Tiny Prism Labs

Intelligence At the edge, Innovation at the core

Our Offerings

We specialize in delivering cutting-edge solutions across three core domains.

Embedded Systems

Developing custom hardware and firmware to power intelligent devices from the ground up.

AI/ML

Building and deploying optimized machine learning models for cloud and on-device applications.

Edge Computing

Bringing real-time AI capabilities directly to your devices for instant, secure, and offline operation.

Table of Contents

Embedded Systems

Custom hardware and firmware development.

- **Custom Hardware Design:** Expertise in working with Low Power MCUs like nRF52, ESP32C6, STM32U5, STM32WBA.
- **Schematics and PCB:** Designing for custom product development.
- **Advanced Firmware:** Firmware development for specialized components like PMIC-UCD3138.
- **Component Customization:** From Sensor to Processor selection based on the use case.
- **Rigorous Testing:** Extensive hardware testing with industry standards for complete production deployment.
- **RF & IoT Connectivity:** Expertise in RF technologies such as WiFi6 and BLE 5.0 for IoT connected devices.
- **Platform Agnostic:** Proficiency in adapting to any chip platform according to the requirement.

AI/ML

Model design, optimization, and deployment for your workflows.

- **Advanced Computer Vision:** Proficient in building advanced object detection algorithms and deep learning models such as SSD and YOLO.
- **Production-Ready Models:** Deploying on-cloud and on-edge devices like Nvidia AGX/IGX and Jetson Nano.
- **Advanced Feature Extraction:** Utilizing Spectral Analysis (FFT), Spectrograms, and statistical features.
- **Data Ingestion & Processing:** Handling structured and semi-structured data using cloud technologies.
- **Big Data & ETL:** Leveraging PySpark and Apache Airflow for robust data pipelines.
- **Optimized Model Deployment:** Extensive experience with TinyML, TensorRT, and OpenVINO.
- **Multi-Modal Sensor Expertise:** Working with accelerometers, temperature sensors, microphones and more.
- **ML for MCUs:** Optimizing and deploying models on resource-constrained microcontrollers for edge intelligence.
- **Cloud Deployment:** Dockerizing applications and deploying them on GCP and Azure.
- **MLOps Pipelines:** Building model pipelines using Kubeflow, Kubernetes, and KServe.

Edge Computing

AI/ML on IoT devices for real-time, on-device decisions.

- **End-to-End Embedded ML Pipelines:** Expertise in the full lifecycle from sensor data collection and preprocessing to on-device predictions.
- **Core Focus:** Our approach emphasizes security, hardware compatibility, and cost-effectiveness in every solution.
- **Low-Power Specialization:** We specialize in deploying optimized ML models on energy-efficient, low-power processors such as STM32U5 and nRF52840.
- **Fully Offline Operation:** Our solutions ensure reliable performance with no dependency on internet connectivity.
- **Advanced Edge Platforms:** We extend our capability to advanced systems like the NVIDIA Jetson Nano, enabling scalable and secure AI solutions across a wide range of applications.

CASE STUDY // EMBEDDED SYSTEMS & EDGE AI

Accelerating Market Adoption for a Next-Generation Medical SoC

The Challenge

A new, ultra-low-power SoC for medical wearables faced a significant market adoption barrier. Potential customers lacked a production-grade reference platform, a robust SDK, and a clear demonstration of high-fidelity signal processing.

Strategic Solution

Tiny Prism Labs engineered an end-to-end development ecosystem, creating a market-ready reference wearable, a sophisticated on-chip signal processing pipeline, a flexible firmware SDK, and a comprehensive test suite.

Core Outcomes

- **Reference Design:** A complete hardware wearable serving as a viable product blueprint.
- **Signal Processing:** On-chip pipeline ensuring clinical-grade data quality.
- **Edge AI:** Power-optimized model with 98% accuracy for real-time analysis.

Technology Stack

- **Firmware:** C, Zephyr RTOS
- **Signal Processing:** CMSIS-DSP
- **AI & Hardware:** Custom Edge Engine, Altium
- **Validation Suite:** Python, Streamlit

CASE STUDY // CLOUD & ON-PREMISES

Predictive AI for Sustainable Water Management

The Challenge

A water treatment organization was operating reactively, relying on historical data and manual analysis for resource planning. This approach lacked the ability to anticipate sudden changes in water flow, leading to inefficiencies.

Strategic Solution

We developed a cloud-native AI forecasting engine on Microsoft Azure. The solution leverages advanced time-series models to predict water flow with high accuracy and delivers forecasts via a simple API for seamless integration.

Core Outcomes

- **Predictive Forecasting:** Enabled proactive, data-driven decision-making for field teams.
- **Adaptive AI:** A continuous learning loop keeps the model accurate and relevant.
- **Seamless Integration:** API-first delivery required zero changes to the client's existing dashboards.

Technology Stack

- **AI & ML:** Python, TensorFlow, LSTM, SARIMAX
- **Cloud Platform:** Microsoft Azure
- **Deployment:** REST API

CASE STUDY // ON-PREMISES & EDGE

Intelligent Traffic Analytics at the Edge

The Challenge

Municipalities and private estates often rely on cloud-based analytics for traffic management, incurring high costs and latency. A more efficient, robust, and affordable solution was needed to provide real-time vehicle analytics directly in the field.

Strategic Solution

We engineered a powerful, self-contained edge device on the NVIDIA Jetson platform. The system performs all computations locally, using a sophisticated AI pipeline for real-time vehicle detection, tracking, and re-identification across multiple cameras.

Core Outcomes

- **Instant Response:** On-device processing provides real-time analytics with zero cloud latency.
- **Cost-Effective:** Significantly lower total cost of ownership compared to cloud-based subscriptions.
- **Multi-Camera Tracking:** Re-identifies vehicles across different cameras for comprehensive journey analysis.

Technology Stack

- **Edge Platform:** NVIDIA Jetson Nano
- **AI & Vision:** Python, PyTorch, TensorRT
- **Analytics:** Custom Real-time Application

CASE STUDY // EDGE, CLOUD & ON-PREMISES

Real-time Face Recognition for Secure Environments

The Challenge

Standard security solutions often depend on a single deployment model, introducing latency or high costs. A flexible, camera-agnostic solution was needed that could perform fast, reliable recognition locally, or scale with a cloud or on-premises backend.

Strategic Solution

We engineered a highly portable solution deployable on compact edge devices, private servers, or the cloud. The system runs a proprietary, optimized facial recognition engine achieving 90% accuracy and integrates with any IP camera via RTSP streams.

Core Outcomes

- **Flexible Deployment:** Portable design runs on edge, cloud, or on-premises servers.
- **High-Accuracy AI:** Proprietary model delivers 90% accuracy in real-time.
- **Camera Agnostic:** Integrates effortlessly with existing IP cameras via RTSP streams.

Technology Stack

- **Edge Platform:** NVIDIA Jetson, Raspberry Pi 5
- **AI & Vision:** Python, OpenCV, Proprietary Engine
- **Dashboard:** Custom Real-time Application

CASE STUDY // INDUSTRIAL IOT & EDGE AI

Predictive Maintenance for Industrial Machinery

The Challenge

Unexpected machinery failures lead to costly downtime and reactive, inefficient maintenance cycles. Industrial operators required a proactive solution to anticipate equipment wear and tear by analyzing complex sensor data in real-time.

Strategic Solution

We engineered a compact, rugged hardware device that mounts directly onto machinery. This device runs a highly efficient CNN and anomaly detection model on a low-power microcontroller to process vibration and temperature data at the source, transmitting inferences wirelessly via BLE.

Core Outcomes

- **Reduced Downtime:** Proactive alerts enable maintenance before critical failure occurs.
- **On-Device Intelligence:** Real-time processing on a low-power MCU eliminates cloud dependency.
- **Seamless Integration:** Dashboard built on Grafana for easy adoption and integration.

Technology Stack

- **Hardware:** nRF52/54, STM32WBA
- **AI & Firmware:** C, TensorFlow Lite, CMSIS-DSP
- **Connectivity & Viz:** BLE, Grafana

Thank You

We look forward to discussing how our expertise can help bring your next project to life.

ajkj@tinyprismlabs.com

+91 8123577974

tinyprismlabs.com