SUALAB INTRODUCTION

## SUALAB Solution

SUALAB, specialized in A.I. Deep learning image analysis technology, provides a fast, accurate and user-friendly Deep learning machine vision S/W library for manufacturing industry.

### Deep learning Solution

수상 실적

- Recipient of "2017 IT Innovation Award of The Year" BUSINESS
- Recipient of "2017 Startup Awards" Selected for "Vision Solution Startup" the award for largest and fastest growing company in each category
- Recipient of "2017 FabCON Innovation Awards" for the Digital Global Innovation 10 projects Selected by the Korean Semiconductor Industry of Over Twelve Years Industry
- Selected as a 2016 C-Lab Top 6 Startup, in the Fintech Vision category (The only Korean company to be recognized in the Top 6, AI, Fintech, Healthcare, Machine Vision, Industry)

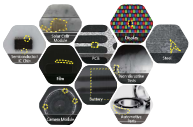
SUALAB INTRODUCTION

### Select Clients

SAMSUNG — Mobile & vision parts inspection solution
LG — Electronic/electronics parts inspection solution
SK — Filter inspection solution
Hanwha — Solar Cell inspection solution
DK 동국제강 — Steel surface inspection solution
KAC 한국산업공사 — Industrial scanning & image inspection solution
TOYOTA Lexus Motor Company — Automobile parts inspection solution
Hitachi Chemical Advanced Technology — Auto/Cell phone parts inspection solution
Panasonic Ideas for life — Electronic parts inspection solution

### SuaKIT Applicable Industries

SuaKIT has wide track records not only in the electric/electronics industries—such as solar, PCB and display—but also in various applications, such as non-destructive testing and steel.




SuaKIT SOLUTION

## What are the differences between SUALAB's Deep learning solution and conventional Machine vision technology?

| Conventional Machine vision method | SuaKIT's Deep learning method |
|---|---|
| Complex images cannot be analyzed<br>1 algorithm is required to analyze a defect image, so it is difficult to analyze a defect image, or to convert and modified. | Simple image and complex image can be analyzed<br>Deep learning can learn and analyze the defect image, so it is easy to analyze the defect image. |
| Low Accuracy<br>Accuracy is low because it is difficult to analyze the defect image, and it is difficult to analyze the defect image. | High Accuracy<br>Deep learning can learn and analyze the defect image, so it is easy to analyze the defect image, and the accuracy is high. |
| High industrial labor cost from Automation<br>It requires a lot of manpower and time to analyze the defect image, and it is difficult to analyze the defect image, so it is difficult to analyze the defect image, and it is difficult to analyze the defect image. | Lower labor cost in Automation<br>Deep learning can learn and analyze the defect image, so it is easy to analyze the defect image, and it is easy to analyze the defect image. |

SuaKIT SOLUTION

### SuaKIT Training Methods

- **Single Image Analysis** — Train and inspect features of one image
- **Image Comparison** — Train and inspect defects by measuring the difference between two images
- **Multi Image Analysis** — Train and inspect defects by analyzing the same area among various images
- **One Class Learning** — Inspect defects by training only normal images. Find out abnormal images

### SuaKIT Core Functions

- **Segmentation** — Inspect defect areas by pixel or area or defects in the image
- **Classification** — Classify images into categories that are defined beforehand
- **Detection** — Select each and extract the ROI (Region of Interest) in class

SuaKIT NEW FEATURES

## SuaKIT's Unique features

### Continual Learning: Minimize training time and number of training images

By utilizing continual learning technology, customers can "train and run" systems with the number of training images to be reduced to the same as the study.

**What is Continual Learning?**

Continual learning is a new way of training. Deep learning is made for training with a large amount of data, so it requires a lot of data and labeling of images and takes a long time.

- Generation of Index "Classification"

### Uncertainty Data Analysis: The easiest way to review training data

Possible to analyze any uncertain data, which is hard to difficult to classify into 2 class.

Easy to find falsely classified images (caused by incorrect labeling)

**What is Uncertainty Data Analysis?**

We can find unsuspected uncertainty data in the training data. Uncertain data that could negatively affect the performance of Deep learning.

SuaKIT NEW FEATURES

### Image Comparison: learning the difference

Inspect defects by analyzing the difference between normal and defect images.

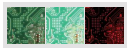
**What is Image Comparison?**

This function focuses on the difference between reference and a target images to monitor "normal" or "defective" and inspect defects such as a change in a global condition.

- Generation of "Segmentation and Classification"

### Multi Image Analysis: Comprehensive single neural network for multi type images

It's time to stop creating one train and run for each image. Multi image analysis can be trained.



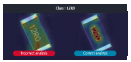
**What is Multi Image Analysis?**

When a multi-shot image is used, we analyze various initial condition and defects in a single image. Multi image analysis can be analyzed many defects and in the end can validate and re-locate in multi-shot images.

- Generation of "Segmentation and Classification"

### Visual Debugger: Efficient way to analyze the result

Unlike black box models, it's easier to check whether it's actually operation has been correct or, is according to the user's intention.




**What is Visual Debugger?**

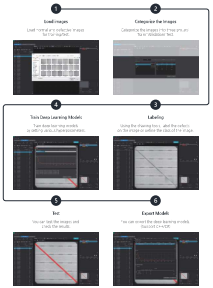
This feature visualizes which areas in the image are focused on by the AI and the part, which is correct, can be check + error the training in the model based on the user's intuition.

- Generation of "Heat Map"

How to Use SuaKIT

## SuaKIT Process

1. **Load Images** — Load normal and defective images for training
2. **Categorize the images** — Categorize the images into three groups for Validation Test
3. **Train Deep Learning Models** — Train deep learning models to verify and classify defects
4. **Label by** — Using the drawing tool, label the defects on the image or define the class of the image
5. **Test** — You can test the images and check the results
6. **Export Models** — You can convert the deep learning models (Inference) to EXE



SuaKIT BENEFITS

## Why SuaKIT Solution?

### Special algorithms for manufacturing industry ensure high inspection accuracy

Significant advantage with accuracy through using data of many inspection images and development of deep learning algorithms specialized for manufacturing industries.

Provide solutions to leading smart factories such as Samsung, LG and SK, with greater reliability and accuracy than competitors.

### Minimize processing time based on unique technology

Utilizing GPU and core processing technologies, such as OLCA and ocl.hint, we have developed a proprietary deep learning algorithm for faster data processing speed.

Utilizing multi-core and batch processing, it is possible to "2 more times faster processing" in a actual production environment.

### Provide customized deep learning model by operating Solution Development team, a team of Deep learning experts

Provide customized solution with deep learning models for each customer's requirement by a Solution Development Team, consisted of deep learning experts.

Provide time-efficient "2 times faster" deep learning models for customers.

### High compatibility with on-line inspection algorithms

Provides C++ and C# API, easy to interface to on-line inspection algorithms based on C++ and C#.

SuaKIT INFORMATION

## FAQ

**Q** How many number of training images are required?

**A** Highly depends on the complexity of the image. Around 100~200 images per each defect class should be required.

**Q** How much time is required for training?

**A** For 1,000 images (1920×1920), Deep learning needs about 1 hour.

**Q** How fast is the processing time?

**A** For segmentation (1920×1920, image with Gaussian STD 1000~2), the processing time is less about 1~2 s.

## SuaKIT Specifications

| | Minimum requirement | Recommended |
|---|---|---|
| OS | Windows 7 Ultimate / Windows 10 Pro64 / Windows 10 IoT Enterprise Edition2016 LTSB | |
| CPU | Intel® Core™ i5 or higher | Intel® Core™ i7 or higher |
| RAM | 16GB free memory of 8GB or higher | 32GB |
| GPU | NVIDIA® GeForce® GTX 960 | NVIDIA® GeForce® GTX 1080Ti or higher |
| Storage (Hard Drive) | Hard disk 20 G | Hard disk 20 G |
| Resolution | Full HD (1920×1080) or higher | recommended 2k (resolution 4) |
| Keyboard/Mouse for Input Devices | Free serial port 3 USB or higher (USB "mouse/keyboard") | |
| Installation | USB and Online Download | |
| Security | Available only when a dongle key is attached. (*) | |

## GLOBAL NETWORKS

- **Korea** (http://www.sualab.com)
  - Korea Headquarter — Headquarters
  - China — China Subsidiary
- **China** (http://www.sualab.com)
- **Taiwan** (http://www.sualab.com)
  - Taiwan — Distributor office
- **Singapore** (http://www.sualab.com)
  - Singapore — Distributor Headquarters
  - Malaysia — Distributor office
  - Thailand — Distributor office
  - Vietnam — Distributor coverage
  - Myanmar — Distributor coverage
- **Japan** (http://www.sualab.com)
  - Japan — Distributor Headquarters
- **EUROPE** (http://www.sualab.com)
  - Spain — Distributor Headquarters
  - Portugal — Distributor office
  - Mexico — Distributor office
  - Brazil — Distributor office
  - Chile — Distributor coverage
  - Argentina — Distributor coverage
  - Colombia — Distributor coverage
  - Peru — Distributor coverage
  - Morocco — Distributor coverage