard languages) integrated with robust hardware sensors (camera, microphone) to enable multimodal human-robot interaction. A key innovation is the modular AI interface, which allows users to deploy and customize advanced machine learning models, including sentiment analysis, object tracking, and image recognition, directly within the robotic workflow. Supported by the TUBITAK 1501 R&D program.

[31/05/2017 – 13/12/2020]

Pioneering Turkish Emotion Analysis with LLMs Executed the first pre-2020 study to fine-tune pre-trained Large Language Models (LLMs) specifically for Turkish emotion analysis using curated, domain-specific datasets. By leveraging novel transfer learning techniques, the research achieved State-of-the-Art (SOTA) accuracy scores, surpassing traditional baselines. This groundbreaking work resulted in 3 published papers and established a new benchmark methodology, directly paving the way for subsequent advancements in Turkish computational linguistics.

Link: https://www.doi.org/10.1177/0165551520985507

[31/10/2015 – 31/08/2018]

Zigbee-Based IoT Ecosystem & Smart Home Platform Architected and developed a comprehensive smart home ecosystem for Gesislab Elektronik, supported by the TUBITAK 1501 program. The project involved designing a centralized web-based command hub comparable to industry leaders like Google Home, enabling seamless wireless device orchestration via the Zigbee protocol. Successfully managed a complex, heterogeneous technology stack by

integrating low-level firmware (C, C++) with dynamic backend services (Python, C#.Net) and a hybrid database layer (PostgreSQL, NoSQL) to ensure scalable, real-time system performance.

[14/03/2016 – 14/06/2017]

Cross-Lingual Sentiment Lexicon Generation Framework Addressed the scarcity of annotated data in low-resource languages by developing an automated framework to generate Turkish sentiment lexicons from English resources. The project implemented a novel triple unification process to map sense-level polarities to word-level scores and employed a multi-algorithm bilingual translation strategy to resolve semantic ambiguity. The resulting lexicons were successfully validated in sentiment classification tasks, providing a robust alternative to data-intensive supervised methods. Supported by the prestigious TUBITAK 1001 research grant.

[30/04/2017 – 30/12/2021]

TCMB Banknote Production Tracking System Developed a high-security monitoring platform for the Central Bank of Turkey's Banknote Printing Plant to ensure end-to-end traceability of machinery, personnel, and sensitive raw materials. The system optimized production efficiency through real-time statistical analysis while safeguarding operations through an automated anomaly-detection and alert mechanism.

[01/01/2017 – 29/03/2017]

Ford Otosan Production Line Laser Automation System Engineered a mission-critical laser marking automation solution for the Ford Sakarya Factory by reverse-engineering proprietary production protocols to synchronize real-time vehicle data with the manufacturing process. Built on a hybrid C++ and C#.Net architecture, the system orchestrates the precise operation of the laser unit and peripheral electromechanical components (feeders, cutters, fume extractors), delivering a high-stability solution that has operated continuously on the production line for years with zero downtime.

[01/01/2017 – 31/01/2017]

NLP Tooling for Linguistic Research Developed a specialized n-Gram extraction and text mining engine for the Hacettepe University Department of Linguistics. The tool utilized Python (NLTK, Zemberek) to process complex Turkish morphological structures, enabling advanced academic research on large text corpora.

[01/01/2013 – 30/09/2013]

MarketStar: Metastock Trading Plugin & Commercial Ecosystem Engineered a third-party financial analysis plugin tailored for the Metastock trading platform using a hybrid C++ (DLL) and C#.Net architecture. Beyond the core analytical engine, we designed and deployed a complete commercial infrastructure, including a secure licensing system, integration with a virtual POS payment gateway, and automated installation packages. Also delivered comprehensive user support modules and documentation to ensure seamless onboarding.