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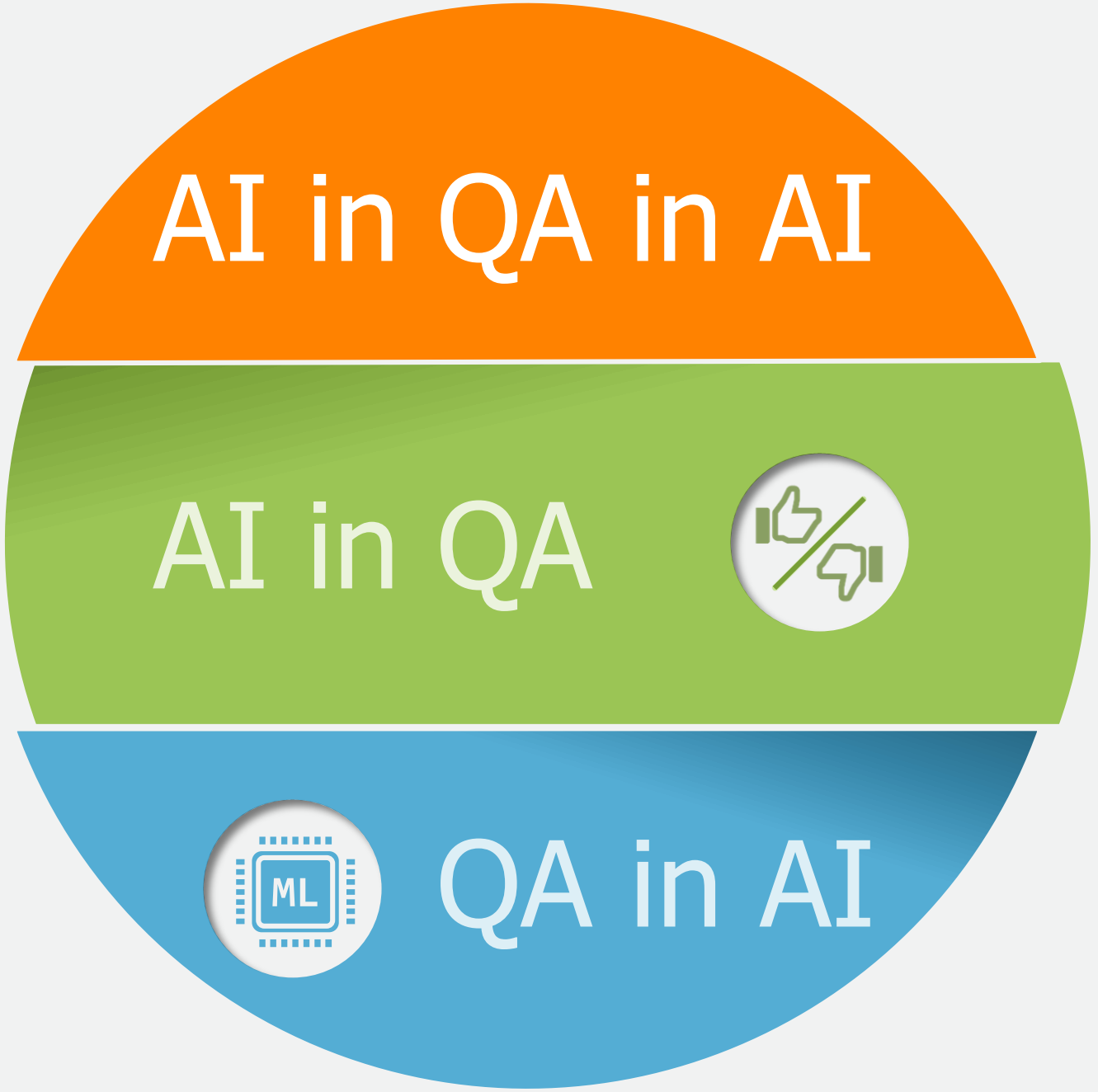

Symbio is a global software engineering and R&D services company

Think Global, Act Local

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We co-create **innovative ideas** with you and help you to co-develop them to **transformative digital solutions & services** that connect, engage, and amaze your customers.

Our Offering

- Innovation
- Artificial Intelligence & Robotics
- Embedded Solutions
- Digital – Intelligence of Things
- Quality Assurance & Testing

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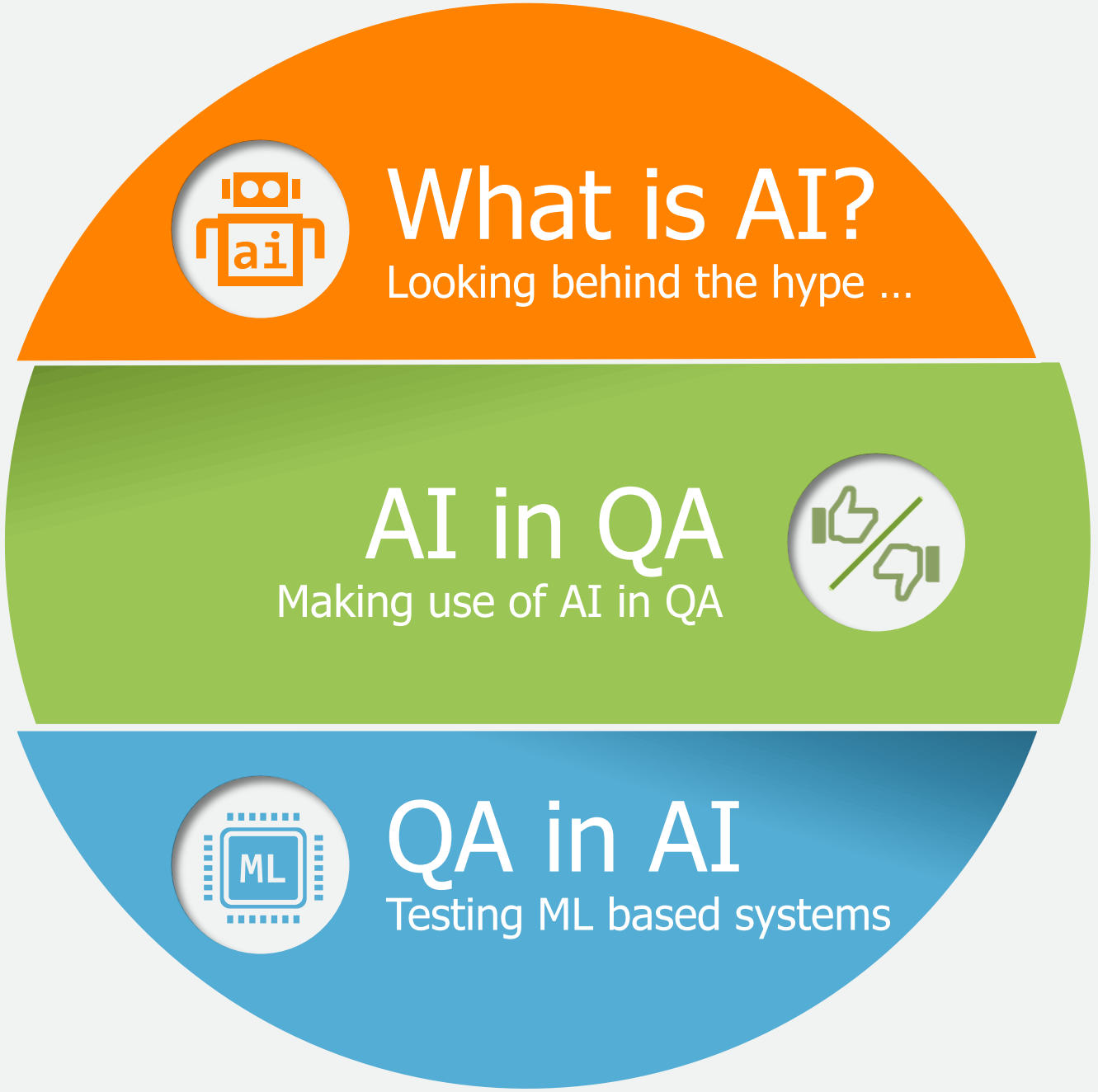

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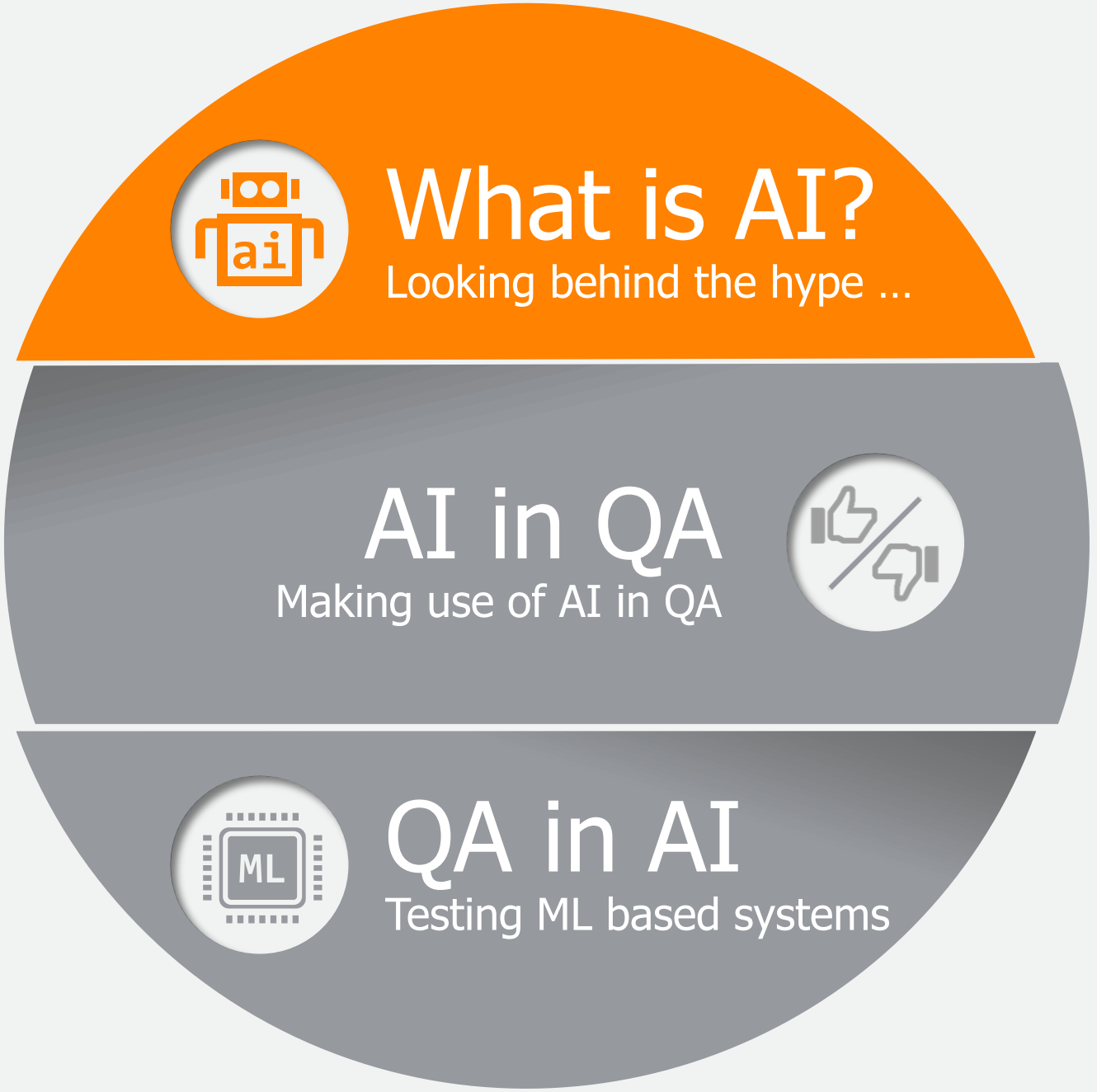
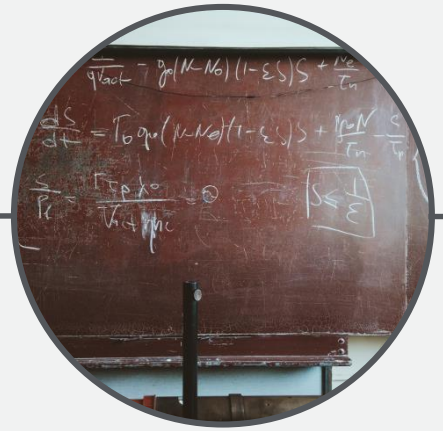


DEFINITIONS: ARTIFICIAL INTELLIGENCE

INFORMAL

- Intelligence exhibited by machines
- Machines mimicking "cognitive" functions associated with humans
- Playing strategic games, natural language processing, driving a vehicle etc. …
- AI effect: "AI is whatever hasn't been done yet"

SCIENCE



- Study of Intelligent Agents – any device perceiving it's environment and taking actions maximizing it's success in some goal
- Such agents may also learn, hence "Machine Learning" (c. 1959)
- Or use knowledge i.e. "Knowledge Representation and Reasoning"
- And bunch of other stuff …

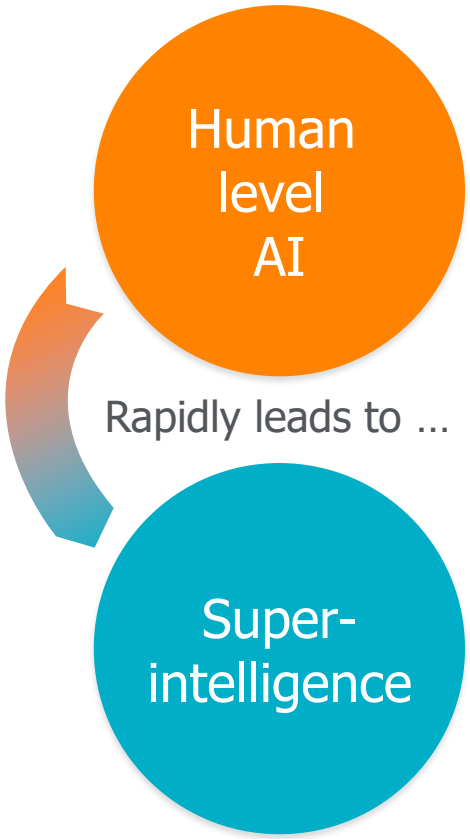
MORE BUZZ

- Deep Learning – machine learning with a cascade of many layers of non-linear processing units
- Shallow Learning – not deep
- GOFAI – Symbolic AI, that was when grandpa was doing studies
- Artificial General Intelligence or "Strong AI" or "Full AI", i.e. hypothesised human level AI
- Superintelligence …

SO WHEN DO WE GET GENERAL AI? OR SUPERINTELLIGENCE?

Difficult to predict but there's so much media buzz on this that let's spend a few minutes on the topic

1 Superintelligence?



2 Ask the experts?

Combined likelihoods for human level AI from several "AI Expert" polls:

- by 2022 – 10% probability
- by 2040 – 50% probability
- by 2075 – 90% probability

Most of these people expect that Superintelligence might follow in about 30 years. Some are bit more enthusiastic

3 Track-record?

If you asked the same question 50 years ago from the same set of people (i.e. the guys who led the field mid 1960s) the answer was that general AI will be there in about 20 years …

"It's a bit like worrying about the overpopulation on Mars"

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YOUR OFFERING WILL BE DATA-DRIVEN

WHERE ARE WE TODAY?

Big Data

zettabytes today

CPU / GPU

MapReduce
Deep Learning

Cloud

Compute
Storage

DX

Abstraction level
Ease of use

Automatic Computing Engine by Alan Turing

Machine Learning and AI

Super Intelligence (?)

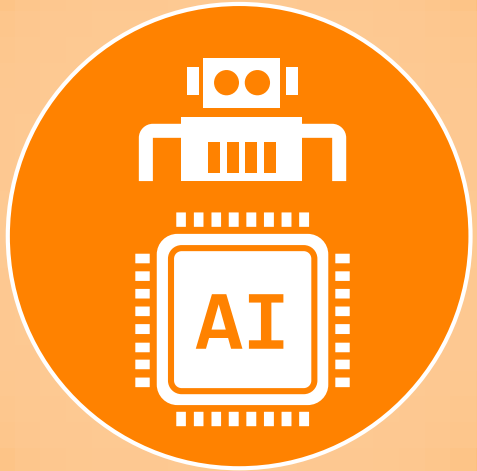
Photo by Markus Spiske on Unsplash

A SIGNIFICANT OPPORTUNITY FOR ALL

Reduce costs

Create experiences

10%



10X

Add value

Change the game

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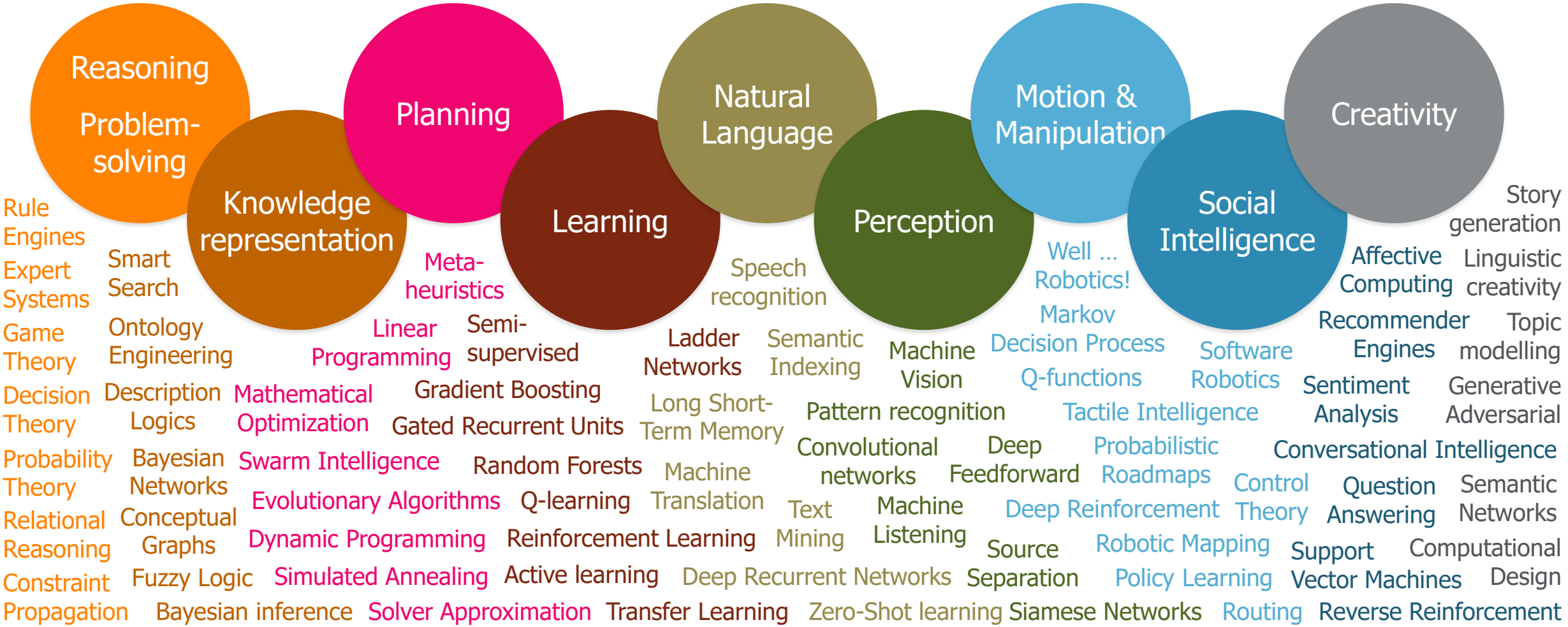
Why?

IT'S A TOOLBOX!

AI is not a single field of research or one specific approach



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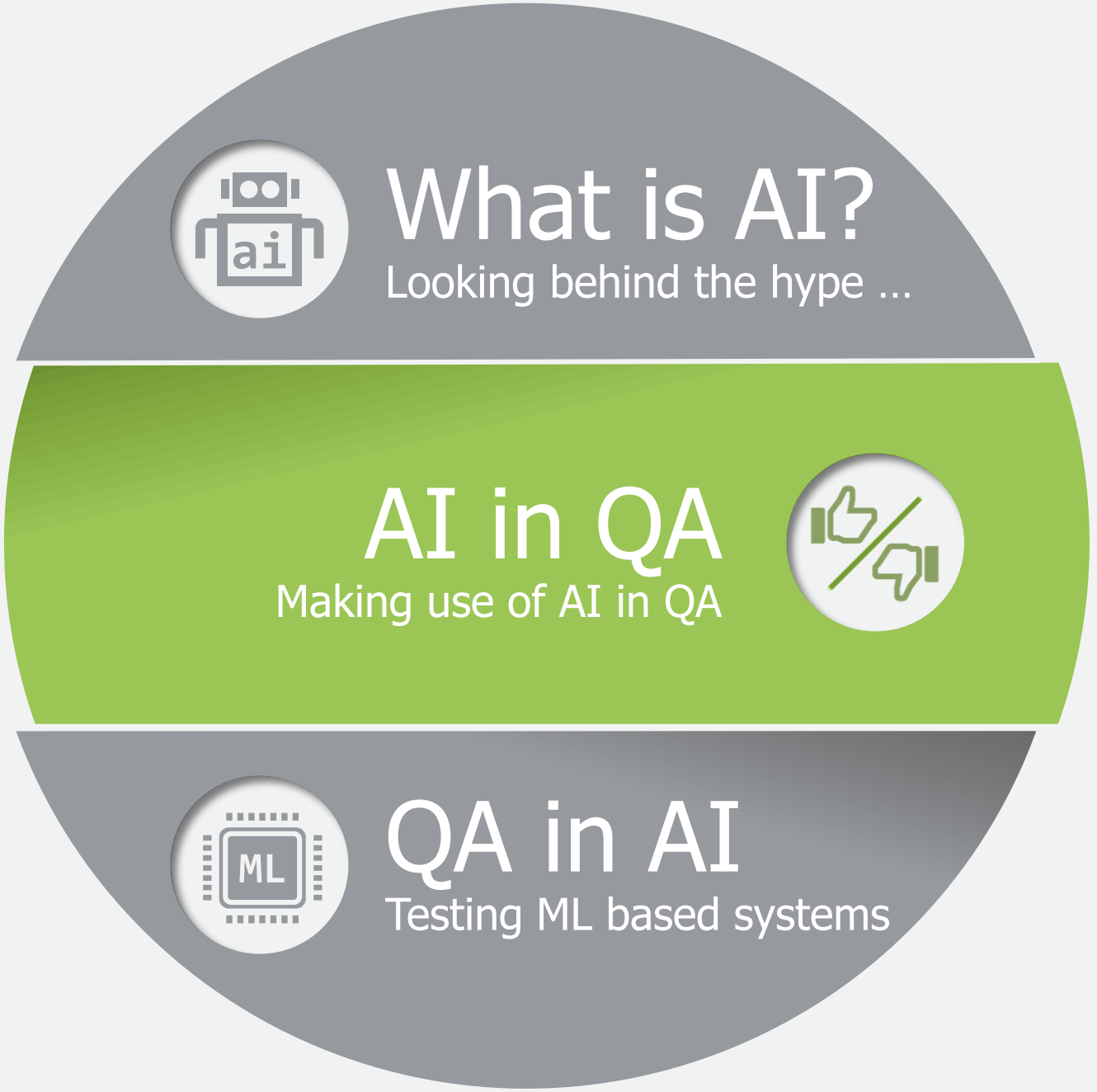
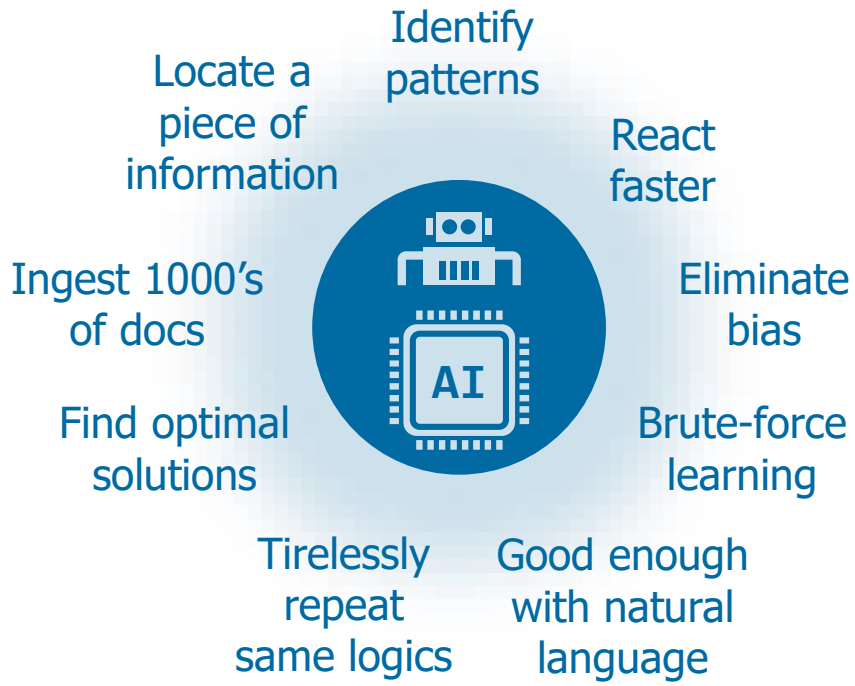
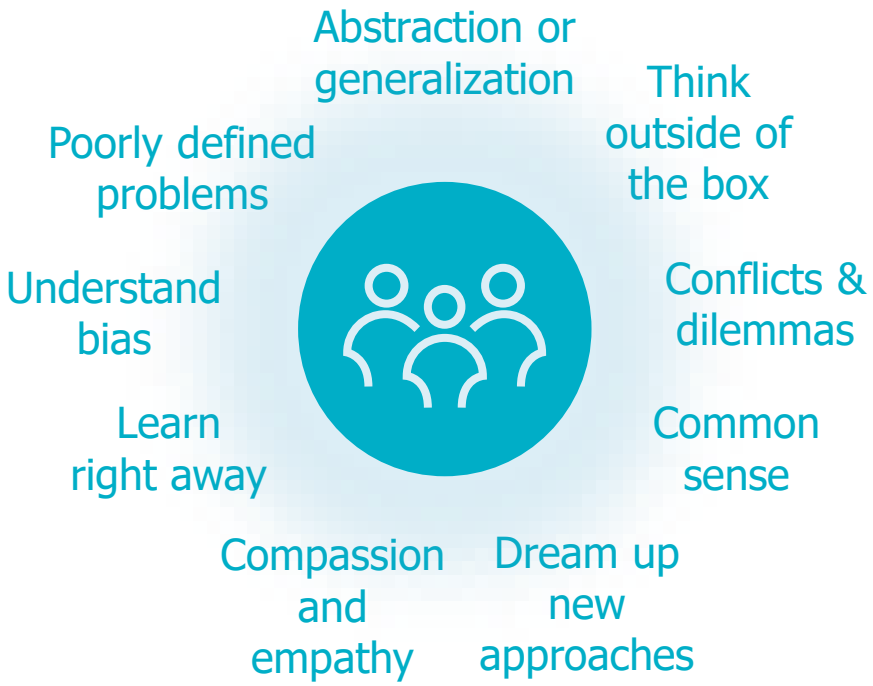


HOW DO YOU COMBINE HUMAN LABOUR AND INTELLIGENT MACHINES?

Machines can do much better in many areas



The right person will win hands-down in others



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WHAT YOU REALLY NEED IS
A SMART COMBINATION OF BOTH

Machines can do much better in many areas

Identify patterns

Locate a piece of information

React faster

Ingest 1000's of docs

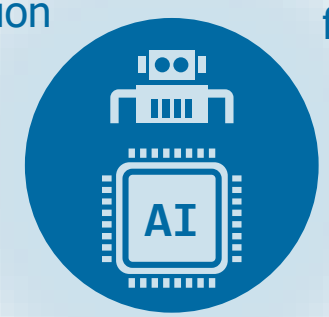
Eliminate bias

Find optimal solutions

Brute-force learning

Tirelessly repeat same logics

Good enough with natural language



What if you combine those strengths?

The right person will win hands-down in others

Abstraction or generalization

Think outside of the box

Poorly defined problems

Understand bias

Conflicts & dilemmas

Learn right away

Common sense

Compassion and empathy

Dream up new approaches

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TOOLS ARE HERE TO AUGMENT – NOT TO REPLACE
ROLE OF THE TESTER WILL CHANGE

Generate test scripts

Automate test execution

Screen scraping, machine vision

Traceability and predictability

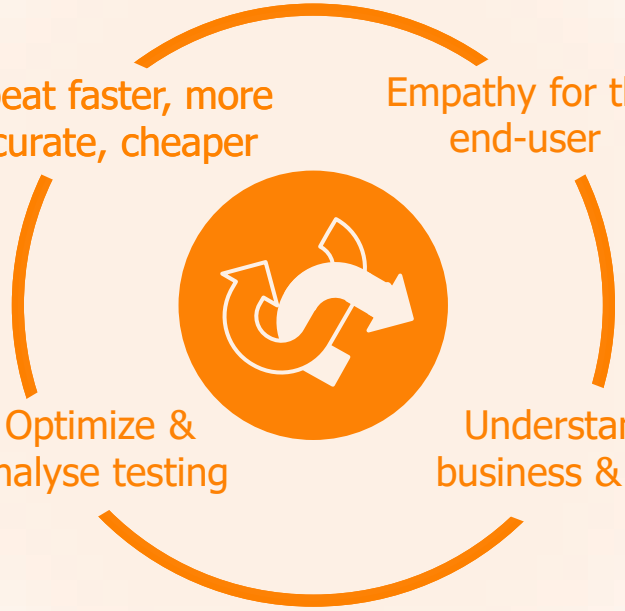
Learn from history

Test suite optimization

Impact analytics

Test scenario mining

A perfect fit for Quality Assurance!



Understand user experience

Consider best and worst usage

Manage and guide automation

Validate and act on findings

Understand business value

Apprehend technology context

Interpret analytics findings

Grasp shortcomings of automation

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THE NEW TESTER: THE AUTOMATOR NOT THE AUTOMATED

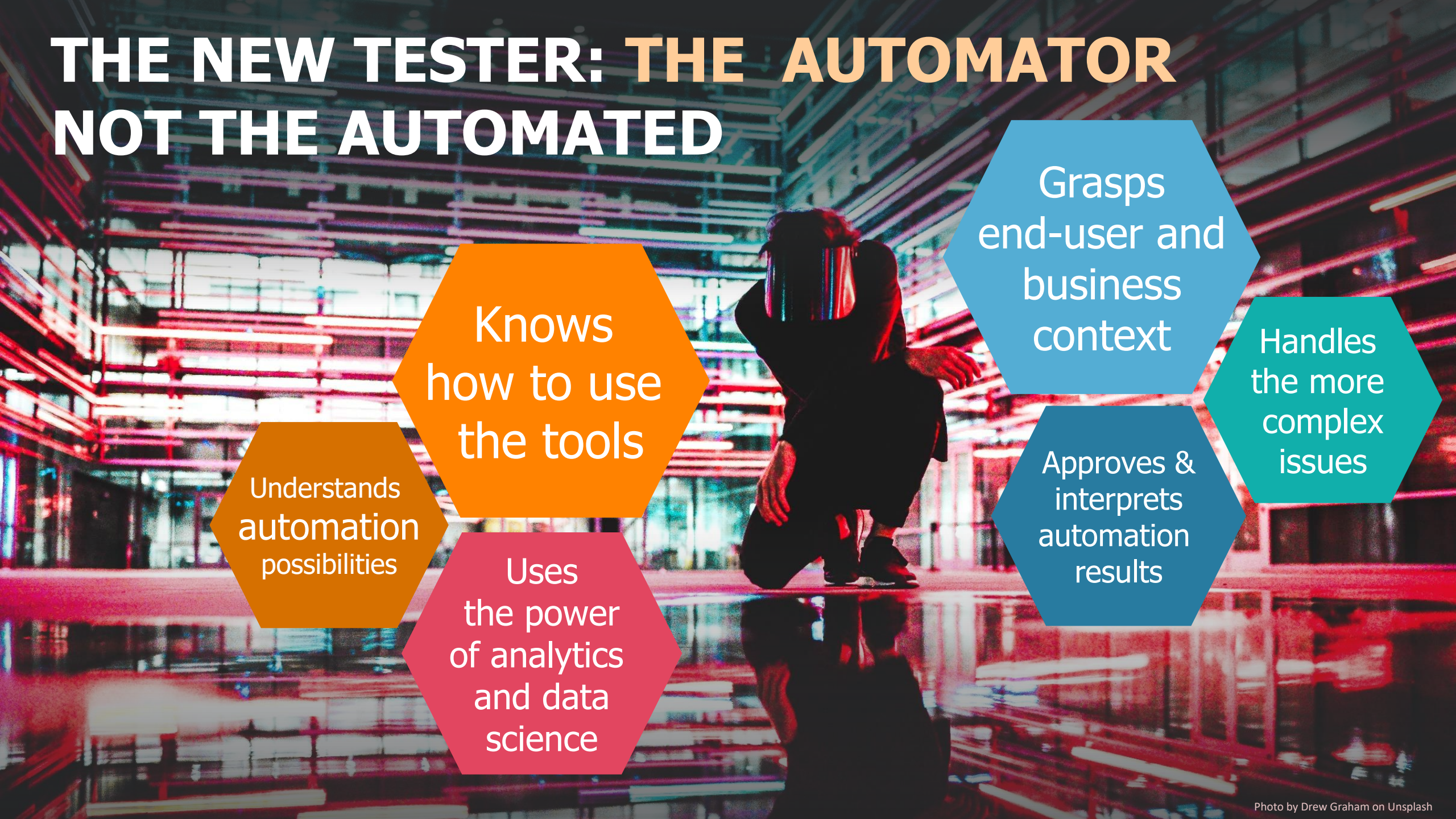

Photo by Drew Graham on Unsplash

CASE ROBOT AIDED TEST AUTOMATION

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Multi-Device UI Test Automation with RATA

IF YOU CAN TOUCH IT, RATA CAN TEST IT!

- Non-intrusive black-box testing for devices
- Both functional and non-functional testing
- Platform independent – either touch or software based

Solution

- Optical Character Recognition (OCR) and Icon detection enable UI changes without extensive rework of test automation scripts
- Model-based approach for generating pseudo-random test paths
- Optofidelity robot, imaging and high speed cameras
- Automated reporting and analytics

RATA has been successfully applied in several industries

- Automotive
- High tech / consumer devices
- Industrial Equipment

THE REAL VALUE

- ✓ One-time set-up – can run 24/7
- ✓ Accelerated R&D and testing cycles
- ✓ Improved test quality and repeatability
- ✓ Also performance, stability, longevity testing
- ✓ Easy benchmark / competitor analysis
- ✓ Ability to test new kinds of control and activation methods
- ✓ Test device performance without modifications or connections

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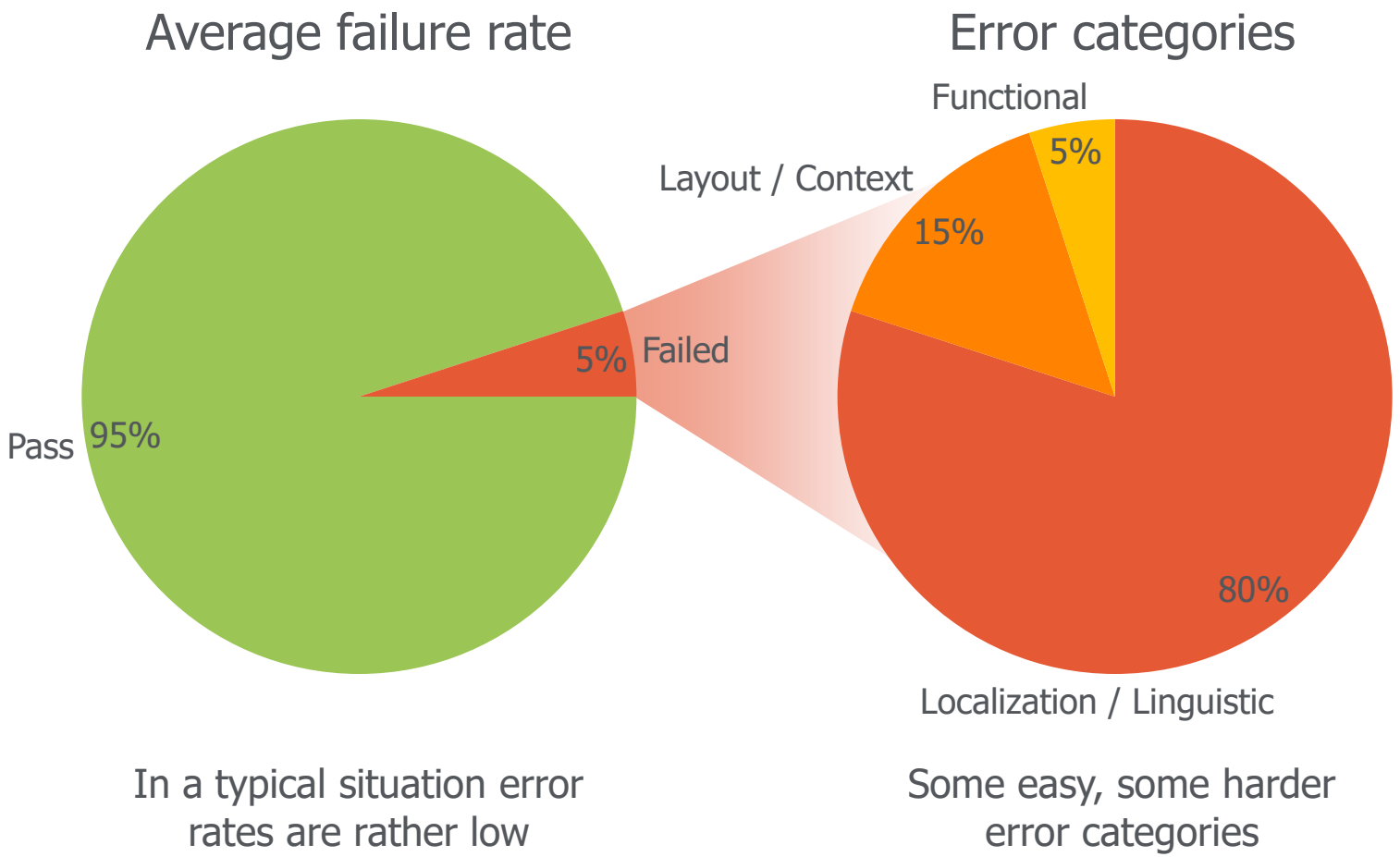
Check out our RATA video:
https://www.youtube.com/watch?v=n_915xMRGAo

FUTURE DIRECTIONS: MACHINE LEARNING FOR LQA

Localization Quality Assurance is a complex domain with a lot of routine work



In a typical situation error rates are rather low

Some easy, some harder error categories

Machine Learning to help?

Some **easy** categories

- Text overlapping UI elements
- Typos, grammar errors, unlocalized, truncated, …

Some **harder** … e.g.

- Technically correct translation but still not right
- Inconsistency issues

Machine translation tools are developing fast …

… but they will not solve our problem

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SO A DEAD END … ? NOT SO!

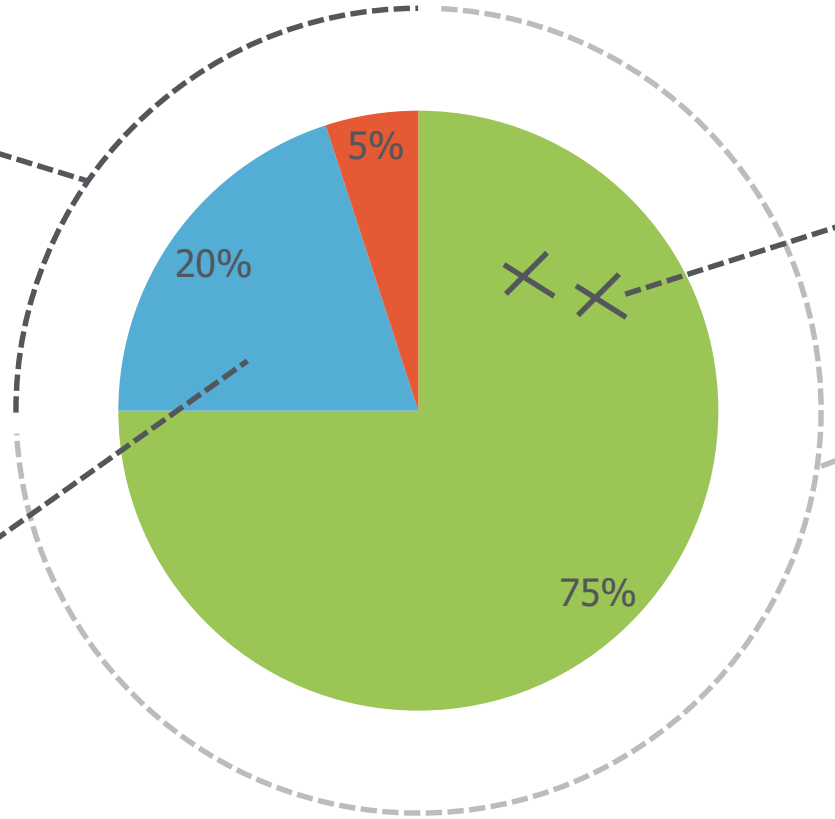
You need that smart combination of human and machine capabilities

Tester to focus on ¼ of total test cases, identified as suspicious

Keep rate of false negatives low at the cost of high rate of false positives

75% of cases not requiring attention from a human

Even very high amount of false positives will not dilute benefits



Other benefits will also follow

- Immediate feedback
- Regression testing
- Cycle time reduction
- Improved quality
- Less error leakage
- More interesting for tester

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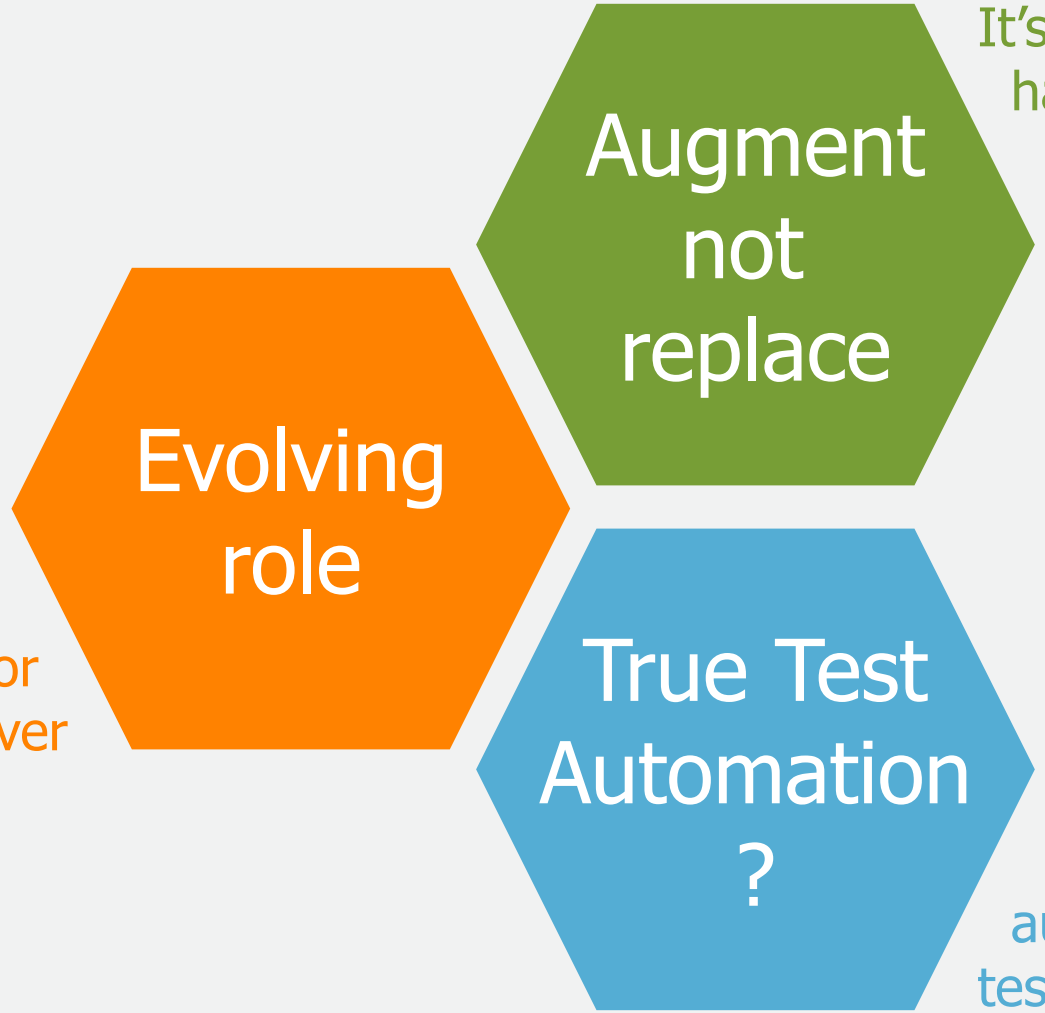
IN SUMMARY



It's excruciatingly hard to get machine learning / automation to work perfectly

The role of the tester will evolve towards the automator and problem solver

Tools today already offer possibilities to move from automated testing to true test automation

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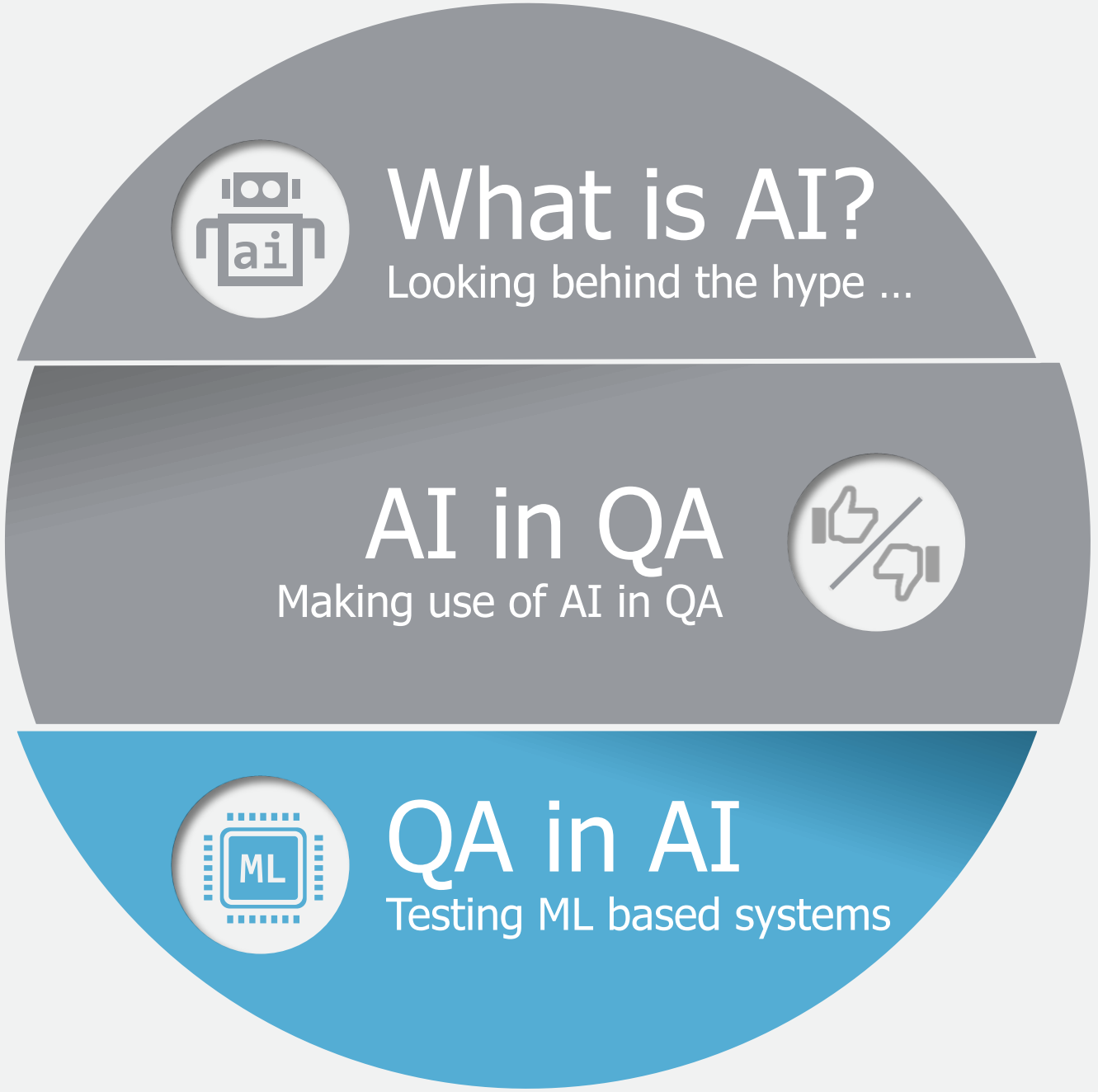
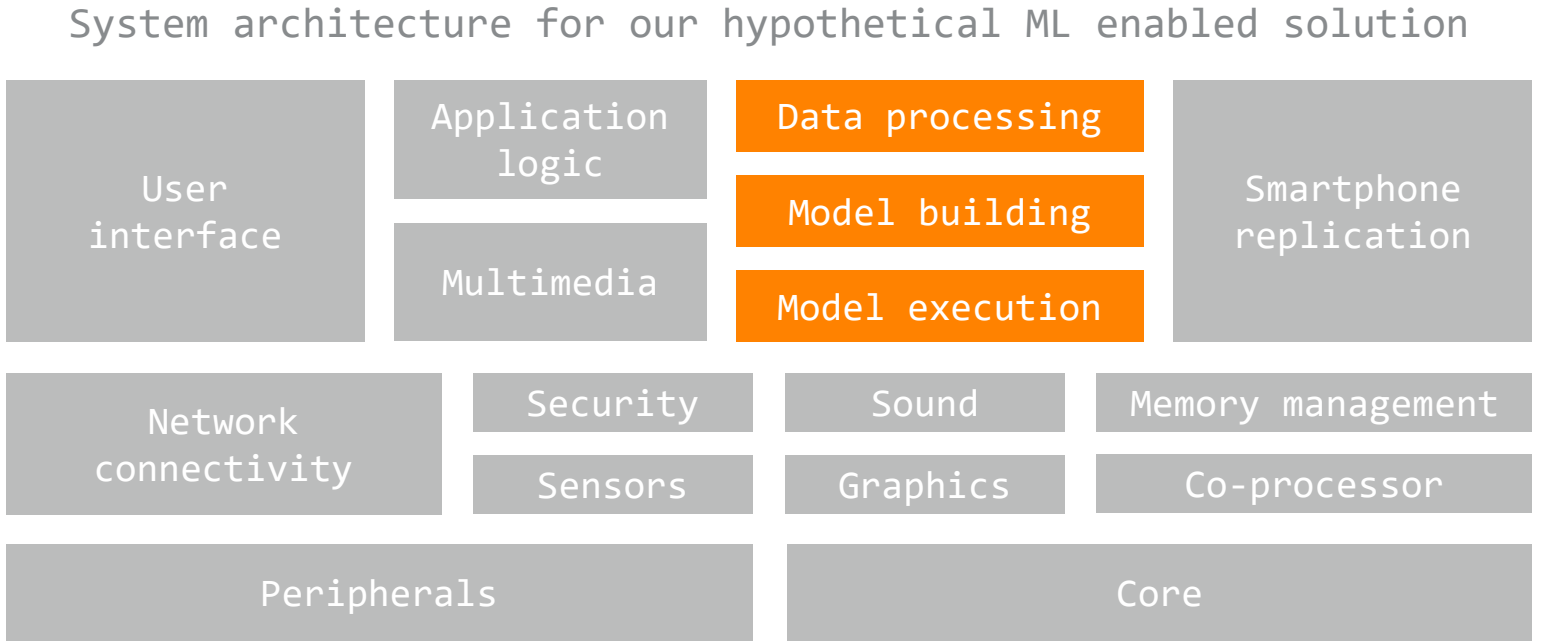


THE CHALLENGE:
HOW DO YOU ENSURE QUALITY FOR DATA-DRIVEN PRODUCTS?



First observation

In a real application the Machine Learning (ML) components will only constitute a small part of the whole

A bit of reflection

You probably used ML since you wanted to

1. infer something out of data
2. get self-customizing behaviour; and/or
3. you just plain could NOT even start to program it by hand

More likely with central impact to CX

New paradigm:

Data is code!

Let's consider a bit what could go wrong here …

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Your data?

"It's a picture of a basketball player"

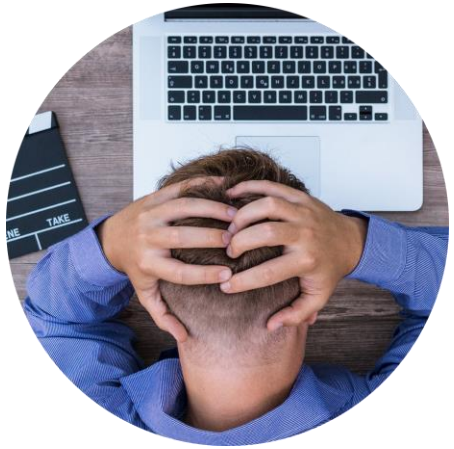
Your training data might be biased or otherwise unfit in so many different ways

Your data again?

"This API just started to behave funny"

Earlier you had code dependencies – now you're also getting data dependencies

Your ML engineer?



"It's just not converging how it should be"

Although tools are getting easier to use, a small typo could still produce a valid model that just does not train right

Other people?

"That seems to be an ostrich"

Adversarial attacks appear to work well. Consider for example automated process for handling insurance claims…

Data defines the behaviour of your system

Test the data! Test the distributions. List possible sources of error. E.g. can your system end up impacting it's own training data?

Your data pipeline processes data in complex fashion

Keep track of data dependencies. Version your models and data. Clean up your data. Monitor it. Consider live validation.

The tools are a bit black box and complex to use

Consider coding patterns to follow. E.g. unit tests to just validate (ML related) code, not behaviour. Consider approaches such as mutation testing.

There could be complex ways to misuse them too

Is it realistic (e.g. it's possible and there's good benefit / risk ratio)? If so – good luck!
Use detection schemes …*

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* It's all still rather new but even zero-knowledge attack detection (i.e. attacker does not know there's a detector in place) seems difficult. Schemes such as neural fingerprinting appear very promising.

IN SUMMARY

Look for and use (good old) best practices

However many data science / machine learning practitioners may not be familiar with Agile & DevOps

Think of data as code

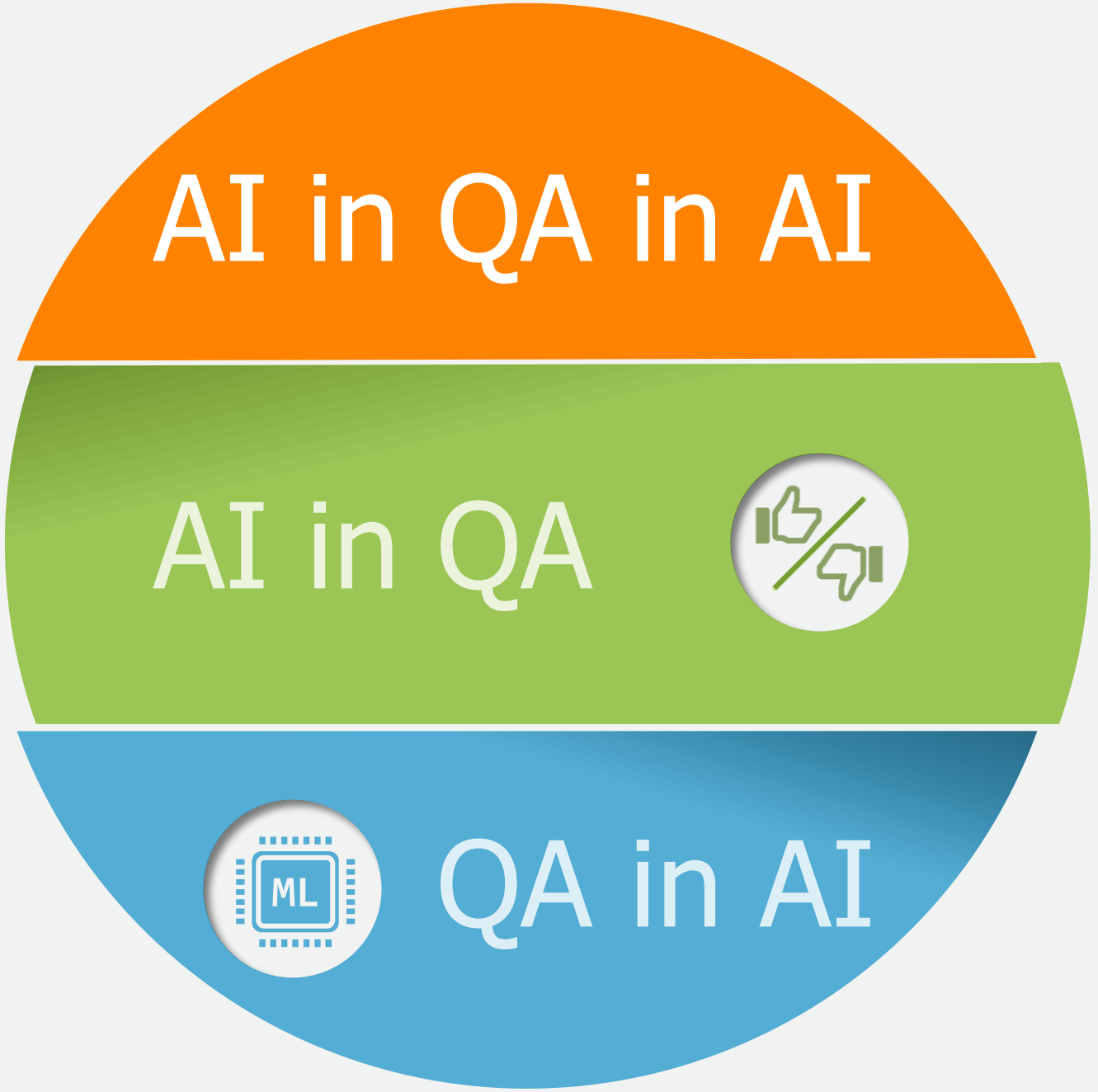
Quality Assurance just got way more complex … luckily were are already familiar with code

Be bold … and also be careful out there!

You definitely should start exploring, the future will be data driven … just keep in mind it's all rather new

Folks, it's time for

Q&A



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