

From Theory to Reality: AI Experience & Practical Use Cases

How can your company strategically implement AI for maximum impact?

We've built proven frameworks and standardized processes to help businesses seamlessly adopt AI and ML—both in their internal operations and across client projects. Our approach ensures high-quality implementation, smooth integration, scalability, and real business impact, enabling teams to incorporate AI-powered solutions into their workflows and systems with confidence.

Our expertise enables teams to confidently adopt AI-powered solutions, driving innovation in robotics, manufacturing, construction, and beyond.

This material explores the outcomes of our **Research** findings and highlights **Technology Demonstrations** and **AI-driven Solutions** with practical applications across various industries.

Practical Use Cases

Optimizing Sheet Metal Bending

Industry

Automotive, Industrial Equipment, Manufacturing

Business Challenge

A global manufacturer of advanced sheet metal processing machinery and automation

systems, specializing in laser cutting, punching, bending, and integrated smart factory solutions, operates a complex sheet metal bending process with multiple bending tools. Each tool is suited for different part parameters such as dimensions, material type, and bend angles. Selecting the optimal tool manually is time-consuming and dependent on operator expertise.

To address this challenge, we suggested developing an AI-powered recommendation system that can automate tool selection based on part specifications, improving efficiency and accuracy.

Project scope

The suggested solution can be structured into the following key phases:

- ✦ **Data Collection & Processing:** Aggregating historical bending data and standardizing parameters
- ✦ **Model Development & Training:** Building and refining an AI model to analyze part characteristics and predict the most suitable tool
- ✦ **Evaluation & Optimization:** Validating model accuracy and optimizing recommendations
- ✦ **Deployment:** Integrating the AI system into the production workflow for real-time tool selection

Solution

By automating the traditionally manual and expertise-driven process of tool selection, the AI-powered solution will accurately predict the most suitable tooling for new sheet metal parts, including those requiring bending. This advancement not only streamlines production but also sets the stage for broader adoption of AI across the client's manufacturing operations.

Enhancing Construction Data Search and Documentation Preparation

Industry

AEC

Business Challenge

Over decades, the client has accumulated

gigabytes of construction and construction related data including proposals. However, every time they need to find some data or create a document like a proposal, they need to go through a very manual and time-consuming process of searching for correct data or do it from scratch. The solution they needed had to automate and improve this process using AI and base proposals on previously created proposals for more accurate and faster preparation. Searching for historical data using traditional methods is not only time-consuming, it relies heavily on manual processes. Additionally, much of the information is stored in formats that are not easily searchable, making it challenging to retrieve relevant data efficiently.

To tackle these challenges effectively, we have devised a solution centered around the efficient creation of new proposals based on previously made proposals, leveraging historical data. Our approach includes establishing a comprehensive knowledge base integrated with AI for streamlined data retrieval and analysis.

Solution definition

The solution includes selecting an existing LLM that balances understanding relevant documentation and specific language, normalizing and pre-processing existing data for embedding (such as OCR, metadata, and summarization), using the RAG approach to integrate organizational documentation knowledge into the AI model, and leveraging this embedded knowledge in Chat/Agent applications.

Project scope

The suggested solution is structured into the following key phases:

- ✦ **Data Preparation:** Create data set that contain all the data to be used in this solution
- ✦ **Data Normalization:** Convert and prepare data so that it can be used for RAG using selected LLM, for example, pre-process data using OCR so that legacy data can be vectorized, extracting data from BIM documentation
- ✦ **Application Development**
- ✦ **Results Verification:** Preparing test environment for model comparison and data retrieval

Solution

With the offered solution, the company will streamline knowledge sharing across teams, boost access to historical data, enable proposal creation based on experience data, lower production costs, and support continuous improvement.

Transforming Cost Estimation and GCD Extraction

Industry

Digital Manufacturing Software

Business Challenge

The client currently faces limitations in analyzing PCB designs because their software is primarily designed for mechanical parts, not electronic components. A key issue lies with

Gerber files, which are commonly used in PCB design and manufacturing. These files do not contain critical textual data about specifications like layer thickness, board thickness, hole plating, or materials. Instead, this information is embedded in the image files themselves, often as a set of lines rather than readable text.

Since the client's customers do not always provide the supplementary files needed to extract this data, the client's ability to perform GCD extraction and accurately estimate costs is significantly impacted.

To overcome these challenges, we offered an AI-driven solution that can enable the automatic extraction of critical PCB design specifications from Gerber files. This solution will eliminate the need for supplementary text files and enhance the client's ability to perform accurate cost estimation and GCD analysis.

Solution definition

An offered AI-driven solution is aimed to:

- ✦ Extract critical PCB specifications (e.g., layer thickness, material, hole plating) directly from Gerber files, particularly from drilling legend images
- ✦ Use computer vision and AI techniques to recognize and interpret non-textual design details
- ✦ Automate and enhance cost estimation processes by ensuring comprehensive data extraction

Solution

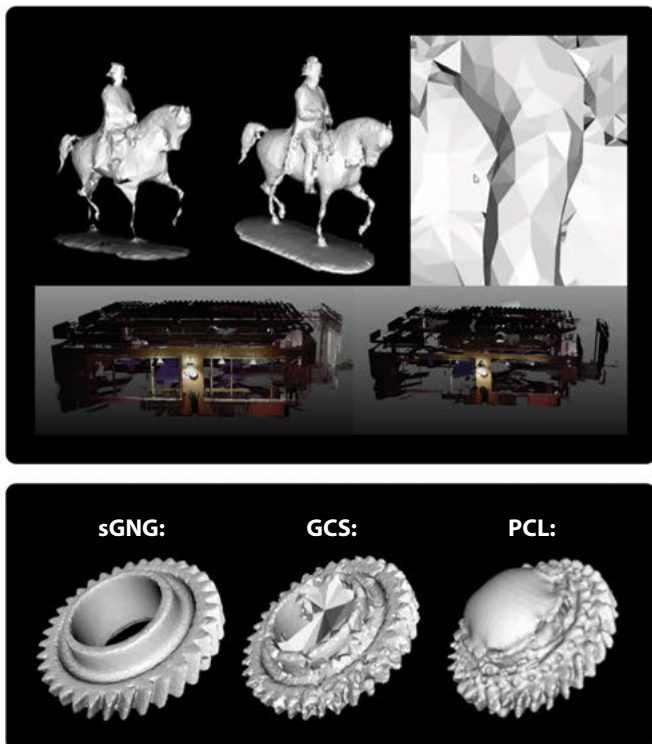
This AI-powered solution can bridge the gap in the client's existing platform, enabling them to expand their capabilities in PCB analysis and improve accuracy in cost assessment.

Research

Surface Reconstruction Based on Neural Networks

The project involves developing a C++ library designed for network-based surface reconstruction from raw point clouds. The primary objective is to leverage advanced neural network techniques to accurately reconstruct surfaces from unstructured 3D data. The goal is to develop efficient algorithms and tools based on advanced neural network techniques that can deliver high-quality surface reconstructions in a time-effective manner, enhancing the usability and effectiveness of 3D scanning technologies.

The work is based on the principles and methodologies outlined in the research paper "Growing Cell Structure and Neural Gas Incremental Neural Networks"



AI-Powered Technology Demonstrations

AI Construction Takeoff

Technology demonstration of automating the detection of a predefined set of symbols in electrical construction drawings and the calculation of room square footage to streamline the construction takeoff process, improve the planning and management of electrical systems maintenance and repair, and check the accuracy of electrical construction plans in construction and facility management, property development, architecture and design, and building inspection areas.

AI Construction Failure Inspection

Technology demonstration leverages an advanced image recognition method and showcases how construction building companies and inspection agencies can automate the detection of construction failures by identifying structurally critical cracks, which results in significant improvement of the safety inspection efficiency and accuracy and reduction of the accident risks caused by structural damage.

Architectural Chatbot for Revit

Technology demonstration showcases how ChatGPT can assist in creating detailed residential building floor plans using Autodesk® Revit®, a leading Building Information Modeling (BIM)

software. The aim is to streamline the design process, enhance precision, and improve overall efficiency in architectural drafting by leveraging the advanced capabilities of AI.

AI Warehouse Robot Simulator

A new technology demonstration of simulating, suggesting, and training robots suitable for warehouse technical constraints based on the warehouse model to achieve greater efficiency, accuracy, and flexibility in logistics, supply chain operations, and warehouse management while also enhancing workforce safety and reducing the risk of workplace injuries and other health emergencies.

Construction Safety—Hard-hat Detector

Technology demonstration showcases a web-based application that enhances construction site safety by identifying

workers without hard hats from a video stream. Utilizing Google TensorFlow's advanced machine learning algorithms, the monitoring process becomes fully automated and helps construction managers ensure that all personnel adhere to essential safety protocols.

AI for Facility Management

Technology demonstration showcases Google TensorFlow use to enhance facility management by extracting elements of building facades from plain photo images. The aim is to improve efficiency, accuracy, and cost-effectiveness in renovation by introducing an automated process that significantly streamlines the creation of a bill of materials by leveraging machine learning capabilities.



**Are You Ready to Take the Next Step?
Not Sure Where to Start?**

Our experts can guide you through your AI journey—from strategy to execution. Contact us to explore AI opportunities for your business and sign up for the AI workshop today!



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