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PAKASIC

Leading Open-Source Innovation with Local Expertise

https://www.pakasic.com
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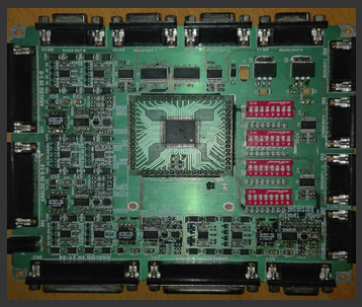

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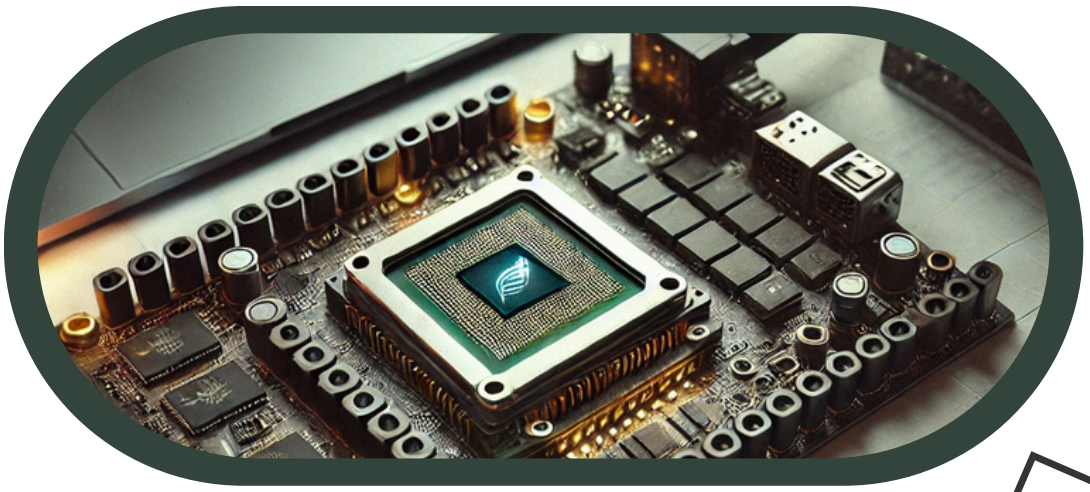
GOAL & SIGNIFICANCE:

At PakAISC, our primary goal is to lead the development and deployment of indigenous, secure, and cost-effective hardware solutions for the industry's needs. PakASIC target to empower the regional technology ecosystem by utilizing open-source software tools and hardware technologies to develop specialized and personalized high-performance computing systems that are both affordable and adaptable. Our focus is on building sustainable solutions in embedded systems, real-time applications, FPGA-based hardware, chip design, and multi-layer fast PCB design, with the ultimate aim of improving local innovation, accelerating technological self-reliance, and advancing the broader economic and industrial development.

The significance of PakAISC lies in ability to address the critical technology gap in the local industry by providing accessible, secure, and efficient design solutions. By promoting the use of open-source hardware and software tools, we are reducing reliance on costly proprietary systems and making high-performance technologies more accessible. PakASIC work is important in the context of driving local technological innovation to develop and deploy digital systems for specific needs while reducing costs.



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Vision & Mission

Our Vision

To be a pioneering force in developing indigenous, secure, and cost-effective chip designs using open-source tools and hardware architectures, supporting the local industry and community with cutting-edge solutions to drive sustainable technological advancement in the region.

Our Mission

Our mission is to address local chip design challenges by utilizing open-source software and hardware solutions. We are committed to creating innovative, secure, and affordable chip designs that meet the unique needs of our community and industry, generating a culture of technological independence and local expertise. Through collaboration, continuous learning, and cutting-edge research, we aim to be a key enabler of the region's growth in the global technology landscape.

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SPECIFICATIONS:

Secure Processor-Based System Design

Utilizing the RISC-V open-source processor architecture, PakAISC targets low-cost, royalty-free hardware designs to empower the local industry with flexible and customizable embedded processors. This approach facilitates the development of efficient and secure embedded systems that meet the specialized demands of various applications.

Real-Time Application Development

Targeting the power of Linux and the GCC compiler, we specialize in developing industrial-grade real-time applications. Our focus is on delivering high-performance solutions that meet stringent real-time processing requirements, ensuring reliability and efficiency in mission-critical systems.

FPGA-Based Hardware Design

We target open-hardware FPGA systems, integrating open-source design compilers for hardware description languages (HDL) to chip design. This enables us to deliver applications requiring bit-level parallelism and high performance, with a strong emphasis on real-time capabilities. Our FPGA solutions provide flexibility and scalability for diverse industrial and research applications.

Chip Design

Specialize in open-source chip design compilers and the HDL-to-chip development process. By utilizing these open-source tools, we aim to democratize chip design, making it accessible, cost-effective, and adaptable for local industry needs. Our goal is to create highly efficient, secure, and customizable chip solutions that drive innovation.

High-Speed Multi-Layer System Board Design

We are experienced in embedded hardware design with a strong focus on high-speed and mixed-signal PCB design. Our expertise spans multiple industries, where we have successfully led and contributed to complex, multidisciplinary projects. With a deep understanding of signal integrity, power distribution, and system integration, we design and optimize hardware solutions that meet stringent performance and reliability standards. Our ability to bridge the gap between innovation and practicality allows us to develop cutting-edge embedded systems tailored for diverse applications.

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CORE-STRENGTH AND DOMAIN AREAS

- **Low-Cost, Secure, and Flexible Chip Design:** With expertise in RISC-V processor architecture and open-source chip design compilers, we specialize in creating cost-effective, royalty-free, and secure hardware systems for local industries.

- **Real-Time Industrial Applications:** We excel in developing high-performance, real-time applications using Linux and the GCC compiler, targeting industries that require reliable, time-sensitive solutions.

- **FPGA and Parallel Computing:** Our core strength in FPGA-based designs enables us to develop custom solutions for applications requiring bit-level parallelism and real-time performance, suitable for industrial and research environments.

- **High-Speed, Multi-Layer PCB Design:** With specialized knowledge in multilayer PCB design, we provide integrated system solutions that meet both low-power and high-performance demands.

- **Real-Time Computer Vision:** We have expertise in real-time computer vision for high-speed camera interfaces such as GMSL and MIPI, along with high-frame-rate object detection and automation for edge devices.

- **Data Acquisition and Complex Systems:** Specializing in data acquisition system design, we handle multi-sensor configurations and complex applications to meet diverse industrial needs.

- **Control and Industrial Automation:** Expert in designing high-performance BLDC motor controllers for industrial automation, focusing on precision speed and torque control. Specializes in energy-efficient solutions with real-time feedback and adaptive control algorithms.

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SUPPORT & SERVICES:

- **Hardware/Software Co-Design System Development:** Provide support for the co-design, implementation, and integration of embedded systems, utilizing RISC-V processors, FPGA offloading, and open-source tools. Incorporating FPGA acceleration, computational power, provide real-time processing and parallelism to meet the demanding requirements of modern systems.
- **Real-Time Application Engineering**: Offering consulting and development services for industrial-grade real-time applications, ensuring they meet performance and timing requirements.
- **FPGA Design and Customization:** Helping clients design, implement, and optimize FPGA-based solutions with a focus on high-performance, parallel processing, and real-time applications.
- **Chip Design Services:** Providing expertise in open-source chip design and HDL-to-chip development, enabling businesses to build custom chip solutions.
- **PCB Design and Prototyping:** Offering support in designing and prototyping high-speed, multi-layer PCBs for system integration across various industrial sectors.
- **Real-Time Computer Vision:** Delivering solutions for real-time computer vision applications, particularly for high-speed camera interfaces and high-frame-rate object detection in automation systems.
- **Data Acquisition Systems:** Supporting the design and integration of multi-sensor data acquisition systems for complex industrial and research applications.
- **Control and Industrial Automation:** Providing custom motor controller designs for BLDC motors, tailored to enhance efficiency, performance, and precision in motor-driven systems. The solutions are optimized for industrial automation applications, ensuring reliable and precise control in demanding environments.

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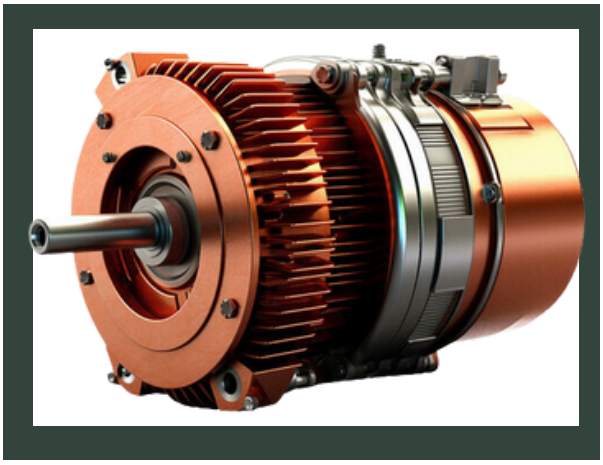
Key Applications :

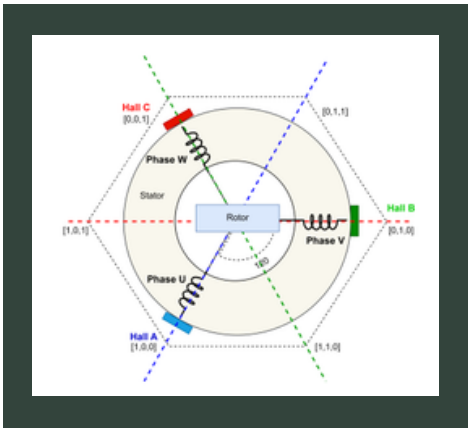
FPGA Based Seed Sorting

The seed sorting machine is designed to perform real-time sorting with exceptional speed and precision. Capable of operating at 120 FPS while processing 4K HD video, the system leverages FPGA technology to eliminate wire delays and memory read/write latency. By utilizing bit-level parallelism, it ensures efficient, high-speed performance, making it ideal for demanding sorting applications.

BLDC Smart Motor Controller

The smart BLDC motor controller is a versatile and robust solution designed for electric vehicles, supporting a wide voltage range (48V to 120V) and handling currents up to 500A. It offers scalable power output from 10KW to 50KW with modular drive card stacking and dual motor control for advanced applications. Key features include regenerative braking, multiple driving modes (brake, cruise, and speed selection), and integrated protections against overcurrent, over-temperature, and voltage fluctuations. With a user-friendly design, it provides USB and RJ45 interfaces for programming and diagnostics, along with an onboard cooling system for efficient thermal management. Its compact, rugged design ensures high performance and reliability.





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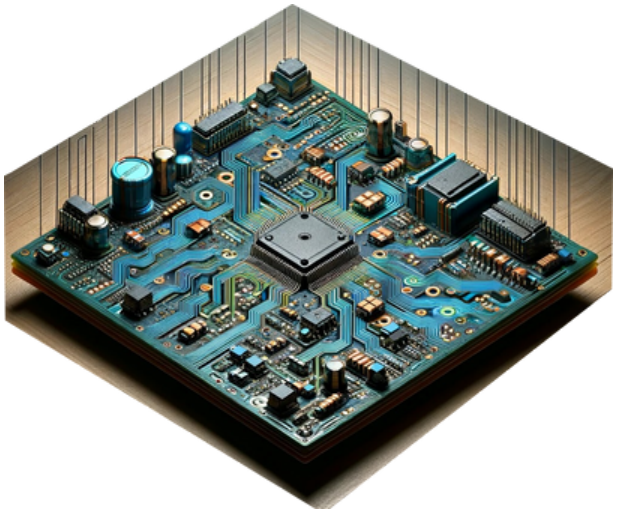
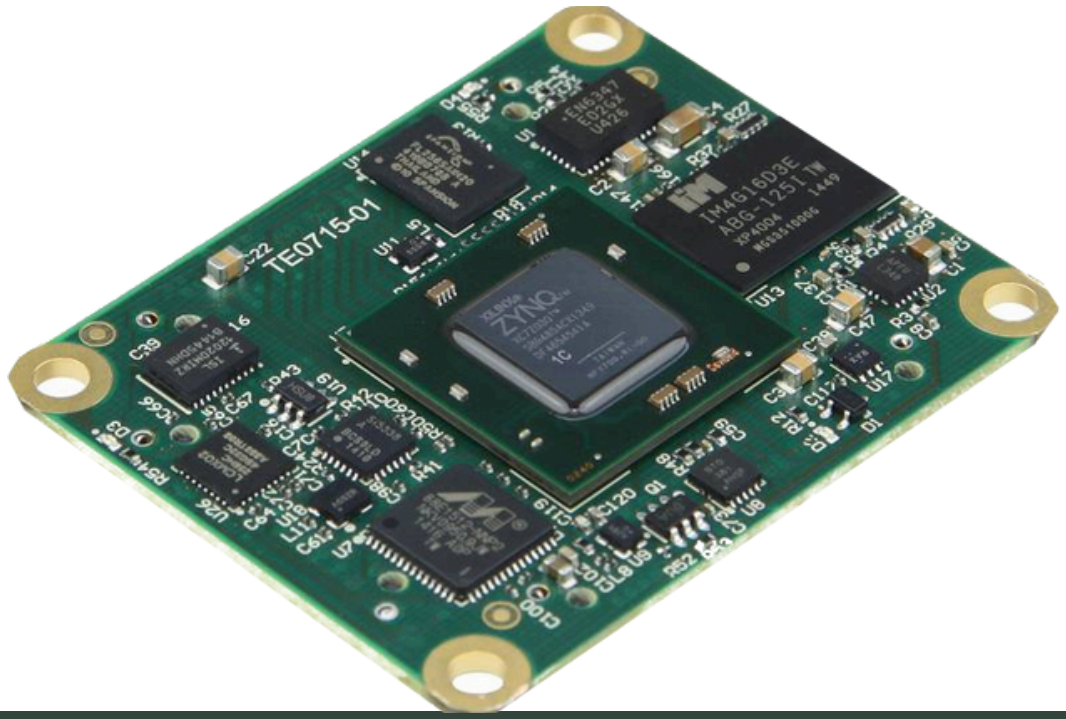
Single Board Computer Architecture with Heterogeneous Processing Systems and Mixed-Signal Technologies for Industrial Applications

We developed embedded hardware design, having high-speed and mixed-signal PCB development for advanced industrial applications. Our design includes Single Board Computers (SBCs) featuring Zynq-based FPGAs, optimized for real-time edge computing and computer vision tasks.

With extensive experience across multiple industries, we have successfully led complex, multidisciplinary projects.

Our deep understanding of signal integrity, power distribution, and system integration allow us to produce hardware solutions that meet rigorous performance and reliability standards. By bridging innovation with practicality, we deliver cutting-edge embedded systems for high-speed, real-time industrial environments.





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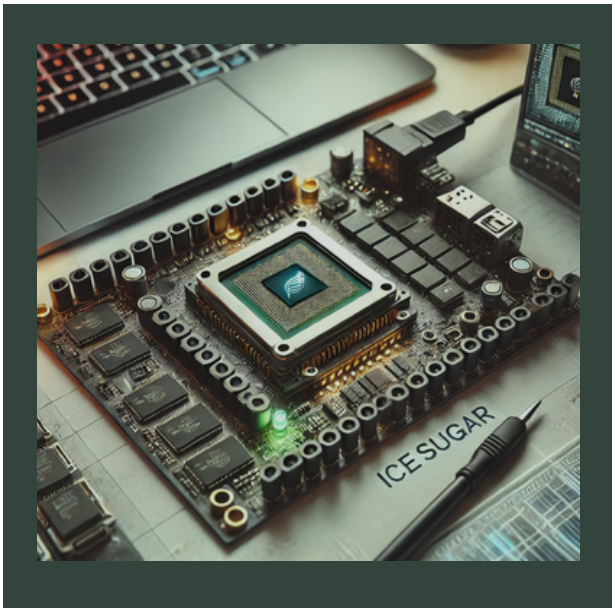
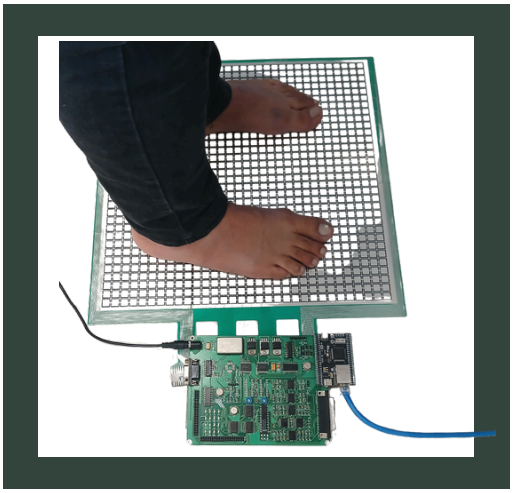
RISC-V Processor Design

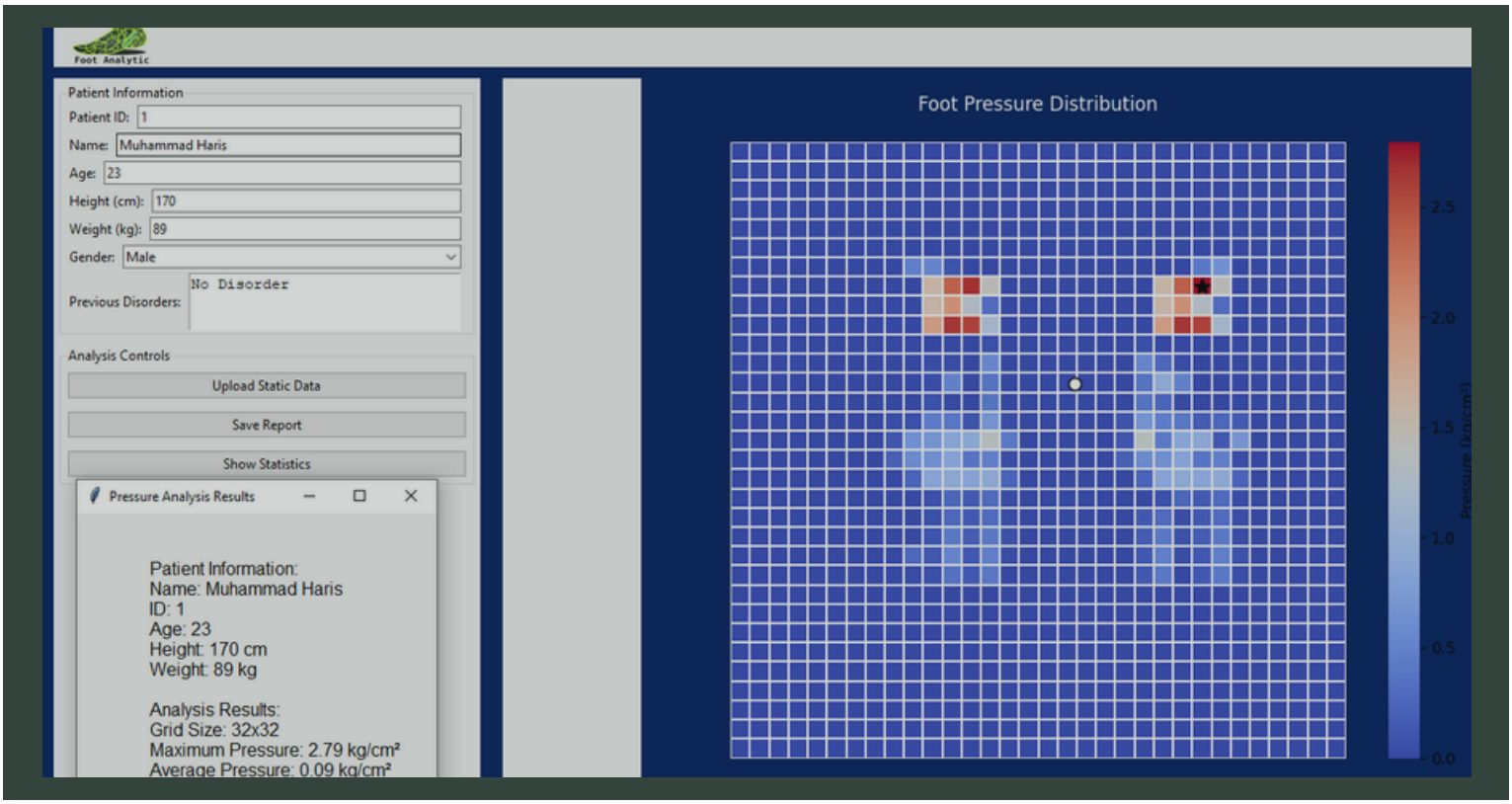
Developed an FPGA-based RISC-V processor architecture implementing the RV32I instruction set. The design has been successfully tested and verified using an open-source GCC compiler. The processor achieves a clock frequency of 50 MHz and has been tested and ported on OpenFPGA hardware, demonstrating robust performance and compatibility with open-source toolchains. This project presents an efficient and scalable processor solution for embedded applications.



Foot Weight Distribution System

The Smart Foot Width Distribution System identifies human body dysfunctions by analyzing pressure distribution across different foot points. It uses a matrix of strain gauges sensors having precise data acquisition and use open-source hardware and software technologies. The system performs real-time analysis for immediate feedback and utilizes cloud infrastructure for storing data and conducting advanced analytics, enabling detailed diagnosis of complex postural and structural issues.





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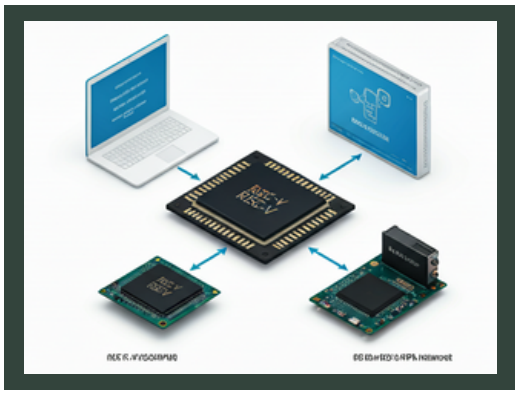
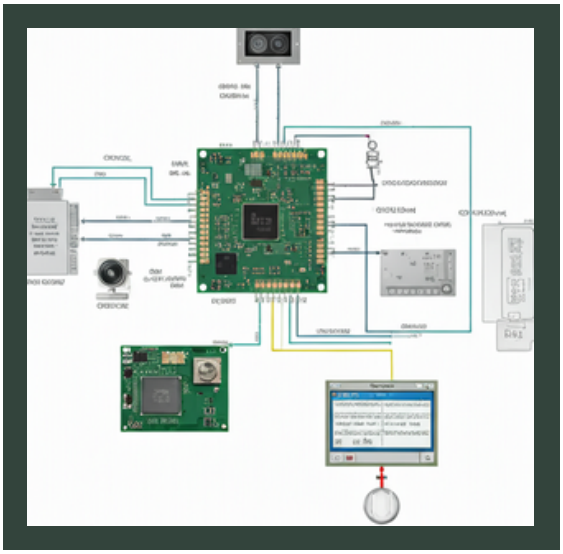
Hardware Software Co-Design

This project focuses on the hardware-software co-design of a specialized system that integrates open-source processor architectures, hardware, and software tools. The system uses a RISC-V processor for managing and controlling application processes, while FPGA accelerators handle compute-intensive real-time tasks. The RISC-V processor is programmed using GCC compilers and toolchains, while FPGA programming and porting are accomplished with open-source design compilers. The final system integrates OpenFPGA hardware and commercially available RISC-V cores for a complete, efficient, and customizable implementation tailored to the specific application needs.



FPGA based Computer Vision System for Real-time Applications

This project focuses on an FPGA-based computer vision system designed for real-time applications. It processes high-speed imaging data transferred via high-speed multimedia communication protocols, such as GMSL and MIPI, to FPGA devices. The system is optimized for real-time object detection and classification, aiming to reduce wire delays and ensure immediate data processing. Targeted at industrial applications, it addresses challenges where real-time processing is essential. The system can process a wide range of video feeds at a rate of up to 150 FPS, providing reliable performance for demanding use cases.



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