



1. About us

NovaAutomation Innovations Pvt. Ltd. (NAIPL) is a Startup founded by a small group of researchers and AI Engineers who dream of creating a company which can produce indigenous AI products/services not only for India but the entire world. The core team has both research and industry expertise and all of them hail from India's prestigious IISc and IIT's. All the team members have a great academic and industry track record and have several accolades during their academic and career paths for their problem-solving skills. These accomplishments have emboldened their faith in building a global AI company from India. The team is very enthusiastic to take leverage of big data available across various industries and harness the power of artificial intelligence to solve complex problems and drive positive change across industries. We believe in pushing the boundaries of what's possible, utilizing AI as a catalyst for innovation and advancement. Through our work, we aim to contribute to a future where intelligent technologies enhance Innovation, efficiency, decision-making, and overall human experience.

2. Existing Technology and Prior Experience

Novaautomata team has excellent capabilities in AI/ML technologies, especially in Natural Language Processing (NLP) and Computer Vision (CV). At Novaautomata, we specialize in leveraging these advanced technologies in NLP and CV to transform and elevate organizational productivity. Our expertise in these fields allows us to deliver tailored AI solutions that meet the unique demands of various industries, ensuring significant enhancements in efficiency and operational capabilities.

2A. Natural Language Processing (NLP) expertise and solutions

Our proficiency in Generative AI architectures, including state-of-the-art Large Language Models (LLMs), enables us to integrate sophisticated language processing capabilities into your organization. These models can automate a wide range of tasks, from data-entry, drafting and summarizing documents to generating relevant content, significantly boosting productivity. By automating repetitive and labor-intensive tasks, we help your team focus on strategic and creative initiatives, driving innovation and efficiency. Additionally, we utilize the latest Retrieval-Augmented Generation (RAG) architecture to handle and process organization-specific documents.

In this section we explain LLMs and RAG briefly and how we leverage both these technologies is brought out, followed by the uniqueness of our solutions based on this technology.

Advanced AI Technologies: Large Language Models (LLMs) and Retrieval-Augmented Generation (RAG)

Large Language Models (LLMs) Large Language Models (LLMs) are advanced neural networks designed to understand, generate, and interact with human language at an unprecedented scale. Trained on billions of parameters and vast amounts of text data, these models exhibit a deep understanding of language nuances, context, and semantics.

NLP Solutions and Key aspects

Our technology combines the strengths of LLMs and RAG to facilitate efficient information retrieval and generation, offering deep insights tailored to specific domains. Organizations benefit from automated document management systems that retrieve relevant information, generate summaries, and provide actionable insights, thus streamlining manual processes. Additionally, the combined system enables advanced analytics and decision support by analyzing large document volumes and presenting key data points for informed decision-making.

The key aspects of our solution are:

We propose a holistic solution which consists of the following:

- I. Digitization of all the data (Structured & Unstructured) using AI at various levels.
- II. Imparting the right structure to the entire data flow using concepts of ontology or knowledge graph
- III. Building AI models at individual units and at the overall system level.

1. Digitization of all data

Our proficiency in Generative AI architectures, including state-of-the-art Large Language Models (LLMs), enables us to integrate sophisticated language processing capabilities into your organization. These models can automate the entire digitization irrespective of the kind of format its fed for e.g., scanned documents, PDFs, handwritten notes, excel sheets etc., Additionally, we utilize the latest Retrieval-Augmented Generation (RAG) architecture to handle and process organization-specific documents. All these models are Standalone and do not use any external APIs for its working and hence privacy and security is not compromised in any manner.

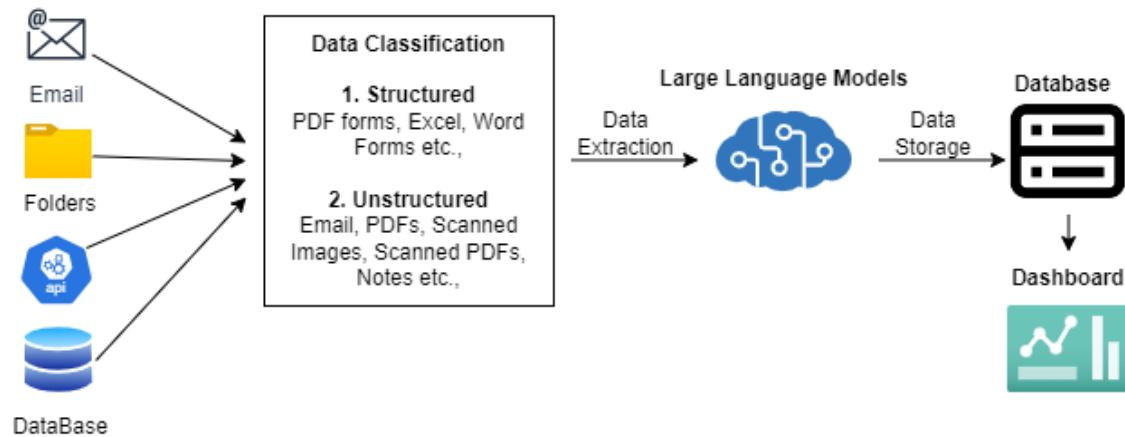


Figure: High-Level architecture diagram for the proposed automation

2. Imparting the right structure

The structure and the interdependencies of the organization has to be understood at different levels using the concepts of ontology or knowledge graphs. Ontology is a structured framework to represent knowledge in a specific domain. It defines the types of entities, relationships, and constraints that exist in that domain. With this type of structure, we can create the right database structure and hence the data flow which would enable use building the ML models at various levels of the organization. This exercise would also make the database responsive to any kind of complex queries.

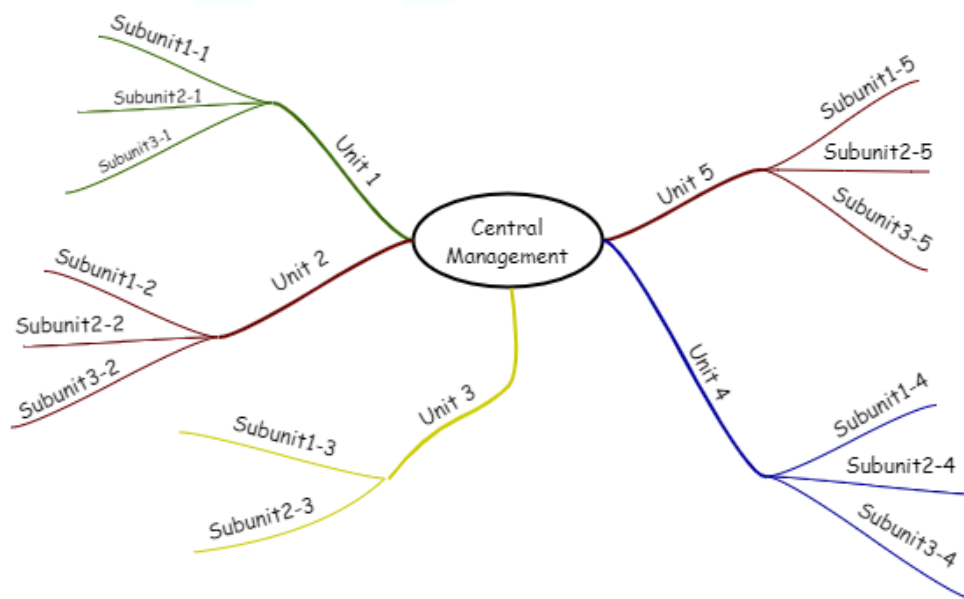


Figure. Representative diagram showing the ontology creation for the organization

We offer robust solutions for retrieving relevant information from extensive documents, even those spanning hundreds of pages. Our technology can efficiently extract and organize key data, making it easily accessible and actionable.

Our capabilities extend to analyzing large collections of documents, such as invoices, and providing valuable analytics for the organization. This helps in uncovering insights and trends that can drive business decisions.

3. Building AI agents at the different levels

ML based prediction models will be built at various unit levels. The above ontology diagram would help in building the ML models at various important nodes and also identifying the right features for these models. Finally, a prediction model at the system level will be built using all the data from the various units.

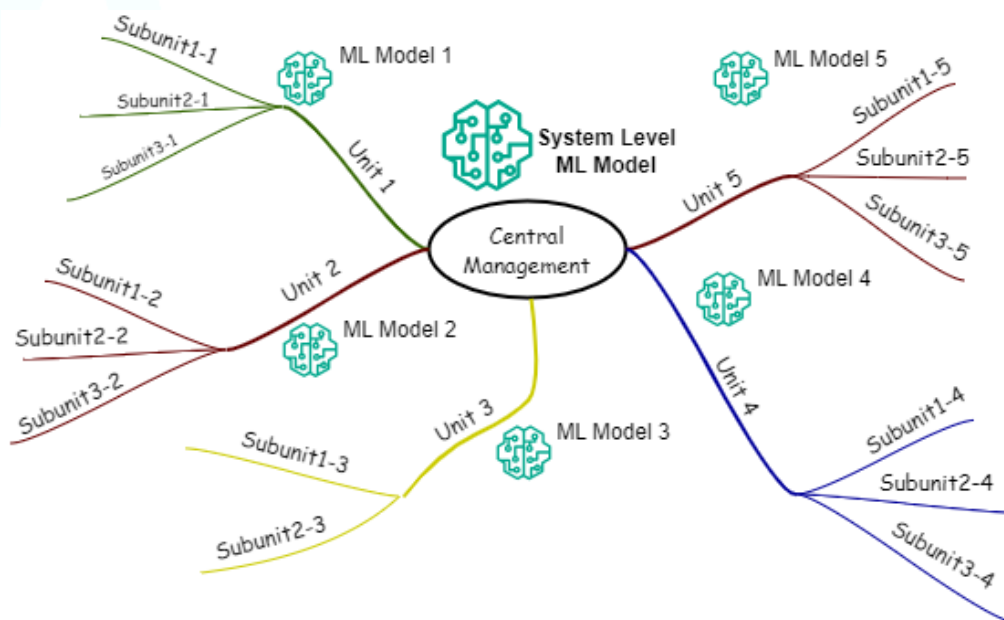


Figure. A Federal way of imparting intelligence at different levels for more control on the reliability modeling

4. Interpretability of the results

During the development of these models, we will keep in mind the interpretability of the results and provide insights which would be helpful to the end user. Highly insightful dashboard with vital analytics would be provided for the user to view any data at any time.

5. Secure and Integrative Solutions

- Our NLP solutions are highly secure, as they are designed to operate independently without interacting with or using APIs from third-party software. This ensures the utmost privacy and security for your sensitive data.
- We offer the flexibility to integrate information extraction capabilities with any proprietary software that your organization uses, ensuring seamless and efficient workflows.

2B. Computer Vision (CV) Expertise and Solutions

Our team boasts of expertise in cutting-edge computer vision technologies, encompassing advanced object detection models and vision transformers. In this section we describe briefly the technologies we use for the solutions we offer, followed by the details of the solutions in the domain of security, surveillance and quality control.

CV technologies for detection, tracking and segmentation

Our team excels in the domain of computer vision, leveraging cutting-edge technologies for object detection, tracking, and segmentation. We harness a diverse range of advanced models, including You Only Look Once (YOLO), Single Shot MultiBox Detector (SSD), and Faster R-CNN, each tailored to deliver high accuracy and efficiency in real-time applications such as security surveillance and autonomous driving. These models offer unparalleled precision in object localization, thanks to their unified architecture, multi-scale feature maps, and region proposal networks. Moreover, we stay at the forefront of innovation by integrating Vision Transformers (ViT), a groundbreaking approach that revolutionizes image analysis. Vision Transformers, inspired by their success in natural language processing, excel in capturing long-range dependencies and contextual information within images. With their self-attention mechanism and scalability, ViTs offer superior performance in tasks like image classification and segmentation, making them indispensable tools for advanced computer vision applications.

CV based solutions

Our cutting-edge computer vision solutions provide advanced security, surveillance, and quality control capabilities. From facial recognition for access control to AI-driven real-time quality monitoring, our systems ensure precision and efficiency in safeguarding your assets and maintaining the highest standards of quality.

CV for Security and Surveillance

In the realm of security and surveillance, our computer vision technologies offer advanced capabilities for monitoring and protecting your assets:

Facial Recognition Systems: These systems can be used for access control, ensuring that only authorized personnel can enter restricted areas. By analyzing facial features, the system can accurately identify individuals and grant or deny access based on predefined permissions.

- **Anomaly Detection Systems:** Using advanced algorithms, these systems can continuously monitor surveillance footage and automatically detect unusual activities or behaviors, such as loitering, trespassing, or unattended objects. Alerts are generated in real-time, allowing security personnel to respond promptly.
- **Behavior Analysis Algorithms:** These algorithms can analyze patterns in surveillance footage to identify suspicious or unusual behavior, such as someone attempting to tamper with equipment or engaging in potentially dangerous activities.

CV for Quality Control

In the realm of quality control, our computer vision technologies ensure that production processes meet the highest standards. Our solutions can detect defects, anomalies, and inconsistencies in products with unparalleled accuracy.

- **Automated Visual Inspection Systems:** These systems can be deployed on assembly lines to inspect products for defects such as cracks, deformations, or incorrect assembly. High-resolution cameras capture images of each product, and advanced image processing algorithms analyze these images to detect any flaws.
- **AI-Driven Real-Time Quality Monitoring:** By integrating AI with visual inspection systems, we can provide real-time monitoring of product quality. This system can identify and flag deviations from quality standards as products move along the production line, ensuring immediate corrective actions.
- **Image Recognition Tools:** These tools can be used to ensure consistency and compliance with quality standards. For example, in the food industry, image recognition can verify that packaging is correct and that products meet visual quality criteria, such as color and shape.

To summarize, the key benefits of choosing NA IPL:

- NA IPL's team has experience in designing and implementing several ML architectures (shallow learning, Transformers, GAN's, VAE's, CNN's etc.,) for various diverse domains including, manufacturing, HealthCare, BFSI (Banking, Financial Services and Insurance), Smart Cities.
- NA IPL's team is adept at tailoring custom made ML models, contextual to a particular data and domain.
- NA IPL's team not only holds the expertise in implementing AI/ML models but also optimizing the performance of these models on the hardware by using parallel processing and multi-threading techniques.
- Being from a research background the team is well acquainted with research expertise and experienced in technical writing with several publications.
- Separate software team with experienced professionals who can package the AI product as a SaaS or Web application with a great user interface.

3. Projects handled by the team members in the past

Automation of New Insurance policy setup

Structured and Unstructured applications and attachments from emails consisting of insurance applications are collected and the required insurance policy as a new application creation is automated. Several text extraction and natural language processing tools are used to perform this task.

Sentiment analysis using BERT finetuned on custom dataset

Finetuning BERT (Bidirectional Encoder Representations from Transformers) on a custom dataset involving taking the pre-trained BERT model and training it further on a specific dataset that is tailored for sentiment analysis. This was implemented for finding out sentiment analysis of reviews on e-commerce websites.

Trigger word detection using LSTMs with attention

Detect a specific trigger word or phrase that initiates the listening and processing of voice commands in a voice-activated assistant. The technology was built for use in devices like smart speakers, virtual assistants, and other voice-activated systems.

Visual Document Understanding

Developed end-to-end deep learning pipelines for information extraction from noisy scanned financial documents using transformers and CNN based architectures, in Pytorch. – Developed an image processing technique (inspired from Chargrid) which is more optimized and improved the accuracy.

Object detection using single stage and two stage CNN based detectors (YOLO, Faster RCNN)

This technology was implemented to automate the process of inventory tracking and management in a retail environment using object detection.

Facial recognition for attendance monitoring system.

This FR technology was implemented for an automatic attendance and authorization system for a firm.

Offline Handwritten Text Recognition

Deep learning solution focused on recognition of semi-legible and illegible handwriting, developed in TensorFlow. This was developed for the Banking sector to automatically read data on cheques.

Graphical User Interface (GUI) for GT (Ground Truth) Correction

Studied and experimented with multiple techniques that can help humans analyze long sequences of text without error. – Implemented the selected techniques in a GUI. – This led to ~30x speedup in GT correction and verification.

Synthetic Data Generation

The pipeline can generate synthetic data for any structured or semi-structured documents (both handwritten and machine printed) with minimal manual annotation.

Semi-Automated Labelling

Most of the training datasets have thousands of images which need to be manually annotated. The solution reduces the annotation time by up to 90%.

Decision system design for UAV Scheduling

Developed a robust software architecture and decision-making system or tasks to be accomplished by an unmanned aerial vehicle (UAV).

3. Currently Ongoing Projects:

Integrated Planning and Scheduling Application (IPSA):

IPSA is a web application to evaluate and optimize cost of implementation of electric bus systems for a state or city. The web app will provide an interface for users to create projects and evaluate various scenarios. Based on the user inputs, the app will advise the users in selection of depot and bus schedules for electrification. Further, the application will assess feasibility of e-bus operations for a specific bus model, selected schedules and further optimize schedules for buses and the chargers based on the trip timetable or user inputs. The app will estimate the inventory required and the cost of implementation of the e-bus systems. Several Data science and Optimization algorithms are employed to build this tool which is further integrated in a software with frontend as ReactJS, backend as Django and PostgreSQL as the database system.

Client: GiZ & World Resources Institute

DAKSH (Digitization, Analytics Know-how and Scheduling)

Developing a decision support tool for public transport authorities and operators to digitize and optimize public transport planning and scheduling for E-buses.

Client: Transit Intelligence

ERP software (Contract management)

Developing a contract management software for digitization, operations management, performance evaluation and payment assesment for Bengaluru metro transportation corporation (BMTTC) and EV bus contractors of Bengaluru City.

Client: Transit Intelligence

Gene Alchemy

Gene Alchemy is a tool designed to assist biomedical and Pharma companies to assist in biomarker identification, drug discovery, clinical data management using machine learning. Presently the application has modules to explore and analyzing gene expression data related to various types of cancer and clinical data. This application aims of empowering users to gain insights into the complex molecular profiles associated with different types of cancer, facilitating informed decision-making by biomarker identification, predicting survival status etc., Additionally, the module also helps in data analytics of clinical data.

Client: Live100

4. AI Team

Dr. Rajasekhar Bangaru, PhD, Indian Institute of Science

Dr. Bibin Francis, PhD, Indian Institute of Science

Prateek Singh, BS, Indian Institute of Science; Masters, Aritifical Intelligence, IIT KGP

Kaushik Kukadiya, MTech, Artificial Intelligence, Indian Institute of Science

Karmanya Beniwal, Masters, Smart Manufacturing, Indian Institute of Science

Harshit Dubey, BS, Indian institute of Science

5. Software Team

Rohit Katariya, BTech, Computer Science, 6+ years of Software engineering

Manjunath, BTech, Computer Science, 6+ years of Software engineering

Tejaswini N, MCA, Full Stack Developer

Navneetha N, MCA, Front End Developer

Kiran, BCA, Designer

6. Interns

Partha Guntur, Computer Science & AI Engineering

Kamalesh, Computer Science & AI Engineering

Rohita P, AI Engineering

Manu Vahan, Computer Science & AI Engineering

Raman Luhach, Computer Science & AI Engineering

Sinduja, MSc, Bioinformatics & AI

Subalakshmi A T, MSc, Bioinformatics & AI

7. Advisors

Prof. Abhik Choudhary, Indian Institute of Science

Prof. Gandham Phanikumar, Indian Institute of Technology, Madras

Prof. Rajendra Munian, Indian Institute of Technology, Ropar

Dr. Rashmi Patel, M.B.B.S, M.S, Surgeon

8. Collaborating Organizations

Sree Ramachandra Medical College, Chennai

Rishihood University, Sonipat