



[TechBatch] Business Statement

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[20.10.2023]

Design Studio Section:

[Section 8]

Presented by:
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MERDOL]

Introduction

TechBatch is an organization established by a group of five Electrical & Electronics Engineering senior students at Middle East Technical University. Our main goal is to bridge the gap between theoretical knowledge and practical application within cooperation. As will be stated below, we are aiming to tackle one of the proposed engineering design projects. Each has different requirements and challenges which should be considered deeply. In this report, firstly, the main structure of our organization will be mentioned. Then, capstone projects are described. At the end of the report, there will be a timetable for the duties of the team as well as the resumes of the team members.

Mission and Vision of the Company

Mission

Our mission is to collaboratively propose innovative and sustainable solutions to one of the projects of this year. We are committed to pushing the boundaries of conventional knowledge, establishing a dynamic learning environment, and delivering a solution that addresses real-world challenges. Through effective communication, benefiting from each member's expertise, and continuous refinement, we aim to create a project that not only meets academic standards but also addresses the industry's needs.

Vision

Our vision is to be recognized as a pioneering team that is known for its ability to develop and implement cutting-edge solutions. We are hoping to integrate our theoretical knowledge with practical skills, creating a project that reflects our academic knowledge and leaves a lasting impact on the field. In the end, we are aiming to propose a reliable, sustainable, and efficient solution to the project we will choose.

Human Resources

TeamBatch has been formed by keeping in mind the best compatible people who are able to meet all requirements of any project. The team has various areas of expertise, such as signal, electronics, computers, communications, and biomedical, so that the needs of any project can be fulfilled with different aspects. Although the team members specialize in distinct areas, they can work in a multidisciplinary manner. Moreover, all team members are hardworking, ambitious, well-disciplined, and have excellent communication skills.

Group Code of Conduct

- Official meeting hours will be held on Tuesday each week at 6 p.m.
- For decisions, the majority vote will be taken into account.
- Every group member is expected to attend regular meetings unless there are mandatory reasons.
- Every group member is expected to inform other group members about the developments of their tasks.
- In case of conflict, closed vote open counting will be made.
- If one of the members has a serious issue in that week, their responsibilities can be shared by other members.
- Every group member is expected to meet the project deadline.

Description of Capstone Design Projects

Project 1: Ad Hoc Network Communication System for Disaster Relief

In most of the countries, especially in our country Türkiye, some disasters such as earthquakes, floods and fire occur often. Even if interference and rescue procedures become faster and more efficient day-by-day, these procedures cannot be done sufficiently. Therefore, each disaster causes people to pass away. Even though today's technology and techniques cannot prevent deaths, it does not mean that they are useless. New ideas like this project using the technology and techniques or developments in them always provides benefits to people who suffer from disasters. The main objective of this project is to form a communication network that is going to be used when a disaster occurs. The Rescue procedure is going to be faster and more

influential thanks to the project Ad Hoc Network Communication System for Disaster Relief.

This project aims to detect disaster locations to start rescuing procedures rapidly. To realize this operation, an effective communication network between the units of the system must be formed. Communication network is used and generated by 3 mobile units and 1 base unit which is static. Transmitting messages comes true by emitting signals in infrared frequencies from base unit to mobile units and vice versa. However, there are some constraints to create this communication network:

- Range of infrared emitter to transmit data properly.
- Obstacles which mobile units may meet in a disaster area.

By considering these constraints, we should make necessary arrangements to form the communication network. At first sight, arguments below can be proposed as the solutions for different problems of the project:

1. Transmission and Reception by Units

This problem constitutes the basis of the project because detection to rescue procedures cannot be done without transmission and reception of data by the units. To provide communication, each unit should carry an emitter and receiver. However, the range of the emitter is limited; therefore, mobile units should enter this range to communicate with the base unit when it is necessary. To obtain meaningful data from the signal transmitted, decoding must be performed and embedded to the processors. For transmission and reception, proper IR sensing devices must be used.

2. Detection the Disaster Area

Mobile units should search the area to detect the disaster. For this procedure, cameras carried by mobile units should be used. Moreover, cameras lead units to avoid crashing with each other or an obstacle in the area.

3. Determination of Disaster Location

When a MU finds the disaster area, it must call the other MUs. However, to realize it, it has to know the location of itself and the disaster location. This procedure can be done by dividing the search area into predetermined fractions. Since the initial positions of the MUs are random, they must be charged by the base unit first. In this way, each MU becomes responsible for

a predetermined area. Thanks to this technique, determination of the location and calling other MUs gets easy.

Company Constraints on the Project

As a company we have a limited budget for the projects, and this project has 3 mobile units and one base unit to provide a communication network. Therefore, the expenses may be high to form these units. Moreover, in our company there is no person who has experience with motors before and motor information is needed to complete the project. Furthermore, for detection of the target field, some image processing algorithms may be needed which causes us to do extra research on them.

Project 2: Autonomous UGV

Technological devices are coming into our lives day-by-day. People of all ages can give many examples of technological devices that they use in their daily lives. Moreover, some of these devices are getting more popular and spreading such as robot vacuum cleaners. The vacuum cleaner can find its way without crashing. This can be possible by mapping. In this project, a vehicle is expected to be designed to do some operations like robotic vacuum cleaners. However, this project aims to create an autonomous Unmanned Ground Vehicle (UGV) capable of navigating indoor environments autonomously.

We'll focus on incorporating perception, planning, and control capabilities into the UGV, as in the technologies seen in autonomous cars, cleaning robots, drones, and other daily use autonomous systems. By understanding and implementing these essential components, we aim to gain valuable insights into the workings of autonomous systems and their potential applications in indoor settings. However, this project has some constraints that are expected to be met:

- The only allowed sensor is 2D LiDAR. No cameras or positioning sensors are allowed.
- The height of the device should be lower than 30 cm.

Considering these constraints of the project, we have to make necessary arrangements for the problems that can be faced during the development process.

1. Mapping

In this step, the device should be able to construct a 3D map using 2D LiDAR. It can be moved manually (human-guided way). The regions can be labeled manually and be introduced to the device. However, it is not allowed to make any corrections on the map. In this step, the problem that we will meet is mapping from 2D to 3D. To achieve this, we have to do research. Moreover, to make mapping procedures easier for us, we can use 2D LiDAR movable and rotatable.

2. Navigation

In this step, the device should be able to navigate to the target region. There may be static positive, static negative and dynamic obstacles where all should be avoided. In addition, localization must be done only using the map constructed in step 1 and the LiDAR sensor. In this part of the project, one of the problems we can face is to move without clashing. If a mistake is made at the mapping part, or the vehicle is not able to find where it is according to the map, clashing with the objects will be observed.

Company Constraints on the Project

As a company, we have a limited budget for projects so expensive devices and sensors may exceed our limit. Moreover, mapping from 2D to 3D is very risky to success.

Project 3: Direction Finding Vehicle -DFV

In today's world, people live with technology. In every part of our lives, we can observe technological devices or their impacts on us, and those generally make life easier for us. However, technology is not just used to provide facilities, it is also used for destruction. As technology is developed, new weapon systems and new defense systems start to come into our lives. Each government allocates more resources for their defense industry day-by-day. Therefore, we can say that there is not going to be a face-to-face battle in the future. Technology is used for military purposes in many different fields like radars and air defense systems. In addition to these fields, direction finding systems are also used for military purposes to find RF emitting devices or vehicles. This project can be considered as a prototype of a larger vehicle that tracks the RF signal.

The main objective of this project is finding the direction of a mobile emitter in limited time with high precision. Achieving this project provides

some advantages for defense industry products; for example, it can be used in air defense systems or tracing and targeting processes. If we look under the hood, we explain this project as:

“An emitter emitting RF signal in the range of frequencies 5-6 GHz is randomly located on a circle of 3m radius. DFV carries antennas or RF sensing devices; however, it should not emit any signal to be invisible. DFV tries to catch this emitter for at most 3 seconds by using its direction-finding algorithm.”

Even if it seems like a simple project, this project also has some constraints:

- Emitter's hopping bandwidth is at most 1 GHz.
- Frequency hopping rate of the emitter will be at least 200 hops/sec.
- The emitter will move at most with a speed of 2 m/s.

These constraints should be considered before choosing the project; however, the sponsoring company provides us with some devices that are necessary for the project to use. That contribution should also be considered because it makes the project more economical.

As in every project, we will face some problems during the creation of the DFV. These problems and their potential solutions are below:

1.Reception of RF Signal

Since the emitter is randomly located on a circle and it moves, receiving the RF signal becomes slightly harder. However, we can overcome it by using proper RF sensing devices on a proper location of the DFV.

2. Control of Motors

Emitter and DFV are mobile units. When DVF moves, it should be able to overcome sharp curves, and it should control its speed properly. To solve this problem, we should research motor controls first and learn the basis. Then, we can solve this problem after some trials.

3. Direction-Finding Algorithm

This problem is the main and the hardest problem of this project because creating a new algorithm is going to be exhaustive; however, we are sure that it is worth it. At the beginning of the project, we did not have a solid solution but after some researching procedure, we can form an excellent algorithm.

Company Constraints on the Project

In this project, the emitter is provided by the sponsoring company. However, this emitter cannot be sufficient according to the other companies' decisions. Because of the limited budget, we may have some problems on the emitter, and testing the prototype of the project. Moreover, the project can be considered as a signal processing project mainly. Therefore, some of our partners may not lean toward the project. Furthermore, in this project motor control systems may not work efficiently, and this causes some risks during the development process.

Project 4: Long Thin Hauler

Autonomous vehicles are getting widespread with each passing day. However, they come into our lives with some problems. Autonomous vehicles have different solutions for different problems; nevertheless, some of their problems in traffic or when they park need to be solved by engineers. In this project, the target is to solve the parking problem. In general, the terms "accurate position controlling and parking" refers to the successful control of a vehicle's position and parking inside a predetermined area. This is especially crucial in several sectors, including robotics, aviation, and the automotive industry.

The objective of this project is to create a specialized vehicle that can park itself automatically at a predetermined location. Specific limitations and requirements for the project need to be met. The vehicle is a specialized design that should find the predetermined parking spot and park itself from a random position and orientation within a 3m x 3m area. The vehicle must identify the location of the parking spot within the 3m x 3m area and its own position and orientation with respect to the parking spot. Moreover, the vehicle needs to compute an efficient path to reach the parking spot, considering its current position, the size and shape of the parking spot, and must maneuver

itself into the parking spot within a specified time limit of 1 minute. However, there are also some constraints that the project has:

- The vehicle should have a "forward motion only" capability, which means it can only move in the forward direction.
- The front of the vehicle should have all the sensors, and the back should have all the actuators.
- At least 30 cm should separate the motion units from the sensors.
- Over a minimum of 30 cm, wireless contact between these units must be maintained through the hollow tube.
- The vehicle's chassis must include a metallic or metal-covered hollow tube that is at least 50 cm long.
- The width of the vehicle must be within the range of 3 cm to 10 cm.
- The width of the parking spot cannot exceed 1.5 times the width of the vehicle.

By considering these constraints, we should make some arrangements to solve the problems that we may meet during the design procedure. We mentioned some of these problems and their possible solutions at first sight:

1. Finding Parking Spot

Determination of the parking spot may be difficult because it needs a complex solution. Some sensors such as LiDAR or cameras can be used for the detection. Nevertheless, some algorithms such as computer vision which are used with these sensors are needed.

2. Finding Its Own Location and Orientation

Because of the "only forward motion" constraint, to arrange the orientation becomes difficult. Moreover, the vehicle must arrange its orientation according to its location and the location of the parking spot. However, finding the location of itself is also a problem. To solve this problem, some necessary sensors, devices and also some algorithms should be used to achieve this.

3. Path Planning

If the vehicle knows its location and arranges its orientation according to the parking spot, unfortunately, this will not be sufficient for parking because there will be more than one path to achieve the mission. However, it does not

know which path is more proper or more efficient first. Therefore, some path planning algorithms must be used to solve this problem.

Company Constraints on the Project

In our company, most of us do not have experience on controlling motors and for this project, motors have an important role. Moreover, the implementation of this project requires many sensors; therefore, sensor fusion algorithms and expensive hardware may be needed. As a result, this can increase our costs.

Project 5: Mobile Application for Traffic Violation Monitoring

Traffic accidents have implications that cannot be ignored for individuals, communities, and society. The Turkish Statistical Institute announced that over 1 million traffic accidents occurred last year, close to 200 thousand of which were fatal and injured. These accidents can often be prevented simply by following the rules. Therefore, detecting and identifying the traffic violations and giving a penalty for this usually prevents individuals from doing traffic violations and finally accidents. The aim of this project is to detect traffic violations and report them in order to enhance road safety and reduce traffic congestion by developing a mobile application.

In detailed explanation, the project must detect speeding, running red lights, overtake and pass other vehicles on the right using multiple sensors. Additionally, since these must be done through a mobile app communicating via a central database, the communication between the admin and the user must be reliable and robust. Thus, there are some constraints in terms of the communications and the use of data as below:

- In 1 minute, intervals, the storage usage for recording should not exceed 10 MB.
- Again in 1 minute interval, transmitted data to the central database should not exceed 10 MB.

With these constraints our company, should find a balance between data usage and the accuracy of our detections of traffic violations and also the license plate of the detected vehicle. Thus, below are some solution proposals for different parts of the projects and their arguments:

1. Speeding Detection

For speed detection of other cars, while in motion can be difficult in many ways. Firstly, the speed of the vehicle that detects others must be known. To do that, GPS can be used in the used mobile phone. Secondly, the relative speed of the detected vehicle must be known. To overcome this issue, visual estimation can be used by comparing the fixed objects in sight. However, this may not be accurate, and creating a robust algorithm could be challenging. Another solution could be using radar detectors.

2. Running Red Light Detection

Camera sensors can be used to detect this violation. But this may have some challenges such that the acquired footage must be sent to a central database with limitations. Thus, converting footage to the gray scale probably is going to be needed. This may reduce the accuracy of the detection for the red light.

3. Overtaking on the Right Detection

For this part of the project speed and direction estimation is needed. Using image recognition algorithms can solve this problem.

4. Recognition of the license plate

Traditional algorithms such as template matching and feature extraction can be used. They are simple and fast; thus, they do not occupy too much memory. However, they may not be suitable for complex scenarios such as moving cars, bad quality images. Using deep learning algorithms to recognize the license plate can be another solution. They may be more accurate and robust, but they are computationally expensive as they need a training time with trial and errors and also, they need well documented labeled data to be prepared.

5. Mobile Application and Central Database

Multi-device support is challenging for data consistency issues. Also, statistical analysis of violations may need a careful design of complex databases.

Company Constraints on the Project

In our company, most of us don't have much experience in creating mobile applications and image processing. Thus, it seems like a project that is not

very suitable for our company. However, we still will be discussing it in the upcoming weeks.

Project 6: Smart Baby Monitor

Baby monitoring devices can ease parents' lives as they enable parents to control their baby's situation while keeping up with their daily tasks and their own lives. It has vital importance as most parents need to work hard in the daytime and have relaxing free time when they get back home to cope with their busy lives while taking care of their newborn baby at the same time. Considering that most parents are apprehensive about their babies, improving the performance of the baby monitoring devices can develop the confidence of parents through these devices and motivate them to use them more. Moreover, it is crucial to make these devices user-friendly and error-free.

The project requires:

- detection of the body temperature of the baby with high sensitivity and low error,
- detection of crying and automated responses as a lullaby or voice of the parents,
- detection of movements faster than 20 cm/sec,
- detection of whether or not the baby is sleeping,
- and lastly detection of the particular words of the baby with high precision and recall rate.

1. Accurate Sensor Data

Firstly, sensors such as infrared temperature sensors and movement sensors can be used for sensing body temperature and movement as well as detecting sleep/awake phases. Those sensors can be implemented on wearable devices. For instance, actuators can be soldered to a belt which won't disturb the baby however get the most accurate data optimizing the position.

Moreover, to achieve high-accuracy data from those sensors we can apply signal processing algorithms, which won't be challenging for our group as most of the members have experience in signal processing.

2. Communication

Besides that, communication between the main monitor and the sensors can be implemented with various wireless communication methods such as Wi-Fi or Bluetooth. The technology we are going to use should be chosen

according to the range we want, efficiency and the sufficient transmission rate. Also, since those are well-established technologies, we do not think we will face a problem in terms of destruction of the data or latency regarding communication.

3. Voice Detection and Generation of Automated Responses

Secondly, the detection of the crying of a baby with low latency and the generation of response instantly can also be achieved with signal processing algorithms which our group feels confident about. Also, we may need to implement a microcontroller or processor to manage the delay.

4. Word Classification

Lastly, the classification of the baby's words can be done by machine learning based classification algorithms, furthermore, we can generate training data sets and label them easily considering the vast amount of voice samples on the internet. Machine learning algorithms won't be challenging for us as well since our company has experience with those algorithms as well.

Company Constraints on the Project

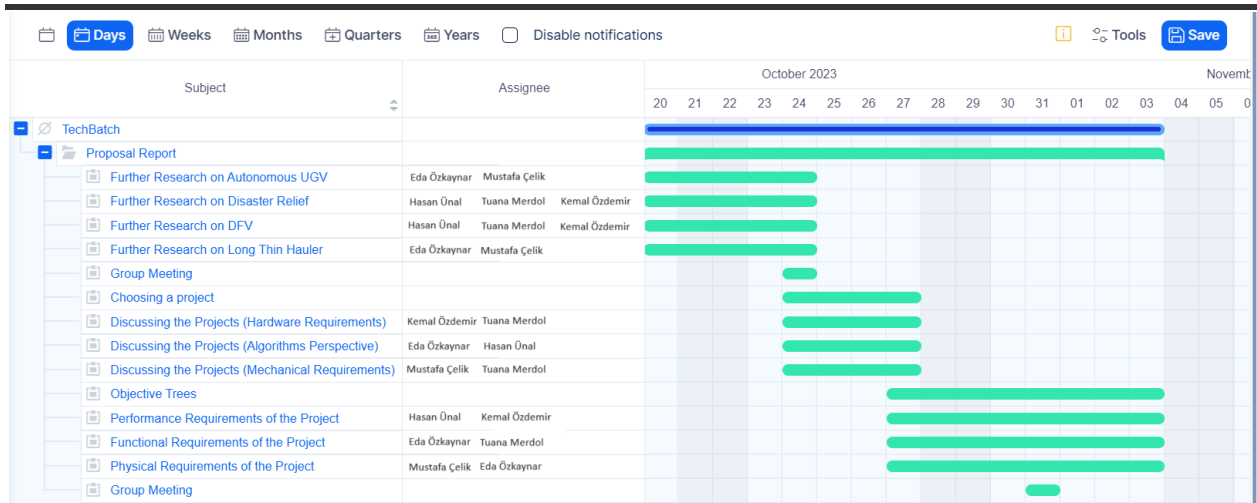
The challenges regarding that project could be the issue that lots of analog data need to be sensed and processed which will cause unpredictable errors. Also, testing the systems we implemented could be challenging as we cannot use real babies for test purposes we need to come up with alternative methods. On the other hand, this project can be done with a low budget as the sensors and the modules for communication are relatively cheap while the main monitor could be any monitor that our company already has.

Conclusion

In conclusion, TechBatch was founded by five senior Electrical & Electronics students to build a path between the academia and the areas of the industry. In this report, we introduced the structure of the organization with important topics as well as description of the capstone projects. Our commitment is to bring insight into real-world application of Electrical & Electronics Engineering. We look forward to working with cooperation to overcome challenges and achieve our goals in this journey.

Appendix 1

Timetable for the tasks including the assignment of responsibilities until the submission of the proposal report.



Appendix 2

CVs (Maximum of 2 pages per person)

Eda Özkaynar

Senior Student

Email: eda.ozkaynar@metu.edu.tr
Address: Orta Doğu Teknik Üniversitesi, Üniversite
ler Mahallesi, Dumlupınar Bulvarı No:1 06800 Çan
kaya Ankara/TÜRKİYE
Phone: 539 330-5802
Date of birth: 2000
Nationality: Turkish



OBJECTIVE

I am a senior Electrical and Electronics Engineering student with a strong background in job experiences and a passion for signal processing. As an engineer, I'm looking for a demanding position where I can use my multidisciplinary skills, dedication, and enthusiasm for learning to progress cutting-edge research.

EXPERIENCE

Feb 2022 - Present

Candidate Engineer HAVELSAN

- Development of pedestrian dead reckoning algorithm
- Development of step counter algorithm
- Kalman filter
- Signal processing

Nov 2022 - Present

Undergraduate Student Researcher Heart Research Laboratory (METU)

Supervisor: Yeşim Serinağaoğlu Doğrusöz
A graphical user interface is being developed to calculate activation time maps from cardiac signals and swiftly determine the pacing location.

Aug 2022 - Sep 2022

Internship TUBİTAK

- Research of object tracking algorithms
- Applications of object tracking algorithms with Python

Jul 2022 - Aug 2022

Internship HAVELSAN

- Development of multilateration and localization algorithms
- User Interface design using Python

Dec 2021 - Jun 2022

Candidate Engineer TAI

EDUCATION

Ankara/Turkey
2018 - Present

Electrical & Electronics Engineering Middle East Technical University

Interests: Signal Processing, Biomedical
GPA: 3.86

COMPUTER SKILLS

- MATLAB
- Python
- C/C++
- Verilog
- Siemens NX

LANGUAGES

English
Advanced

German
Elementary

Turkish
Native

AWARDS

Bülent Kerim Altay

CONFERENCE PUBLICATIONS

Graphical User Interface for the Computation and Visualization of the Cardiac Activation Times (The 31st IEEE Conference on Signal Processing and Communications Applications)

Hasan Said Unal

Ankara, Turkey | +90 (542) 664-1295 | hasan.unal@metu.edu.tr

EDUCATION

Middle East Technical University

Bs in Electrical and Electronic Engineering

CGPA: 3.67/4

Relevant Courses: Signals and Systems, DSP, Electromagnetic Theory, Computational Intelligence

Ankara, Turkey

Expected Graduation 06/2024

WORK EXPERIENCE

Middle East Technical University

Undergraduate Researcher, EE Department

- Machine learning algorithms.

Ankara, Turkey

04/2022 - Present

Interlabs Advanced Technologies

Undergraduate Researcher

- Conducted research on classification algorithms as part of the computer vision team.
- Implemented a program that utilized matching algorithms to stitch images.

Ankara, Turkey

10/2022 – 06/2023

Turkish Aerospace Inc. (TAI)

Software-Engineer Intern

- Employed my skills in C programming and socket programming.
- Developed a custom communication protocol for the server-client system for my division.

Ankara, Turkey

08/2022 – 10/2022

HONORS

- 15th of Turkish University Exam (YKS)
2018
Ranked 15th place among 2 million 600 thousand students (Top 0.0006%)

SKILLS AND INTERESTS

- *Computer Skills:* MATLAB, Python, Pytorch, LabVIEW, Machine Learning, Siemens NX, LTSpice, C Programming, Verilog VHDL, Socket Programming, Linux, FDTD
- *Language Skills:* Turkish (Native), English (Advanced Level)
- *Interests:* Paragliding, Camping

SENIOR STUDENT

MUSTAFA
ÇELİK



CONTACT INFORMATION

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🏠 Cankaya / Ankara

📞 +90 551 234 1147

📅 Feb 14, 2000

🌐 Turkish

📄 [linkedin.com/in/mustafack](https://www.linkedin.com/in/mustafack)

COMPUTER SKILLS

- MATLAB
- Python
- C/C++
- Verilog
- LTspice
- Siemens NX

LANGUAGES

- Turkish | Native
- English | Advanced
- Spanish | Elementary

OBJECTIVE

I'm a senior student in Electrical and Electronics at Middle East Technical University. My strong interest in mathematics and physics played a pivotal role in guiding my choice of this department. Upon joining METU, my fascination shifted towards the fields of signal processing and computer science. Through my coursework, projects, and job experiences, I've acquired substantial knowledge. I possess a perpetual willingness to embrace fresh opportunities that allow me to apply my learning and further expand my skill set.

EXPERIENCE

PART-TIME DESIGN ENGINEER

TAI. Ankara, Turkey | Dec 2022 - Present

Innovative Technologies

INTERNSHIP

TAI. Ankara, Turkey | Aug 2022 - Sep 2022

Flight Control Systems - System Engineering

INTERNSHIP

ASELSAN. Ankara, Turkey | Jul 2022 - Aug 2022

Weapon Systems - System Engineering

EDUCATION

MATHEMATICS / MINOR

Middle East Technical University. Ankara, Turkey | 2022 - Present

ELECTRICAL & ELECTRONICS ENGINEERING / MAJOR

Middle East Technical University. Ankara, Turkey | 2018 - Present

Interest Areas: Signal Processing, Communication & Computer

GPA: 3.63

PROJECTS & RESEARCHES

Coding Theory (2022 - Present)

Supervisor: Assist. Prof. Ahmed Hareedy

Erasmus+ "Prevention of Early School Leaving" 1st Youth Workshop (2020)

My partner and I have developed a mobile app for the prevention of early school leaving in children.

ACHIEVEMENTS

Final stage in Atılım University Mathematics Olympiad Competition (2018)

Final stage in Firat University Mathematics Olympiad Competition (2016)

Mustafa Kemal ÖZDEMİR

Contact +90-538-206-23-67

Information kemal.ozdemir@metu.edu.tr
mkozdemir1907@gmail.com

Education Middle East Technical University, Ankara, Turkey
B.S., Electrical- Electronics Engineering (2018 - current)

- CGPA: 3.50/4.00

Ankara Science High School, Ankara, Turkey (2014-2018)

- CPGA: 94.92/100

Work Experience Summer Intern

- DATABOSS Analytics & Security A.Ş. (July 2021-September 2021)

Summer Intern

- ASELSAN ELEKTRONİK SANAYİ VE TİCARET A.Ş. (August 2023-September 2023)

Skills Programming

- C, C++, MATLAB, Python, Verilog

Software

- MATLAB, Siemens NX 11.0

Languages Turkish *Native*
English *B2*
Spanish *A2*

Curriculum Vitae

PERSONAL

Name, SURNAME Tuana Merdol
Date / Place of Birth 28 August 2000 / Istanbul, Turkey
Address İşçi Blokları-100.Yıl Mah. 1524.Sok.
No:46-C Daire:20 06530 , Cankaya Ankara / TURKEY
E-mail tuanamerdol@gmail.com
e237538@metu.edu.tr
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EDUCATION

2018-Ongoing Bachelor of Science in Electrical and Electronic Engineering,
Middle East Technical University, Ankara, Turkey
(GPA: 3.73/4.0)
2014-2018 High School Diploma,
İzmir Atatürk Lisesi, İzmir, Turkey

RESEARCH and WORK EXPERIENCE

June 2023-Ongoing Erasmus Internship in Research Group of Daniel Brunner in FEMTO-ST Institute, Optics Department, France

- Research and design of an optical mesh structure to achieve the linear operations necessary for implementing optical neural networks on a chip.

October 2021 - June 2023 Undergraduate Researcher in ULTRAMEMS INC. , Dept. of Electrical and Electronics Engineering, Middle East Technical University (METU), Ankara, Turkey.

- Design and simulations of novel fiber optic MEMS microphone.
- Gained experience on optical and manufacturing simulation tools as well as real life experiment devices.

11 August 2022- 10 September 2022 Internship at ULTRAMEMS INC.

- Learned and gained experience about production of Mems Microphone. Learned software tools for production and investigation of Mems devices such as Keysight ADS and Coventor Simulator3D.

16 August 2021– 10 September 2021 Internship at DEICO Engineering Inc.

- Worked in the software design team. Generated hardware test algorithms for devices under test by using NI TestStand.

EXPERTISE & SKILLS

Software

- MATLAB
- C
- Python/ PyTorch, NumPy
- ANSYS APDL
- Verilog HDL
- Keysight ADS
- Coventor Simulator3D
- Proteus
- Siemens NX
- NI TestStand

Teamwork

- METU Robotics Society member
- METURONE Electronics Team, METU
- METU Debate

Certificates

- High-honor student at METU.
- The University of Tokyo, From the Big Bang to Dark Energy certificate from Coursera. (March 6,2021)
- Introduction to Machine Learning Course from Global AI Hub. (March 26,2021)

Languages

- Turkish (Native)
- English (Advanced Level)

Hobbies

- Digital design and drawing
- Outdoor sports and yoga