

The Sentin logo is displayed in a white box on a dark background. The logo itself is in a dark blue, lowercase, sans-serif font.

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The background of the entire page is a photograph of a car body on an assembly line. The car is silver and is being worked on by robotic arms. The setting is a large industrial factory with high ceilings and large windows.

Checklist for AI & Machine Vision projects

**The 24 questions your company should
answer before starting.**

Are you ready? – 4 Categories

We are using 4 major categories to determine if you are ready for AI projects. They contain important questions about the requirements of your current processes, the technical, financial and project related topics. We summed them up as the following:

- 1. The status quo**
- 2. The data requirements**
- 3. Your return on investment (ROI)**
- 4. Bringing the system to production**

Part 1 - The Status Quo

The current task, inspection or evaluation process.

You are the expert of your inspections or evaluations. This section helps to translate your requirements to the AI world and can help to identify the right AI architecture. The following questions help to identify how complex the evaluation is and what classes/features/defects should be considered.

☐ 1 of 4 - Do you have objective criteria for the evaluation?

This could be a norm or quality guideline (e.g. if a crack immediately results in a defect, but porosities <5mm are ok). This helps to qualify the results and the requirements of the Artificial Intelligence.

Notes:

☐ 2 of 4 - Do you care for a defect or feature dimensions/count or location?

Are you interested in the size of a crack or you just want to count something in an image? This is relevant for the AI model architecture and output.

Notes:

☐ 3 of 4 - How many different features do you want to classify/detect?

If you check for cracks, malformed, porosity and incompleteness this would be 4. If you just decide between OK and Not OK this would be 2 (called binary classification).

Notes:

4 of 4 - How many different parts, views or locations do you check?

AI models can be very robust, but if you have many different parts and views e.g. on 3 production lines you should consider this in the requirements.

Notes:



5 Causes: Pseudo
Scrap & Slippage?
What are FRR/FAR?

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Does the part meet the quality requirements?

Real Condition	True-Positive Good Part	False-Negative Pseudo Scrap	Yes
	False-Positive Slippage	True-Negative Correct Scrap	No
		Yes No	Test Result

Read more here (GDPR compliant link):
<https://t1p.de/kdou>



Part 2

The Data Requirements.

Did you know that ~80% of an AI project are about data preparation and organization?

Part 2 - The Data Requirements.

The more data the better.

As a rule of thumb: the more complex or detailed the task the more data you need. The more you know of your data the better an AI can be trained. If your images are digital and well-organized AI experts can work on solutions faster and achieve better results.

☐ 1 of 5 – Do you know how many digital images you have?

The training of an AI solution needs data. There are rare cases where you can use an out of the box model. If your inspection is common, you can reduce the number of images needed, but if it is unusual or has a lot of variety the amount may increase. What is the distribution between the different classes. Do you have 100 images of cracks, but only 10 of porosities? This might be a problem.

Notes:

If you do not have any digital images, is there a way to digitize or collect them?

☐ 2 of 5 - Which file type are you using? Are they compressed?

We recommend using TIFF or PNG files, because they can be saved lossless. This can be better, because the AI model can analyze more information. JPGs are smaller but may loose some image information due to their compression.

Notes:

AI Task	Effort & Data Requirements	Evaluation time	Localization
Classification	low	low	no
Object Detection	high	moderate	yes
Segmentation	very high	high	better

Learn more about it in the FAQ.

GDPR compliant link:
<https://t1p.de/i0av>



☐ **3 of 5 – Do you know your average file size? What is the min. and max.?**

The larger the image, the more information has to be processed. This can have an impact on the evaluation time. Some companies check really large parts and generate huge files (e.g. 10.000 x 10.000 pixel - 100 Megabyte). Others may check small parts with small images (1024 x 1024 pixel - 500 Kilobyte). This also has an impact on the hardware you need to train or evaluate.

Notes:

☐ **4 of 5 – Do you have your data stored online?**

If your images are on an analog film in your basement, it could take some time to use them for AI training. Better would be a digital version on a SSD. We recommend a cloud connection because of the backup capability and availability.

Notes:

☐ **5 of 5 – Do you have labelled/annotated data?**

This could be a simple sorting per file system or filename. One folder with defects and one folder with passed images. Alternatively there are tools that allow you to manage your files for AI projects and label features inside the images.

Notes:

☐ If you have labelled data, did you use a special tool? Which format have you used e.g. COCO format? (optional)

☐ If not, can you label them or know someone who can? (optional)

Part 3

The Return On Invest.

"The pessimist sees difficulty in every opportunity. The optimist sees opportunity in every difficulty."
Winston Churchill



Part 3 - The Return On Investment (ROI)

How is the current process affecting your business?

We have talked about the technical requirements for an AI project. The following questions deal with the financial part and can help to convince decision makers. The questions can also help to make a first calculation for the ROI - coming from process cost and time saving.

☐ 1 of 8 – Do you know how many images you process per week?

Normally this depends on the inspection or evaluation. We know projects where there were about 5.000 images per week e.g. in non-destructive testing of pipelines. Other projects had 20 Mio. images per week e.g. in the public sector and others had about 100 per week for large parts.

Notes:

☐ 2 of 8 – Do you know the average image evaluation time? Any limitations?

In non-destructive testing there are cases that take up to 7 minutes per image or longer. In manufacturing you need fast processing. If you take the number of images per week by the time it takes you to inspect a single one, you can get an indicator of time saving. For most cases AI models can evaluate images in less than a second or even in a few milliseconds.

Notes:

☐ 3 of 8 – How many people/machines are doing the inspection?

In some branches it is hard to find qualified personnel. If you could save the time of your inspectors, they could focus on other tasks. If you already have an inspection system or automation solutions in place, are they performing well?

Notes:

☐ 4 of 8 – Do you know your current accuracy? What is the target?

Quality controls or inspections need high detection rates. If you want to use AI, you need to know where you are at the moment and what you are aiming at. Otherwise it will be hard to determine if the AI solution really performs better.

Notes:

☐ 5 of 8 – Do you want the process to be more reliable or reduce false alarms?

This question determines what the focus of your evaluation should be. Some people come from a low detection rate resulting in many false-negatives others come from high false-positives. In manufacturing this often means pseudo rejects (parts that are actually good, but falsely accused of being defect) or high customer complaints (because the system failed to detect parts that were defect).

Notes:

☐ 6 of 8 – Do you know what a wrong evaluation costs?

For public sector this can be a fine or if an inspection is wrong people can be hurt. In manufacturing this could be pseudo scrap or customer complaints. There are projects where a single complaint (of a plastic part) costs 1.000€ or more with all the internal costs.

Notes:

7 of 8 – Do you have a clear goal for using an AI system?

This question might sound trivial, but it can help to identify if you even need an AI system. Rule-based Machine Vision systems (not AI) have been around for some time. If you just want to check if something has passed an area a photoelectric sensor might be enough. Not every task needs an AI to perform well.

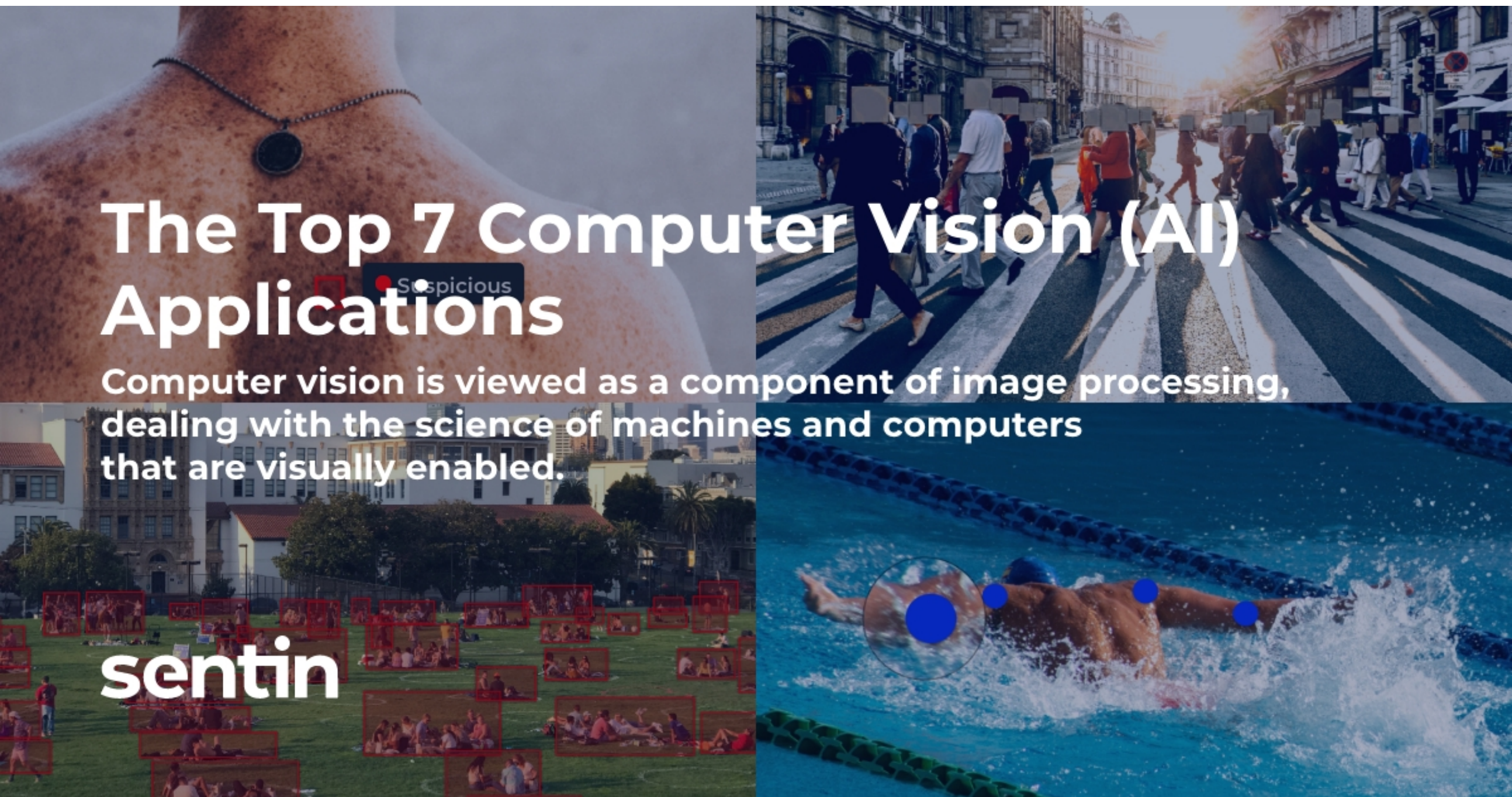
Notes:

The main benefits AI system offer are that they get better and more robust the more data they have and that they can work with complex tasks. Then they can be faster, cheaper and more accurate as other solutions.

8 of 8 – Do you have run prior AI or Computer Vision projects?

Artificial Intelligence is coming to more and more companies. Some companies have been early adopters. But most need to have tested and reliable solutions. If you already have run automation projects or have an computer vision engineer in your team this could be a benefit.

Notes:



Read more here (GDPR compliant link):
<https://t1p.de/035l>



Part 4

Bringing a system to production.

**“If you are working on something
that you really care about,
you don’t have to be pushed.
The vision pulls you.”**

Steve Jobs

Part 4 – Bringing a system to production

The key to successfully using an AI.

The last part is about the hurdles that can make it hard to complete a project successfully. It is dealing with the organization and deployment of the solution. Many projects fail because these questions do not get asked or get asked too late.

☐ 1 of 7 – Do you have the hardware (e.g. GPUs)? How about maintenance?

To successfully run an AI model you may need special hardware. The computation power needed is different from normal desktop applications, because they process image data. If something has to be bought or installed, who is responsible for that?

Notes:

☐ 2 of 7 – Do you have internet or network access?

Cloud applications are the future of software, but not every location has internet access. If you have mobile inspection team you may depend on LTE. Other networks are encapsulated from the internet. This is something you have to consider, because where is the computation power and how do updates come to the system.

Notes:

☐ 3 of 7 – Do you have a project responsible? Who supports it?

Innovative projects need the support of the participants. If the CEO understands that this project will boost the company's efficiency and you offer a ROI, it may be easier to get a budget. If the IT department understands the requirements of the project, it will be faster to install the needed hard- and software. Therefore, be sure to have all information and requirements.

Notes:

☐ 4 of 7 – Do you have the financials clear?

Before you start to set up an AI project you should ask yourself which department will pay for it? Is there a budget for innovation projects? Is there a budget for solving the process problem? Who needs to be involved in the process to make the buying decision? Often it saves a lot of time if the buying center knows right from the start that there may be a new supplier. **Did you know that some countries also fund innovation projects?**

Notes:

☐ 5 of 7 – Do you have a timeline for the project?

The questions before should have shown, that there are many things to consider. If you do not have any images or all of them are analog this will take longer than boosting the accuracy of an existing machine vision system.

Are you expecting some peaks or down time of your current process? Is there another project which might collide with your plans?

Notes:

☐ 6 of 7 – Do you know how to verify the results of an AI?

This is one of the most important questions for a successful AI project. When is the AI better than your prior solution? Better accuracy? Faster evaluation? If this is not answered you may struggle to really use the AI model and stick to the old solution.

Notes:

7 of 7 – Do you know how to update an AI system?

What happens if your process changes? How do you adapt? Can you update your system on your own? Who does the maintenance?

Notes:

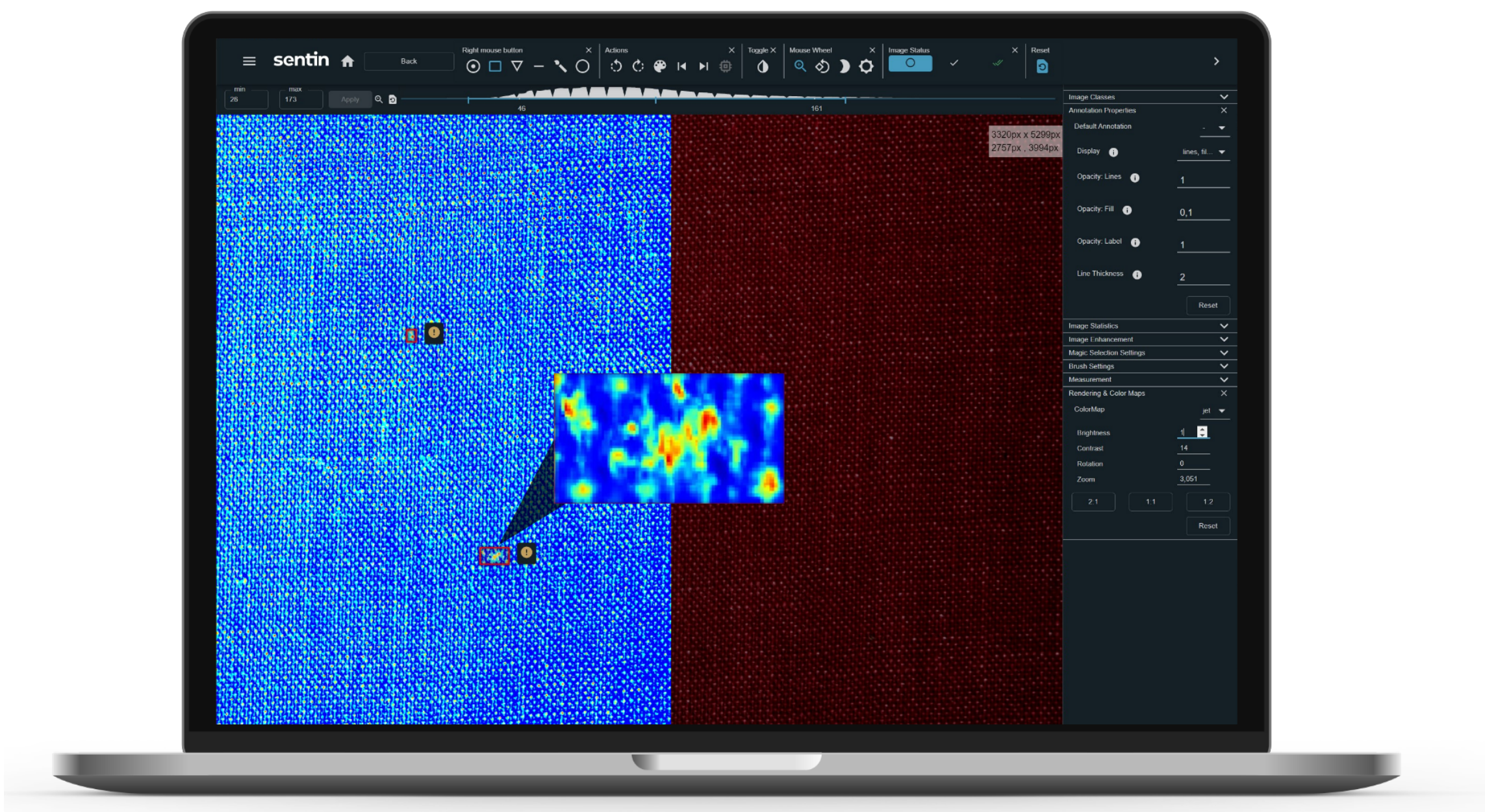
Do you want some feedback?
Do you need help with a step?

If you were able to answer all the questions you are well prepared for starting your project. Even if not you did an effort to start a project. We want you to be sucessfull with your AI project. **Therefore, feel free to ask us a question and get some advice.**

About us

The **sentin** team is made up of experienced developers and engineers who can look back on a shared history with industry giants such as Bosch Rexroth, Airbus Defence and Space or Audi AG.

The company focuses on the visual and image-based inspection of materials and products, for which they provide deep learning enabled software solutions for a wide range of industries.



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