



# Najaf Jafarli Muslum

**Mechanical Engineering Bachelor's Applicant**

**Baku, Azerbaijan**

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## PROFILE

Motivated and analytical high-school student with a strong interest in **Mechanical Engineering, Robotics, Physics, Mathematics, and Technology**. Hands-on experience in mechanical design, CAD modelling, robotics, prototyping, and embedded systems through academic and independent engineering projects. Served as the **Engineering Lead and Team Captain** on team-based projects, taking primary responsibility for technical development, mechanical design, prototyping, testing, and system integration while coordinating and leading project teams. Experienced with **Fusion 360, Tinkercad, Arduino, ESP32, C/C++, sensors, servo motors, DC motors, and 3D printing**. Demonstrated strong problem-solving, leadership, teamwork, and technical presentation skills through national and international robotics competitions and STEM projects. Seeking to pursue a **Bachelor's degree in Mechanical Engineering** and develop advanced skills in engineering design, robotics, and sustainable technology.

## Education

**No. 244 Secondary School | Baku, Azerbaijan**

Expected Graduation: **2027**

**Baku Ataturk High School | Baku, Azerbaijan**

**Completed 10th Grade, 1st Semester | 2025**

**Relevant subjects:**

- Mathematics — Excellent
- Physics — Excellent
- Computer Science — Excellent

**ACADEMIC ACHIEVEMENTS**

- **Gold Medal & Awarded a Gold Medal and 2nd Place in the 'Best of the Best' round (2 gold medals)— Technology & Engineering Category,** International STEM Olympiad, 2024
  - **Awarded a 50% Grand Final Scholarship** and qualified for the Grand Final in the Netherlands.
  - **Silver Medal —STEM Olympiad Codementum Category**
  - **Silver and Bronze Medal — STEM Olympiad Mathematics**
- **2nd Place — Future Innovators Junior Category,** VII Republican Robotics Olympiad 2024
- **1st Place — Mini Sumo Category,** ROBOTEX Azerbaijan–Eurasia Championship 2024
- **Finalist — Regional STEM Innovation Competition, 2024**
- **Certificate of Participation — BP Engineering Bootcamp “From Theory into Practice” (2-Day Program), 2025**
- **Outstanding Performance Award — RoboChallenge 14th Edition International Olympiad,** University POLITEHNICA of Bucharest, Romania, 2023
- **Participant — XIV Robotic ARENA International Robotics Tournament,** Wroclaw University of Science and Technology, Poland, 2023

- **An academically distinguished high school student with a high cumulative GPA**, combining strong performance in mathematics and sciences with hands-on expertise in robotics and engineering.
- **Selected to present the “Sand Sweep” project at COP29, Baku, Azerbaijan, 2024**, by invitation of the Ministry of Youth and Sports of the Republic of Azerbaijan.
- **Certificate of Participation — “The Application of Genetic Algorithms to Artificial Intelligence” Conference, Baku, Azerbaijan, 2025.**
- **Certificate of Participation — Invited Participant, “From Azerbaijan to the World” International Mathematical Olympiad Conference, 2023.**

## **Engineering Projects**

### **MedArm Robotic Surgical Arm Project | 2025–2026**

#### **Project Purpose:**

Designed and built an **AI-assisted, remotely controlled robotic surgical arm prototype** aimed at enabling doctors to provide specialized surgical assistance to patients in conflict zones and geographically isolated areas.

#### **Technical Development:**

- Designed and modeled mechanical components in **Fusion 360** and assembled the robotic system using an **ESP32 microcontroller and servo motors** for precise and responsive movement.

- Developed a **wearable teleoperation glove with a gyroscope sensor** to capture hand movements and translate them into corresponding robotic-arm movements in real time.
- Programmed **C/C++ control logic** with an AI-assisted safety mechanism designed to detect and restrict sudden or unintended movements and alert the operator to potential errors.
- Integrated an **ESP32 camera module, pulse sensor, and blood-pressure monitor** to provide remote operators with live visual feedback and real-time patient vital-sign data.
- Conducted iterative testing and refined the mechanical and control systems to improve **movement accuracy, responsiveness, stability, and reliability**.
- **Presented the working prototype and engineering concepts to international judges and audiences at the World Robot Olympiad (WRO) 2024.**

#### **Key Engineering Features:**

- **Remote Teleoperation:** Enables robotic control from a remote location.
- **Precision & Responsiveness:** Combines servo-driven actuation with real-time motion tracking.
- **AI-Assisted Safety:** Designed to reduce the risk of unintended operator movements.
- **Real-Time Monitoring:** Provides live video and physiological data to support remote supervision.

## **Sand Sweep — Autonomous Beach Cleaning Robot | 2024**

### **Project Purpose:**

Designed and built a **fully autonomous, zero-emission beach-cleaning robot** capable of detecting, sifting, and collecting coastal waste using renewable energy, with the aim of reducing manual labor and marine pollution.

### **Technical Development :**

- **Autonomous Control:** Developed an **Arduino Mega-based control system** integrated with GPS and Bluetooth, enabling autonomous navigation with an optional manual override mode.
- **Mechanical Sifting System:** Designed a high-torque **DC motor-driven lifting and vibrating mechanism** to sift sand, separate debris, and collect waste in an onboard container.
- **Automated Waste Management:** Programmed the system to detect a full waste container and initiate an **automatic return-to-base maneuver**.
- **Environmental Sensing:** Integrated wetness sensors to prevent operation in unsuitable water conditions and light sensors to optimize cleaning schedules and prioritize **daytime solar charging**.
- **Safety & Fault Management:** Developed fail-safe control logic to detect system faults, automatically shut down hardware, and send alerts to the base station.
- **Telemetry & Emergency Response:** Integrated a **gyroscope and GPS** to detect tipping, attempt self-recovery, and transmit the robot's tilt angle and location to the base.
- **Power & Structural Engineering:** Designed a **solar-powered energy system** and calculated structural loads and joint stresses to improve durability on uneven coastal terrain.
- **Testing & Optimization:** Conducted iterative testing and optimized mechanical and control systems for improved **reliability, stability, and operational efficiency**.

#### **Key Achievements:**

- **2nd Place — World Robot Olympiad (WRO) 2024.**
- **Invited to present the “Sand Sweep” project at COP29, Baku, Azerbaijan, 2024,** by the Ministry of Youth and Sports of the Republic of Azerbaijan.
- Received **prototype acquisition and investment inquiries from multiple companies** following the competition demonstration.

### **Aquabot — Autonomous Aquatic Waste-Cleaning Robot | 2023**

#### **Project Purpose:**

Designed and engineered an autonomous, solar-powered aquatic waste-collection vessel aimed at reducing floating waste and protecting marine ecosystems in coastal areas.

### **Mechanical & Structural Engineering:**

- Designed a **twin-hull catamaran structure** to improve stability, balance, and navigation in varying water conditions
- Reinforced the chassis using **triangular truss structures** to increase load-bearing capacity while maintaining safe waterline and buoyancy limits.
- Designed and sealed the **DC propulsion system** to minimize the risk of lubricant or oil leakage into the water.

### **Electronics & Autonomous Systems:**

- Programmed an **Arduino Uno** to process ultrasonic sensor data and calculate distances to floating debris for target detection and tracking.
- Integrated **water-level sensors and an automatic bilge-pumping system** to remove water entering the vessel during operation while retaining collected solid waste.
- Integrated **GPS navigation** for autonomous return-to-shore functionality, with Bluetooth and joystick control for manual override.
- Developed a **solar charging and battery system** to support extended autonomous operation.

### **Testing & Presentation:**

- Conducted field testing under different water conditions to **evaluate stability, sensor response, navigation, and system reliability.**
- **Presented and demonstrated the working prototype at the World Robot Olympiad (WRO).**

## **TECHNICAL SKILLS**

### **Mechanical Engineering:**

Mechanical design • Technical drawing • Mechanical prototyping • Basic mechanics • Structural analysis • 3D printing

### **CAD & Design:**

Fusion 360 • Blender(beginner) • Tinker cad

### **Programming & Control:**

Java • C/C++ • Python • Arduino IDE • ESP32 programming

### **Robotics & Electronics:**

Arduino • ESP32 • Sensors • Servo motors • DC motors • Motor controllers • Gyroscope • GPS • Basic electronics

### **Software:**

Microsoft Excel • Word • PowerPoint

## **EXPERIENCE**

### **Volunteer — 5th Children's Book Festival | Azerbaijan 2026**

- Assisted with event organization and coordination.
- Supported visitors and participants throughout the festival.
- Contributed to the smooth operation of festival activities.

### **Part-Time Assistant — Local Hardware Store**

#### **Summer 2026**

- Assisted customers with selecting tools, components, and technical products.
- Maintain organized equipment and inventory.
- Developed practical knowledge of tools, materials, and workshop equipment.

- Strengthened customer service, communication, and problem-solving abilities.

## **INTERNATIONAL & PROFESSIONAL EXPOSURE**

- **COP29, Baku, Azerbaijan — 2024:** Selected to present the SandSweep project by invitation of the Ministry of Youth and Sports of the Republic of Azerbaijan.
- **ROBOTEX Azerbaijan–Eurasia Championship — 2024:** 1st Place, Mini Sumo Category.
- **World Robot Olympiad — 2024:** 2nd Place and prototype presentation to international judges and audiences.
- **Robotic ARENA International Robotics Tournament — Poland, 2023**
- **RoboChallenge 14th Edition — University POLITEHNICA of Bucharest, Romania, 2023**
- **Pasha Cup VI Hackathon — Baku, 2024**

## **LANGUAGES**

- Azerbaijani — Native
- Turkish — Native
- English —Fluent

## **INTERESTS**

- Mechanical Engineering • Robotics • Mechatronics • Aerospace Engineering • Mathematics • Autonomous Systems • Manufacturing • 3D Printing • Product Development • Space • Electric & Magnetism • Liquid Dynamics • Programming

**Hobbies:** Judo, Kickboxing, Volleyball, Swimming, Mathematics, Engineering Projects, and Software Development.