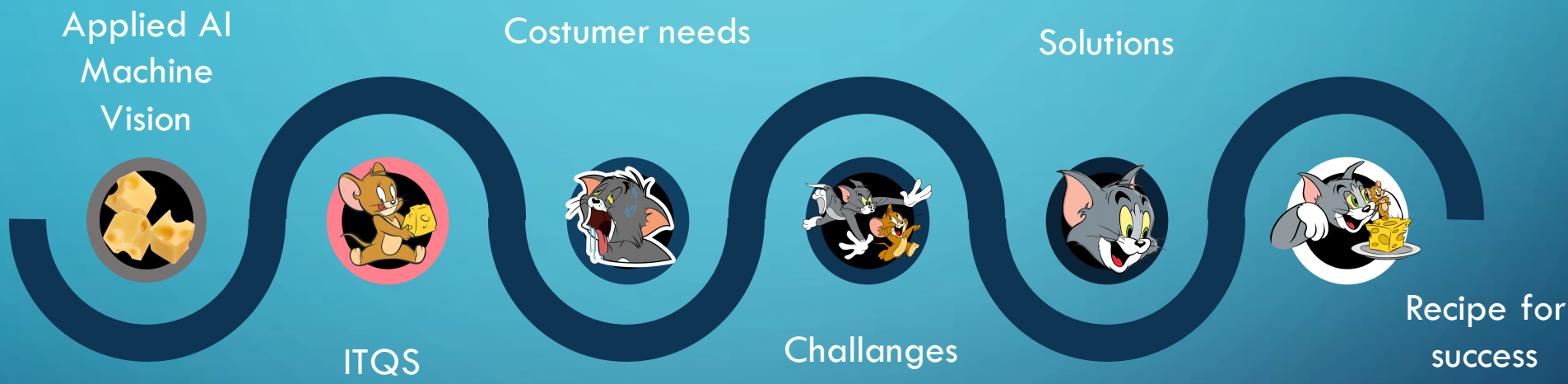
CONTENT



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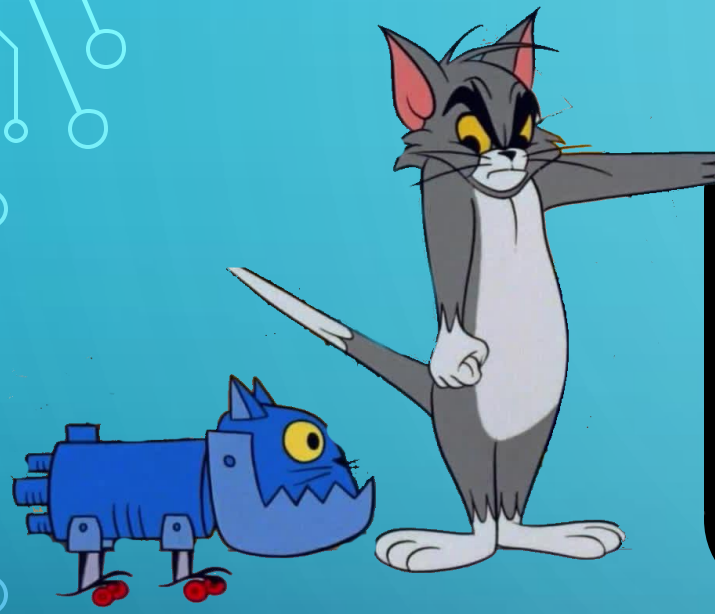
TIME FOR MACHINE VISION



Everything that can be detected by humans from digital data/images can also be detected by neural networks…

and even what is not...
UV, IR, X-ray, MR, microscopic images,

and not tired, objective...
All this at an affordable cost

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CONQUERED TERRITORIES

- Medical
- Traffic
- Self-driving
- Transportation
- Production
- Livestock
- Farming
- Mobile mapping
- Biometrics
- Mobile Apps

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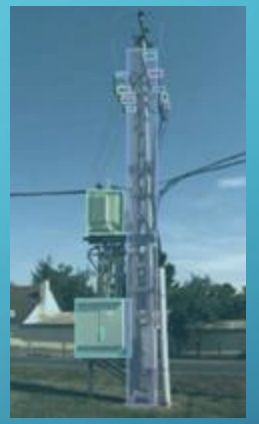
ITQS SERVICE AREAS

Traffic analysis

Medical diagnostics



Infrastructure inspection

Railroad maintenance

Medical production QC

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MEDICAL PRODUCTION QUALITY CONTROL

QC at the end of production pipeline

There is usually only one QC phase at the end of production

Critical errors

Highlight products are 100% checked, no critical error is allowed

High manual assembly rate

Due to the product range, there are installation steps that are difficult to automate

Long shelf life products

The warranty period is 5 years, so often the claim is substantially different from the production time, difficult to calculate

Packaging condition critical

The products are sterilised, so it is critical that the packaging is free from defects and damage

Many types of errors

Large variety of critical errrors

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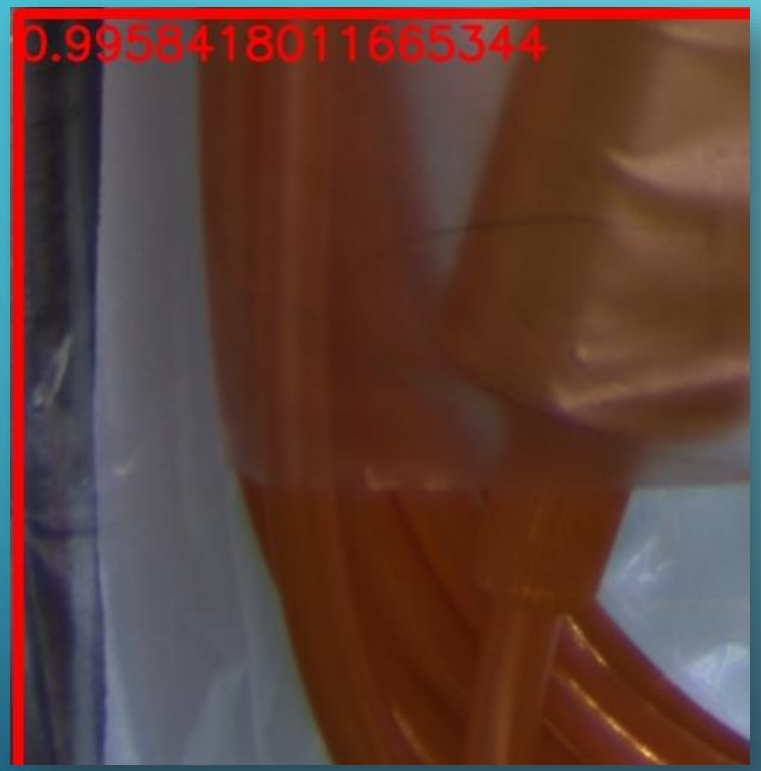
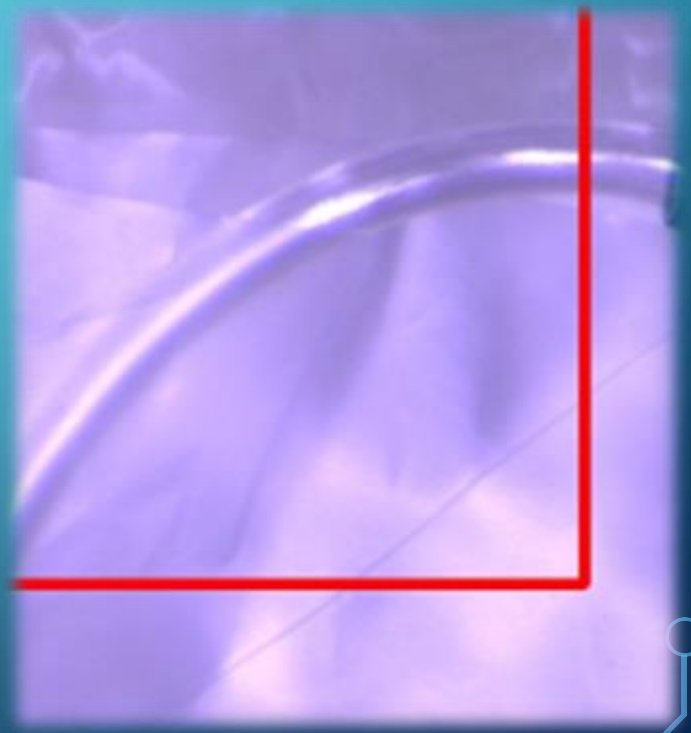
NEEDLE IN THE HAYSTACK





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THE MACHINE VISION EQUIPMENT

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MAIN CHALLANGES

- **Not a CLASSIC IT project**, more risk, more research, less predictable
- Extremely high expectations, requirements (rejects < 1ppm)
- No common „understanding”

SOLUTIONS

- Formalization, digitalization
- Breakdown into self-sustaining steps
- Go HYBRID
- Common dictionary

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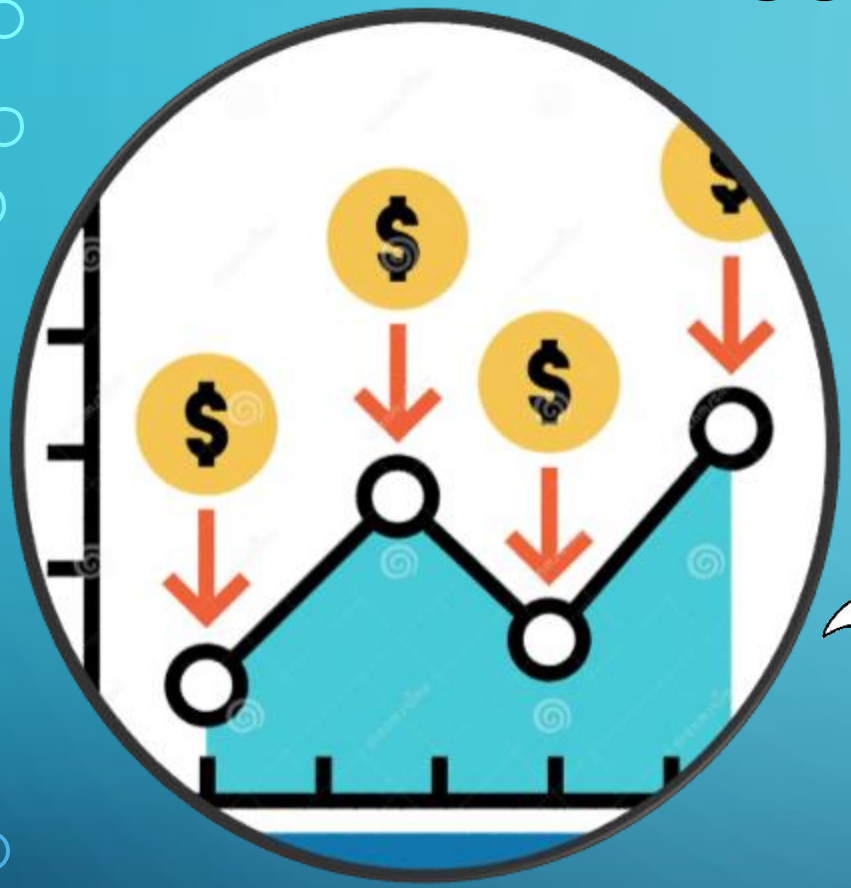
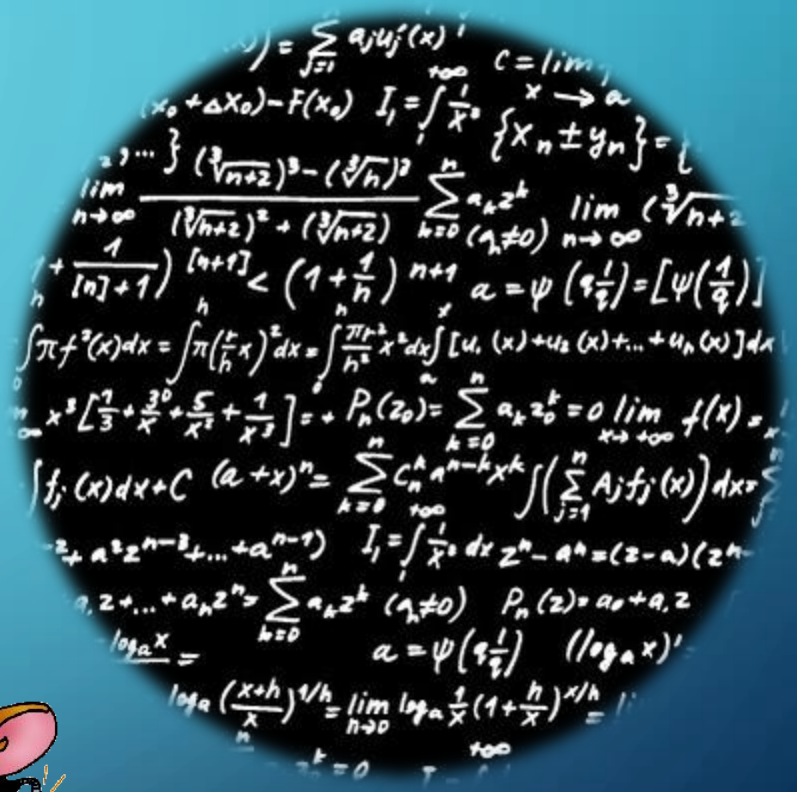
COMMON LANGUAGE



VS.



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COMMON DICTIONARY - MAPPED INTO A TECHNICAL ANNEX

	Total population = P + N	Predicted condition: Positive (PP)	Predicted condition: Negative (PN)
Actual condition	Positive (P)	True positive (TP)	False negative (FN)
Actual condition	Negative (N)	False positive (FP)	True negative (TN)

$$\mathrm{ACC} = \frac{\mathrm{TP} + \mathrm{TN}}{\mathrm{P} + \mathrm{N}} = \frac{\mathrm{TP} + \mathrm{TN}}{\mathrm{TP} + \mathrm{TN} + \mathrm{FP} + \mathrm{FN}}$$

$$\mathrm{PPV} = \frac{\mathrm{TP}}{\mathrm{TP} + \mathrm{FP}}$$

$$\mathrm{TPR} = \frac{\mathrm{TP}}{\mathrm{P}} = \frac{\mathrm{TP}}{\mathrm{TP} + \mathrm{FN}}$$

1.sz. Melléklet

VALÓS SZENNYEZŐDÉS

GÉP ÁLTALI DETEKCIÓ	POZITÍV	NEGATÍV
POZITÍV	TP	FP
NEGATÍV	FN	TN

$TP_{arány} = \frac{TP+FP}{TP+FP+FN+TN}$ cél javaslat ⇒ 1%

(BBH részéről ez javasolt első körben, de a 100%-os, vagy minél magasabb százalékú valós hiba detektálás kárára később felülvizsgálandó)

$Det_{arány} = \frac{TP}{TP+FP}$ elvi max. 100% ⇒ TBD%

(később a tapasztalatok, próbák alapján definiálható, a lehető legmagasabb valós hiba detektálása a cél)

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HYBRID

Go / No go ✓

IT DEVELOPMENT ✓
SENSOR DEVELOPMENT ✓

MI 60% - 70 % PROPOSALS ✓

MI 99 % ✓

PROCESS ASSESSMENT AND RETURN ON INVESTMENT CALCULATION

IT DEVELOPMENT

SENSOR DEVELOPMENT

TRAINING MODELS

BUILDING KNOWLEDGE BASE

TRANSFER TRAINING

PREPARATION

DEVELOPMENT PHASE

HYBRID

AUTOMATED

END OF PREPARATION

END OF PHASE I.

END OF PHASE II.

END OF PHASE III.

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SUCCESS

Accuracy: 0.98

Precision: 1.0

Recall: 0.94

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THANKS FOR YOUR ATTENTION!

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