

# ARTIFICIAL INTELLIGENCE



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**EMBRACE YOUR**  
Mechanical Engineering with AI



Valid for Period:  
2024



# THANK YOU

FOR CHOOSING US

Mechanical engineering thrives on experience. Particularly in times of a shortage of skilled workers, it is therefore essential to preserve and embrace your company's knowledge. The AI technology from RNA Digital Solutions offers a powerful way to make mechanical engineering knowledge easy to use with software.



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# ENGINEERING X AI

TECHNOLOGY, INDUSTRY EXAMPLES, BENEFITS

RNA Digital Solutions has developed AI technology for feeding technology and the entire mechanical engineering market. We store engineering knowledge in AI and make it easy to use via software. The technical sales and engineering departments in particular benefit from this. Decisions made in these areas determine the later costs of a project. The less expert knowledge, the higher the chance of margin burns and time-consuming wrong decisions.

Our AI technology is 100% developed in-house. In order to store engineering knowledge in AI, we link this knowledge with 3D CAD data of the workpieces. For the application of feeding technology, we incorporated the data from the last 15 years of the Rhein-Nadel Group into the training. Today we are in the process of transferring our AI technology to other areas of mechanical engineering.

In order to link your engineering knowledge with AI, we take your 3D CAD data and use it to adapt the pre-trained AI to your tasks. Our AI technology always can be used wherever the relationship between workpiece and production tool prevails.

## INDUSTRY EXAMPLES

Store your engineering knowledge in AI:

- Faster and more precise technical statements in the early project phase
- Avoiding wrong decisions & bad planning that eat up project margins
- Empower new employees faster
- Elimination of brain drain effects



**Screwing**  
e.g. TUBE

AI can be used to evaluate whether a screw can be conveyed in a tube or whether it gets tilted or even jammed. It is a simple classification task of type yes/no.



**Gripping**  
e.g. GRIPPER GEOMETRY

With the help of AI, it is possible to find the optimal solution for gripping principle and the ideal gripping features on the workpiece, all based on your best practice data. Input size for the AI is the 3D CAD file of the workpiece.



**Injection Molding**  
e.g. SIMILARITY ANALYSIS

AI can help to find similar injection molding workpieces in your database from past projects. The results serve as a jumping-off point for planning a new machine including handling.



**Stamping / Bending**  
e.g. TOOL CONCEPT

The input variable for the AI can be the finished bent workpiece as a 3D CAD file. The output can be the geometry of the bending tool or the bending sequence.



**Welding**  
e.g. WELDING GUN

AI can answer the question of which tool principle is best suited to process a particular welding stud. The input variable for the AI is the 3D CAD file of the workpiece.



**Forming**  
e.g. QUALITY

AI can be used to predict whether certain surfaces / geometries in the forming tool will create quality errors in the sheet metal.





# AI MODULES

## STANDARD APPLICATIONS

Our AI technology is a summary of several AI modules. These modules can be developed and used separately from each other. To get started using our AI services, we recommend starting with a standardized AI application and rolling it out within your company.

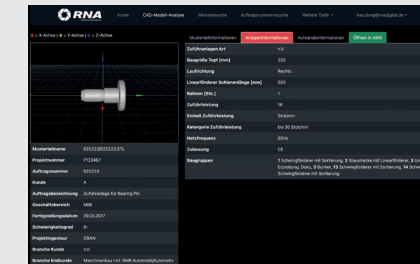
In the following you will find some standard applications that we use within the Rhein-Nadel Group in the departments of sales, engineering and quality assurance. Of course, they are related, but not limited to feeding technology.



### SIMILARITY ANALYSIS

**Finds similar projects**

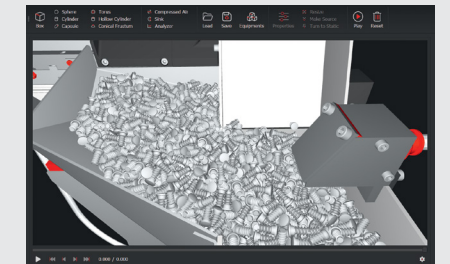
In a similarity analysis, the user uploads the 3D CAD file of the workpiece into the AI, and, as a result, receives a ranking of the most similar workpieces / projects from the past few years. This reduces the risk of choosing the wrong starting point for a project and thus incurring high follow-up costs.



### DATA MANAGEMENT

**Handles your project data**

The data management module is an add-on for AI similarity analysis. Once similar workpieces have been found, you want to be able to access as much data as possible about the associated projects in a targeted manner. Our backend service handles your project data exactly for this purpose.



### FILLING LEVEL

**Predicts filling density and mass**

We create filling scenarios using simulation and the CAD data of the workpieces. This allows us to determine the filling density for specific storage containers. We then use these data to train an AI that calculates filling levels and their total mass in real time.



### HOOKING / NESTING

**Classifies into yes / no**

Certain shaped workpieces delivered as bulk material tend to entangle, thus making a separation significantly more difficult. With only a few hundred CAD data of hooking and non-hooking workpieces an AI classifier can be trained to predict the risk of hooking / nesting.



### RESTING ASPECTS

**Predicts workpieces' resting aspects**

A typical question that often arises when handling bulk materials is which workpiece orientations can be expected. This AI module estimates the workpieces' resting aspects in real time after upload the 3D CAD file into the software.



## FACTS



**33.000+**  
Training data from past feeding projects



**110+**  
AI requests per month



**102**  
RNA internal users: sales, engineering, quality assurance



**Mobil**  
Everywhere, every time and every device

## CASE STUDY #1

# SIMILARITY ANALYSIS

**CUSTOMER:**  
**Rhein-Nadel Automation**

**SCOPE:**  
**incl. data management**

**DURATION:**  
**7 months**

## Engineering x AI

AI you can deeply evaluate every new customer request by taking previous project results into consideration.

Have we ever supplied a machine for a workpiece like this before? How did we design the tool back then? Would we do it all over again? All of these are typical questions in a project inquiry, not only in feeding technology, but in mechanical engineering in total. Empirical data and engineering knowledge help to answer these questions and put a new project on the right track right from the start.

The AI module of similarity analysis is being used by RNA from customer request to engineering and all over to quality checks.

### SALES

In feeding technology as well as in general mechanical engineering, experts often must be called in for customer inquiries. They have to trigger their knowledge in order to assess the customer's requests. With the module similarity analysis, the AI takes over that job.

### ENGINEERING

Designing a new tool from scratch always entails the risk of intense optimization loops. It is better to find a suitable starting point or at least to get inspiration for tool design from comparable past projects. With our AI this has never been easier to do so.

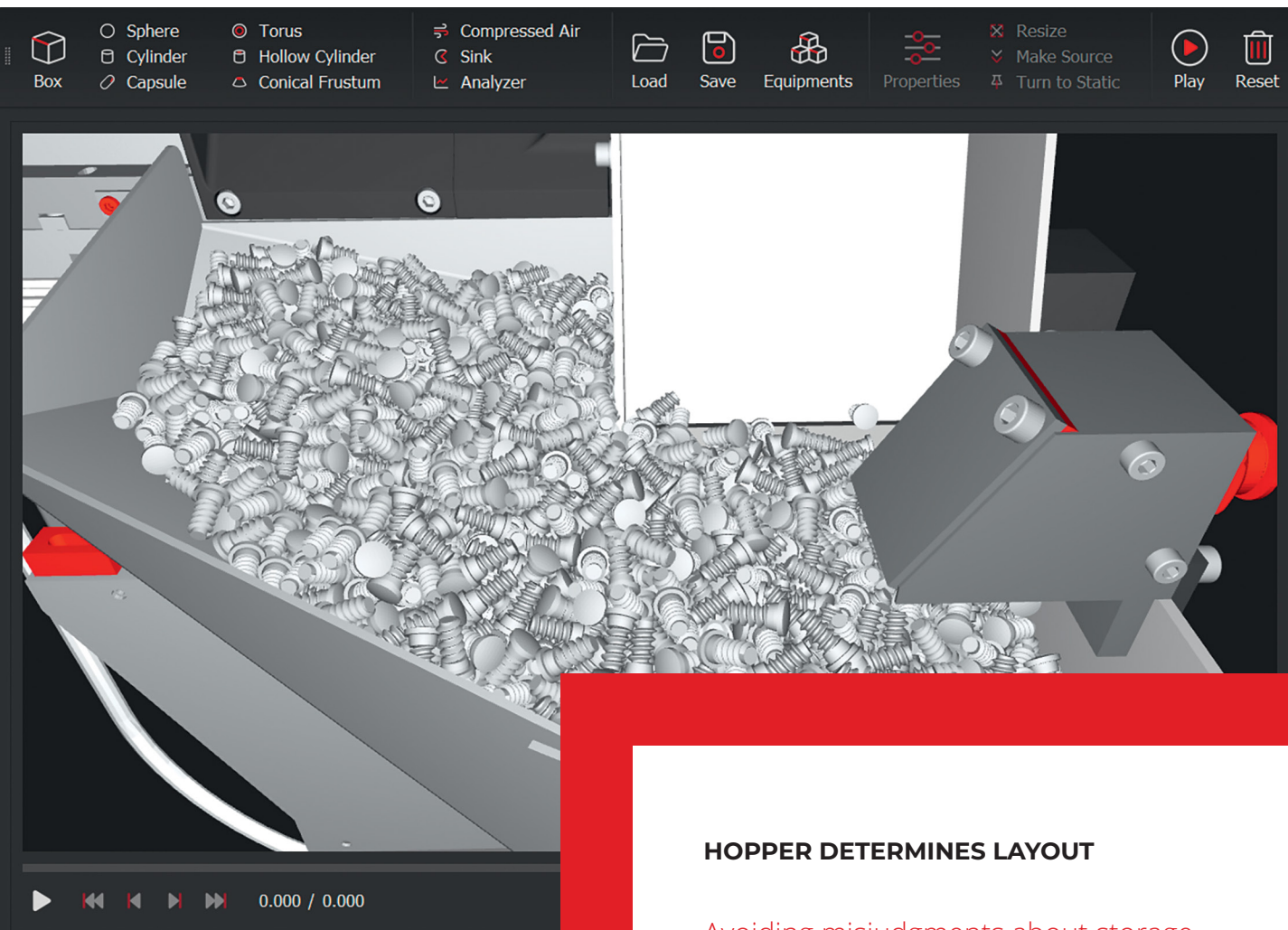
### QUALITY ASSURANCE

Once a new feeding system is completed, it is approved internally by QA and the final machine conditions are documented. All findings go directly into the AI as a new data set. RNA has thus created a closed circuit in which the AI module can work and be further enhanced.



# FILLING LEVEL

## CASE STUDY #2



### HOPPER DETERMINES LAYOUT

Avoiding misjudgments about storage container capacity through AI means a better layout!

As the level of automation increases, the requirement for autonomy time also increases. In most cases this is 120 minutes. To ensure the autonomy time, the customer uses special storage containers. These so-called hoppers are positioned relative to the system and can take up a lot of space depending on the required autonomy. Since space in factories is expensive and rare, the customer is always faced with the complex task of deciding between adequate hopper dimensions and the smallest possible space requirement.

**CUSTOMER:**  
**Screw industry**

**SCOPE:**  
**Cloud-based AI module**

**DURATION:**  
**1 month**

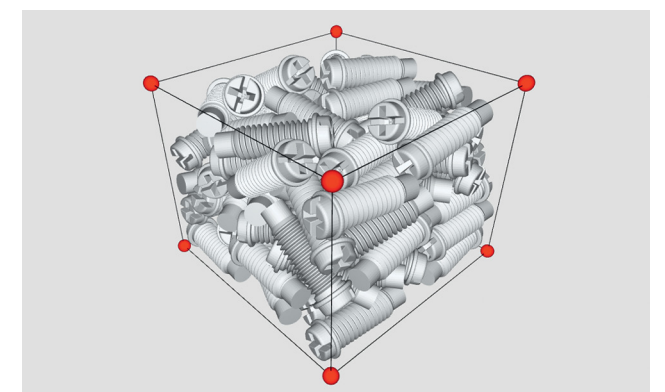
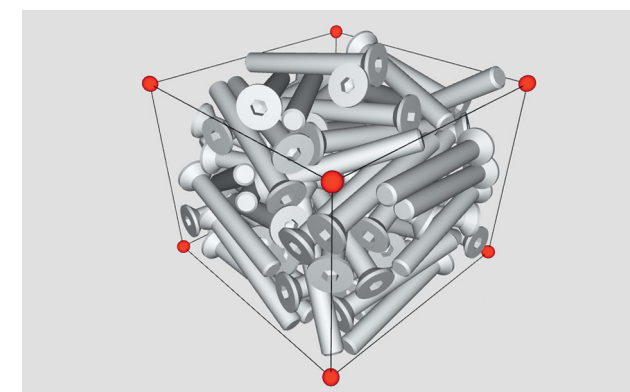
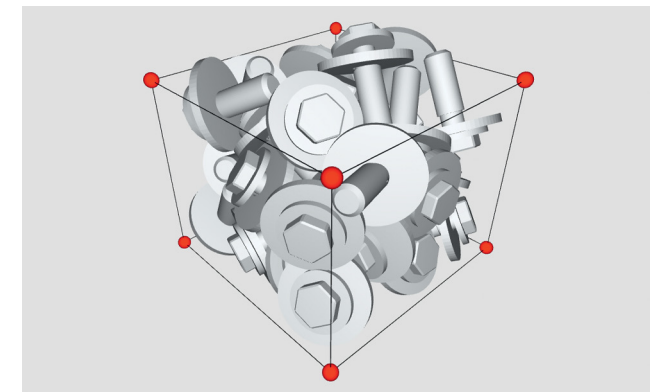
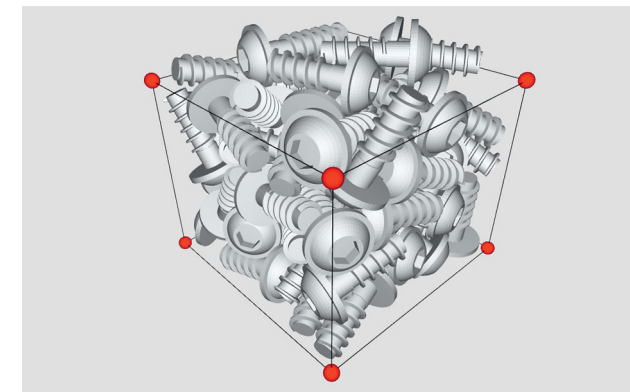
## PREDICTION OF FILLING IN REAL TIME WITH AI

### INCORRECT DIMENSIONING results in unexpected project costs

A misjudgment when sizing the storage container can result in shorter refill cycles that have to be carried out. This increases the production costs for the plant operator and ties up additional worker capacity.

### SAMPLE PARTS are not always available

Traditionally, the quantity of workpieces fitting into a hopper was evaluated through real experiments. System developments are increasingly taking place in parallel with the sample part development itself, so that samples of workpieces are not always available.



### SIMULATION as source for generating training data

In order to obtain the training data for the filling level AI module, we used our in-house developed simulation. Doing so, the customer's storage container was modeled into the simulation software and the different workpieces were digitally filled in. After a few hundred simulations, the training database was ready to precisely train an AI.

# PROJECT SCHEDULE

## 6 STEPS

Our strength lies in the fact that we already have the AI modules in use within the RNA group.



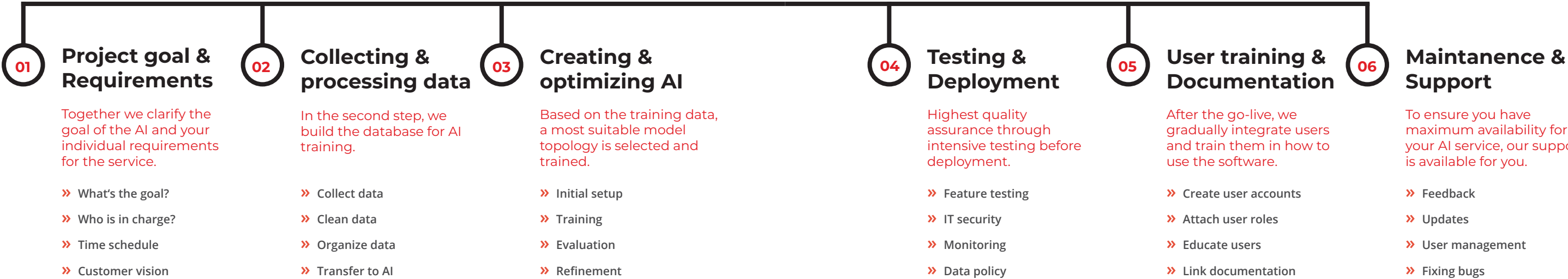
### APPROACH & TEAM

Before we start an AI project, we will clarify with you in a non-binding & free of charge consultation whether all the necessary IT and data structural requirements have been met in order to build AI modules for you.

A project team at RNA Digital Solutions consists of:

- > Team leader
- > Data scientist
- > AI backend developer
- > Frontend developer

### 6 STEPS TO SUCCESS





# IT SECURITY



We attach great importance to the security of your AI modules.



## 1

### Role distribution and limitation of requests

You define the user roles and rights together with us and can then actively assign these to your employees. You can also set individual daily limits for AI requests.

## 2

### SQL injection protection

SQL injection is a type of attack in which the attacker can inject arbitrary SQL code into the software's database and execute it. Deletions of data sets or their leaks can be consequences.

## 3

### Two-factor authentication

Our AI modules come with the option of two-factor authentication. For example, to log in, users need a second device such as a smartphone with an app for authentication on it.

## 4

### Protection against CSRF

Cross-site request forgery (CSRF or XSRF for short) is an attack in which a malicious HTTP request is planted and executed without the user's knowledge.

## 5

### Two-way SSL/TLS encryption

A secure HTTPS connection can only be started if both sides (server and user) have authenticated themselves with the appropriate certificate.

## 6

### Protection and control of user uploads

Restricting user uploads to .stl and .step file formats only to prevent the upload of potentially malicious content/code.



# PRICES

EVERY AI MODULE  
CAN BE PURCHASED SEPARATELY

## 01 SIMILARITY ANALYSIS

Our AI adapted to your CAD data & needs

- One-time effort 5.990 EUR
- Operation and maintenance costs incl. support 599 EUR/mon.
- Duration approx. 2 weeks

## 02 DATA MANAGEMENT

Module to connect your project data (photos, videos, PDF, CAD, ...) with the AI similarity analysis

- Individual quote after clarifying the feasibility

## 03 FILLING LEVEL

Real time prediction of workpiece filling

- One-time effort from 14.590 EUR
- Operation and maintenance costs incl. support 169 EUR/mon.
- Duration approx. 12 weeks

## 04 HOOKING / NESTING

Real time classification yes/no

- One-time effort from 12.950 EUR
- Operation and maintenance costs incl. support 129 EUR/mon.
- Duration approx. 8 weeks

## 05 RESTING ASPECTS

- One-time effort 3.490 EUR
- Duration approx. 2 weeks

## 06 CONSULTING

Regarding infrastructure, data, tech stack etc.

- Daily rate 1.190 EUR

## RETURN ON INVEST

Feeding technology depends on expert knowledge. This also applies to all other domains of mechanical engineering. Decisions are made based on experience. Our AI helps to incorporate stored expert knowledge into your decisions. In this way, technical and business decisions can be taken faster and more accurate at early stage.



ENTER AI  
AT A LOW PRICE  
LEVEL



SHORT  
PAYBACK PERIOD



NO MORE  
SHORTAGE OF  
SKILLED WORKERS

**599 EUR**

is the monthly  
subscription fee for  
the basic AI module  
with up to 50 users.

**1.5 YEARS**

is the estimated  
average time of return  
on invest, considering  
the complete  
package.

**BRAIN DRAIN**

Experienced knowledge  
remains in the company  
and is accessible at  
the click of a mouse.  
New employees are  
empowered more quickly.



**THANK  
YOU**  
FOR CHOOSING US



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