




1



AI and Industry 5.0

- Human-centric, resilient, and sustainable evolution beyond Industry 4.0
- Integration of AI with human intelligence for smart collaboration
- Predictive analytics, autonomous systems, digital twins
- AI-enabled mass customization & zero-defect manufacturing
- Emphasizes sustainability, resilience, and personalization
- Key Drivers for Adoption
 - Climate Commitments & ESG Regulations
- Demand for Mass Customization

Customers expect personalized products; Industry 5.0 enables flexible manufacturing with AI support. - Workforce Empowerment: Technology complements human skill, promoting inclusive innovation and job enrichment rather than replacement.

Confidential

2

Digital Twins and Predictive Analytics



Definition- Digital twins are real-time digital replicas of physical assets that enable monitoring, simulation, and optimization

Use Cases

- **Predictive Maintenance**
Digital twins help forecast equipment failures before they occur, reducing downtime and maintenance costs
- **Resources and Energy Simulation**
They simulate energy and resource usage to identify inefficiencies and improve sustainability.
- **Workflow Optimization**
Digital twins analyze and optimize workflows, enhancing productivity and operational flow.

Impacts

- **Downtime**
Early detection of issues leads to fewer breakdowns and uninterrupted operation
- **Improved Resource Planning**
Accurate simulations support better forecasting and efficient resource allocation.

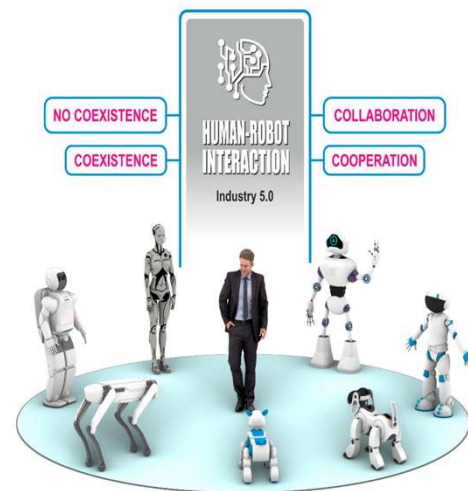
Confidential

3

Cobots & Human-Robots Collaboration



- Cobots represent a paradigm shift from full automation to augmented intelligence designed to work with people, not instead of them.
- Core Functions of Cobots: Adaptive force sensing for safety
Real-time learning from human operators Integrated vision systems for situational awareness.
- Applications in Smart Factories: Component assembly with ergonomic enhancements Collaborative painting, welding, and inspection Manipulation in medical or precision tasks.
- Human Empowerment: Cobots reduce physical strain on workers Enable redeployment to creative and decision-based roles Cobots redefine productivity through partnership not replacement.



Confidential

4

IIoT and Edge Computing



- **IIoT (Industrial Internet of Things)**
IIoT connects industrial devices and sensors to gather and analyze data for smarter operation
 - **Edge Computing**
Edge computing processes data near the source (at the edge), reducing reliance on central servers
- Benefits**
- **Lower Latency**
By processing data locally, edge computing enables faster responses with minimal delay
 - **Improves Security**
Local data handling reduces exposure to external threats and enhances data privacy
 - **Smarter and Quicker Decision Making**
Real-time insights at the source empower immediate, data-driven actions on the factory floor.



Confidential

5

Predictive & Prescriptive



- **Predictive Maintenance**
Predictive maintenance uses data to anticipate equipment failures before they happen.
- **Prescriptive Maintenance**
Prescriptive maintenance recommends specific actions to prevent or fix potential equipment issues.

Technologies

- **Sensors** - Sensors collect real-time data on machine conditions like temperature, vibration, and pressure.
- **AI-Algorithms** – AI analyzes patterns in data to detect anomalies and predict maintenance needs.
- **Cloud/Edge Analytics**
These platforms process and analyze data efficiently, either locally (edge) or remotely (cloud)

Impact

- **Reduced Costs**
Timely interventions lower repair costs and prevent costly unplanned downtime.
- **Increases Equipment Lifespan**
Regular, optimized maintenance extends the operational life of machinery.

Confidential

6

AI the Brain of Industry Automation

Artificial Intelligence is the core intelligence enabling adaptive and responsive systems within Industry 5.0. It empowers machines to learn from data, reason through complex scenarios, and make autonomous decisions that optimize production flows.



Intelligent Systems

AI provides adaptive and responsive intelligence.



Autonomous Decisions

Machines learn, reason, and act independently.



Human-Machine Interaction

Facilitates seamless collaboration.

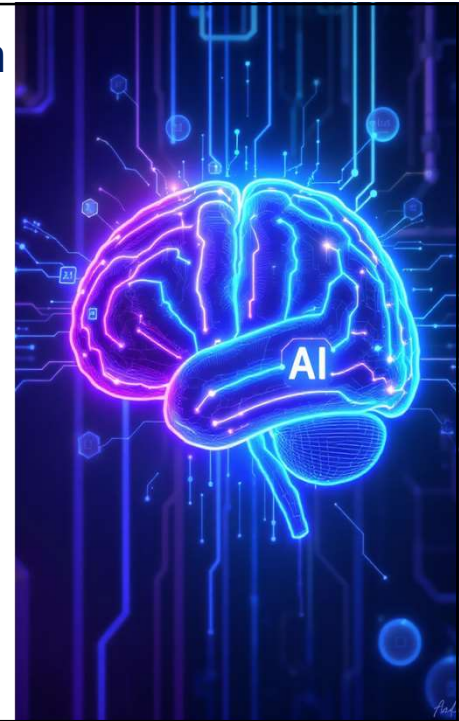


Predictive Capabilities

Crucial for complex problem-solving and optimization.



CUBE Ai SOLUTIONS
Smart Solutions, Powered by AI Brilliance

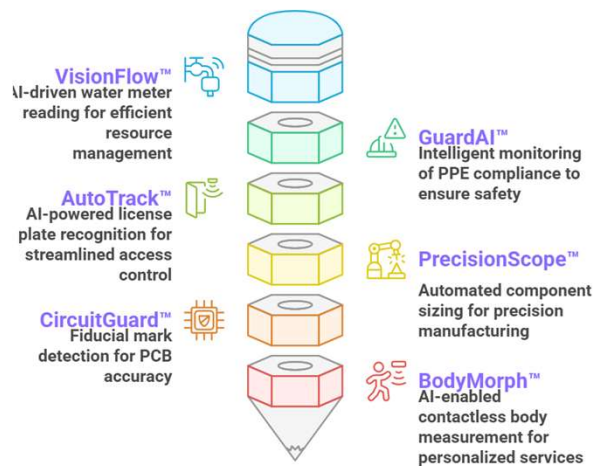


7

Innovative AI-Powered Vision Solutions Industry 5.0



CUBE Ai SOLUTIONS
Smart Solutions, Powered by AI Brilliance



8

VisionFlow – AI-Driven Water Meter Reading



Challenges

Traditional methods of water meter reading are often plagued by inefficiencies, inaccuracies, and high labor costs. Manual readings can lead to billing errors and delayed maintenance responses, impacting both utility providers and consumers.

Our AI-Powered Solution

VisionFlow utilizes advanced image processing and machine learning algorithms to extract and process meter values from images in real-time. This innovative solution integrates seamlessly with cloud-based systems, enabling automated billing and continuous monitoring of water usage.

Key Benefits

- 99.9% Accuracy in Readings**- Our AI technology ensures that readings are precise, reducing disputes and enhancing customer satisfaction.
- Reduces Operational Costs**- By automating the reading process, utilities can significantly lower labor costs and improve resource allocation.
- Enables Predictive Maintenance**- With real-time data analytics, utilities can anticipate maintenance needs, leading to smarter city applications and improved service delivery.

9

Automated Vision-Based Water Meter Reading



Problem Statement

•**Automation and Precision**- Advanced image processing algorithms enable accurate extraction of water meter readings, even in challenging conditions like poor lighting or dirt on meters. This ensures 99.5% accuracy and reliable data for billing, consumption analysis, and maintenance.

Solution

•**Cost and Time Efficiency**-Automating meter readings reduces labor costs by 85% and speeds up the reading and billing process. Continuous real-time data streaming eliminates manual entry, streamlining operations and improving resource management.



Our Approaches

- Mobile Camera Deployment for Image Capture**- Mobile cameras capture high-resolution images of meters across various locations for efficient data collection.
- Image Cleaning and Preprocessing**- Captured images are cleaned to remove noise and distortions, ensuring high-quality analysis.
- Computer Vision for Meter Reading Extraction**- Computer vision algorithms extract meter readings accurately, even under varying conditions.
- Real-Time Data Integration**- Extracted readings are integrated into a centralized system for real-time analysis and tracking.
- Report Generation and Consumption Analysis**- Automated reports provide insights for billing, leak detection, and water management.

Confidential

10

VisionFlow – AI-Driven Water Meter Reading



CUBE AI SOLUTIONS
Smart Solutions, Powered by AI Brilliance



Detected Numbers with Bounding Boxes

Detected Values: 00135779

11

PrecisionScope – Automated Component Sizing for Manufacturing

The Challenge

In high-precision industries, inconsistent manual measurements can lead to costly defects and material waste. Manufacturers require a reliable solution to ensure accuracy and consistency in component sizing, as even minor discrepancies can result in significant production issues and increased costs.

Our AI-Powered Solution

PrecisionScope automates component sizing with sub-millimeter accuracy, utilizing advanced imaging and AI algorithms to measure dimensions accurately. This solution not only improves measurement precision but also incorporates AI-driven defect detection to ensure that only high-quality parts are processed. By automating this critical step, manufacturers can significantly enhance their quality control processes.

Key Benefits

•99.5% Accuracy in Dimension Measurement-

Our technology guarantees high precision, reducing the likelihood of defects and ensuring that components meet stringent industry standards.

•**Reduces Manufacturing Defects and Material Waste-** By minimizing errors in measurement, **PrecisionScope** helps manufacturers save on material costs and improve overall efficiency. This reduction in waste contributes to more sustainable manufacturing practices.

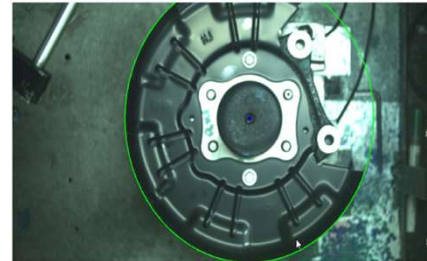
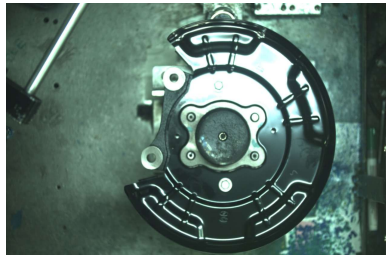
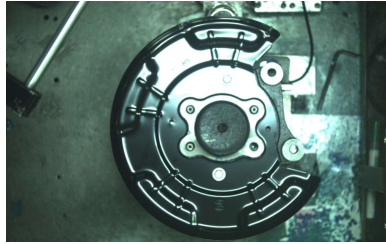
•**Optimized for Automotive, Aerospace, and Precision Engineering-** This solution is designed to meet the rigorous demands of high-precision industries, ensuring that manufacturers can maintain their competitive edge.

12

Automated Precision Measurement of Mechanical Components



CUBE Ai SOLUTIONS
Smart Solutions, Powered by AI Brilliance



Detected Center: (720, 423)

Detected Radius: 378 pixels

Detected Radius: 9.83 cm

Confidential

13

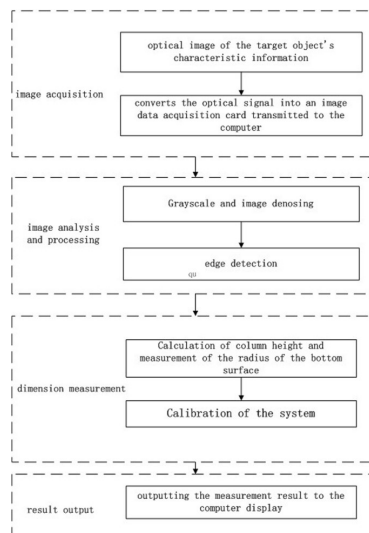
Automated Precision Measurement of Mechanical Components



CUBE Ai SOLUTIONS
Smart Solutions, Powered by AI Brilliance

Existing Challenges

- **Manual Measurements-** Conventional methods often rely on calipers or gauges, which are time-consuming and prone to human error.
- **Inconsistent Accuracy-** Variability in measurements due to operator skill and tool limitations.
- **Difficult Geometries-** Complex shapes or inaccessible areas make traditional measurement techniques challenging.
- **Inefficiency-** Slow measurement processes affect production timelines and increase operational costs.



Proposed Solution

- **Hough Circle Transform- Based Detection**
Utilizing the Hough Circle Transform technique to identify circular features in mechanical parts, enabling precise and automated radius measurement without the need for physical contact.
- **High-Resolution Image Processing**
Processing high- resolution images of mechanical components captured through industrial cameras to ensure fine detail detection and accurate radius computation, even for components with complex geometries.
- **Robust Preprocessing Techniques-**
Applying preprocessing methods, such as noise reduction, contrast enhancement, and edge detection, to improve feature clarity in diverse lighting and environmental conditions. Designing the system to operate in real-time, integrating with manufacturing lines for instant radius calculations, enabling faster quality control and process optimization.

Confidential

14

CircuitGuard – Fiducial Mark Detection for PCE Accuracy



The Challenge

In the world of electronics, the accuracy of printed circuit boards (PCBs) is paramount. Manual inspection processes can be time-consuming and prone to human error, leading to costly mistakes in assembly and functionality. Manufacturers need a reliable solution to ensure that PCBs are produced with the highest level of precision.

Our AI-Powered Solution

CircuitGuard utilizes advanced computer vision and machine learning algorithms to detect fiducial marks on PCBs with exceptional accuracy. This automated inspection process ensures that all components are correctly aligned and positioned, significantly reducing the risk of defects during assembly. The system can be integrated into existing production lines, providing real-time feedback and quality assurance.

Key Benefits

- **High Precision in Fiducial Detection-** Our technology achieves over 98% accuracy in detecting fiducial marks, ensuring that PCBs are assembled correctly and function as intended.
- **Streamlined Production Processes-** By automating the inspection of fiducial marks, manufacturers can reduce the time spent on manual checks, leading to faster production cycles and increased throughput.
- **Cost Savings through Reduced Rework-** By catching alignment issues early in the production process, **CircuitGuard** minimizes the need for costly rework and enhances overall product quality, ultimately improving customer satisfaction.

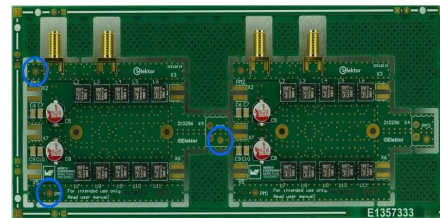
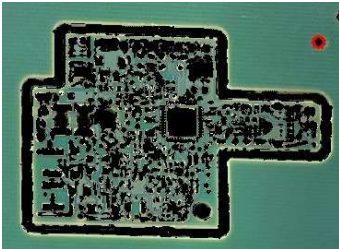
15

Scalable Vision Systems for PCB Fiducial Mark Identification



Existing Challenges

1. **Manual Inspection Issues-** Manual fiducial mark identification is time-consuming, error-prone, and complicated by inconsistent lighting or varying PCB designs.
2. **Precision Alignment for Automation-** Inaccurate fiducial mark detection leads to misalignment, causing defects in component placement by pick-and-place machines.
3. **Noise, Background Interference & Scalability-** Complex PCB backgrounds and noisy environments make fiducial mark extraction difficult, requiring advanced processing. Additionally, real-time processing for multiple PCBs demands highly efficient and scalable solutions.



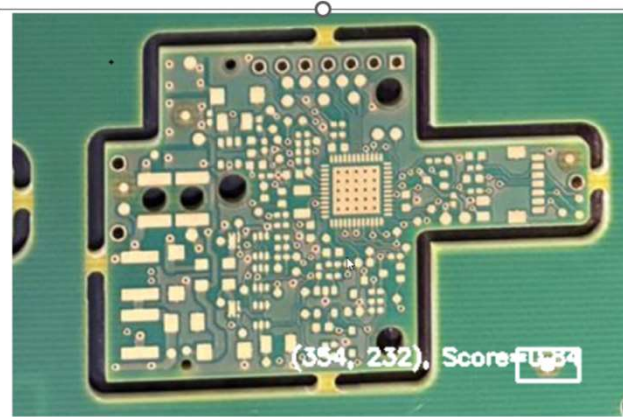
Proposed Solution

The project implements fiducial mark detection for precise circuit cutting on PCB boards. Using computer vision, the system identifies fiducial marks, extracts their coordinates, and aligns the cutting process accordingly. Image processing techniques such as edge detection, pattern recognition, and geometric transformation ensure accurate localization of these marks. By automating this process, the system enhances precision, minimizes material wastage, and ensures correct circuit shapes, improving the overall efficiency of PCB manufacturing and assembly.

Confidential

16

Scalable Vision Systems for PCB Fiducial Mark Identification



Detected Matches with NMS

17

Smart Fabric Inspection



Automation in Fabric Defect Detection

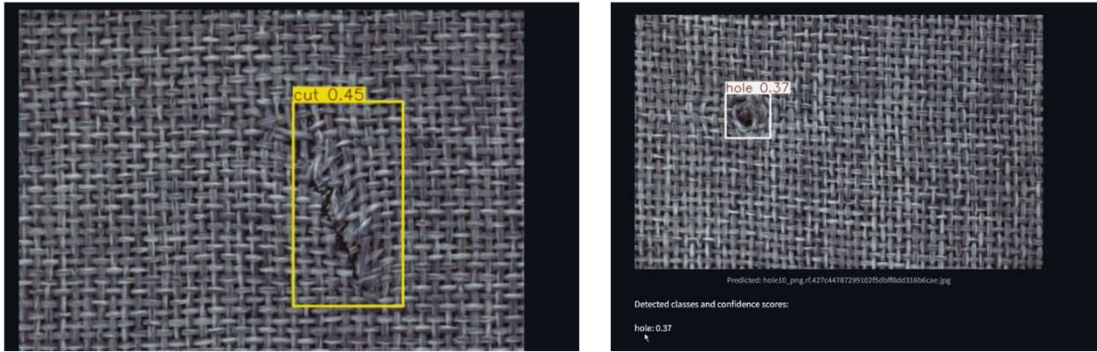
- Real-Time Monitoring: AI-powered cameras analyze fabrics continuously, identifying defects instantly.
- Automated Defect Classification: Categorizes defects like slubs, stains, and holes with high accuracy.
- Conveyor Speed Synchronization: Ensures cameras stay aligned with conveyor motion (up to 50 m/min).
- Self-Calibration & Auto-Focus : Dynamically adjusts focus and lighting based on fabric type and thickness.

Semiconductor-Based Processing Systems

- High-Resolution Imaging: MOS/CCD sensors capture intricate details, identifying micro-level defects.
- Edge AI & Onboard Processing: AI chips process data in real time, minimizing latency.
- Global Shutter Sensors: Prevents motion blur during high-speed fabric movement.
- FPGA-Based Image Acceleration: Speeds up image processing, improving defect identification.

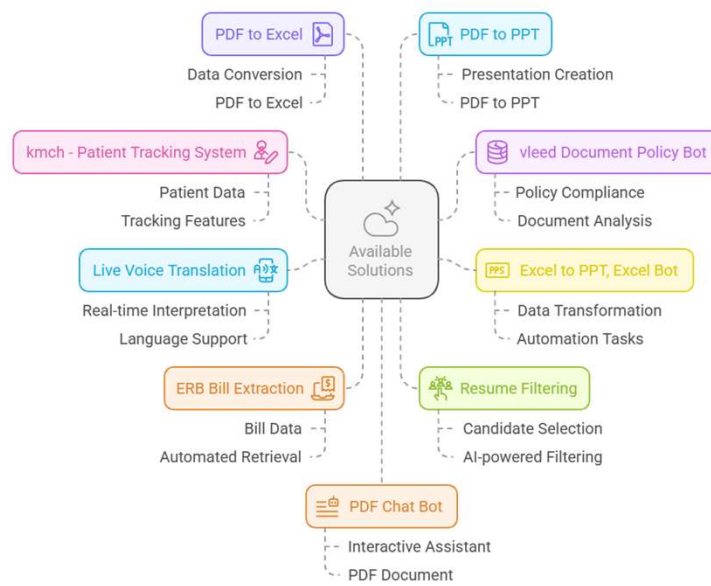
18

Smart Fabric Inspection: Merging Automation and Semiconductor Precision



19

AI Powered Solution Overview



20

AI-Driven PDF to Excel Data Transformation



Challenges

Traditional methods of converting PDF data into Excel involve manual extraction, which is time-consuming, prone to errors, and inefficient. Businesses face challenges with formatting inconsistencies, data loss, and lack of automation, leading to delays in decision-making and resource misallocation.

Our AI-Powered Solution

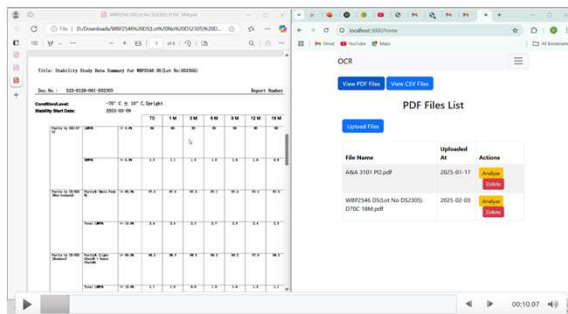
AI-Driven PDF to Excel Data Transformation utilizes advanced natural language processing (NLP) and machine learning to automatically extract, format, and structure data from PDFs into Excel. The AI-powered system ensures accurate data mapping, eliminating the need for manual intervention. Seamlessly integrating with enterprise systems, this solution enhances data accessibility, automates reporting, and optimizes business workflows.

Key Benefits

- **99.9% Accuracy in Data Extraction** – AI ensures precise conversion of complex tables and unstructured PDF content into structured Excel sheets, minimizing human errors.
- **Automates Repetitive Tasks** – Eliminates manual data entry, improving efficiency and allowing employees to focus on strategic activities.
- **Maintains Formatting & Structure** – Retains the original document's layout, ensuring easy readability and usability in Excel.
- **Enhances Decision-Making** – Real-time data extraction facilitates quick access to structured information, empowering businesses with faster insights.

21

AI-Driven PDF to Excel Data Transformation



Page 2 - Table 1.csv

	1	2	3	4	5	6	7	8	9
Test Item Acceptance Criteria	Test Item Acceptance Criteria	TO	1 M	3 M	6 M	9 M	12 M	18 M	
Color	Color	Not more colored than No. 2 Standard Solution (Refer to EP)							
Clarity	Clarity	<= 30.0 NTU							
pH	pH	5.5 - 6.5							
Protein Concentration	Protein Concentration	135.0 - 165.0 mg/mL							
Purity by SEC-GPC	Purity by SEC-GPC	>= 93.0%							

File Home Insert Draw Page Layout Formulas Data Review View Add-ins Help Tell me what you want to do										Help									
Clipboard Font Paragraph Alignment										Number									
Document Recovery										Conditional Formatting Styles Cells Insert Layout Styles Font Styles Editing									
Excel has recovered the following files. Save the one you wish to keep.																			
Project_786421 (Session 5)																			
20-01-2025 10:15:15																			

Conversational AI for Excel to Power Point Presentation

Challenges

Manual preparation of monthly reports from multiple Excel sheets is time-consuming and error-prone. Analysts spend hours consolidating data, formatting visuals, and manually building PowerPoint presentations, leading to productivity loss, inconsistent reporting, and delayed decision-making.

Our AI-Powered Solution

Excel-to-PPT Automation Tool for ACCL streamlines the monthly reporting process by

- **Consolidating multiple monthly Excel sheets** into a single structured data sheet.
- **Automatically generating PowerPoint presentations** with charts, insights, and tables based on predefined templates.
- **Ensuring consistency, accuracy, and reduced turnaround time** for report creation.

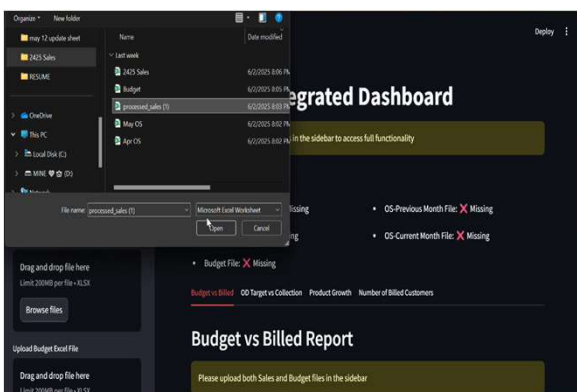
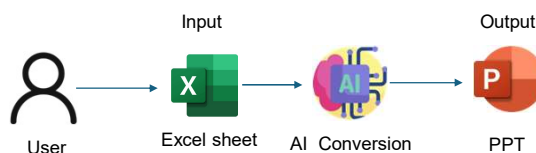
This system integrates seamlessly with existing Excel workflows, requiring no manual formatting or data cleaning.

Key Benefits

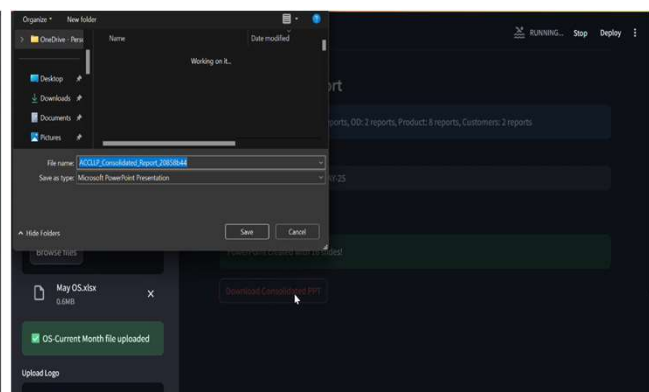
- **Time Efficiency** – Automatically transforms raw Excel data into well-formatted PPTs within seconds.
- **Consistency in Reports** – Ensures visual and data consistency across all presentations.
- **Error Reduction** – Eliminates human errors from manual compilation and formatting.
- **Data Consolidation** – Merges month-wise sheets into one unified report for clear, actionable insights.
- **Easy Integration** – Fits into existing Excel-based workflows without disrupting current systems.

23

Solution Workflow



Excel sheet upload



PPT conversion

24

Conversational AI for PDF-Based Queries



Challenges

Traditional methods of searching and extracting information from PDFs are inefficient and time-consuming. Users must manually scan large documents, making it difficult to retrieve specific insights quickly. This leads to productivity loss and difficulty in handling complex datasets within documents.

Our AI-Powered Solution

Conversational AI for PDF-Based Queries leverages **natural language processing (NLP)** and **machine learning** to enable users to interact with PDF documents using conversational queries. Instead of manually searching through pages, users can ask questions in natural language, and the AI extracts precise information instantly. This system seamlessly integrates with document management platforms, making data retrieval more intuitive and efficient.

Key Benefits

- **Instant Information Retrieval** – Users can quickly obtain relevant answers from large PDFs by asking questions instead of manually searching.
- **Enhanced Productivity** – Reduces time spent navigating and analysing lengthy documents, allowing employees to focus on critical tasks.
- **Accurate and Contextual Responses** – AI understands the intent behind queries and provides contextually relevant answers with high accuracy.
- **Seamless Integration** – Easily integrates with enterprise knowledge bases, document storage systems, and customer support platforms for efficient information access.

25

Conversational AI for PDF-Based Queries



Chat With PDF

Select Language: Tamil

You:
vision

AI:

The vision is for Tamil Nadu to become one of the top 20 global Startup destinations by 2032, based on internationally recognized criteria. This involves enabling groundbreaking innovative and wealth-creating ventures, while also establishing a supportive Startup ecosystem. This ecosystem will emphasize distributed wealth creation, innovative job opportunities, triple bottom line accountability, investor trust, ethical and logical revenue models, and democratized equal growth opportunities for other nations to emulate.

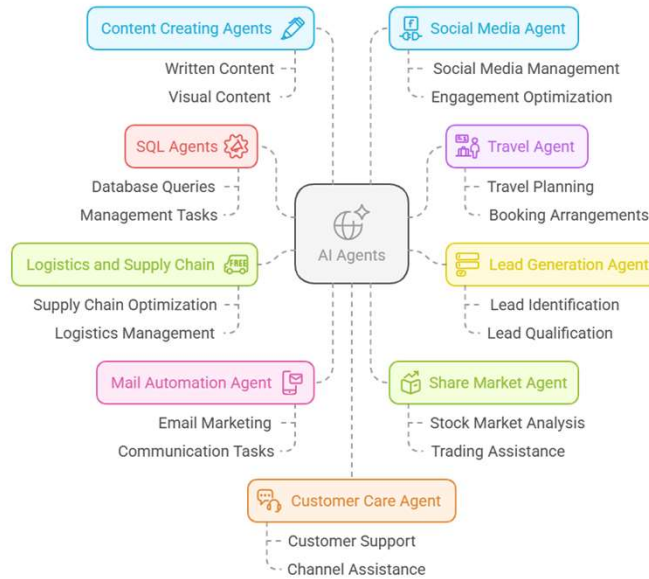
AI:

சர்வதேச அளவில் அங்கீகரிக்கப்பட்ட அளவுகோல்களின் அடிப்படையில், 2032 ஆம் ஆண்டுக்குள் தமிழ்நாடு உலகின் முதல் 20 ஸ்டார்ட்அப் இலக்குகளில் ஒன்றாக மாற வேண்டும் என்பதே இதன் தொலைநோக்குப் பார்வை. இதில் புதுமையான மற்றும் செல்வத்தை உருவாக்கும் முயற்சிகளை செயல்படுத்துவதுடன், ஆதரவான ஸ்டார்ட்அப் சுற்றுச்சூழல் அமைப்பையும் நிறுவுவது அடங்கும். இந்த சுற்றுச்சூழல் அமைப்பு, விறியோகிக்கப்பட்ட செல்வ உருவாக்கம், புதுமையான வேலை வாய்ப்புகள், மூன்று மடங்கு பொறுப்புக்கூறல், முதலீட்டாளர் நம்பிக்கை, நெறிமுறை மற்றும் தர்க்கரீதியான வருவாய் மாதிரிகள் மற்றும் பிற நாடுகள் பின்பற்றக்கூடிய ஜனநாயகப்படுத்தப்பட்ட சம வளர்ச்சி வாய்ப்புகளை வலியுறுத்தும்.

Chat With PDF... Send

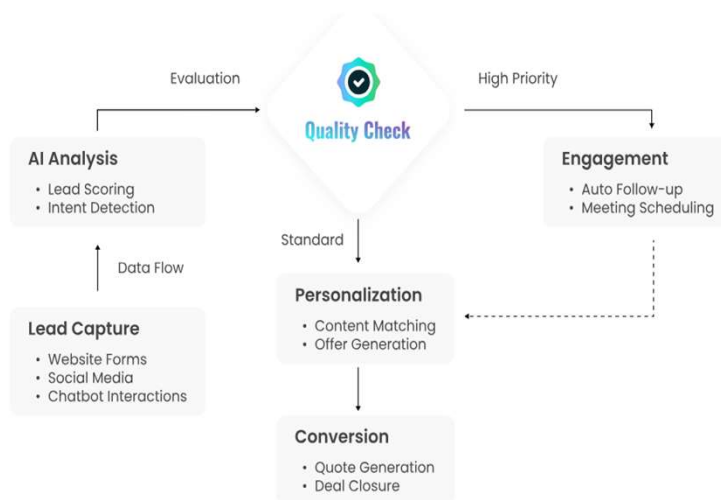
26

AI Agents and their Applications



27

Sales and Leads Generation Agent

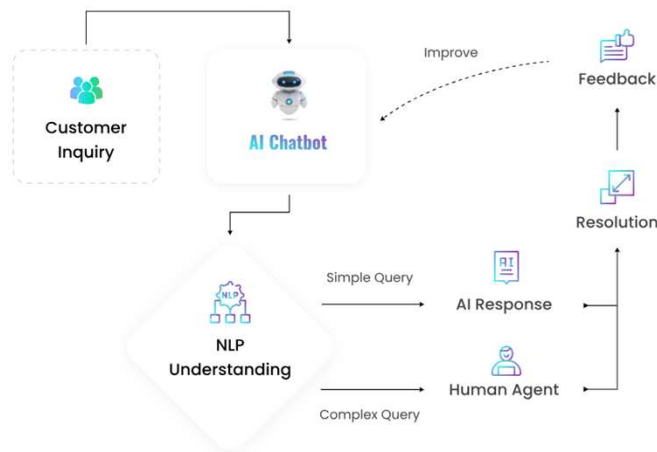


Working principle

- Lead Qualification
- Product Recommendation
- Quote Generation
- Sales Follow-up Automation
- Sales Pipeline Management

28

Customer Service Agents

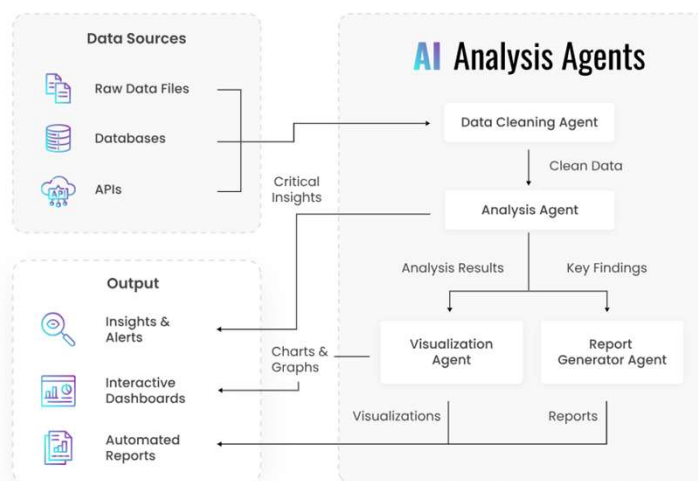


Working principle

- 24/7 Customer Support
- Chatbots Inquiry Classification & Routing
- FAQ Resolution
- Appointment Scheduling
- Returns & Refunds Processing
- Multilingual Support

29

Data Analysis and Reporting Agents

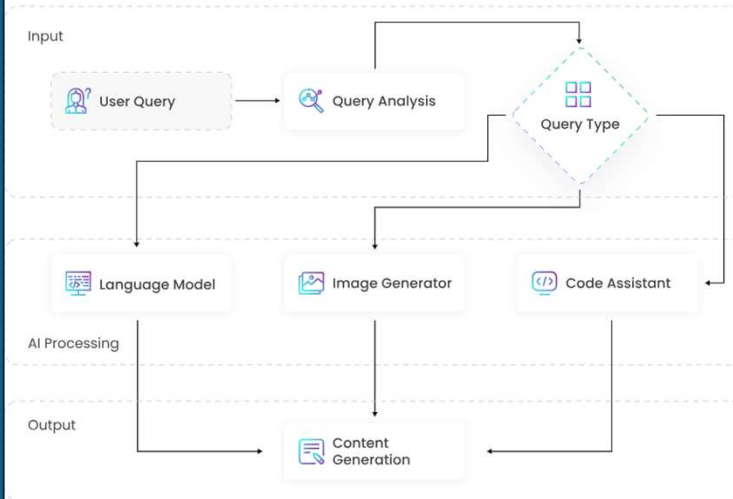


Working principle

- Business Data Analysis Assistants
- Market Trend Prediction Assistants
- Real-time Analytics Dashboard
- Automated Report Generation
- Performance Metric Analysis

30

Content Creation AI Agents



Working principle

- Marketing Material Content Creation
- Business Documentation Generation
- E-commerce Content Creation
- SEO-optimized Content Writing
- Educational Content Creation

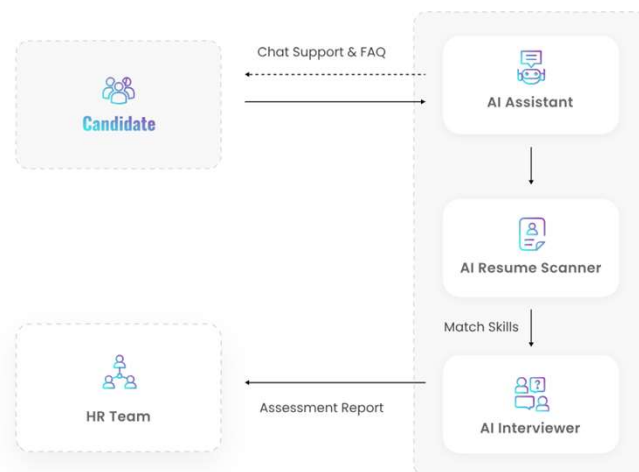
31

HR & Recruitment AI Agents

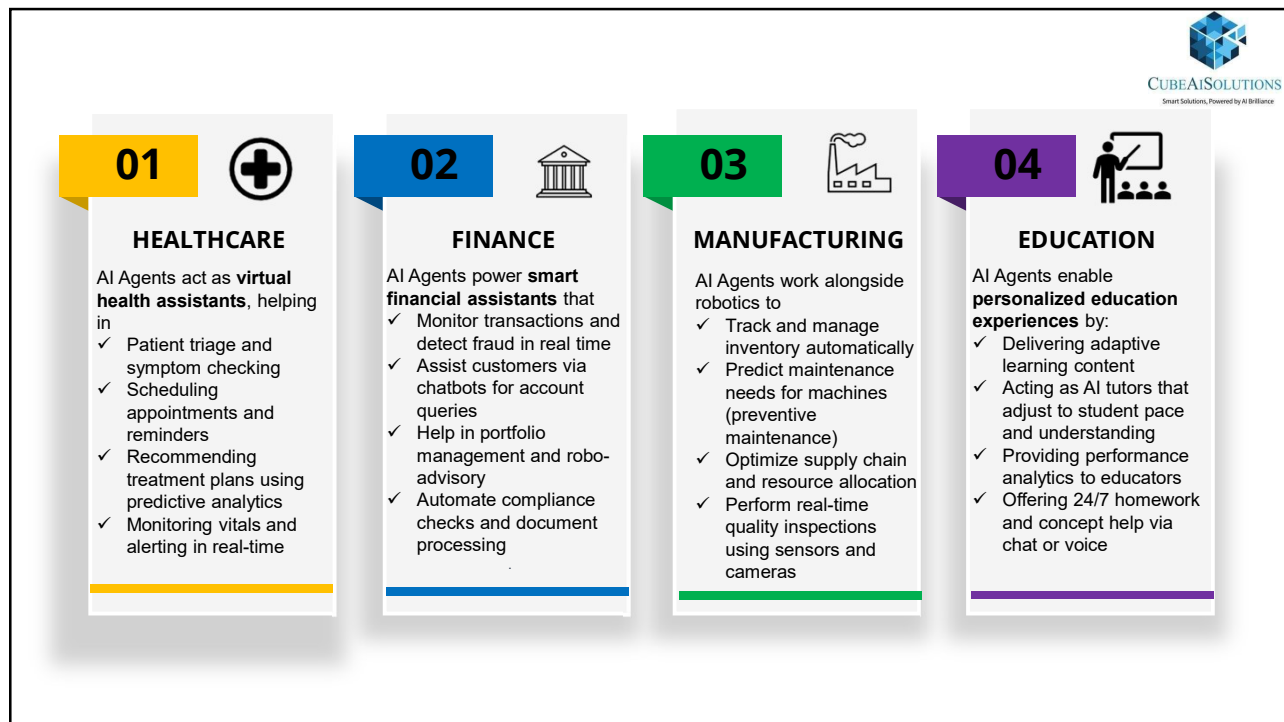


Working principle

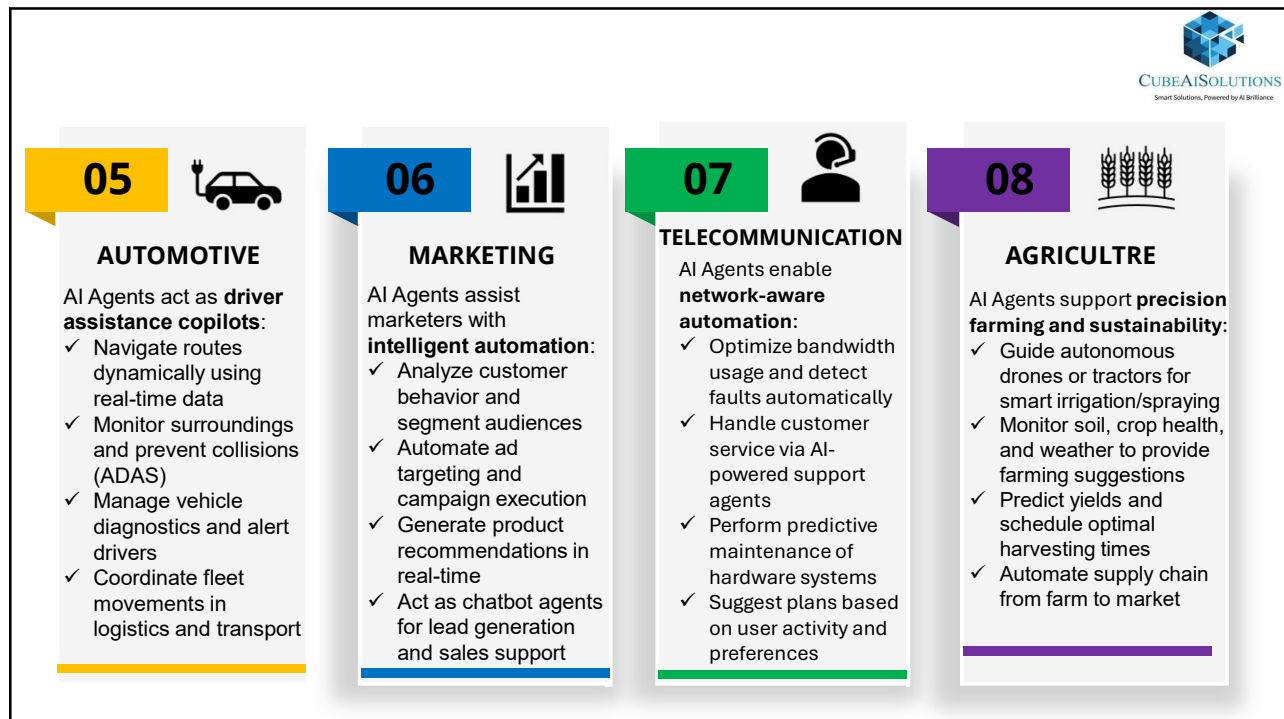
- Resume Screening
- Candidate Outreach
- Interview Scheduling
- Employee Onboarding
- Performance Review Analysis
- Training Program Customization



32



33



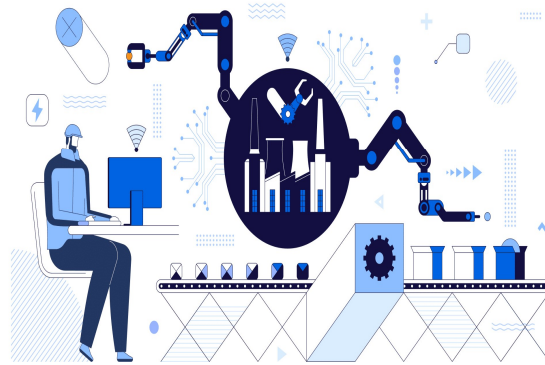
34



CUBE Ai SOLUTIONS
Smart Solutions, Powered by AI Brilliance

Conclusion

- Industry 5.0 blends human creativity with AI precision to create smarter, more personalized solutions.
- Sustainability is no longer optional but a core requirement in modern industrial strategies.
- Starting with small, manageable pilots allows for quick learning and faster, scalable success.
- Collaboration across technology, people, and purpose drives meaningful and holistic innovation.



Confidential

35



CUBE Ai SOLUTIONS
Smart Solutions, Powered by AI Brilliance

+91 9486938781
ceo@cubeaisolutions.com
cubeaisolutions@gmail.com

THANK YOU

Confidential

36

