AKASH

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Automation & Robotics Engineer

MSc Mechanical Engineering (Robotics & Control)
University of Colorado Boulder | 2025

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Automation • Robotics • Embedded Systems • Computer Vision

About Me

Akash Chinthamanipeta
Automation & Robotics Engineer

Who I Am

Automation & Robotics Engineer bridging mechanical engineering with embedded systems. Work spans industrial automation at Algae Barn, robotics research at CU Boulder, and internship at Emerson.

Industrial Automation

ESP32 · ESPHome · Modbus RTU · Pneumatics

Robotics & Control

ROS2 · SLAM · Sensor Fusion · Motor Control

Firmware & Embedded

C/C++ · Python · MAVLink · PCB Design

Computer Vision & AI

CNNs · Stereo Vision · Depth Estimation

Automated POD Filling Machine | Algae Barn

The Challenge

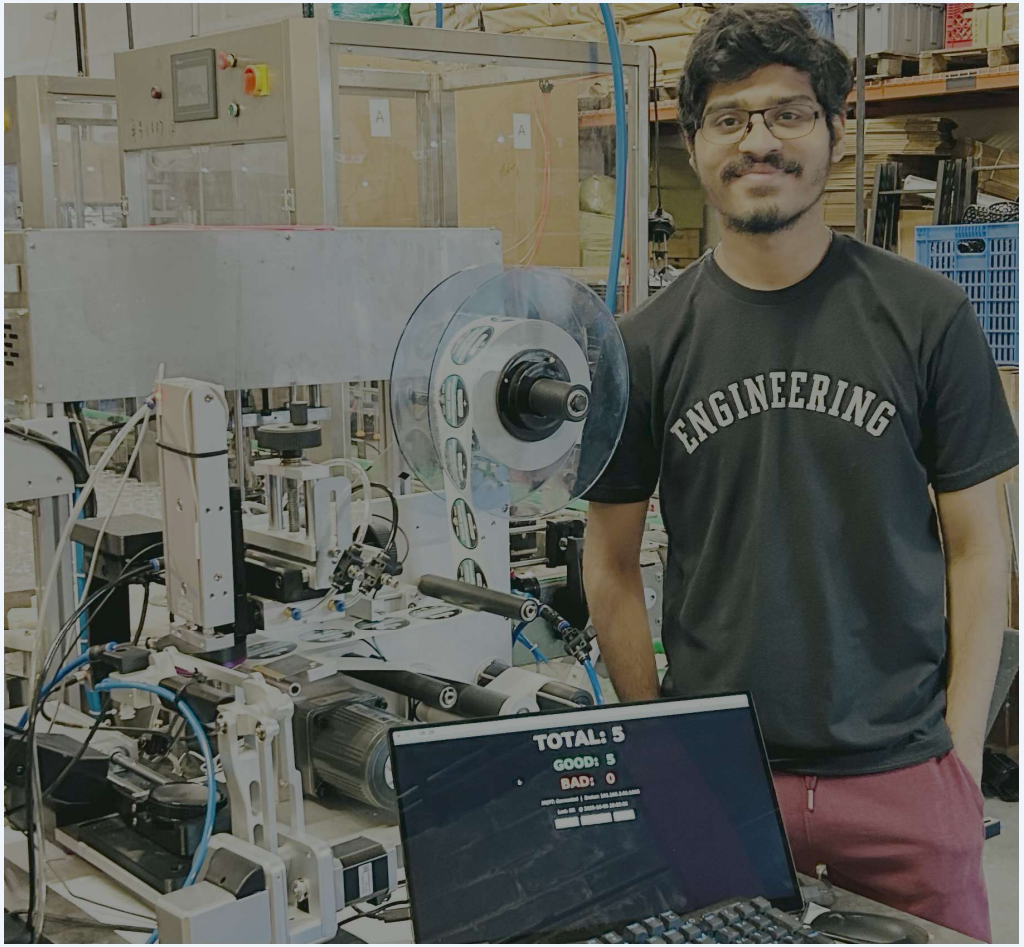
Manual bottle filling was slow, inconsistent, and labor-intensive. The goal: fully automate the fill cycle for algae-based POD products.

What I Built

- 4-head pneumatic fill system with precision solenoid valves
- ESP32-based controller with ESPHome firmware & Modbus RTU I/O
- Flow meters & level sensors for closed-loop fill control
- Relay logic with 41F-1Z-C4 relays & OP71A04 level-shifters
- Published cost-benefit results in Sakshi Education

▶ **Watch Demo Video**

Automated Sticker Labeling Machine | Algae Barn



100%
Label Accuracy

0
Manual Labor Required

The Problem

Manual sticker application was slow, inconsistent, and a significant labor cost. Every product bottle needed individual hand-labeling.

What I Built

- Designed and integrated an end-to-end automated labeling system for production bottles
- Eliminated manual labeling entirely — significant annual labor cost savings
- System tracks TOTAL, GOOD, and BAD label counts in real time (visible on-screen)
- Published cost-benefit analysis in Sakshi Education

▶ Watch Demo Video

Jar Rejection & Alert System | Algae Barn

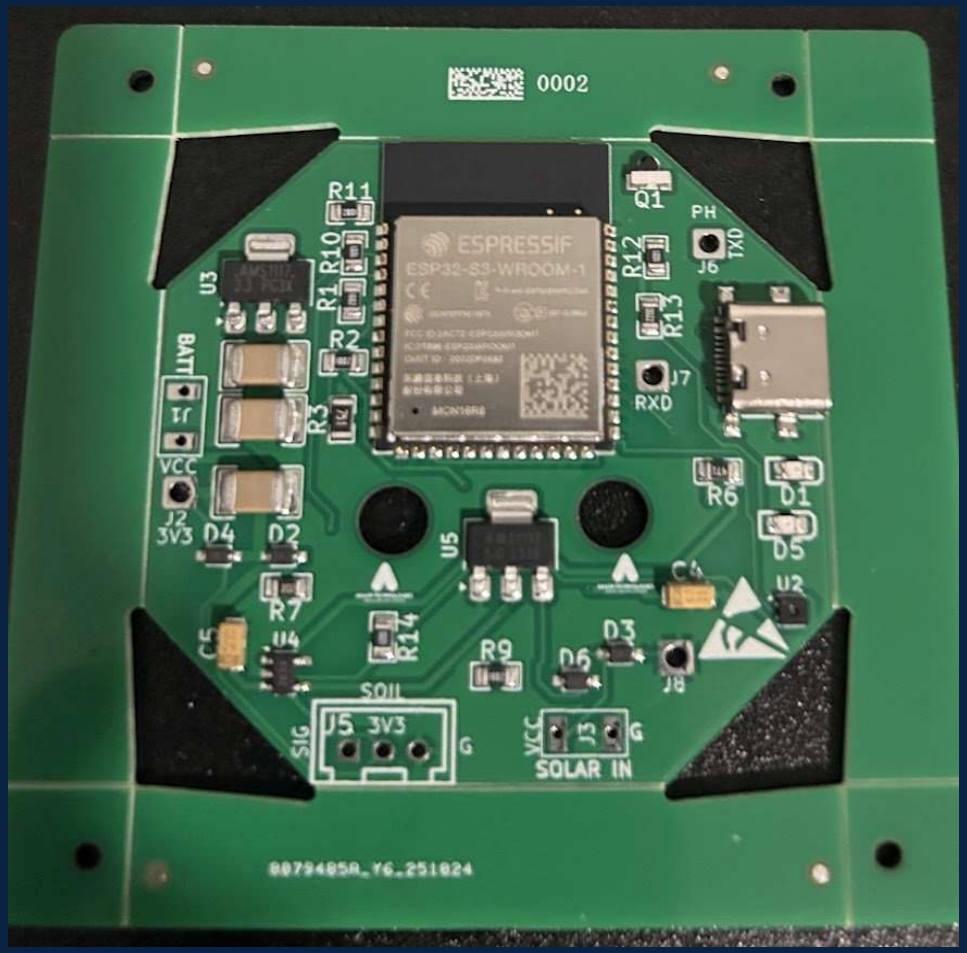
Mechanical Design · Pneumatics · Sensing · Control Logic · Stepper Motor

- Custom-built conveyor with pneumatic cylinders automatically diverts improperly sealed jars to a secondary reject conveyor
- Non-contact sensing identifies defective jars without touching the product line
- Rejection conveyor driven by stepper motor with worm gear for required torque and smooth operation

- Zone-based proximity control activates the motor only when a jar is present — extends motor life and reduces energy use
- Audible alert notifies operator when reject conveyor reaches capacity, allowing production to continue without downtime
- End-to-end solution blending mechanical design, pneumatics, sensing, and embedded control logic

▶ **Watch Demo Video**

HelioNode v0002 | Akash Technologies



What is HelioNode?

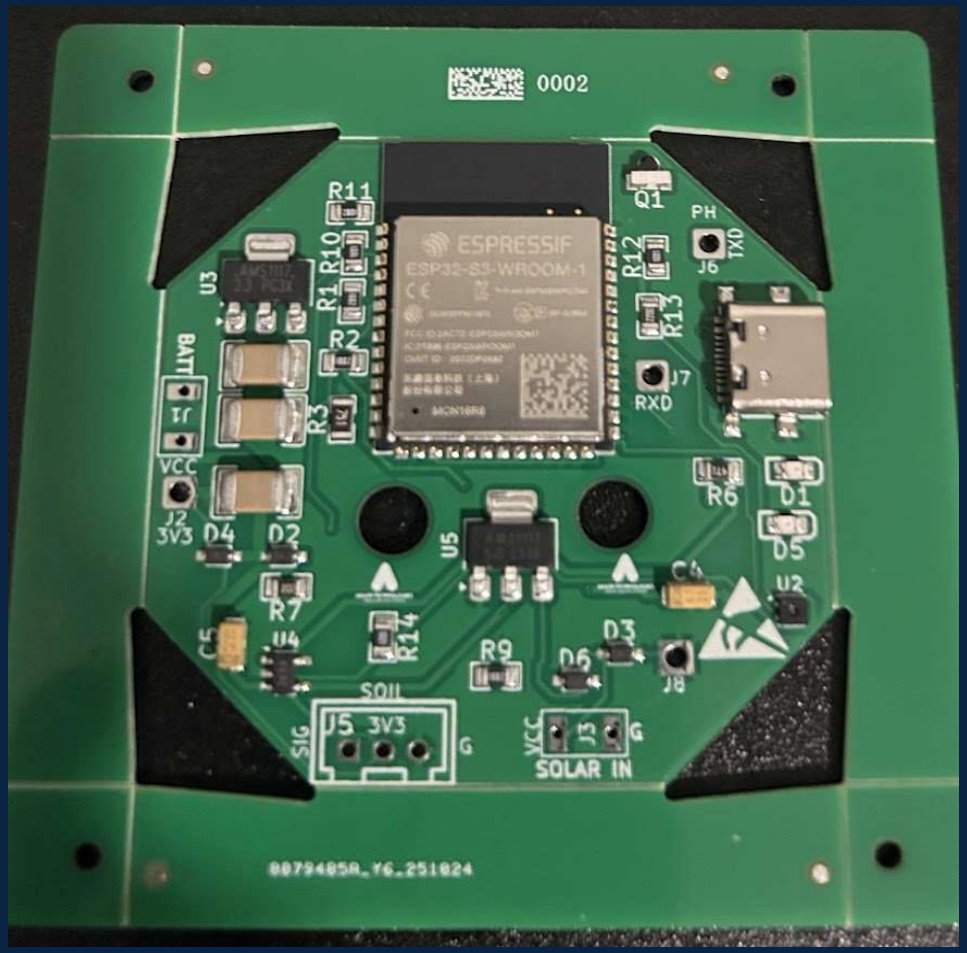
A solar-powered ESP32-S3 IoT node for agricultural and industrial environmental monitoring — the hardware foundation of Akash Technologies' product line.

ESP32-S3 MCU	**Solar** Powered	**Rev 0002** PCB

Technical Highlights

- Custom PCB design with ESP32-S3-WROOM-1, AMS1117-3.3V regulator, and solar charging input
- Schottky diode power architecture fix implemented in rev 0002 — resolved voltage headroom issue
- Supports soil moisture, temperature, and environmental sensors via I2C/UART/ADC
- MQTT → InfluxDB → Grafana data pipeline for real-time field monitoring
- Dual purpose: commercial product development + IEEE publication

HelioNode v0002 | Akash Technologies



What is HelioNode?

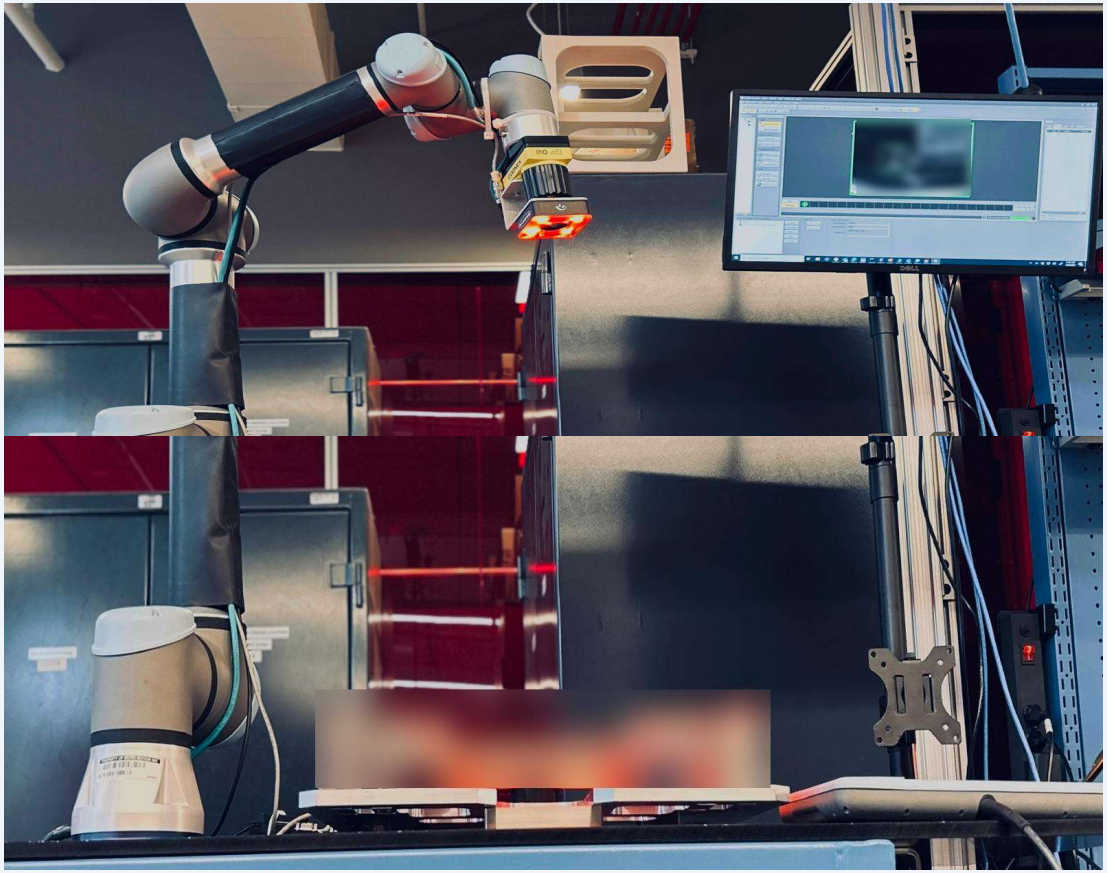
A solar-powered ESP32-S3 environmental monitoring node for agricultural IoT — the first hardware product under Akash Technologies.

Key Features

- ESP32-S3-WROOM-1 with Wi-Fi & BLE for wireless sensor data transmission
- Solar-powered with battery backup — fully off-grid capable
- MQTT → InfluxDB → Grafana telemetry pipeline for real-time monitoring
- Custom PCB revision 0002 — designed in KiCad, manufactured & assembled
- AMS1117 voltage regulation with Schottky diode optimization for rev 0003

Vision: Smart IoT nodes for US agriculture & Indian industrial SME markets — 2030 horizon

Automated Vision Inspection System | Emerson Internship

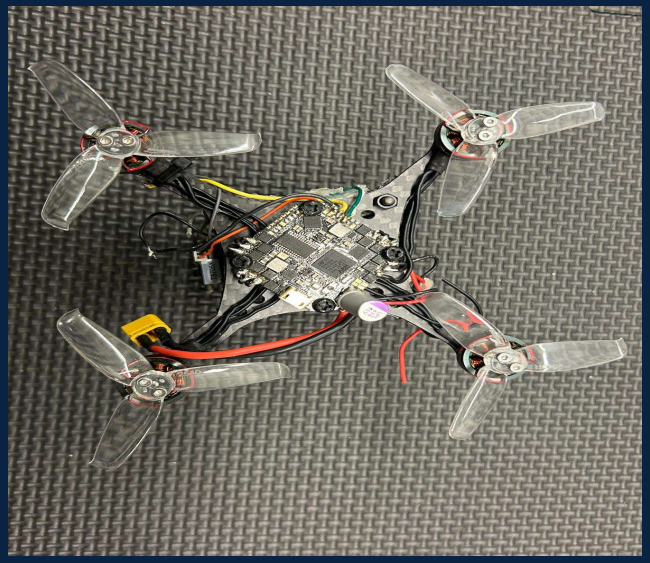


30%
Efficiency Gain

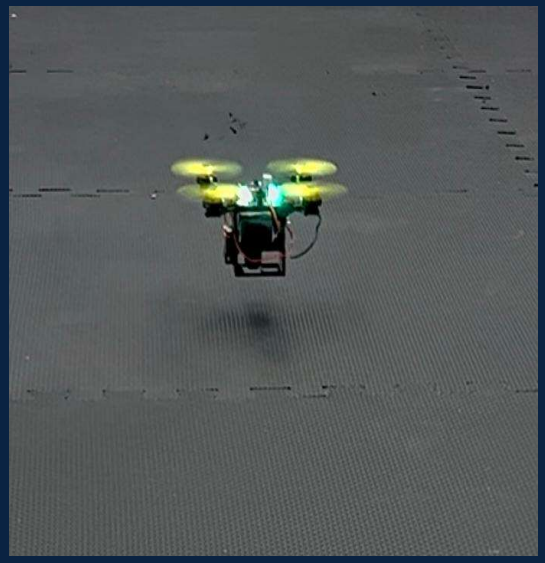
95%
Defect Accuracy

- Replaced manual braze-paste inspection with a Universal Robot arm + Cognex AI camera system
- Programmed RRT path planning for precise, collision-free robotic movement
- Implemented supervised learning algorithms for defect detection & on-screen classification
- Established Ethernet I/O communication between robot and PC for real-time control

Indoor Navigation Drone | CU Boulder PraiseLAB



Hardware Build

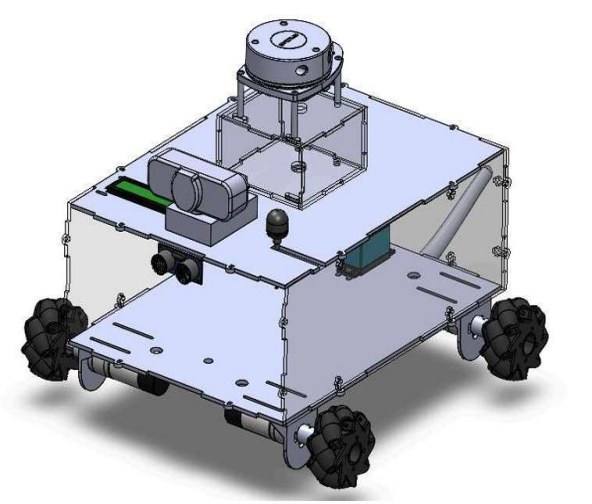


In-Flight Test

Sub-75g · Credit-card size · Speedybee F705 Mini · GPS-denied environments

- Custom firmware for Speedybee F705 Mini flight controller
- Optical flow sensors + TF Mini LiDAR sensor fusion for precise indoor localization
- MAVLink protocol for real-time trajectory commands & telemetry
- Iterative stability tuning — achieved stable hover in GPS-denied environments

Autonomous Robot with SLAM & AI Interaction | CU Boulder



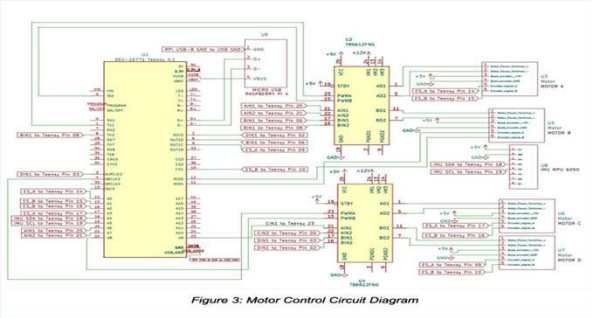
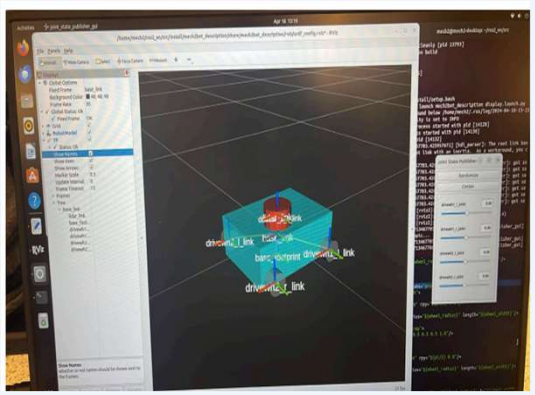
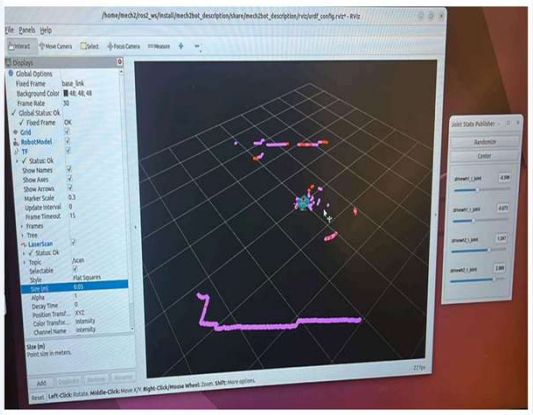


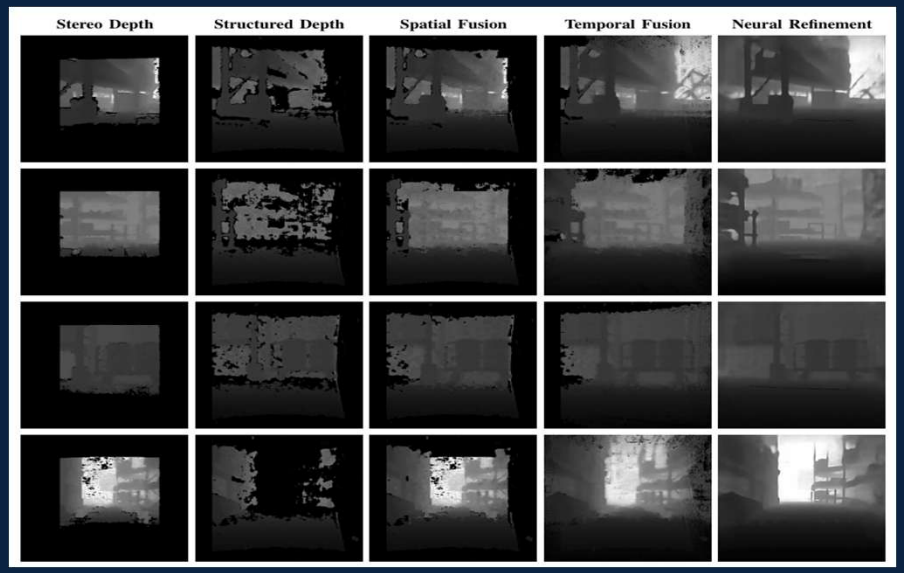
Figure 3: Motor Control Circuit Diagram

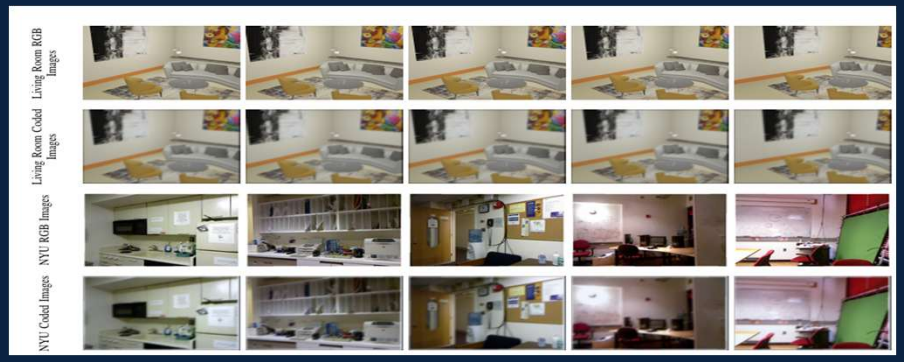




- Designed & built full robot platform — chassis, wiring, and Mecanum wheels
- ROS2 Humble + SLAM pipeline using LiDAR & IMU fusion for autonomous mapping
- Optimized pose estimation & loop closure for drift-free long-duration navigation
- AI-based facial & speech recognition for natural user interaction
- Raspberry Pi 4 + Teensyduino 4.0; tested in Gazebo/RViz simulation & real world

Multi-Modal Depth Estimation | CU Boulder



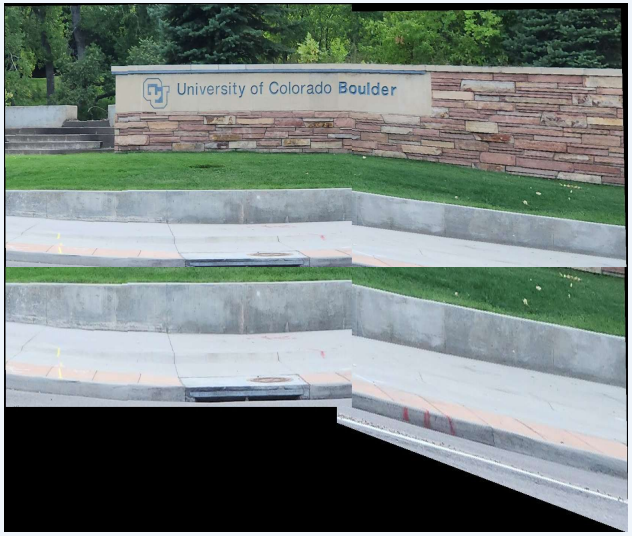


0.0117
MAE

0.0241
RMSE

- Physics-informed neural network for real-time depth estimation from multiple modalities
- Integrated stereo vision, structured light, and IMU for robust fused depth
- Coded image pipeline simulating depth-dependent blur via phase mask PSFs
- Modified U-Net architecture with skip connections for depth feature learning
- Physics-based constraints reduced per-frame computational overhead significantly

Seamless Image Stitching | Computer Vision



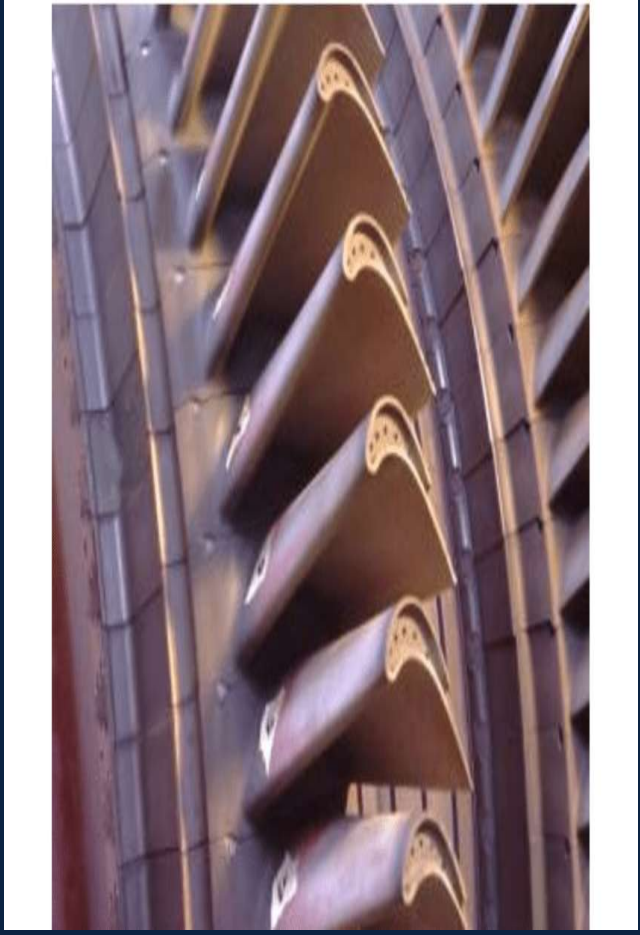
CU Boulder Campus

Indoor Room Stitch

Aerial View

- End-to-end panorama pipeline: feature detection → keypoint matching → homography (RANSAC) → warp & blend
- Handles wide-angle, indoor, and aerial scenes with minimal artifacts
- Applications: photography, virtual tours, mapping & immersive media

Gas Turbine Blade Cooling Optimization | Research



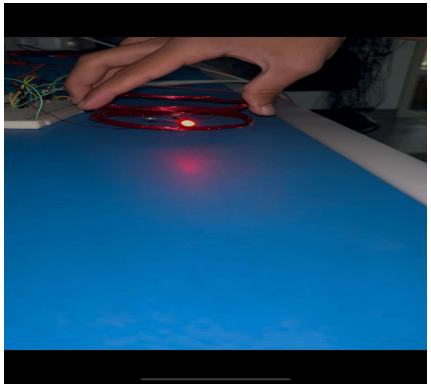
7.8%
Thermal Efficiency Gain

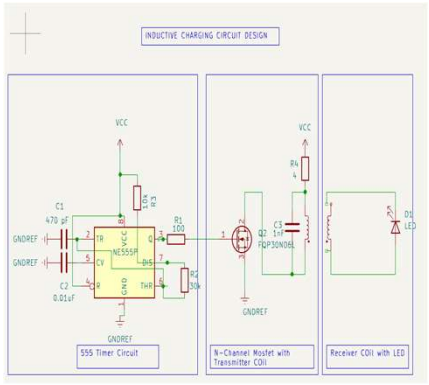
20.83%
Lower Heat Transfer

- Researched wedge-shaped cooling channels for turbine blade efficiency under extreme heat
- Designed teardrop pin fins in CATIA V5; thermal analysis with Ansys FEA
- 3D-printed & tested wedge model in controlled wind tunnel — validated with thermocouple data

Earlier Projects

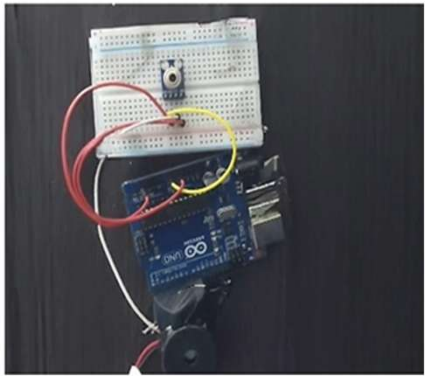
Wireless Power Transfer via Inductive Coupling

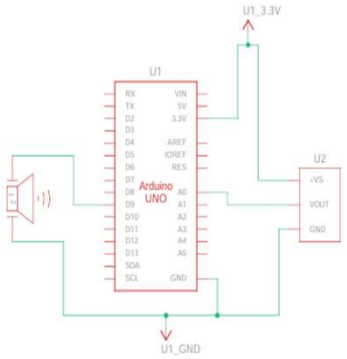




- 555 timer circuit driving N-channel MOSFET transmitter coil
- Receiver coil successfully powers LED wirelessly
- Optimized coil geometry for efficient energy transmission

Contactless Temperature Detection System





- IR sensor + Arduino Uno for contactless fever screening
- Buzzer alarm triggers if temperature exceeds safe threshold
- Designed for door/entry-point integration in public spaces

Let's Connect

Open to full-time roles in Automation, Robotics & Embedded Systems Engineering

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Automation · Robotics · ESP32/ESPHome · Modbus RTU · ROS2 · Computer Vision · Python · C/C++

VP, IEEE Denver Section (Region 5) · MSc Mechanical Engineering, CU Boulder 2025