

# MAREK HROMADA

Hardware Engineer | Robotics Researcher | Systems Innovator

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**GitHub:** <https://github.com/ProgramHamza/>

## PROFESSIONAL SUMMARY

Dedicated engineering student and researcher with a strong background in hardware design, robotics, and biomedical signal processing. Experienced in developing complex physical and software systems, from relay-based computers and RF user interfaces to computer vision algorithms for industrial robotic arms. Proven track record of award-winning innovation in bionic prosthetics and applied engineering.

## TECHNICAL SKILLS & TOOLS

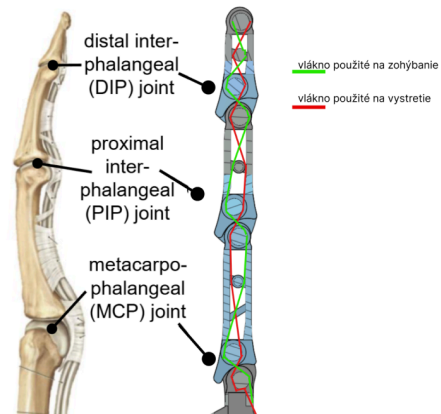
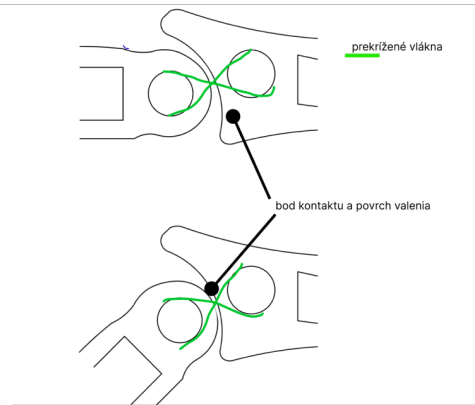
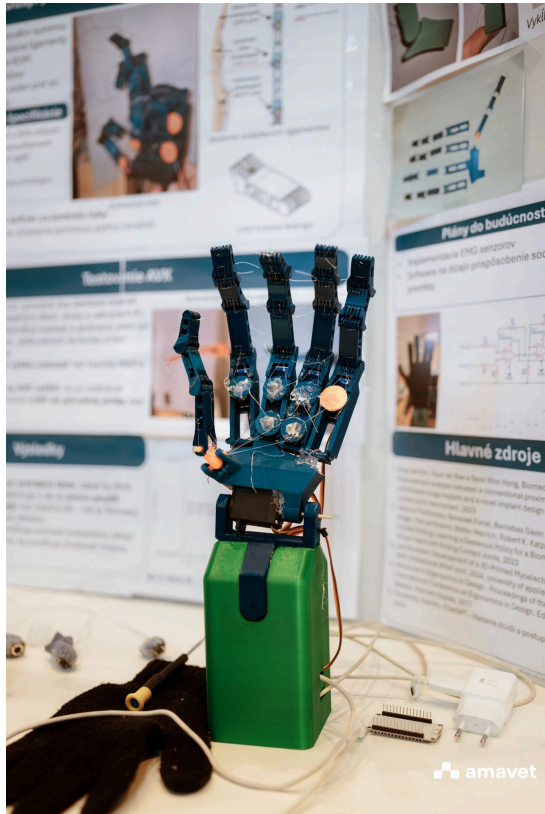
- **Hardware & Electronics:** PCB Design (KiCad), Microcontroller Programming (STM32, ESP32), Embedded Systems
- **Robotics, AI & Simulation:** ROS2, RViz, Computer Vision (MediaPipe), Reinforcement Learning (AlphaZero architecture), MATLAB (Simulations)
- **Software & Scripting:** Python, MicroPython, JavaScript, Linux environment (Ubuntu)
- **Mechanical & Design:** 3D CAD Modeling (Onshape, FreeCAD), Rapid Prototyping

# CORE ENGINEERING & RESEARCH PROJECTS

## 1. Project Anthropomorph

**Timeline:** May 2025 – February 2026 **Domain:** Biomechanics, Prosthetics

github link: <https://github.com/ProgramHamza/antromorph>



- **Bionic Joint Design:** Developing an affordable bionic prosthesis utilizing a novel anthropomorphic rolling joint (AVK) design. This design increases joint durability and extends the lifespan of the prosthetic hand while keeping the cost of the prosthesis low.
- **Biosignal Control Systems:** Experimenting with pressure sensor array wristbands and Electromyography (EMG) technologies for prosthetic control. Consulted with Fakultná nemocnica Kramáre to validate the clinical applicability of these systems.
- **Awards:** Awarded the Prize of the National Center of Robotics (NaCeRo) and the Nexttech science magazine award for the novel joint design. Won the AMAVET Festival of Science and Engineering, advancing to the European Science EXPO MILSET 2026.

## 2. COCOHRIP: Minimax Decision Models for Robotic Arms

**Role:** Researcher at National Robotics Center **Timeline:** Jan 2026 – Present **Domain:** Robotics, Computer Vision, Artificial Intelligence

github link: <https://github.com/ProgramHamza/cocohrip-marek>

- **System Architecture:** Developing computer vision and minimax-based decision models to enable a URS KUKA robotic arm to autonomously play checkers.
- **Software Implementation:** Programming in Python utilizing the ROS2 framework and RViz for 3D visualization.
- **Algorithmic Focus:** Enhancing human-robot interaction through strategic gameplay learning.

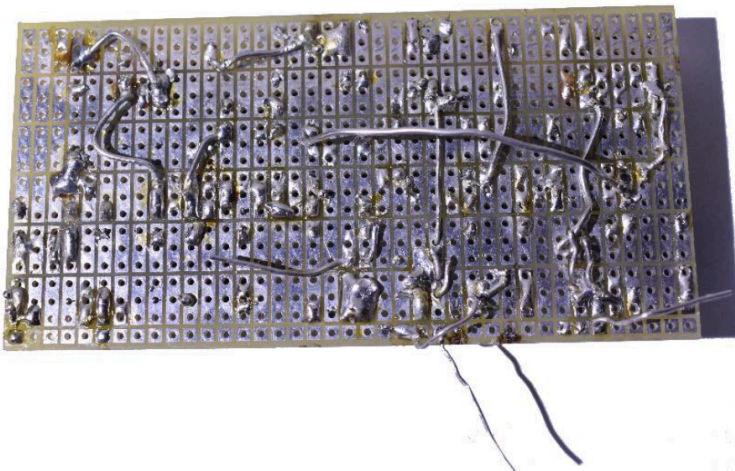
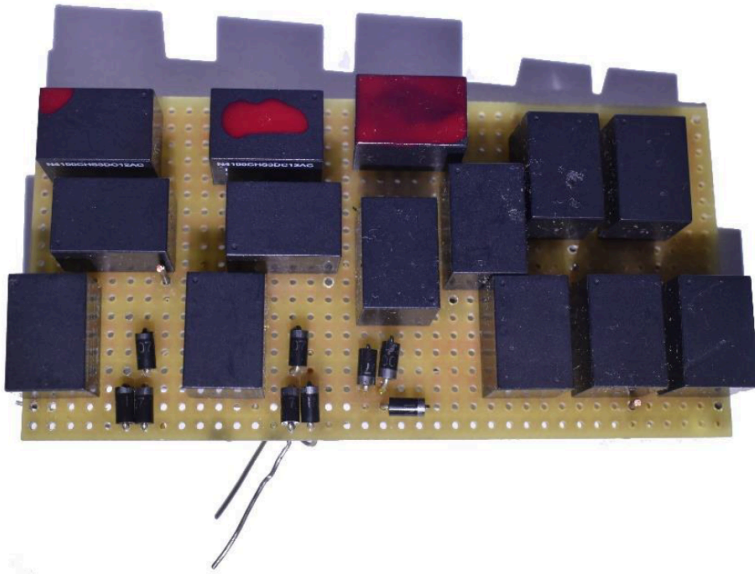
### 3. Rafui: Radio Frequency User Interface

**Domain:** Hardware Engineering, RF Signal Processing

- **Core Concept:** Engineered a 2D user input interface using the skin as a touchpad, bypassing the need for fragile glass screens in industrial and blue-collar environments.
- **Technical Specifications:** The system uses an 80MHz RF signal emitted by an oscillator located on a ring. A bracelet equipped with a sensor array reads the phase shift and magnitude difference to determine exact 2D coordinates.
- **Hardware Prototyping:** Built a working Proof of Concept (POC) utilizing an AD8302 chip and standard CMOS 80MHz oscillators. Designed for extreme environments, integrating custom PCBs, STM32 chips, and Bluetooth modules.
- **System Capabilities:** Achieved a functional calibration process taking roughly 5 minutes, allowing the system to accurately determine 3 distinct virtual buttons.

### 4. ROC: Relay Operated Computer

**Timeline:** Oct 2023 – Mar 2024 **Domain:** Digital Logic Design, Low-Level Hardware



- **Project Scope:** Built a fully functional 4 bit calculator relying on electromechanical relays.
- **Skill Development:** Expanded fundamental understanding of hardware engineering and digital logic design at the lowest level of abstraction.

**SOFTWARE**

**Arterinema (Educational Hardware Ecosystem)**

**Timeline:** Dec 2025 – Present **Domain:** EdTech, E-commerce, Hardware Kit Design

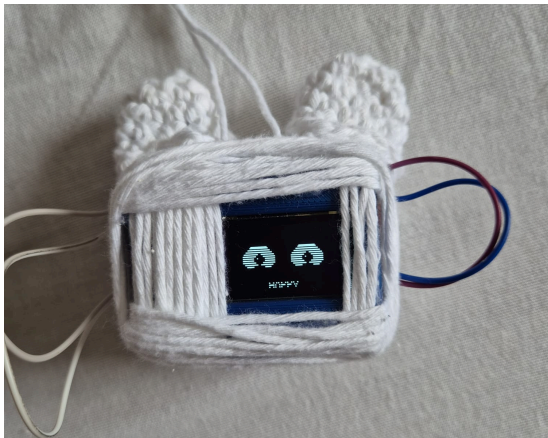
<https://arterinema.vercel.app>

- Developing an all-around educational platform to onboard beginners into electronics and engineering.
- Designed and assembled 4 proprietary hardware starter kits aligning with a custom curriculum.
- Built a community of 6,100+ followers on TikTok focused on electronics and robotics content.

### **Hackathon Prototypes and small scale projects**

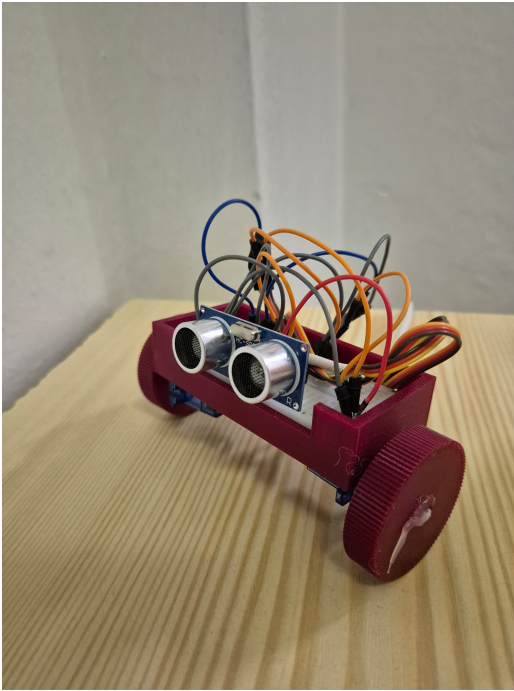
- **Pesibu:** Developed a Wi-Fi-based location tracking "Tamagotchi-style" child companion promoting green travel and safety. Awarded Honorable Mention at Climathon 2025.

product website link: <https://pesibu.vercel.app/>



- **Obstabot:** Engineered a prototype obstacle-avoiding robot used at the Pikofyz 2026 physics camp to teach children basic robotics concepts like control and feedback.

github link: <https://github.com/ProgramHamza/obstabot>



## NOTABLE AWARDS & ACHIEVEMENTS

- **1st Place (x2):** Noove Challenges
  - Design of risk factor assessment system for insurance clients
  - Banking app design for Gen-Z
- **Winner:** AMAVET Festival of Science & Engineering (Advancement to MILSET ESE 2026).
- **Prize of National Center of Robotics & Nexttech Award:** For novel design of Anthropomorphic contact joint (Project Anthropomorph).
- **Silver Medal:** International Economics Olympiad - Winter Challenge.
- **Bronze Medal:** European Statistics Competition - National Round.