

# VOLKSWAGEN

AKTIENGESELLSCHAFT



**Artificial Intelligence helps making Quality Assurance  
processes leaner – an example on test case prioritization (TCP)**  
Edinburgh, Sept. 2019

## Agenda

- 01** Context for AI-based QA tools
- 02** Workflow to integrate AI-tools into QA
- 03** Some insights into the AI-tool
- 04** Summery & outlook

## Agenda

- 01** Context for AI-based QA tools
- 02 Workflow to integrate AI-tools into QA
- 03 Some insights into the AI-tool
- 04 Summery & outlook

## Context of AI-based QA tool



Data protection aspects (GDPR / compliance view)



Process efficiency and performance (digitalization view)



Technology readiness and life-cycle capability (enterprise IT view)



Product vs. owner/user liability (legal view)



Technology assessment (social & ethic view)



## Data protection aspects

- What data are potentially available?  
→ investigate all possible data resources of the problem space
- What data are usable under compliance aspects?  
→ deselect data which will implies a non-compliant data analysis
- What can be realized with these data?  
→ define the real potential solution space

→ Defines the **possible use cases** and capabilities of the AI-tool



## Process efficiency and performance

- What is the maximum automation possible?  
→ based on data and possible technology usage identify opportunities
- What is the trade-off between maximum and applicable implementation?
  - time → time to market aspect
  - know-how → available in the time-frame
  - budget → available and return on investment aspects

→ identify **sweet-spot** for realistic process automation



## Technology readiness and life-cycle capability

- What technology is needed?  
→ AI or more refined ML
- Which technology implementation is mature?  
→ java, python and “standard ML libraries” from Scikit
- Which one can be used in an enterprise level operation and support?  
→ MIT or some BSD-like license framework with active community

→ Low-tech and **mature frameworks** are a good choice for “wide use”



## Product vs. owner/user liability

- Who is responsible for the decision's impact?  
→ tool producer or **tool user**
  - How is confidence into the decision realized?  
→ user needs **information, facts etc.**
  - What can be done by AI?  
→ things an algorithm can do **better than human**
  - Why can/should I trust the AI recommendation?  
→ based on transparency, **validation** etc.
- Our approach: **user liability** given by inherent AI-tool **validation** workflow





## Technology assessment (in the process usage context)

- Social
  - what kind of human work will be substituted?
  - get rid of monotonous list analysis
- Ethic
  - do we some unethical or evil stuff?
  - no delegation of ethical decisions to a tool

→ AI offers human an opportunity to use its **time for more creative QA tasks**

## Agenda

01

Context for AI-based QA tools

02

Workflow to integrate AI-tools into QA

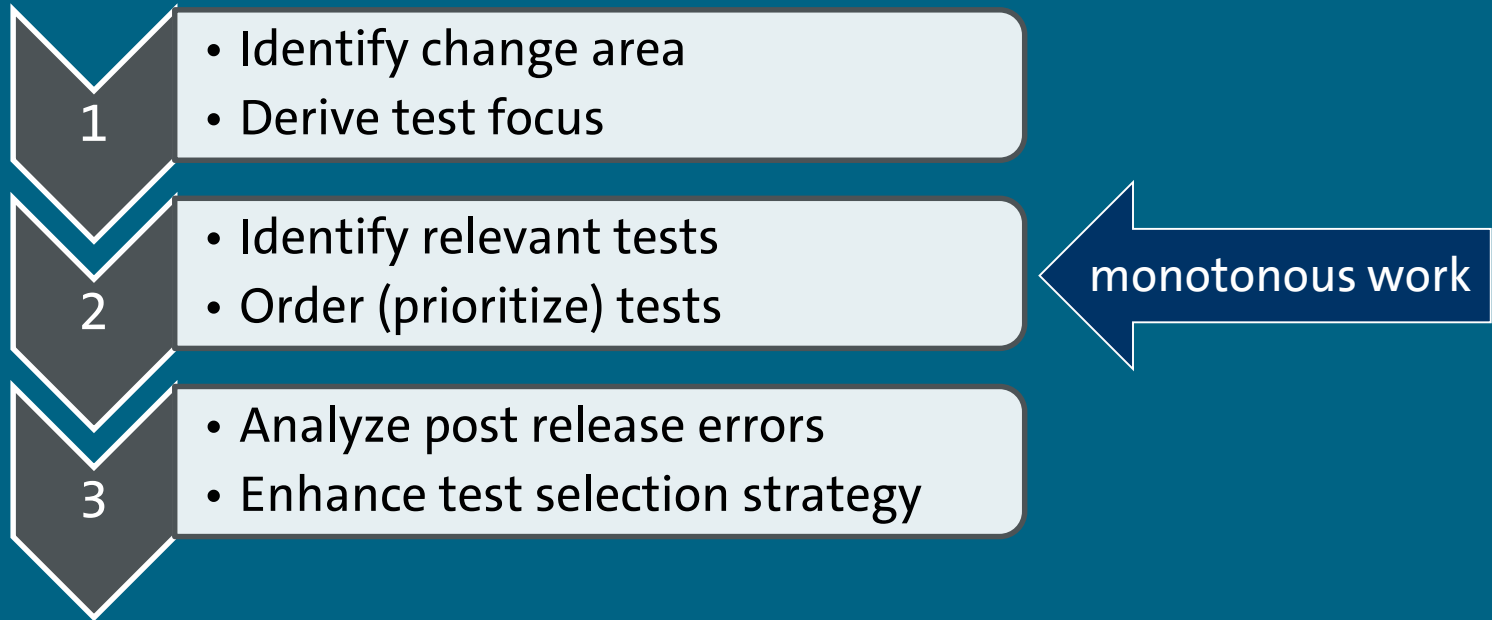
03

Some insights into the AI-tool

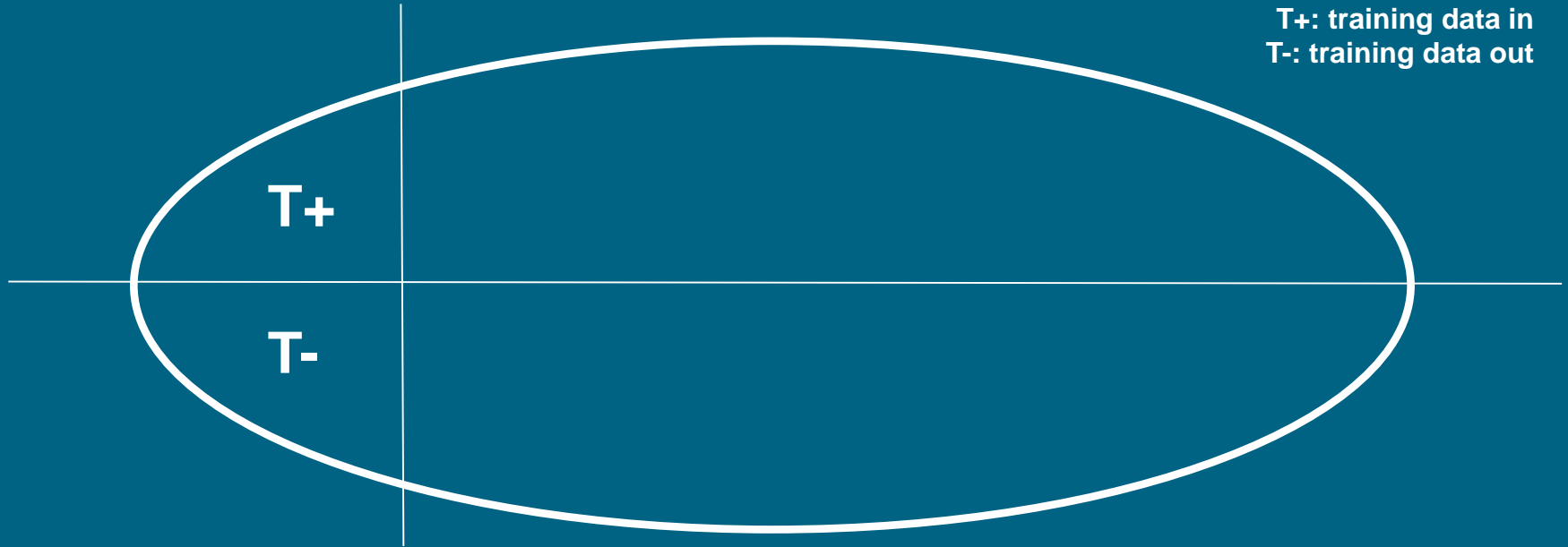
04

Summery & outlook

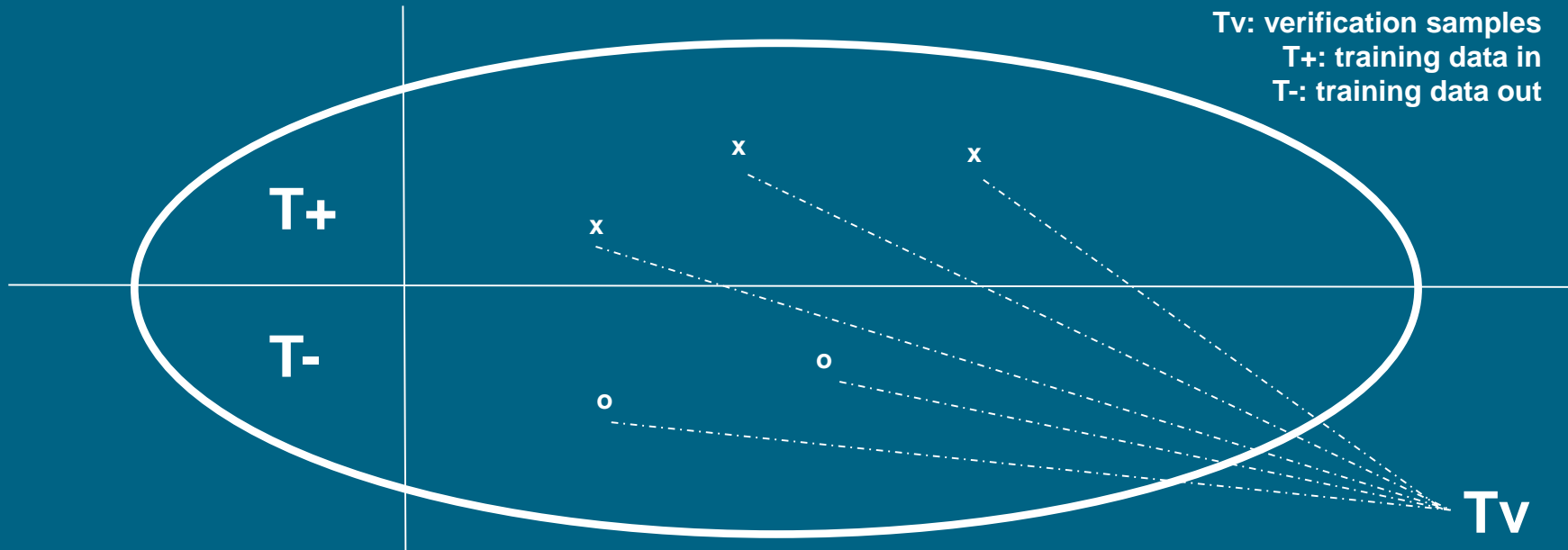
## A typical regression test-set selection and prioritization flow



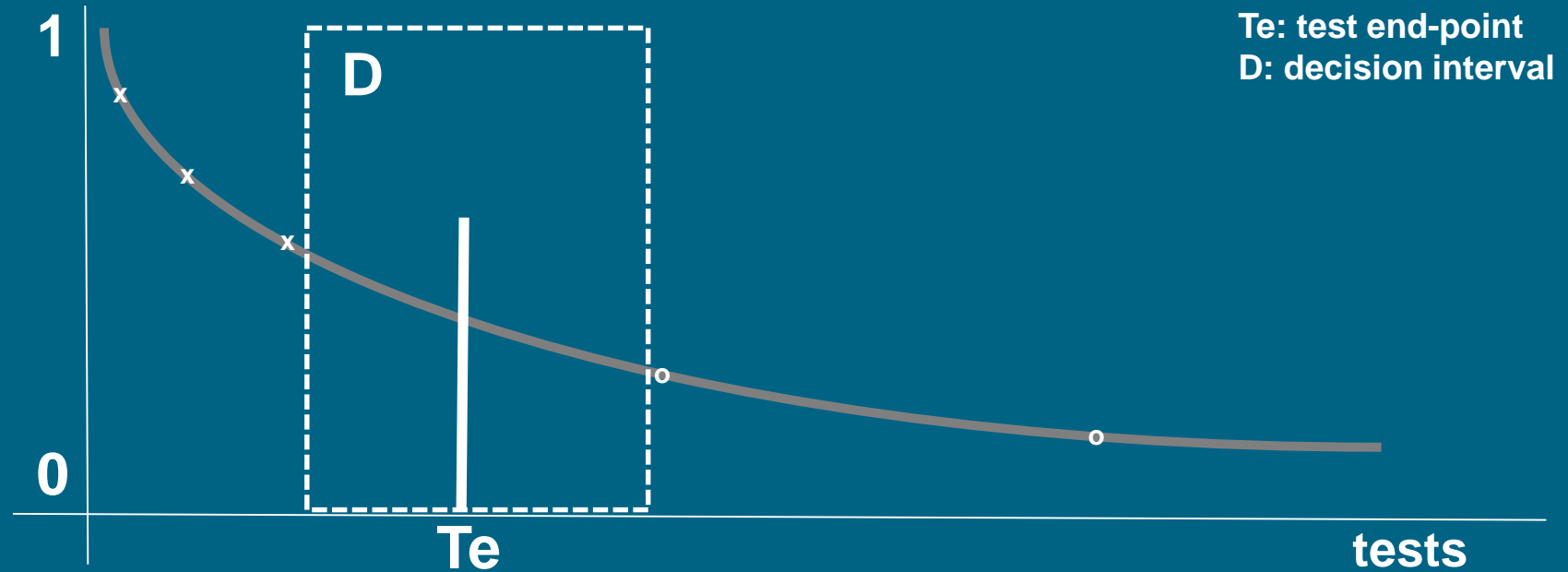
## 1. Train the AI: Define training data – positive and negative samples



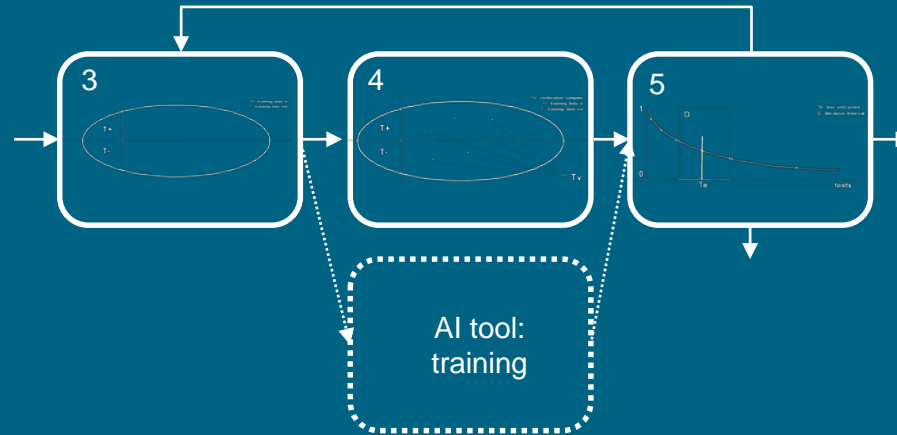
## 2. Check the AI: Define test data – randomized samples



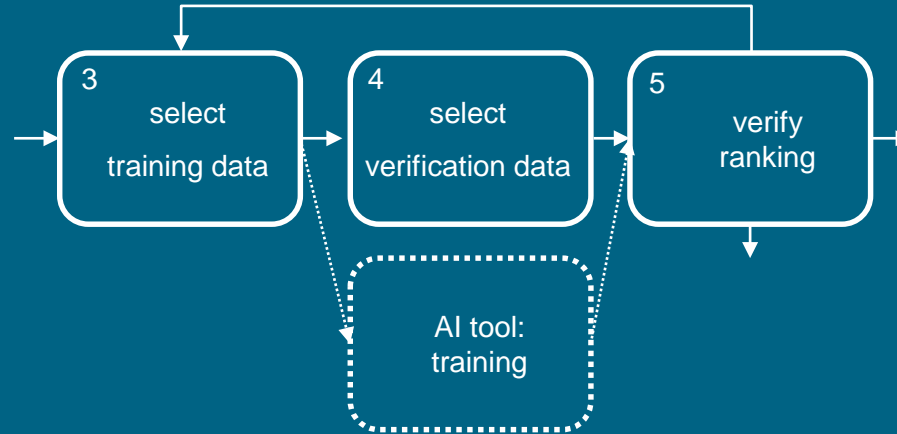
### 3. Use AI: decide the test end-point with the information obtained using AI



## AI-tool integration for the Test Case Prioritization (TCP) of a regression test-set



## Workflow for AI-tool integration into regression test (I)





## Agenda

01

Context for AI-based QA tools

02

Workflow to integrate AI-tools into QA

03

Some insights into the AI-tool

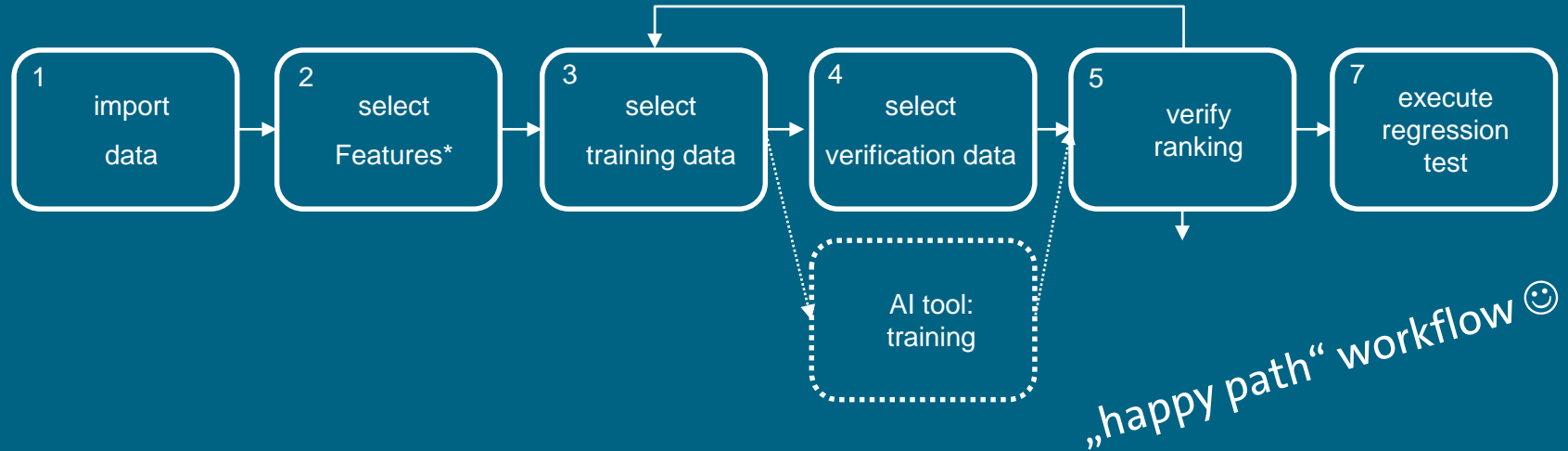
04

Summery & outlook

## Data for the AI – import high-quality data and select relevant features

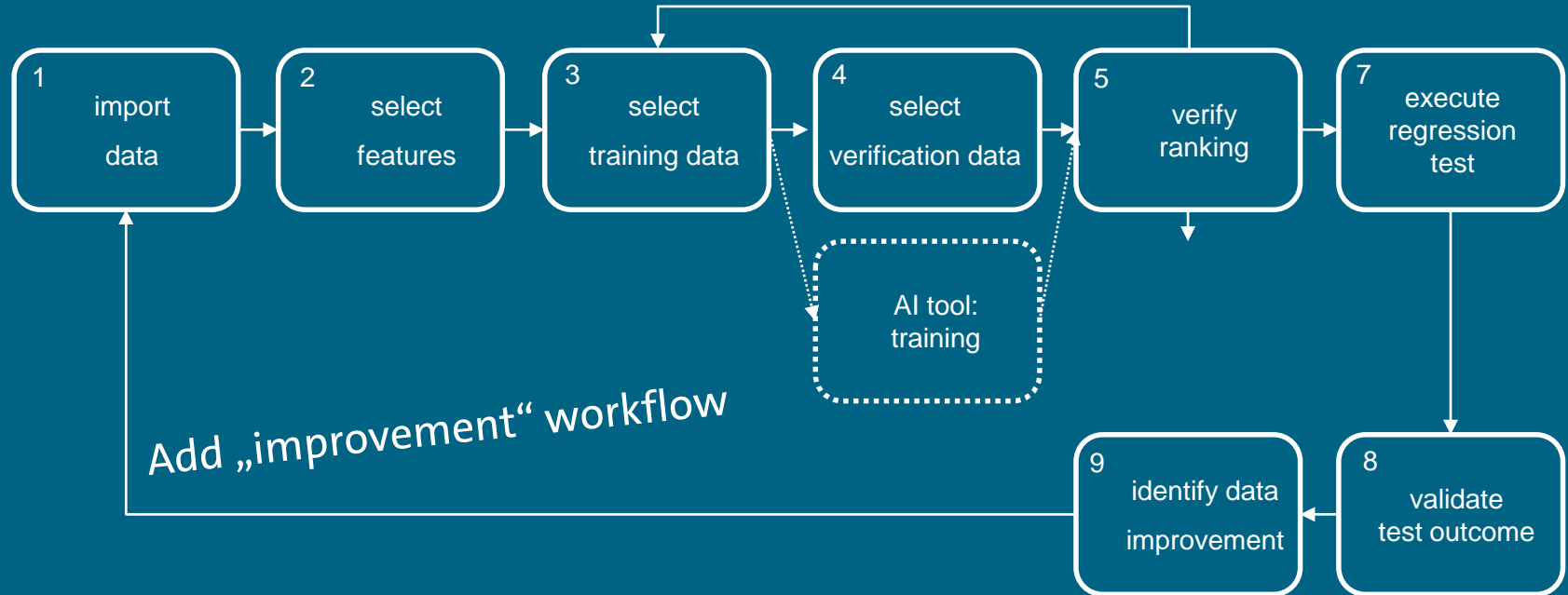


## Workflow for AI-tool integration into regression test (II)



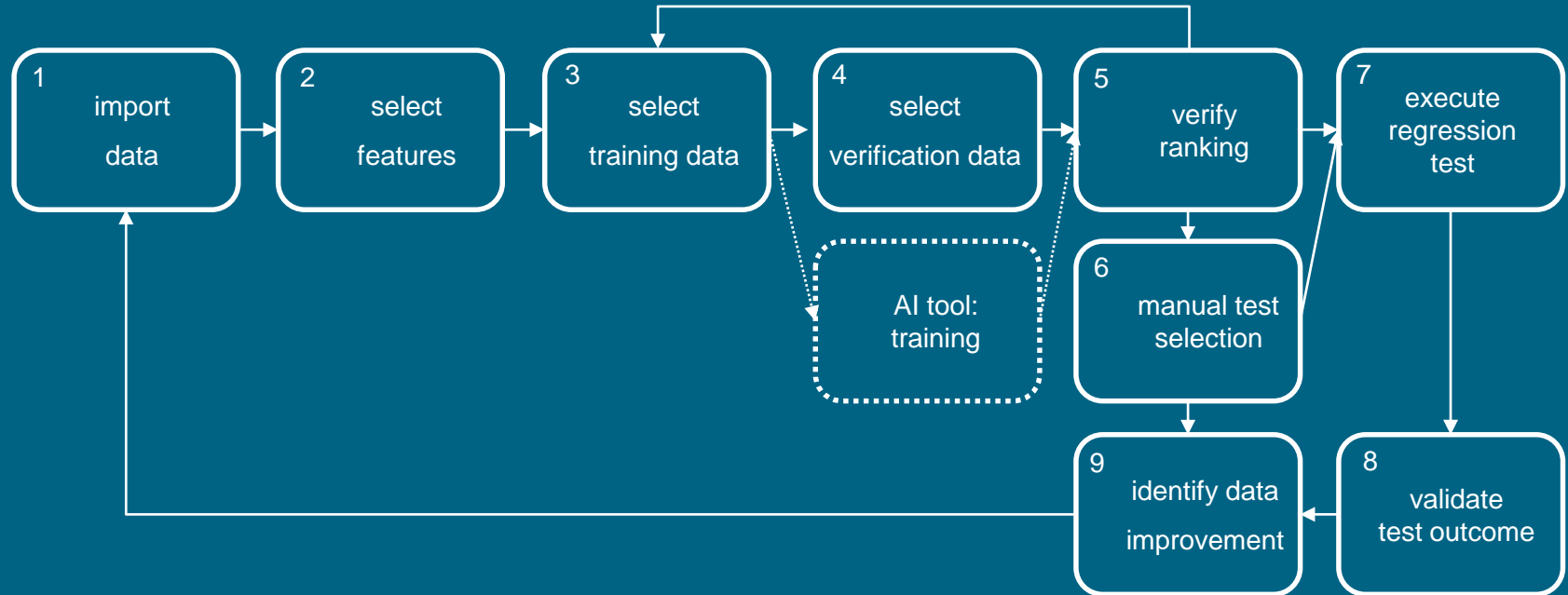
\* Feature selection is also known as data attribute or variable selection

## Workflow for AI-tool integration into regression test (III)

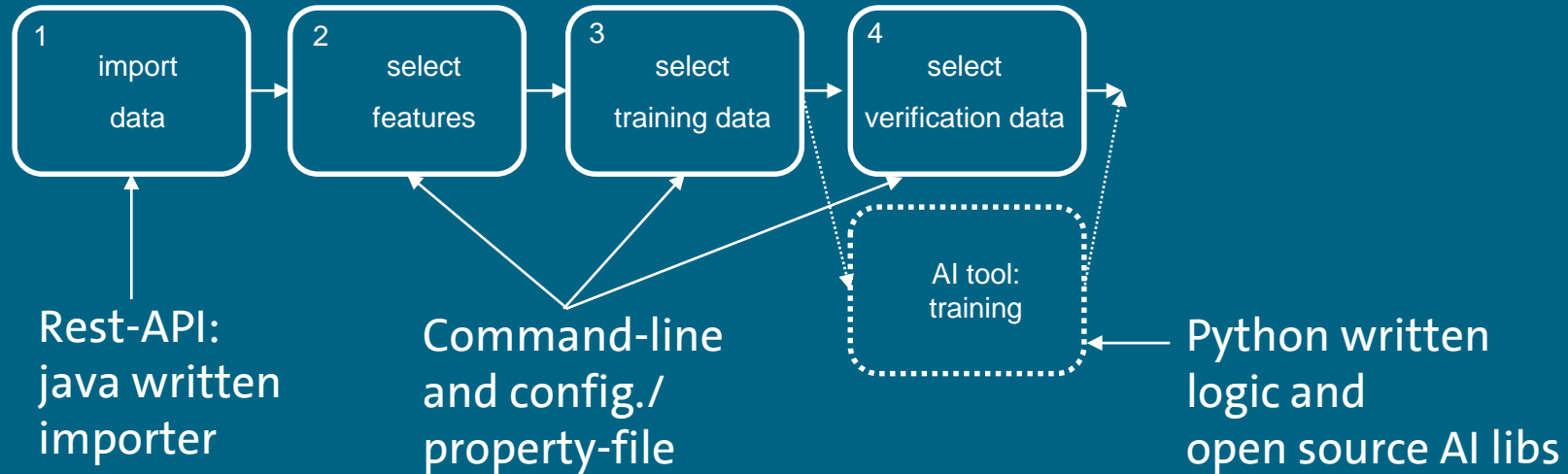




## Workflow for AI-tool integration into regression test



## How it is made?





## Some lessons learned

### Data quantity

- Projects need structured historical data
- For learning / training with 100 data-sets for T+ and T- you can start

### Data quality

- Rest-API must be stable to ensure data is consistent and complete
  - We found inconsistent DB in one project by systematic “feature extraction”
- Not all product teams have the data for AI



## Agenda

01

Context for AI-based QA tools

02

Workflow to integrate AI-tools into QA

03

Some insights into the AI-tool

04

Summery & outlook



## Summery

### Effectiveness of ML

- In case of high data quality the prediction is good (over 0,93)
- In case of non adequate data the process gives feedback for improvement

### Application and usage

- The tool is available for all Volkswagen AG test-managers
- Open code gives teams the chance to adapt the AI tool if needed



## Outlook

Integrate more AI based tools

- without specific AI knowledge by the user
- develop and enhance the workflows for easy application of AI support



Identify more use cases for : **AI4QA**



## Thank you for your interest! – Do you have any questions?

### We are hiring...

- for our Group IT in Wolfsburg
- for our labs in Berlin, Munich, Wolfsburg and all over the world!

Join us at [www.join-it-volkswagen.com](http://www.join-it-volkswagen.com)

