ARTIFICIAL INTELLIGENCE

DE LORENZO

LABORATORY FOR THE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE

With this laboratory, 4 simultaneous students (hardware), and up to 16 in computer equipment (not included) working simultaneously, with this laboratory, teachers can perform more than 20 experiments.

Who is it for?
- Artificial Intelligence Engineering
- Automation Engineer
- Software Engineer
- Mechatronics Engineering
- Process Engineering
- Information Technology
- Technical and Professional Training

DL AI-MX

DESCRIPTION

The didactic laboratory for the development of Artificial Intelligence solutions is a state-of-the-art platform designed to provide a practical and complete experience in the development of artificial intelligence solutions. With software and hardware that allow to illustrate real scenarios, which will develop in the student an integral vision of problem solving from the perspective of Artificial Intelligence.

- Programming Fundamentals
- Algorithms and data structures
- Algorithm analysis and design
- Programming Paradigms
- Databases
- Digital and analog signals
- Fundamentals of Artificial Intelligence
- Web development technologies
- Digital image processing
- Machine learning
- Machine vision
- Bio-inspired algorithms
- Natural language technologies
- Neural networks and deep learning
- Software engineering for intelligent systems
- High level communication protocol

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PEDAGOGICAL APPROACH

In the didactic laboratory for the development of Artificial Intelligence solutions, the challenge-based learning (CBL) approach focuses on providing students with practical, real-world challenges that allow them to apply theoretical knowledge in specific situations. Rather than simply presenting information passively, this approach engages students in solving problems and creating innovative solutions.

Students are faced with challenges that simulate real-life and industry problems, such as process optimization, anomaly detection or efficiency improvement. Using the hardware and software available in the lab, as well as artificial intelligence tools, students work in teams to develop practical solutions that address these challenges.

MAIN CHARACTERISTICS:

- **Multidisciplinary:** Useful for the study of software development, artificial intelligence,
- **Economic:** By involving several disciplines, the cost of the product can be divided among different departments.
- **Open:** Provides the architecture to implement standard and new solutions, allowing the use of the product in professional and research activities.
- **State-of-the-art:** The product provides a descriptive view of software architecture for *development using artificial intelligence.*

MAIN DIDACTIC CONCEPTS:

- AI basics
- Machine Learning (ML)
- Sensors and actuators as data sources
- Data processing and analysis
- Programming and AI tools
- Industrial applications.

SIMULATED INDUSTRIAL CHALLENGES:

- Lighting management.
- Quality control.
- Process automation.
- Detection.
- Predictive maintenance.
- Condition monitoring.
- Optimization.

WHO IS IT FOR?

ARTIFICIAL INTELLIGENCE

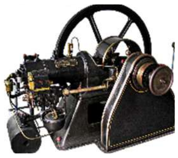
Schools, Academia and Industry (to validate theory and test concepts):

- Automation Engineer
- Software Engineer
- Mechatronics Engineering
- Process Engineering
- Information Technology
- Technical and Vocational Education and Training (TVET)

INTRODUCTION TO AUTOMATION 4.0 AND ARTIFICIAL INTELLIGENCE:

Industry 4.0 is now a reality, revolutionizing production facilities around the world. To fully exploit its potential, technicians with expertise in software engineering and automation are increasingly essential, and professionals with interdisciplinary skills are needed more than ever, Industry 4.0 thrives on the generation, storage, analysis and application of data for decision making, which requires specialized software. Technicians must understand software engineering to manage systems and automation engineering to understand industrial architectures and optimize the use of data. In this context, Artificial Intelligence (AI) is beginning to transform industrial processes by addressing needs that were traditionally met with sensors and human intervention. Although AI is poised to replace certain algorithms and sensors, this change is limited by the shortage of professionals who can bring together automation and software to develop Artificial Intelligence (Machine Learning, Neural Networks, etc.) for industrial applications, *The laboratory for the development of artificial intelligence* (the product) aims to close this gap by training software engineers with essential knowledge of automation and mechatronics, and vice versa.

1785

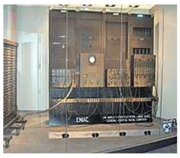


First Steam Engine: James Watt Improves on the Steam Engine, Driving Automation in the Industrial Revolution.

1913

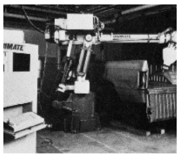
Ford Assembly Line: Henry Ford introduces the first mass assembly line, revolutionizing industrial production.

1946



ENIAC: The first general-purpose digital electronic computer is built, paving the way for computational automation.

1959



First industrial robot (Unimate): It is installed in General Motors to automate repetitive tasks on the assembly line.

1969

PLC (Programmable Logic Controller): The first PLC (Modicon 084) is created to replace hardwired logic circuits, allowing greater flexibility in industrial automation.

1980

Advanced robotics: The use of robots is becoming popular in industry to perform more complex and repetitive tasks, such as welding and assembly.

1977

Deep Blue vs. Kasparov: IBM's computer, Deep Blue, defeats world chess champion Garry Kasparov, showing the potential of artificial intelligence in complex tasks.

2000

First "smart" factory: Advanced automated control and monitoring systems with machine-to-machine communication are implemented, a precursor to the concept of Industry 4.0. Siemens (Amberg, Germany)

2001

Image recognition: The first image recognition technologies with convolutional neural networks are introduced, allowing machines to interpret images and videos.

2011

IBM's Watson: Watson wins in the Jeopardy! program, demonstrating AI's ability to process natural language and make complex decisions.

2020

Artificial Intelligence in Industry 4.0: The use of AI and machine learning to optimize production processes, predictive maintenance and real-time data analysis in manufacturing is consolidated.

2022

ChatGPT: ChatGPT is launched based on OpenAI's GPT-3 architecture, revolutionizing natural language processing and human interaction with machines using advanced generative models.

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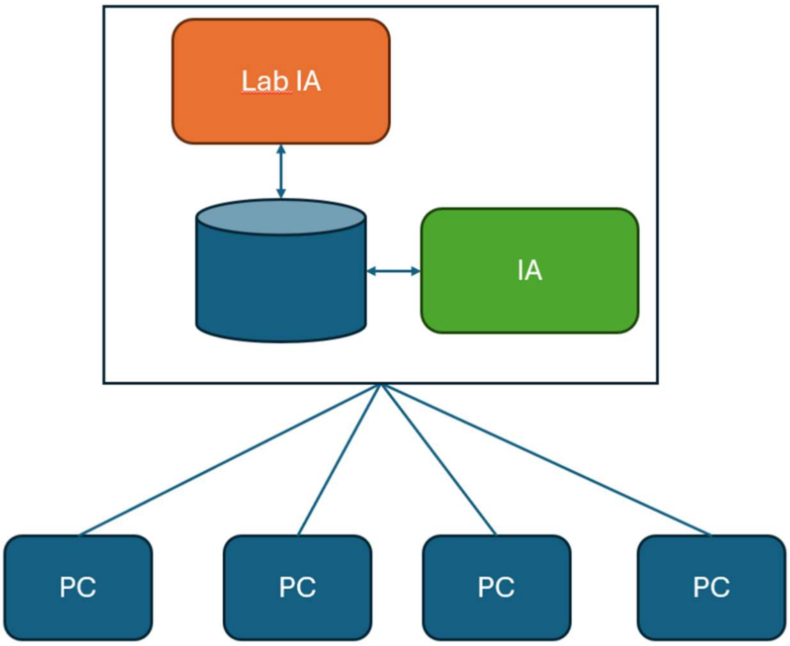
LABORATORY FLOW



The laboratory constantly generates readings on the sensors, the information is integrated into the database. Students connect and extract the information from the database, creating different AI models and using the information from the DB, also from the sensors, they can interact directly with the actuator panel to verify the result created in the AI.

ELEMENTS THAT COMPOSE IT:

SENSOR MODULE.

- They collect essential data to train AI models.
- They provide real-time information for decision making.
- They simulate real-world conditions to solve practical problems.
- They connect the physical world with AI applications.
- They facilitate experimentation with different types of data.
- They allow to measure, monitor and control environmental variables.
- They help to understand the impact of AI on physical systems.
- They promote the integration of hardware and software in educational projects.
- They promote active learning through direct manipulation.
- They foster innovation by exploring new AI applications.

ACTUATOR MODULE.

- They transform AI decisions into physical actions.
- They allow tangible interaction with the environment.
- They demonstrate the applicability of AI in real systems.
- They facilitate the validation of AI predictions and models.
- They teach how to automate processes through AI.
- They simulate practical solutions to industrial problems.
- They convert processed data into useful answers.
- They integrate theoretical learning with visible results.
- They encourage creativity in the design of intelligent systems.
- They drive understanding of the impact of AI on automation.

POWER SUPPLY MODULE.

- Universal voltage input: Compatible with 110-240V AC.
- Regulated outputs: Provides 5V and 3.3V DC simultaneously.
- Current capacity: Supports up to 2A per output.
- Overload protection: Prevents damage due to overcurrent or short circuits.
- Compact design: Easy integration into prototypes or assembled systems.
- Standard connectors: Screw terminals and pins for easy connections.
- LED indicators: Displays real-time power status.
- Energy efficiency: Reduces energy loss during conversion.
- Compatibility: Ideal for powering microcontrollers such as Arduino, NodeMCU and sensors.
- Easy mounting: Can be fixed to surfaces or educational racks.

INTERACTION AND PROCESSING SOFTWARE.

- User-friendly graphical interface: Makes it easy to read sensors and write to actuators.
- Integration with Python: Allows interaction of AI models in TensorFlow directly from the software.
- Real-time processing: Collects data from sensors and transmits it quickly to the AI.
- Feedback system: Receives AI outputs and translates them into commands for actuators.
- Data logging: Saves information for further analysis or training of new models.
- Scalability: Supports multiple sensors and actuators for complex systems.
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