PAKISTAN SUPERCOMPUTING

PAKSUPERCOMPUTING

HPC Pioneers!

https://pakistansupercomputing.com/

PAKISTAN SUPERCOMPUTING

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PAKISTAN SUPERCOMPUTING™

GOAL & SIGNIFICANCE

GOAL:

Provide High Performance Computing Solution to solve compute intensive big-data problems for scientific research, and technological advancements in Pakistan.

SIGNIFICANCE:

Expert in Indigenous end-to-end high performance computing systems design and development for Intelligence and bigdata problems including: “Edge, Cloud, Bare-metal and Distributed Computing.

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VISION & MISSION

Vision:

To position Pakistan as a global leader in supercomputing and AI by developing indigenous, innovative, and powerful tools and technologies that address complex challenges and drive transformative solutions.

Mission:

Build a Center of Excellence in High Performance Computing (HPC) to drive innovation, research, development, and commercialization.

PakSupercomputer

Peak Performance: 1.6 PetaFLOPS

Our Clusters

1. Artificial Intelligence

- Natural Language Processing (NLP)
- Large Language Models (LLMs)
- Computer Vision
- Reinforcement Learning
- Generative AI
- AI Model Training and Optimization

2. Modeling and Simulation

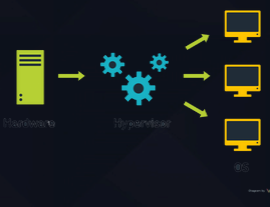
- Mesh Simulation
- Molecular Simulations
- Computational Fluid Dynamics (CFD)
- Finite Element Analysis (FEA)
- Agent-Based Modeling
- Electromagnetic Simulation
- Thermal and Energy Modeling
- Weather and Climate Modeling

OpenAI GPT-4

QUANTUMESPRESSO

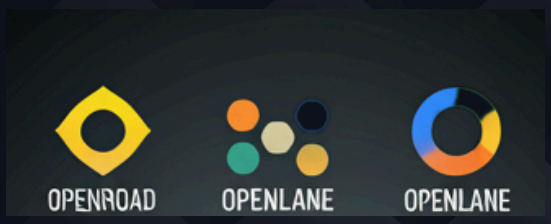
3. Cloud Computing

- Virtualization
- Hypervisor Management (KVM, Xen, VMware)
- Containerization (Docker, Podman)
- Kubernetes Orchestration
- Hybrid and Multi-Cloud Support
- Edge Cloud Computing
- Disaster Recovery and Backup
- Edge AI Solutions



4.Chip Design

- Open Hardware (RISC-V, ARM)
- FPGA Prototyping
- Tapeout Support
- Physical Design (Floorplanning, Routing)
- Open-Source EDA Tools (Yosys, OpenROAD, Magic)
- Verification (Functional, Formal, Timing)
- Digital and Analog Simulation
- Low-Power Design



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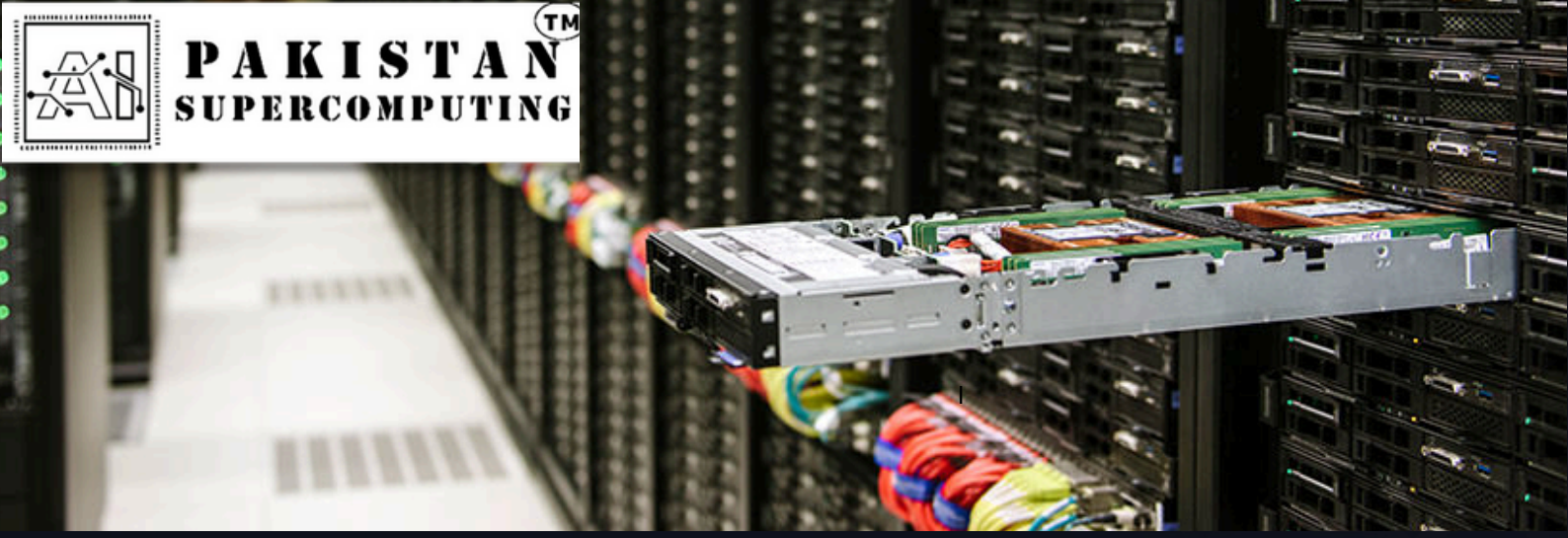

SPECIFICATIONS

Hetrogeneous Computing Power:

- Uses a heterogeneous architecture having **CPUs, GPUs, and FPGAs.**
- Theoretical performance of 1.6 PFLOPS, considered as one of the fastest HPC facility in Pakistan.

High Speed Networking Capabilities:

- High-speed interconnects for efficient and low-latency communication between nodes.
- Robust network infrastructure to support fast data transfer and communication.

Fast Storage Capicity:

- High-performance parallel storage solutions to handle large datasets using GPFS and Luster provides scalable and fast storage capacity.

Energy Efficiency:

- Heterogeneous Computing with Hardware/software co-design approach achieve top performance per watt, indicating high energy efficiency

Elastic Parallel Programming Framework :

- HPC development by offering an intuitive hardware-software co-design environment, enabling developers to create applications without worrying about complex, heterogeneous hardware architectures.

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CORE-STRENGTH AND DOMAIN AREAS

Indigenous HPC Cluster Design and Development:

- Edge, Cloud, and Baremental As Platform

Distributed Artificial Intelligence:

- Large Language Model Development and Deployment
- Large Vision Models for Edge and Cloud Computing

Opensource Simulation and Modeling:

- Parallel Mesh, Distributed Graph, Quantum Simulations, Finite Element, Monte Carlo, Molecular Dynamics, Electromagnetic, CFD, Agent-Based Modeling

Parallel Programming for HPC Applications:

- Real-time and Time Critical Industrial Application Development

Secure Digital System Design:

- Hardware-Software Co-Design using OpenFPGA and open-source RISCV processor.

Hands-On Training for Solving Real-World Industrial Challenges:

- Offer practical hands-on training programs aimed at equipping participants with industrial skills to address real-world industrial challenges effectively

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SUPPORT AND SERVICES

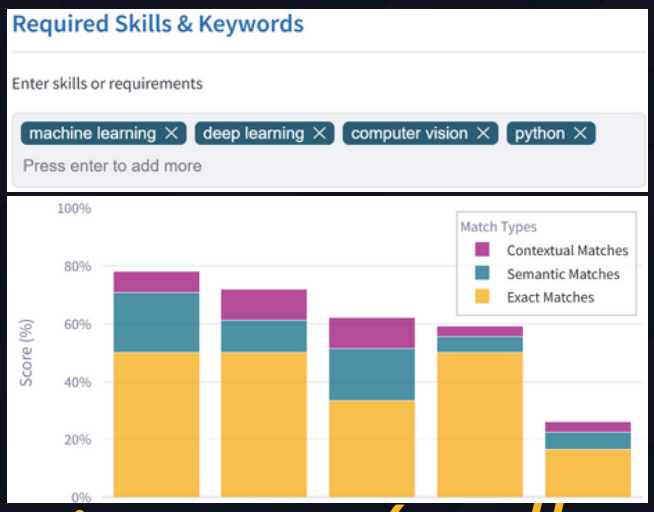
Trainings	Software Development	Technology Support
• Hands-on HPC Training Programs • Think Parallel Programming • Distributed AI • Industrial Problem-Solving with HPC • HPC for Commercializable Research	• Real-time Embedded • Data Analytics • Parallel Computing • Computer Vision • Large Language Models • Simulation and Modeling • Virtual Reality and Augmented Reality	• Decentralized HPC Cluster • Real-time Systems • Cloud Platform • Secure Hardware • Hardware Software Co-Design • Specialized Computing

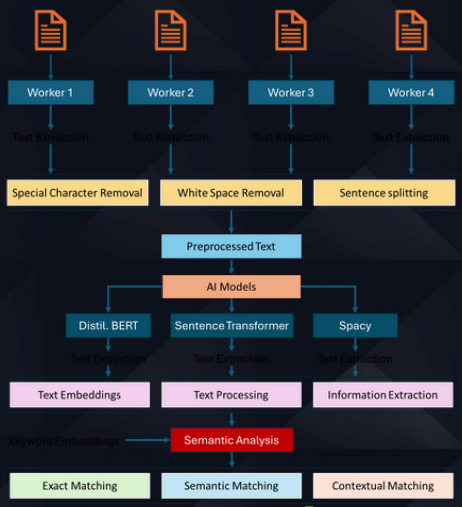
KEY APPLICATIONS & BENEFITS

Developed "12 Minimum Viable Products" against industrial problems including:

1.CVAnalyzer (http://119.156.30.89:8501):

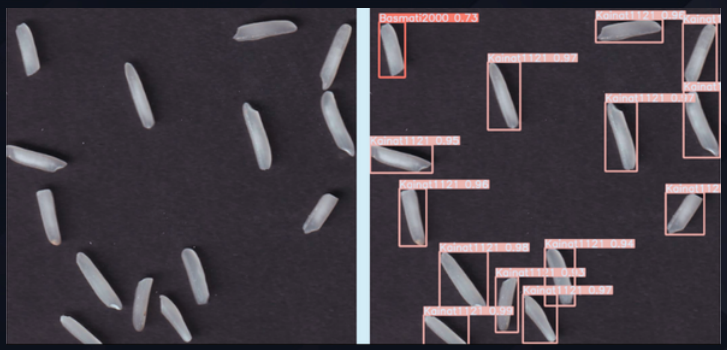
LLM based application for resume analysis and ranking using Multi-Model Semantic processing

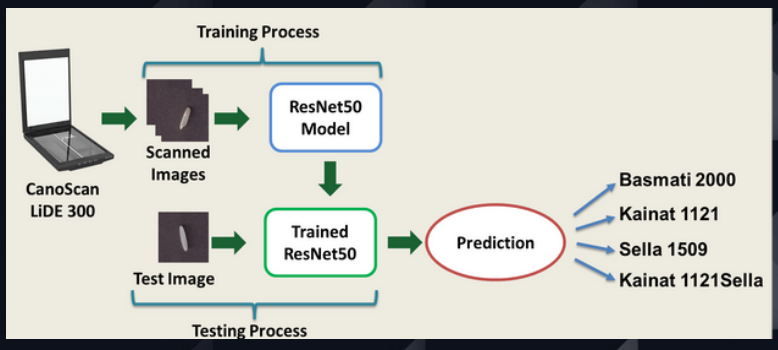




2.RiceAnalyzer (http://119.156.30.89:8502):

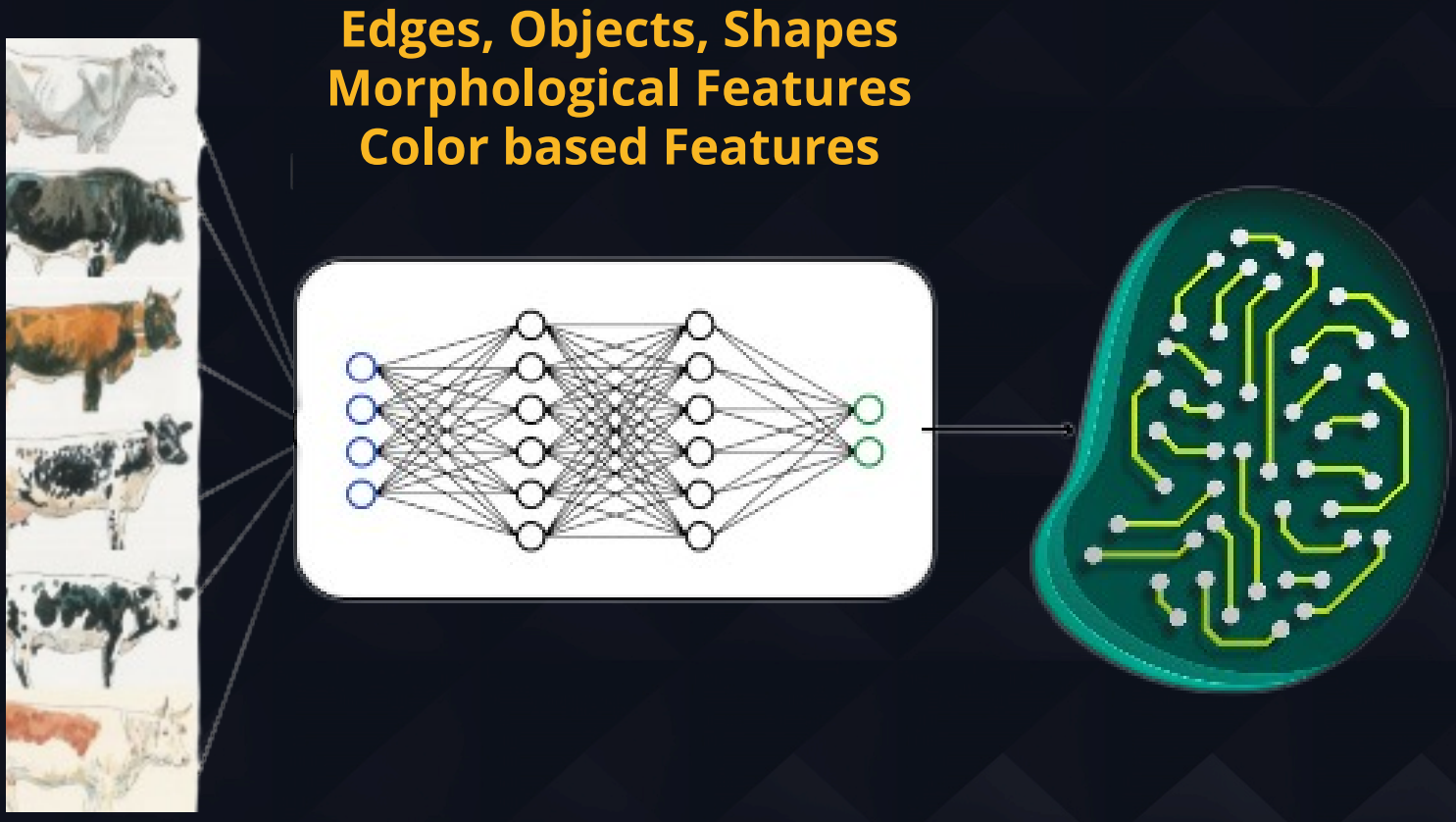
Deep learning based application for rice classification using Morphological and structural Data Engineering





3. CowAnalyzer (http://119.156.30.89:8503):

Cow Breed Classification Application Using Phenotypic Features and an Advanced Deep Neural Network Approach



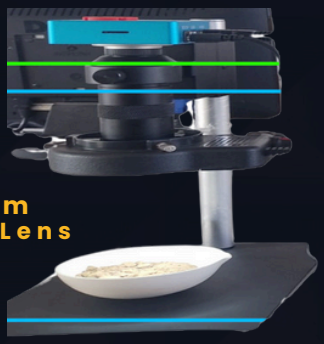
4. CricketAnalyzer (http://119.156.30.89:8504):

The CricketAnalyzer is a real-time deep learning-based application that analyzes ball speed and trajectory from high-speed video. Deployed on a cloud platform, it offers accessible analytics for cricket academies, box cricket, and sports training centers.

5.SOIL ANALYZER (HTTP://119.156.30.89:8505):

Soil texture analysis using visual features and advanced computer vision techniques

55 Mega Pixel
CMOS Camea

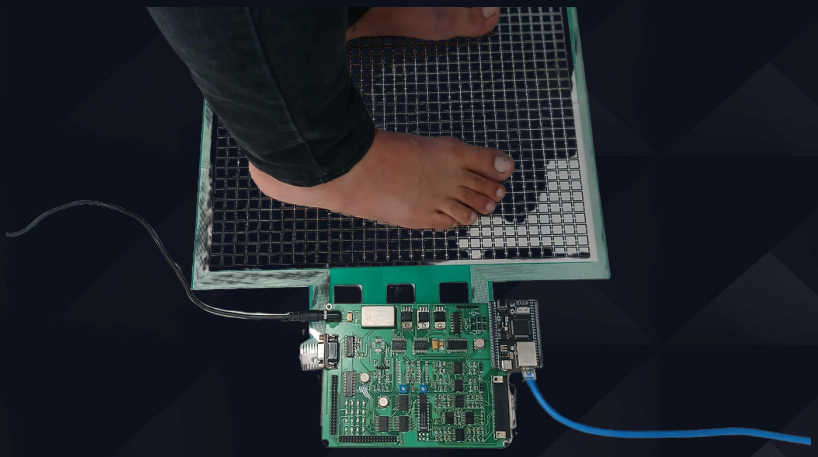


300X Zoom
C-mount Lens

HD-Screen

6. FOOT ANALYTICS (HTTP://119.156.30.89:8506):

Smart Foot Width Distribution Analysis System for Identifying Human Body Dysfunctions

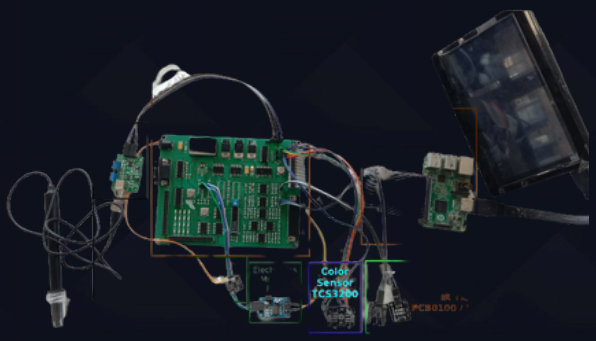


7. VR/AR FOR TELE REHABILITATION:

Virtual Reality and Augmented Reality-Based Gaming System for Tele-Rehabilitation

8. Milk Analyzer:

Identification of milk quality using optical sensors and AI algorithms for classification

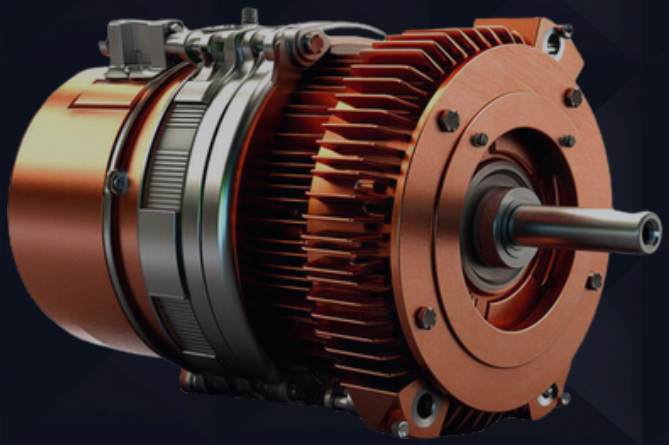


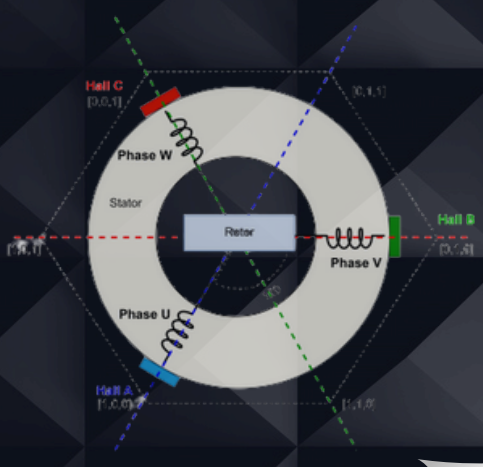
9. RISCV-Cluster:

A low power and low cost open-source RISC-V processor architecture based HPC cluster.

10. BLDC Motor Controller:

Low Cost and Energy Efficient Brush Less Direct Motor controller for industrial automation application





11.FOSSSC: A Free, Open-Source Software StackCluster for Digital System Design

FOSSSC is a free, open-source software stack-based cluster designed for digital system design, enabling chip design, verification, simulation, and programming using high-performance computing and cloud platforms for global accessibility.

12. Advanced Thermal Analytics

Thermal Vision Analytics represents a breakthrough in non-invasive temperature monitoring technology. Our system combines advanced thermal imaging with precise analytics to provide real-time temperature measurements across multiple facial regions simultaneously. This innovation offers valuable applications in medical screening, physiological research, and thermal comfort assessment.

Core Capabilities

Training & Consultancy

Application Development

Hardware Design & Development

Chip-Design

- HDL to Tapeout
- FPGA Acceleration
- Hardware-Software Co-Design
- Open-Source Processors
- EDA Toolchain

Data Center

- Secure Data Storage
- High Availability
- Disaster Recovery
- Energy Efficiency
- Network Optimization

Cloud Computing

- Virtualization & Orchestration
- Hypervisor Management
- Containerized Workloads
- Edge Computing Support

Baremetal Computing

- FPGA & GPU Acceleration
- Distributed AI
- Modeling and Simulation
- Parallel Processing

Key Achievements 2023-2024

20 Specialized Trainings Conducted

20 Local Problems Identified

6 digital datasets addressing local problems

10 Research Groups

12 Minimum Viable Products (MVP) Produced

3 Commercially Viable Products (CVP) gnearated

2 Startups

MEET OUR TEAM

Dr.Tassadaq Hussain
Director
HPC Arhictect & Parallel Programming Expert

M.Zeerak Awan
Data Analytics Expert

Nabeel Ahmed khan
Vision Model Expert

kamran Younis
Large Language Modeling Expert

M.Haris
Vision Model Expert

Amna Haider
Modeling & Simulation Expert

Sidra Khalid
HPC System Administrator

Dawood Mazhar
Embedded/Edge Computing Expert

Zubair Iqbal
Edge/Mobile & Cloud Application Expert

M.Wasay Thair
Junior HPC System Administrator

PAKISTAN SUPERCOMPUTING™

CONTACT INFORMATION

+ 92 315 6476325
+ 92 334 0045268

info@pakistansupercomputing.com

Namal University, 30km Talagang Road, Mianwali