# Buğra Kaplan

Ph.D. Candidate Istanbul Technical University





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# **EDUCATION**

•Istanbul Technical University Doctor of Philosophy - Ph.D. /Mechanical Engineering	2023 - Present GPA: 3.81/4.00
•Istanbul Technical University  Master of Science - M.Sc. / Mechanical Engineering	2020 - 2023 <b>GPA:</b> 3.69/4.00
•F.M.V. Işık University Bachelor of Science - B.Sc. /Civil Engineering,(100% Scholarship)	<i>2016 - 2019</i> <b>GPA:</b> 3.87/4.00
•F.M.V. Işık University Bachelor of Science - B.Sc. /Mechanical Engineering,(100% Scholarship)	2014 - 2018 <b>GPA:</b> 3.85/4.00

# EXPERIENCE

•Işık University 2019 - Present

Research Assistant İstanbul

- Delivered theoretical and practical lectures at undergraduate and graduate levels; actively engaged in student advising, mentoring, and academic guidance.
- Contributed to national and international research projects, supported the preparation of peerreviewed publications, and conducted data collection, experimental studies, modeling, and analysis in line with academic standards.
- Assisted in the coordination of course, exam, and academic schedules, ensuring compliance with institutional quality and ethical standards while improving organizational processes within the faculty.

•Tübitak 2023 - Present

Ph.D. Canditate Researcher

İstanbul

- Conducting design and development studies within the scope of the SÜİT (Advanced Technologies for Sustainable Cities) program, focusing on innovative solutions for sustainable and smart city infrastructures.
- Contributing to the preparation of scientific publications by carrying out research on energy-efficient IoT communication systems, carbon-free/low-carbon energy production, smart transportation, and building energy efficiency.
- Collaborating with interdisciplinary teams to ensure that research outputs align with the Green Deal and sustainability principles, while enhancing the technological readiness levels (TRL) of innovative solutions for urban ecosystems.

•Işık University 2017 - 2019

Academic Assistant İstanbul

- Assisted in course content development, exam preparation, and student support activities, ensuring effective delivery of academic programs.

- Contributed to faculty research projects, supporting the preparation of academic publications and reports.
- Represented the department at academic meetings and contributed to the coordination of administrative and academic processes within the faculty.

## Bahçeşehir University & Wissen Academy

2019 - 2020

Software, Database & ERP Systems Intern Engineer

İstanbul

- Developed applications using C# .Net, HTML5, JavaScript, AngularJS, ASP.Net, MVC, applying OOP, SOLID principles, and design patterns in real projects.
- Designed, managed, and optimized databases with MS-SQL, T-SQL, Entity Framework, and LINQ.
- Implemented functional developments in Dynamics 365 (AX, CRM, F&O) ERP systems, delivering solutions for enterprise resource planning processes.

# •Dalgakıran Compressor Inc.

06/2017 - 07/2017

R&D Engineer Intern

İstanbul

- Contributed to engineering processes in new product development projects by performing design studies, performance tests, and technical analyses.
- Supported coordination between R&D and production teams, ensuring the effective transfer of design outputs into manufacturing processes.
- Conducted cost analysis, efficiency improvement, and lifecycle optimization studies for existing products.

### •CNK Aviation Industry Inc.

05/2016 - 06/2016

Production Engineer Intern

İstanbul

- Conducted performance, quality control, and efficiency analyses of machinery and processes on the production line.
- Actively contributed to product design and manufacturing processes, ensuring feasibility and integration of design outputs into production.
- Performed statistical reporting and process development focusing on material quality, scrap rates, and time management.

# **PROJECTS**

# •SÜİT - Advanced Technologies Platform for Sustainable Cities 🗘 | Papers

2025

In the 21st century, the increasing proportion of the population living in urban areas, combined with the negative impacts of climate change and ecosystem degradation, has accelerated the necessity of implementing the smart city concept at a faster pace. The SÜİT (Advanced Technologies for Sustainable Cities) Platform aims to develop innovative technologies for smart city infrastructures in line with the principles of the European Green Deal and sustainability, while enhancing their technological readiness levels to strengthen Turkey's rapidly growing smart city sector and increase its potential for innovative product development and export. Within this framework, the research program focuses on energy-efficient and scalable communication systems for the Internet of Things (IoT), carbon-free and low-carbon energy production and smart grid management, electric vehicles and smart transportation, spatial data analytics for building energy efficiency, as well as ecosystem monitoring and management.

tory 🞧 | Papers

This project was conducted in collaboration with a university hospital and focused on examining the impact of key physiological parameters on blood flow and intravascular pressure during bypass surgeries. Using advanced computational models and simulation techniques, hemodynamic conditions were replicated, and variables such as vessel diameter, flow rate, and blood viscosity were systematically evaluated in relation to postoperative outcomes. The study provided critical insights for optimizing surgical procedures and minimizing risks, thereby integrating engineering-based hemodynamic modeling with cardiovascular medical applications.

# •AEROCAST - Advanced Energy Regression & Optimization for Computational Analysis of Sustainable Turbines (7) | Papers

2023

This project focused on predicting energy generation from wind turbines using various machine learning algorithms. High-resolution turbine data (including wind speed, direction, temperature, and operational parameters) were analyzed with KNN, Random Forest, Decision Tree, and XGBoost models. The predictive performance of these models was systematically compared for short- and mid-term energy forecasting, and an ensemble model combining their outputs was developed. The study provided a robust scientific framework for more reliable forecasting in renewable energy production and contributed to the optimization of the energy supply-demand balance.

# •PREDIAB - Predictive Analytics for Diabetes via Ensemble Methods 🗘 | Papers

2023

This project investigated the classification performance of machine learning-based ensemble algorithms for the early diagnosis of diabetes. Patient data obtained in collaboration with a university hospital were analyzed using Voting, Random Forest, Bagging, and Gradient Boosting methods, with performance evaluated in terms of accuracy, precision, and recall. The study provided a scientific contribution to identifying the most suitable algorithms for diabetes diagnosis while demonstrating significant potential for the integration of AI-driven healthcare technologies into clinical decision support systems.

#### •HEMERA - Predictive Analytics for Diabetes via Ensemble Methods 🗘 | Papers

2022

This project focused on evaluating the performance of various machine learning algorithms (KNN, SVM, Decision Tree, and Naive Bayes) in classifying cancer cells by type. Conducted in collaboration with a university hospital, the study compared models using multiple performance metrics and demonstrated valuable outcomes for enhancing the effectiveness of AI-based decision support systems in clinical diagnosis of rare and advanced cancers.

# •HERA - Heritage Energy Retrofit Analysis 🗘 | Papers

2021

This project focused on exploring innovative methods to enhance the energy efficiency of traditional housing. The Özdoğan House was examined as a case study, with detailed analyses of the building's thermal comfort, heat loss, and energy consumption profile. Both passive strategies (such as insulation, material selection, and window placement) and active solutions (including renewable energy systems and modern heating/cooling technologies) were evaluated. The findings demonstrated that energy efficiency can be significantly improved while preserving traditional architecture, thereby contributing to the advancement of sustainable building design.

This project conducted a comprehensive study on the classification of breast cancer cells by type using machine learning algorithms such as KNN, PCA+KNN, and NCA+KNN. Carried out in collaboration with a university hospital, the research evaluated the classification performance of different algorithms based on features extracted from clinical datasets. The project introduced an innovative approach supporting early diagnosis in both biomedical engineering and AI-based healthcare applications, thereby contributing to the academic literature and advancing research in computational oncology.

# •DRIVEFF - Driving Efficiency Forecasting with Regression Models • Papers 2020

This project focused on predicting vehicle fuel consumption using various regression models, including Lasso, Ridge, ElasticNet, and XGBoost. The study highlighted the potential of machine learning algorithms to improve energy efficiency in the transportation sector and contribute to sustainable mobility. The findings provided valuable insights for the development of decision support systems applicable to both academic research and industrial practices.

# •SART - Subsonic Open-Circuit Wind Tunnel Design (Subsonic Aerodynamics 2019 Research Tunnel) 🞧 | Papers

This project involved the design of a subsonic open-circuit wind tunnel to facilitate aerodynamic analyses. The system was optimized for flow control, pressure measurements, and aerodynamic force analysis, providing an infrastructure that can be utilized for both educational and research purposes. The study not only contributed to engineering research within the university but also established a foundational experimental platform for validation studies in the aerospace and automotive industries.

# •RÜZGEM - Vertical-Axis Wind Turbine Project (Wind Energy Empowered Educational Centers) • Papers 2018

This project focused on the design and manufacturing of a vertical-axis wind turbine (VAWT) to meet the energy demand of university laboratory buildings. The system was engineered to ensure high efficiency and continuous power generation even at low wind speeds. The project demonstrated the applicability of renewable energy resources for localized energy production and the development of sustainable infrastructure within university campuses.

# •TARİM - IoT-Integrated Drone Design for Smart Agriculture (Tarımsal Akıllı 2017 Robotik İzleme Mekanizması) 🖸 | Papers

This project involved the development of a drone prototype integrated with IoT-based sensors and autonomous control systems to enhance agricultural productivity. The system enables real-time monitoring of critical parameters such as plant health, soil moisture, temperature, irrigation needs, and disease indicators in agricultural fields. These data are transmitted to and analyzed through a cloud-based platform, providing decision support for farmers. The TARIM Project presents an innovative solution for data-driven sustainable production in smart agriculture applications, demonstrating the potential of integrating advanced technologies into modern farming practices.

•Valedictorian, Faculty of Engineering, F.M.V. Işık University

2014 - 2018

I successfully completed my B.Sc. in Mechanical Engineering at Işık University, achieving the distinction of graduating as the Top Student in the Faculty of Engineering.

- •Valedictorian, Civil Engineering Department of F.M.V. Isık University 2016-2019 I successfully completed my B.Sc. in Civil Engineering at Işık University, achieving the distinction of graduating as the Top Student in the Faculty of Engineering.
- •Valedictorian, Mechanical Engineering Department of F.M.V. Işık University 2014-2018 I successfully completed my B.Sc. in Mechanical Engineering at Işık University, achieving the distinction of graduating as the Top Student in the Mechanical Engineering Department.

### TECHNICAL SKILLS AND INTERESTS

Languages: Turkish (Native), English (Advanced)

Programming Languages: Python, C#, JavaScript, SQL, MATLAB, OpenFOAM

Developer Tools: Visual Studio, Jupyter Notebook, Git/GitHub, Anaconda, MS SQL Server Management Studio, SolidWorks, ANSYS, SAP2000, MATLAB Simulink, AutoCAD, Revit

Frameworks: Scikit-learn, TensorFlow, Keras, PyTorch (basic), ASP.NET MVC, Bootstrap, Entity Framework

Cloud/Databases: MS-SQL, Azure (basic ML services), Dynamics 365 (AX, CRM, F&O)

Soft Skills: Academic research & publishing, scientific writing, interdisciplinary collaboration, project management, data-driven problem solving, mentoring & teaching, analytical thinking, adaptability **Personal Interest**: Nature exploration, hiking & landscape photography; art exhibitions, opera, ballet & theatre; poetry, literature & creative writing; discovering new places, cultures & innovative ideas; engineering tools & technological innovations

Coursework: Computational Fluid Dynamics (CFD), Advanced Heat Transfer, Advanced Fluid Mechanics & Dynamics, Advanced Thermodynamics, Machine Learning, Artificial Intelligence for Healthcare & Renewable Energy Systems, Structural Analysis, Smart City Technologies, Sustainability

Areas of Interest: Renewable Energy (Wind & Solar), Computational Fluid Dynamics, Machine Learning & Artificial Intelligence, Smart Cities & Sustainable Infrastructure, Biomedical Engineering, Energy Forecasting & Optimization, IoT Systems, Advanced Manufacturing

## REFERENCES

#### Prof. Dr. Sirin Tekinav

Program Director of National Science Foundation (NSF) & Board Member of Global Engineering Dean Council (GEDC)

#### •Prof. Dr. Mehmet Demirkol

Head of Department | Mechanical Engineering , F.M.V. Işık University

•Prof. Dr. Nurdil Eskin

Professor Dr., Istanbul Technical University

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