



SOLLICH



ChocAI

The more, the merrier

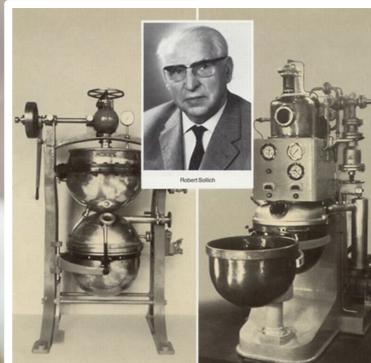
Introduction





LIVING HISTORY

A family tradition of success



1928

Invention of the first vacuum sugar-cooking machine:
SOLLKOCH

1956

Invention & Patenting of a circulationg air temperature control to feed molding and coating machines.

2014

Marketlaunch of the new Sollcofill® / Sollcocap® at the Interpack fair.

SOLLICH
100
years
1920 – 2020

Founding

1920 (Bakery - Ratibor)
1950 (Company)

Head of Office

Bad Salzuflen

Managing Director

Thomas Sollich

Employees

416 (2019)

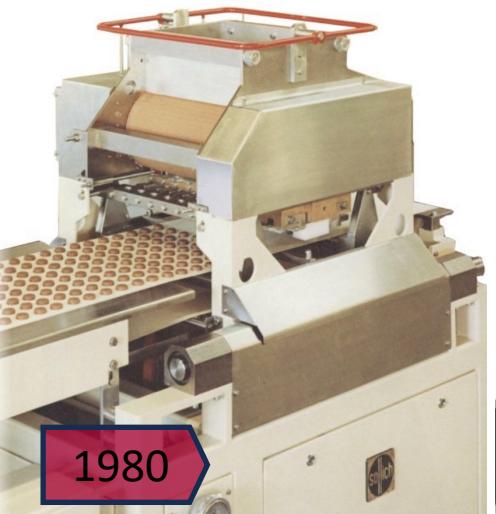
Branch

Special purpose machinery manufacture

Food technology

WHAT MAKES US DIFFERENT**Our Secret**

consistent development of our machines,
illustrated by the example of chocolate molding.



1980



1993



2004



WHAT MAKES US DIFFERENT

Our Secret

Consistent training of our employees



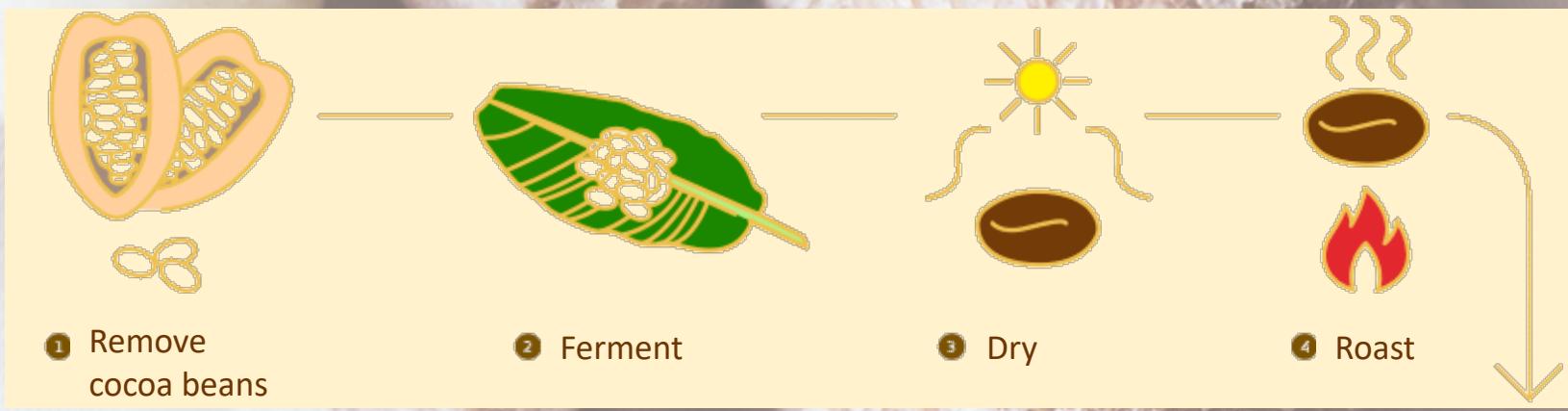
SOLLICH

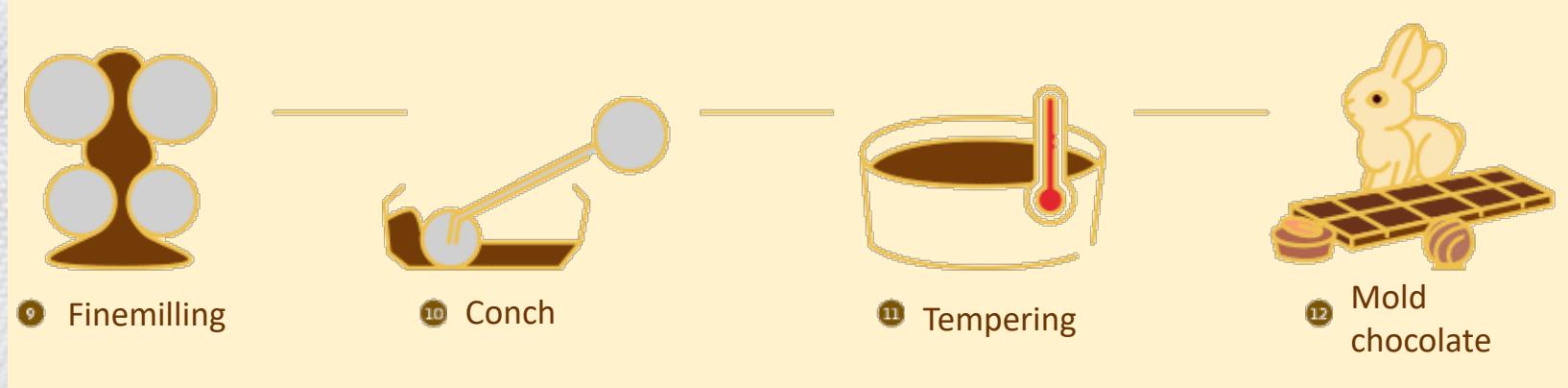
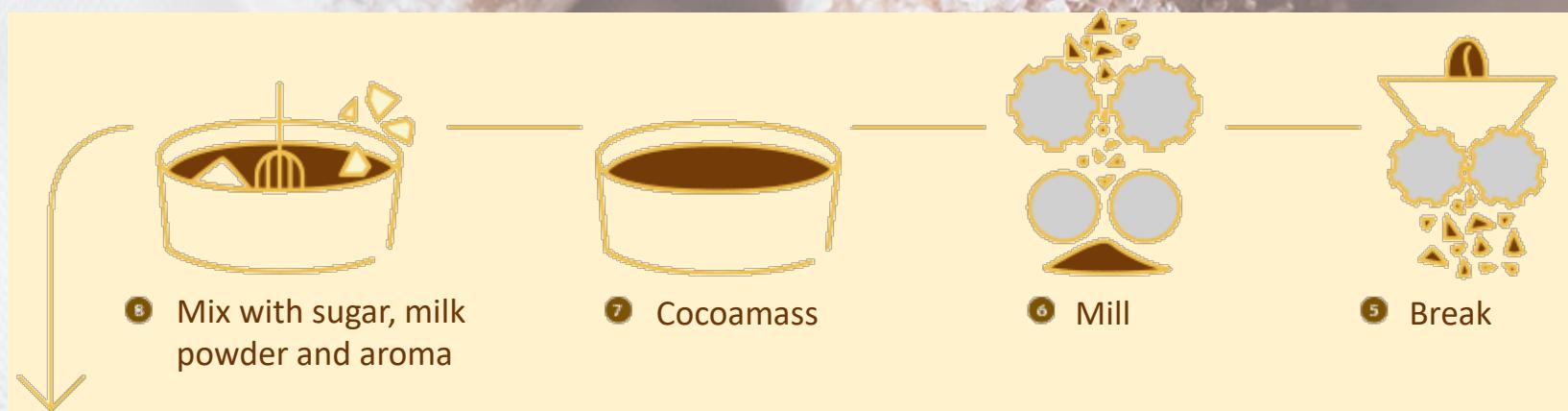
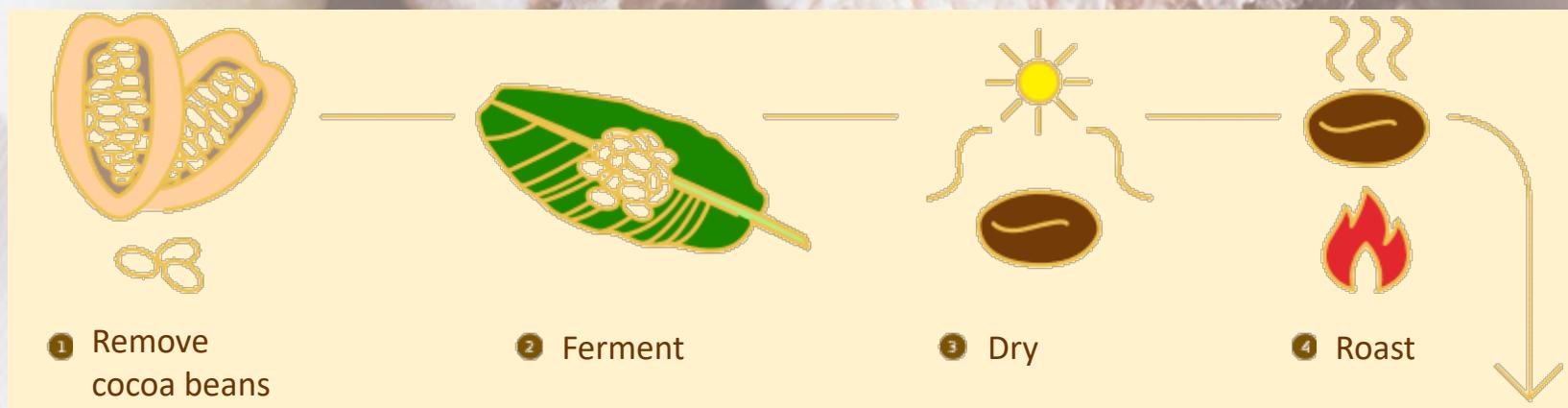
Chocolate

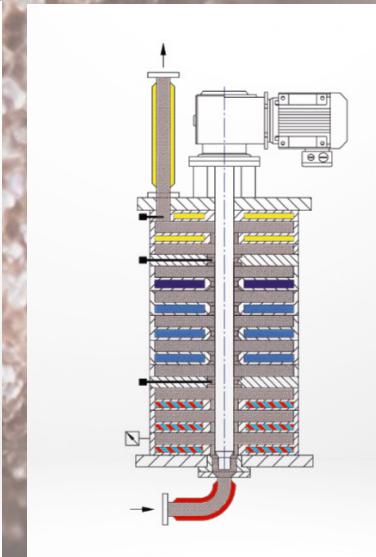


Chocolate

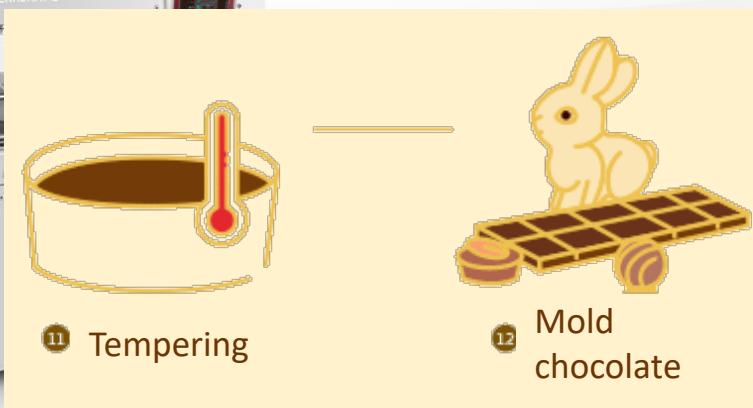








Core competency



ChocAI

In special mechanical engineering

- Data
- Plattform
- Use-Cases
- Learnings

Data

Potential

- Machinery world wide
- Different mass and products over all costumers, but similar process
- Data gathering via gateways or existing remote maintenance module
- For all machinery
 - Temper
 - Coater
 - Moulding
 - Cooling
 - ...



Processdata

- Temperature
- Current
- Pressure
- Level
- Speed

Einstellungen

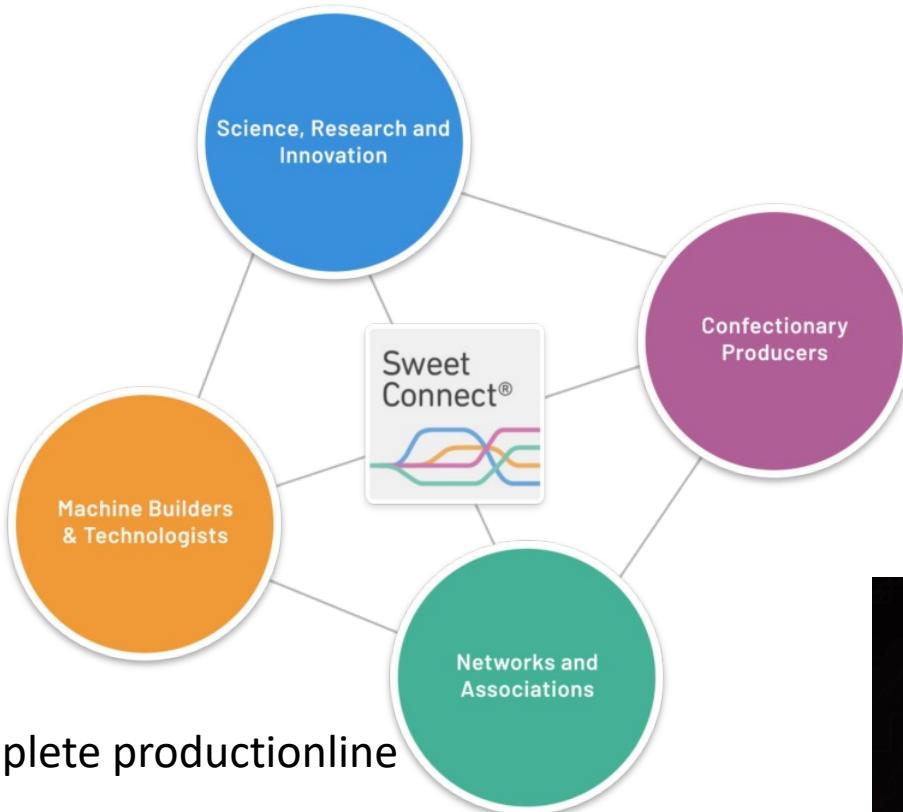
- Set values
- Runtime
- Production time
- Downtime





Plattform

Digital Chocolate



- Sollich machinery as part of a complete productionline (e.g. packing)
- Customer Use-Cases (running productionlines)
- **Goal:** Combined plattform of all machine manufacturer
 - Including competitors
 - Packaging
 - Moulding
 - Choclate supply



SOLLICH

THEEGARTEN^{PAC}_{TEC}
smarter packaging

CHOCOTECH

WDS
WINKLER und DÜNNEBIER
Süßwarenmaschinen

Oka



Use-Cases

Condition Monitoring

Laboratory development

Predictive Maintenance

Trigger and support remote maintenance

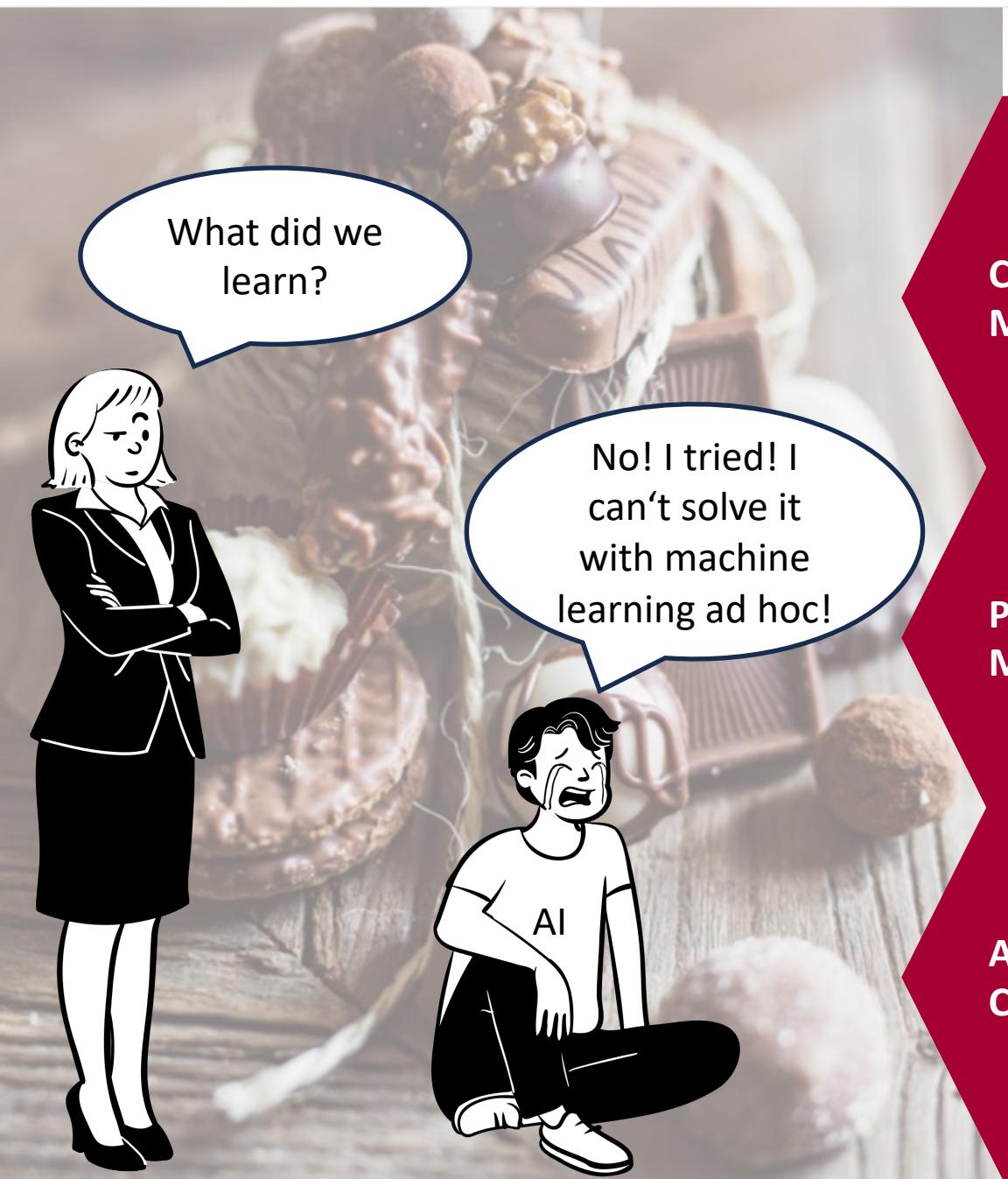
Autonomous Controlsystem

Support machine operator

Autoconfiguration

Processoptimization

- Support measuring and analysis with live dashboards
- Further development of new machine generations
- Inhouse support
- Help unexperienced oder uneducated machine operator
- Compensate missing Expertknowledge
- Natural ressource
- Optimize Energy



Use-Cases

Condition Monitoring

Laboratory development

Support a stable production

Predictive Maintenance

Trigger and support remote maintenance

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Identification
Use-Case

Inter department
communication

External

Internal

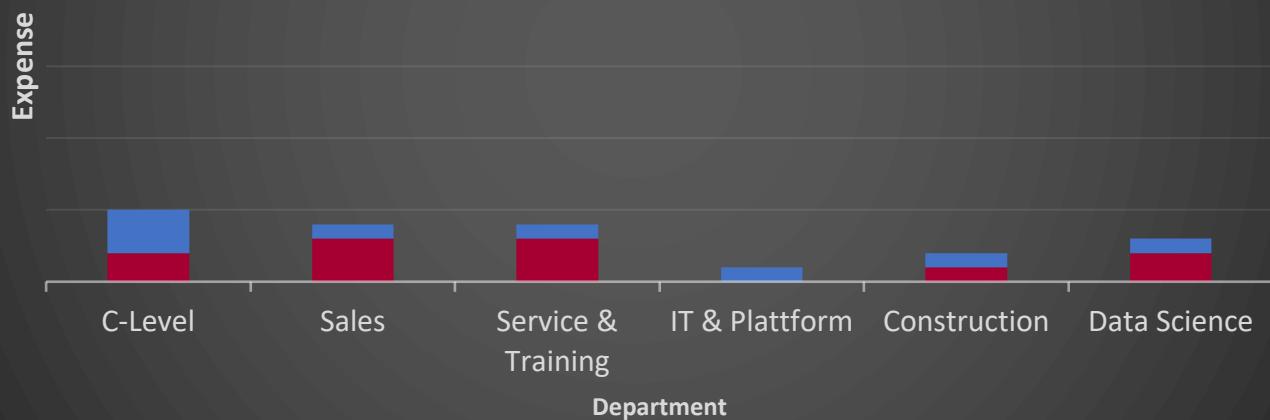
Learnings

Know the customer



- Understanding customers production
- Document ML related sales requests
- Document serviceactions
- ML related findings from expert trainings
- Requirements from the construction

Challenge



Identification
Use-Case

Data availability

External

Inter department
communication

Internal

Work culture (Base data)

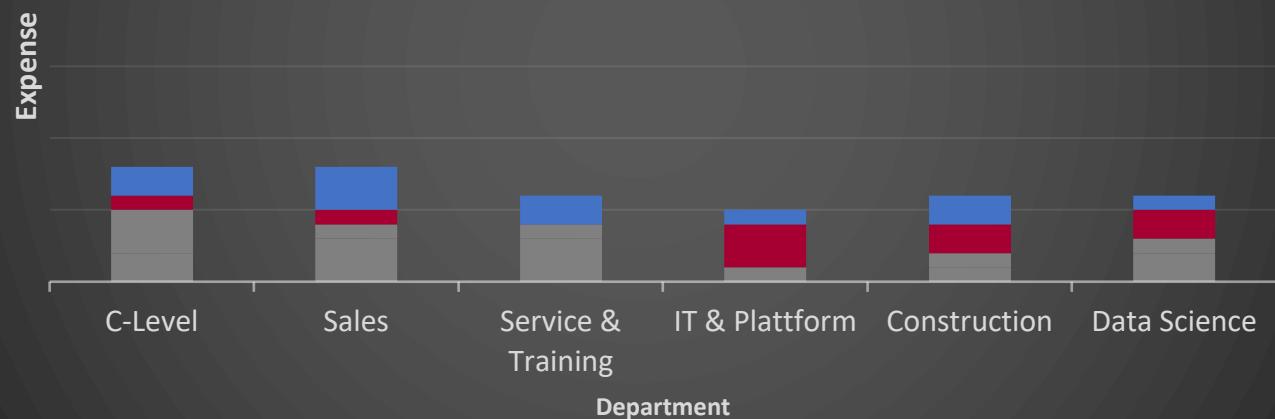
Learnings

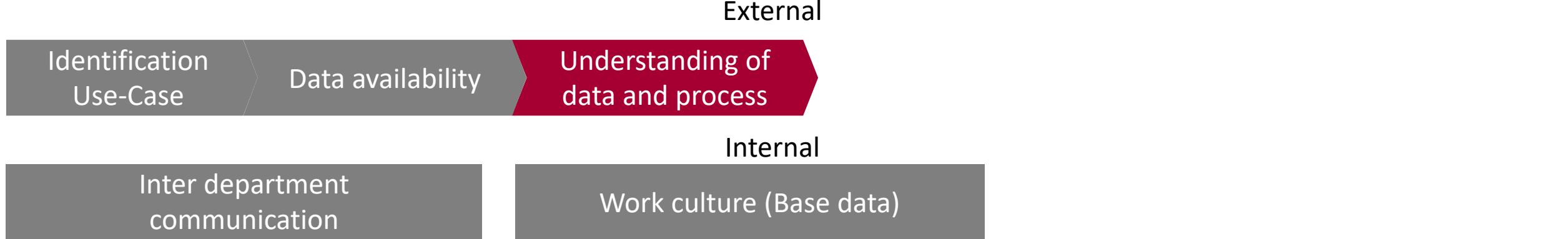
Know the customer



- Machinen data interfaces (Gateways)
- Ethernet activation and usage (Datatransfer)
- Datavisualization (Dashboards)
- Datenstorage (Cloud Plattform)
- Data preprocessing
- Data architecture and integration of base data (production, documentation)

Challenge





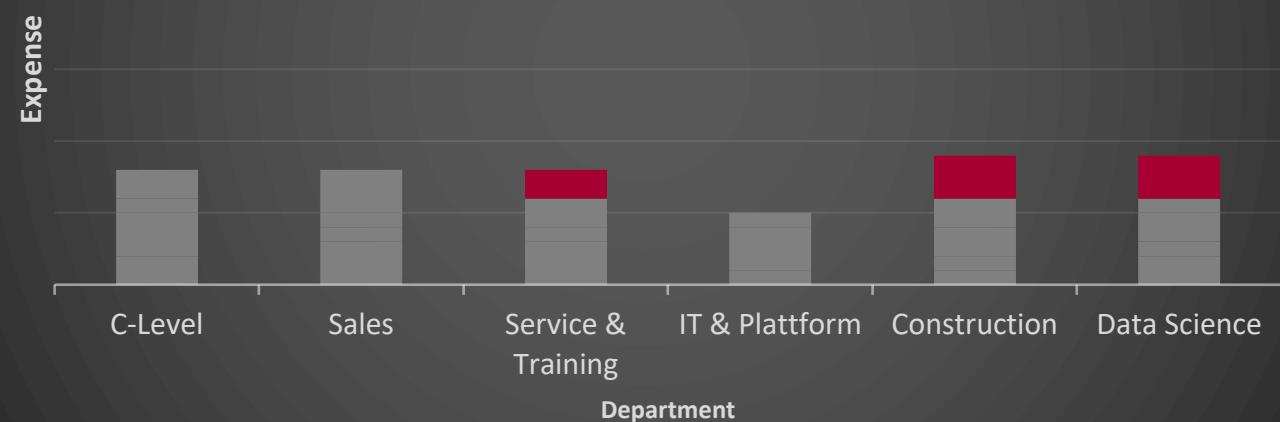
Learnings

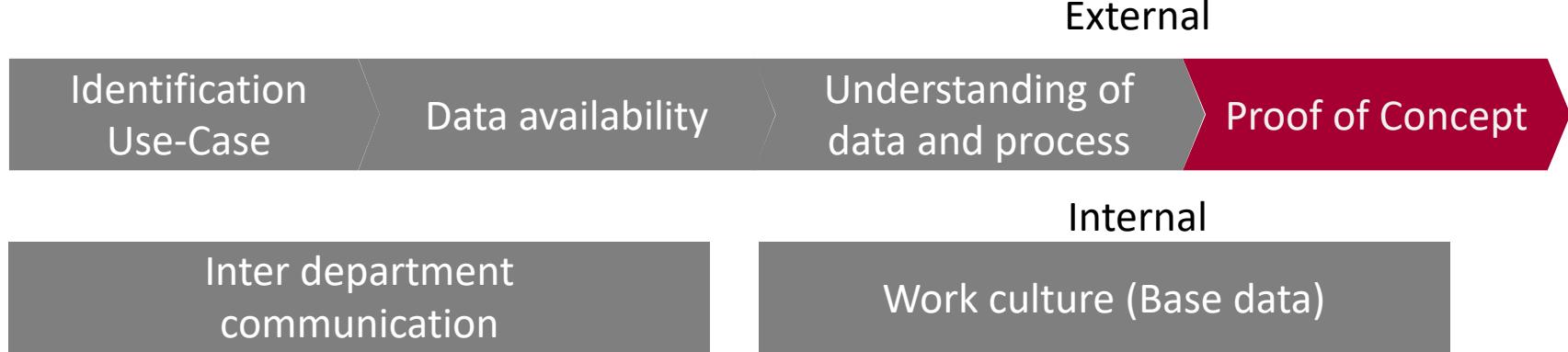
Know the customer



- Communication with customer production (Machine settings)
- Consult Serviceoperations (Reason)
- Knowledge exchange with construction
- Define ML Use-Cases

Challenge





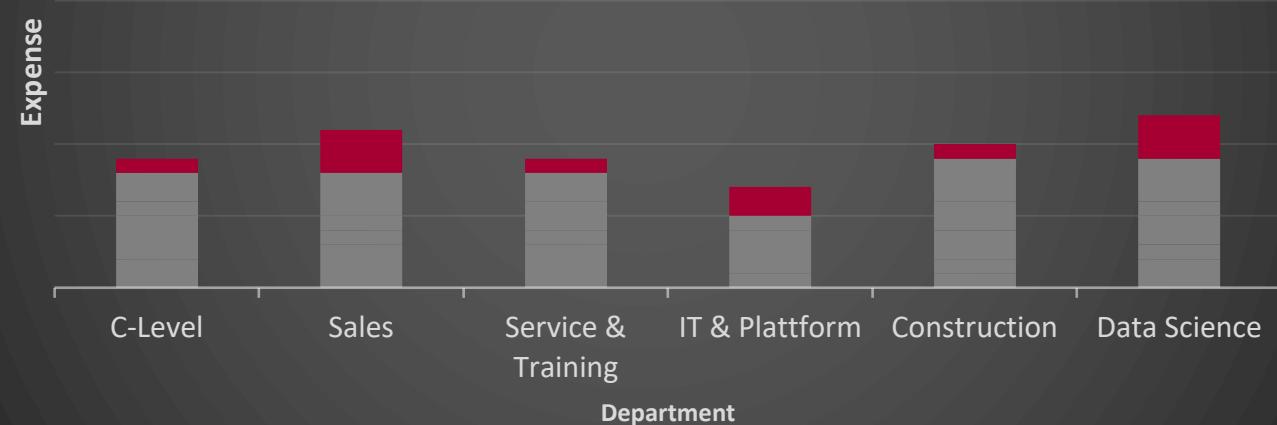
Learnings

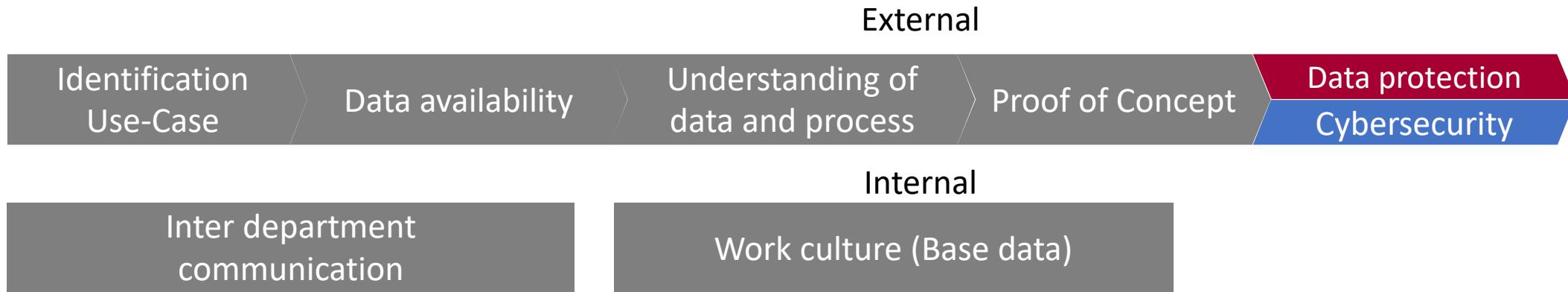
Data Science

- Testing of ML-Solutions
 - SVM, Trees, NN, LLM, statistic
- Verification of the value
- Test deployment
- Construction planning (Hardware-Integration)



Challenge





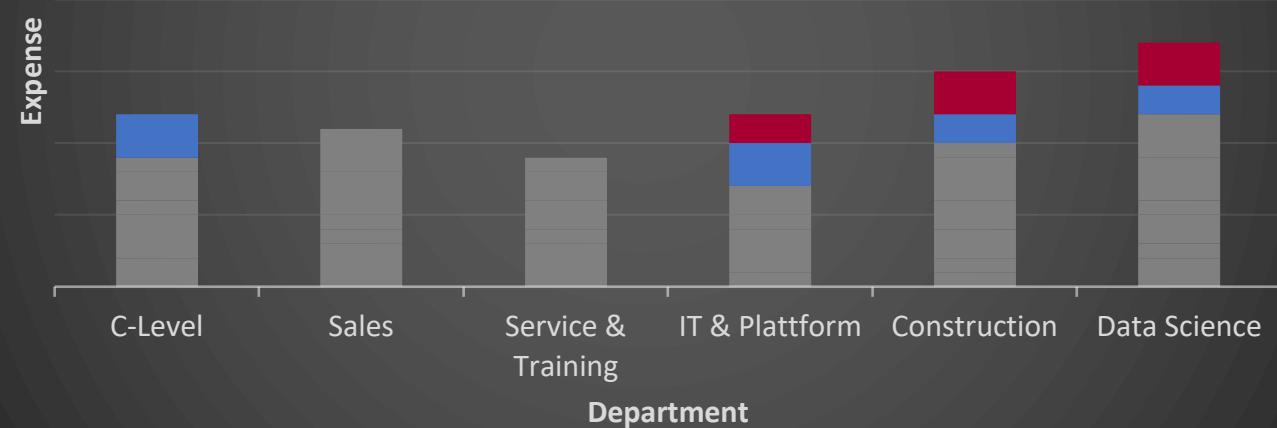
Learnings

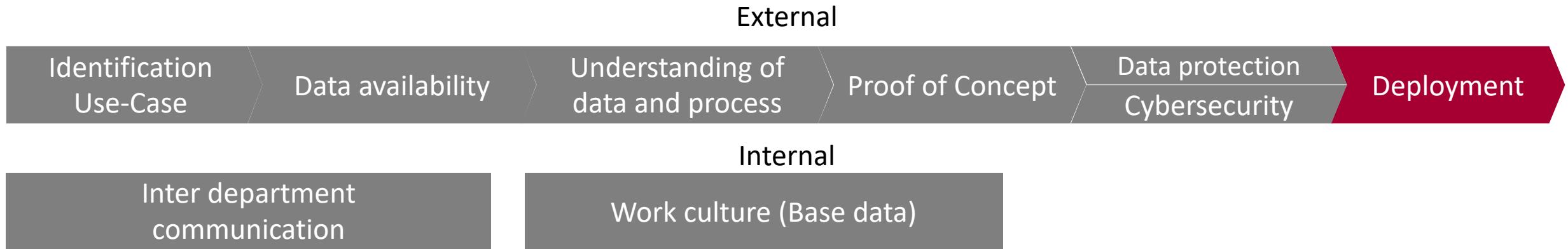
Data Safety & Security



- Upgrade PoC to product
- Establish cybersecurity for data / process
- Guarantee datagouvernance

Challenge





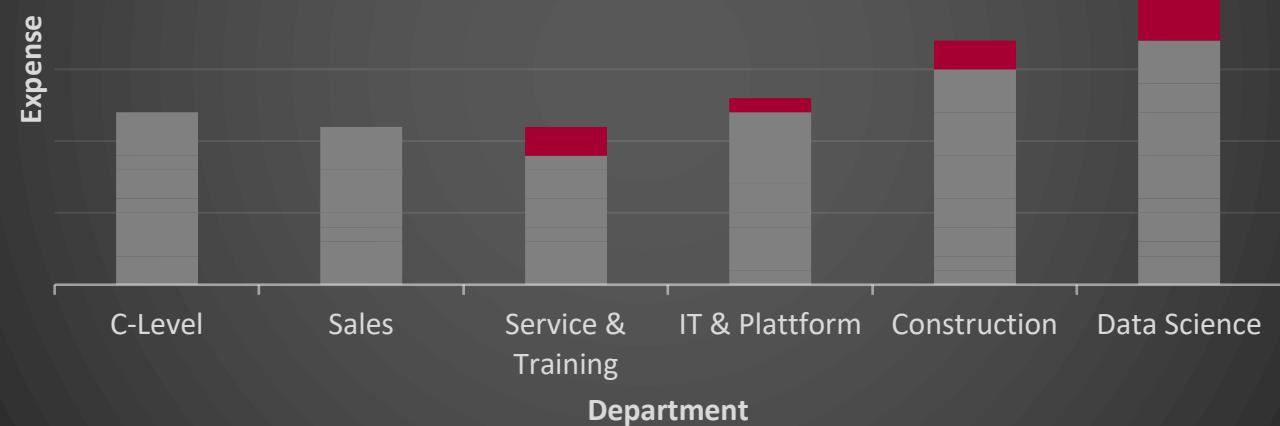
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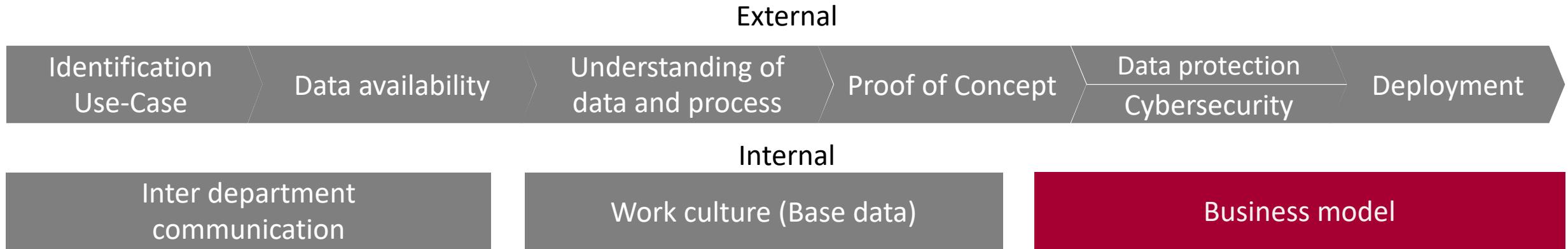
Deployment

- Testing at/with customer production
- Training for customers
- Calibration - Learn at side (or transferlearning)
- Software maintenance (DevOps)
- Updates



Challenge





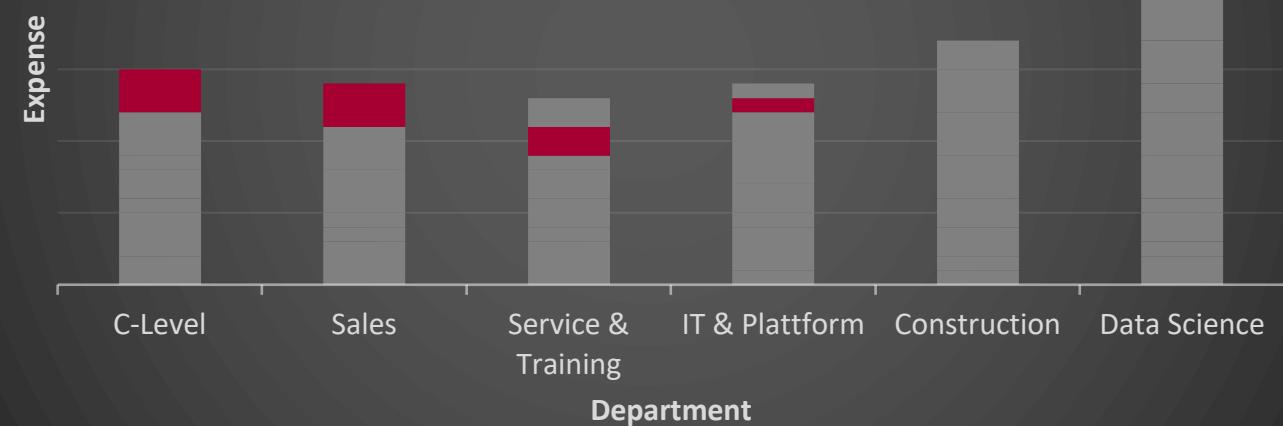
Learnings

Deployment

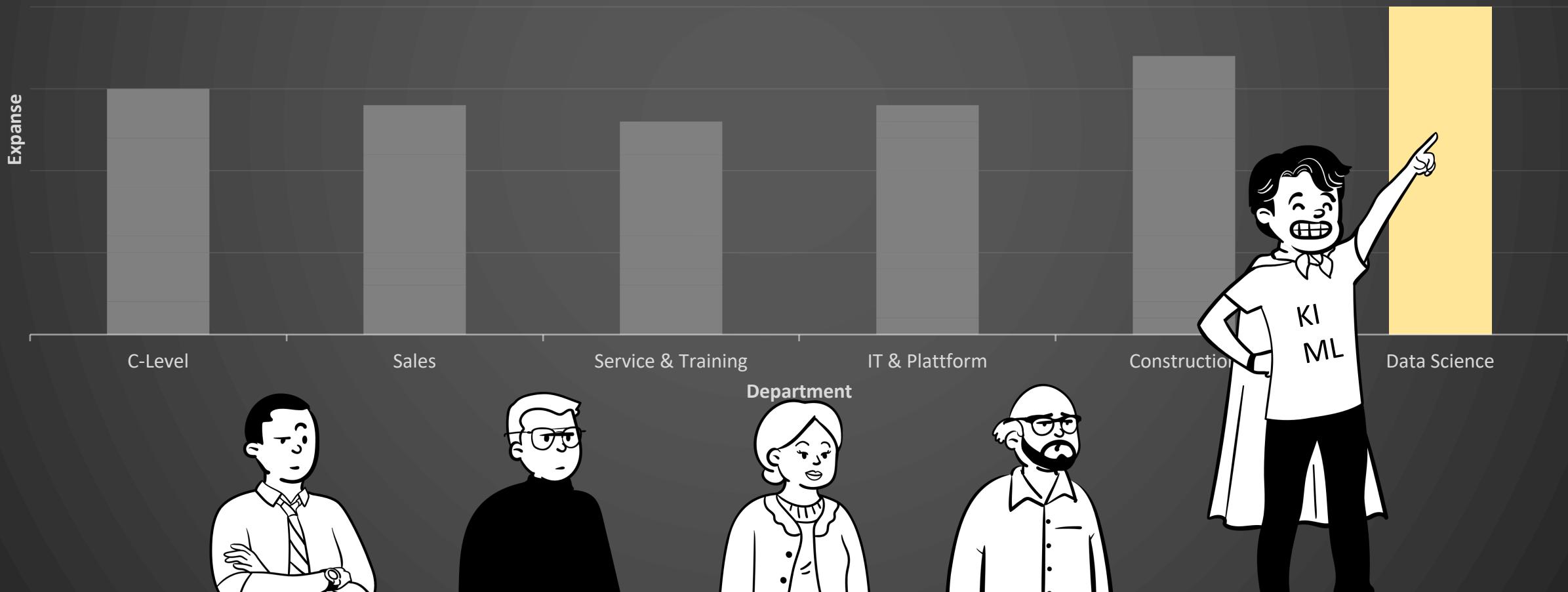
- Investments
- Marketing
- Business model



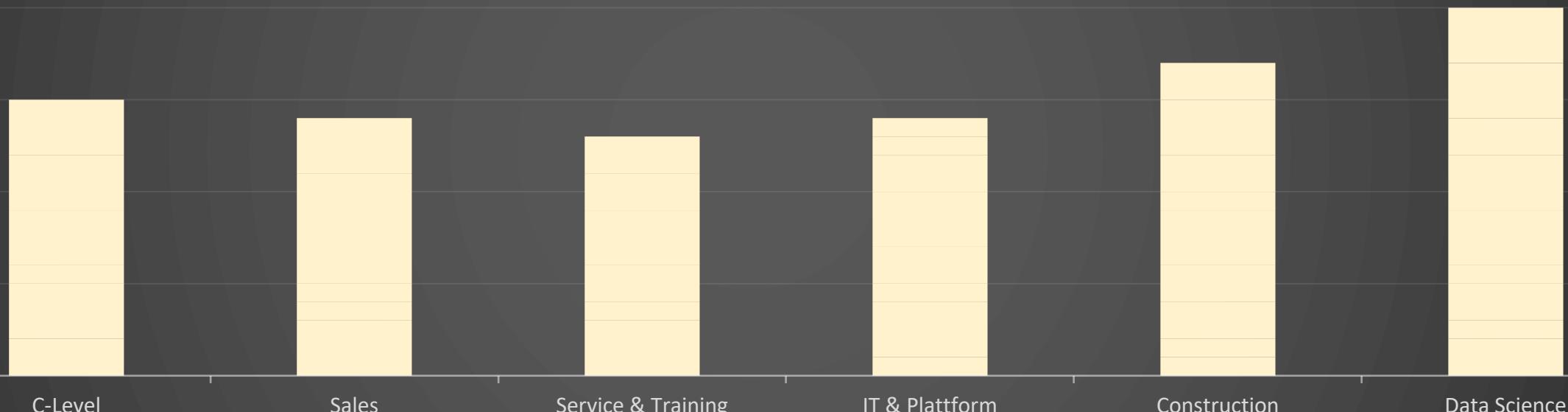
Challenge



Solution



Expense



C-Level

Sales

Service & Training

IT & Plattform

Construction

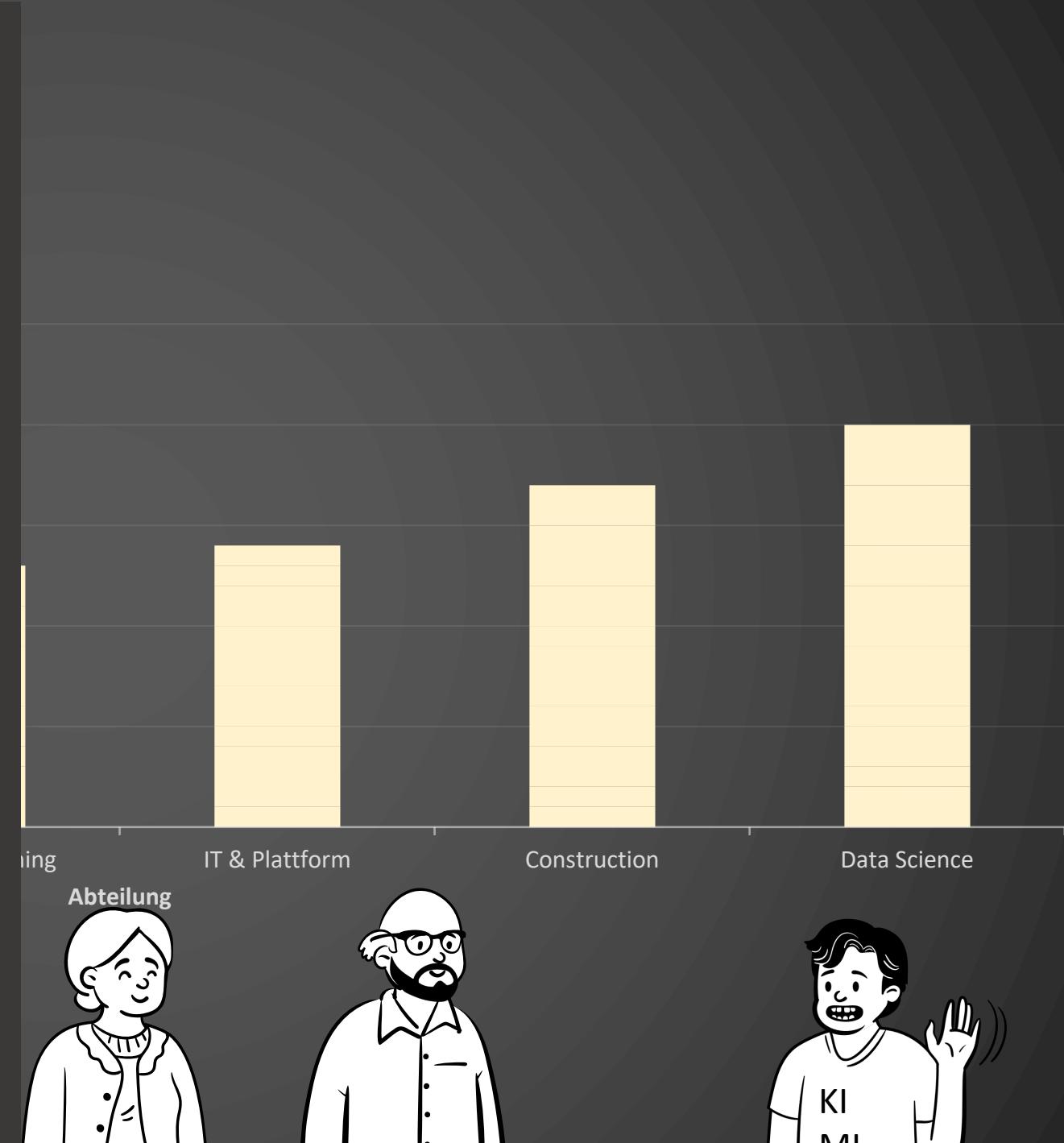
Data Science

Department



Integration of AI needs:

- Cooperation
(Talk and Decide)
- Patience (Try, Fail, Adept)
- Math (all digits at the end)
- Chocolate



Integration of AI needs:

- Cooperation
(Talk and Decide)
- Patience (Try, Fail, Adept)
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- Chocolate

Thank you!





Challenge

Softsensor for control mixing stage

- First part of production: tempering
- Prepare chocolate
- Chocolate runs through three stages
 - Heatingstage (Decrystallisation)
 - Coolingstage (Seed crystal structures)
 - Mischstufe (Melt unwanted crystal structures)

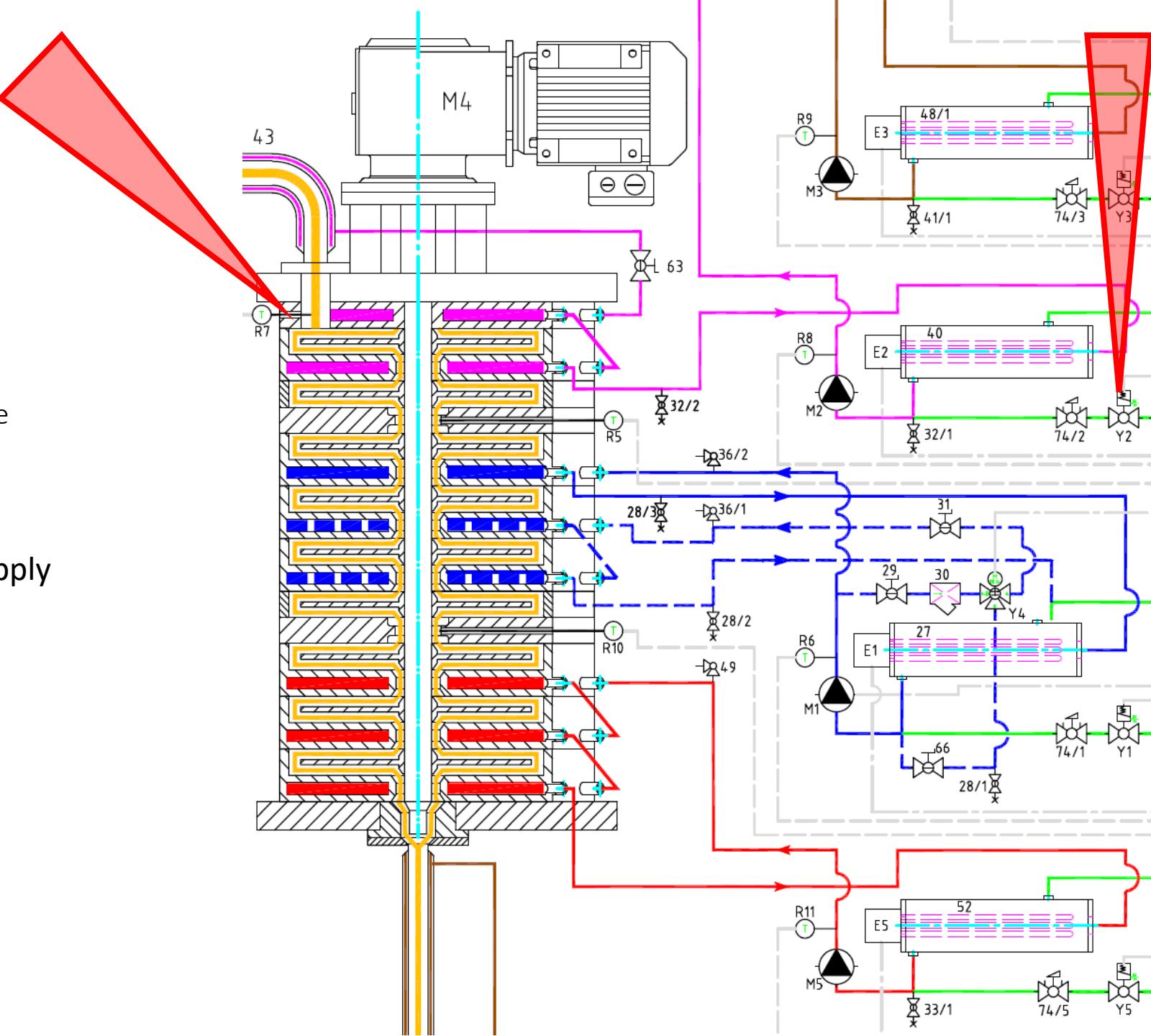




Challenge

Softsensor for control mixing stage

- Three separate water cycle
 - Cooling with external cool water supply
 - Heating through heating cartridge
- Focus of the challenge: Mixingstage
- Control of mixingstage
 - Valve (Y2) cooling water supply
 - Target temperature measuring disc

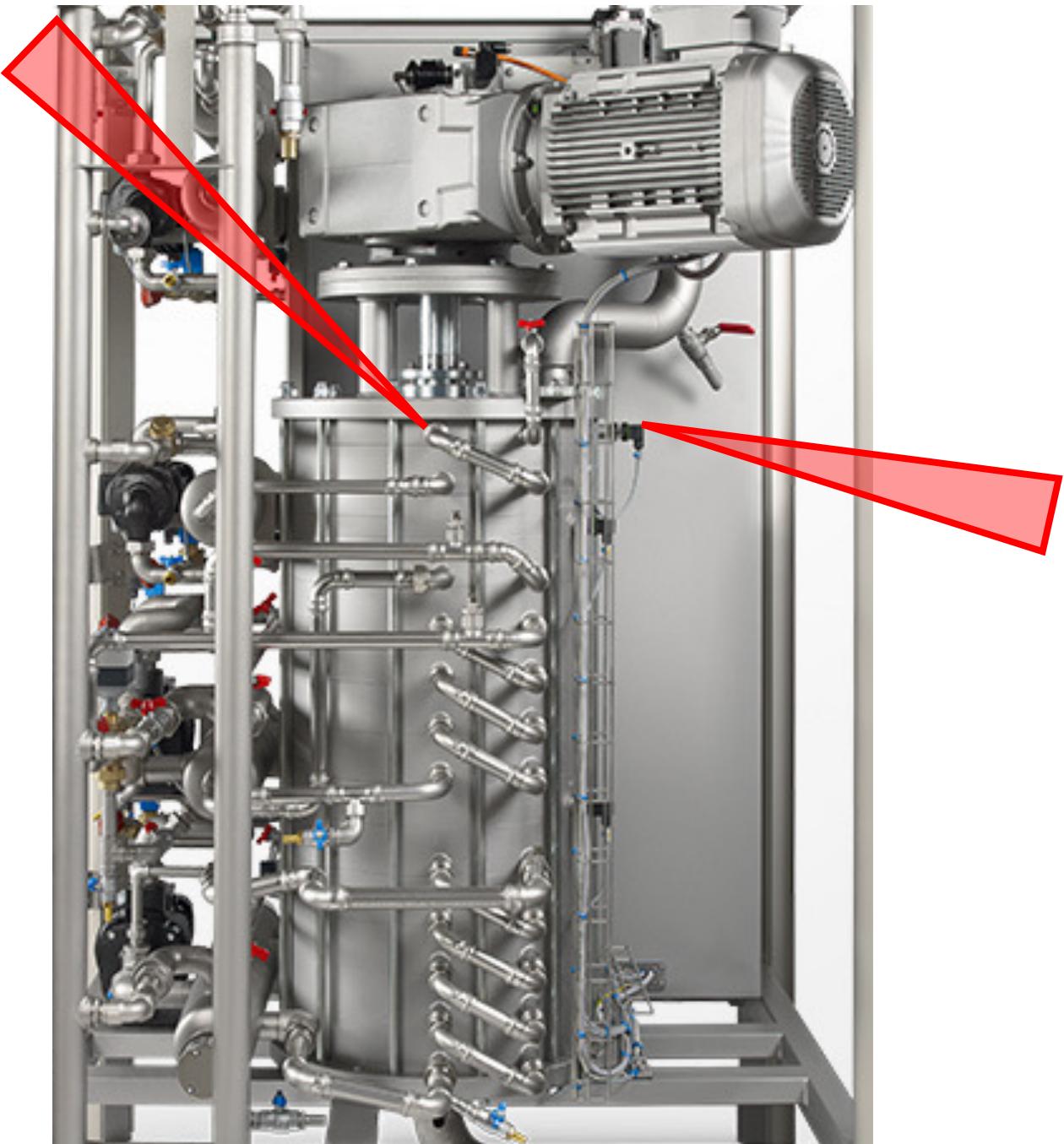




Challenge

Softsensor for control mixing stage

- Three separate water cycle
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Challenge

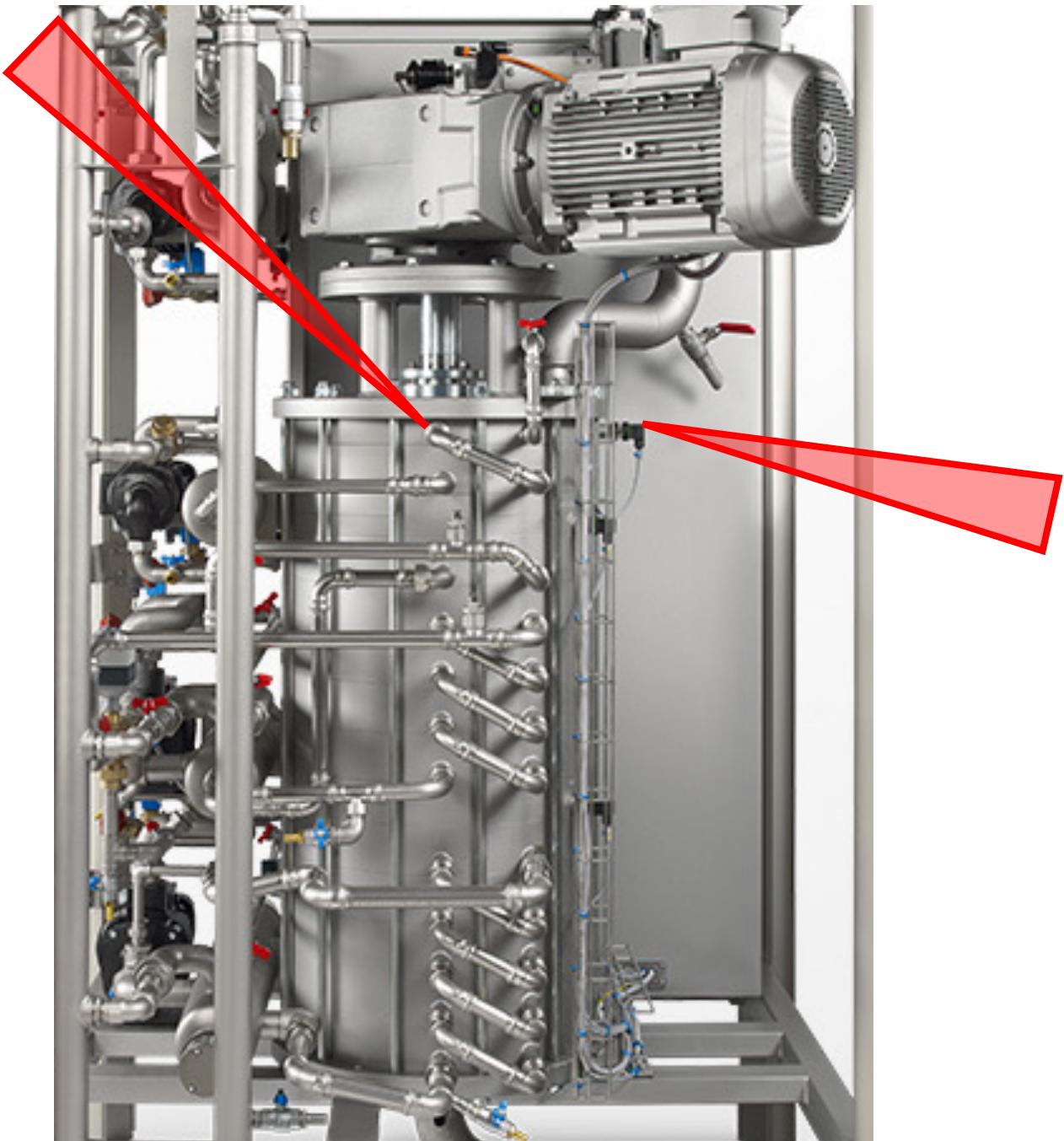
Softsensor for control mixing stage

Goal:

Train an estimator that predicts the temperature at the output of the mixing stage based on all known temperatures and valve positions, rendering the sensor obsolete.

Benefit:

- ~~Measuring disc~~
- ~~Sensors~~
- ➔ less material, less installations



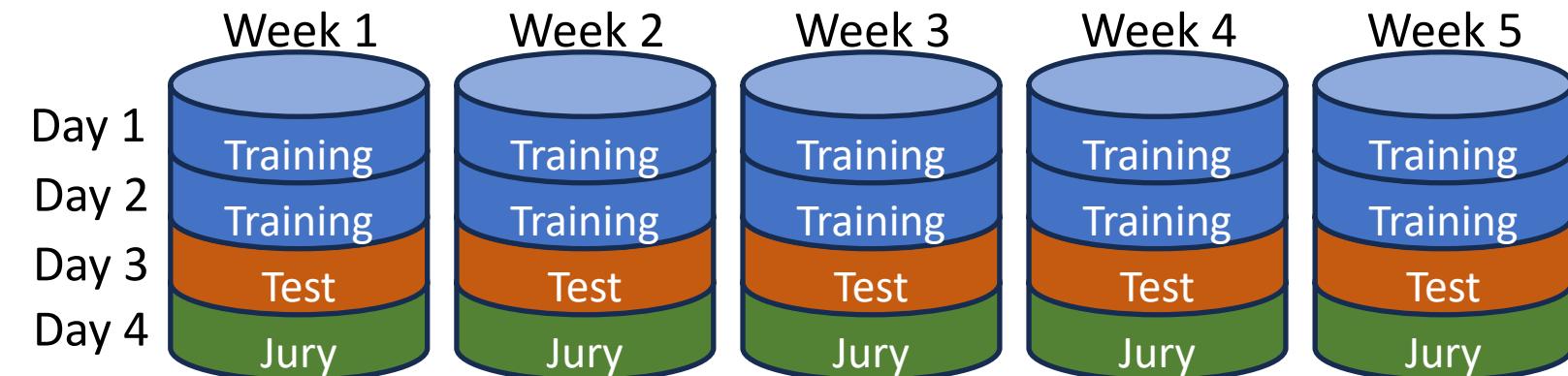


Challenge

Data

- Sampling rate 1 Hz
- 13 Sensors
- Period and split

Target data	Description
Mass Mixing Stage	Chocolate temperature in mixing stage.



Processdata	Description
MassPressure	Input pressure
MassLevelTank	Level in feeding tank
Current Scraper	-
Speed Scraper	-
Current RiserPumpFwd	-
Speed RiserPumpFwd	-
Mass HS	Temp. mass heatingstage
Water HS	Temp. water heatingstage
Mass KS	Temp. masse coolingstage
Water KS	Temp. Water coolingstage
Water MS	Temp. water mixingstage
Water Pipe	Temp. water mantel pipe
Temp Mass Infeed	-



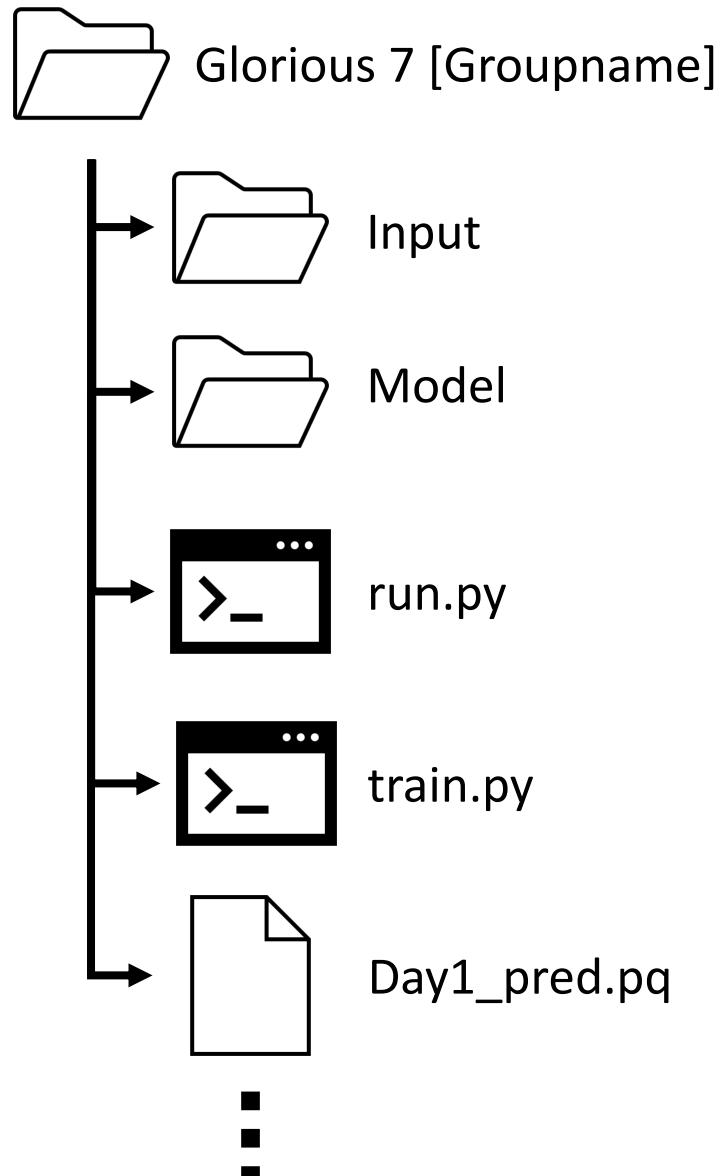
Challenge

Submission

Four path

- 1. Uniqueness:** Submission in directory -> Groupname
- 2. Completeness:** Trainingsscript „run.py“, trained model
- 3. Executability:** Python script „run.py“. Input directory containing trainingdata
- 4. Output:** Four data containing the estimated target variables
Name the output files as input adding a suffix „_pred“

Structur of submission



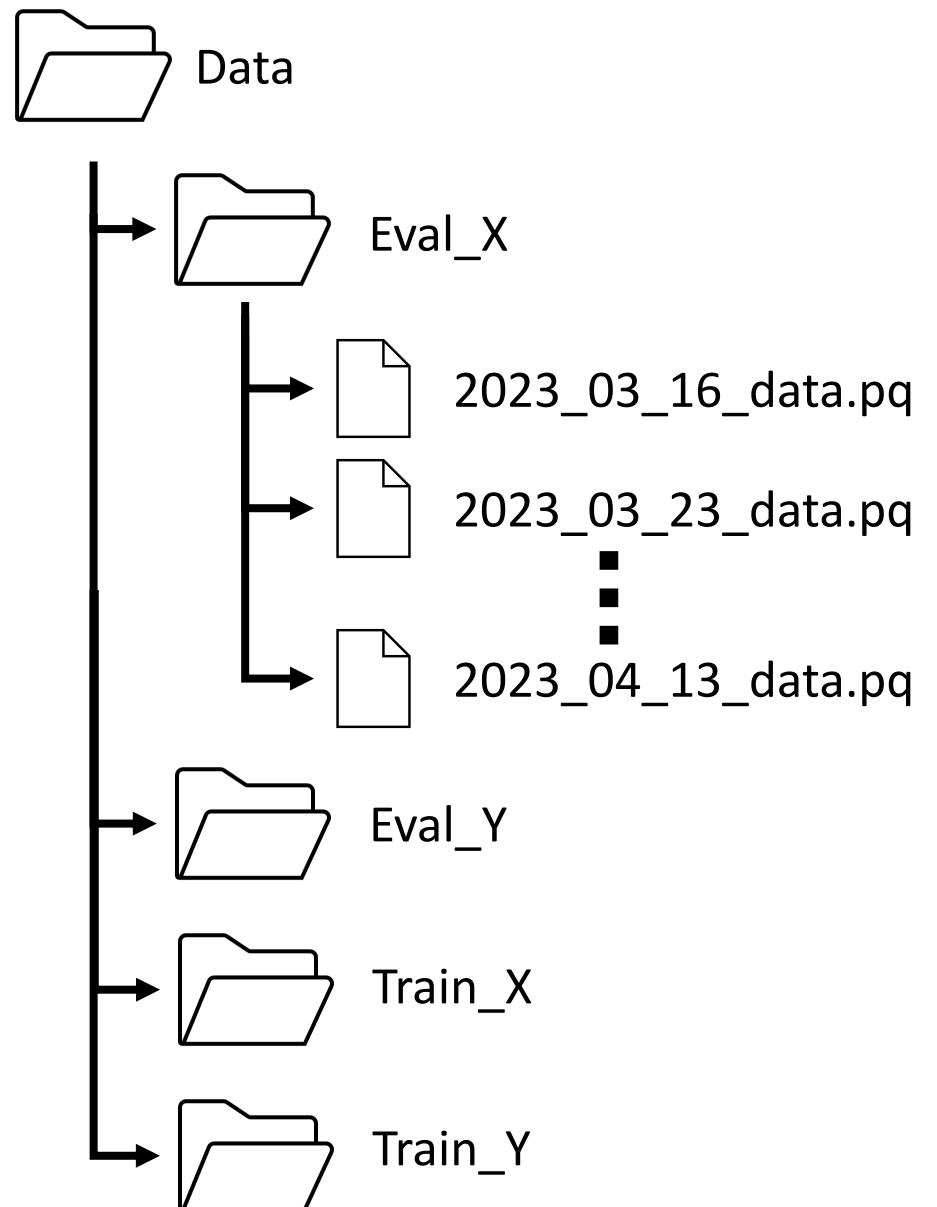


Challenge

Data

- pandas **DataFrame** as **parquet** format
- Training data
 - X - Input data with, shape (68.401, 13) per Dataset
 - Y – Target variable, shape (68.401, 1) per Dataset
- Evaluation data
 - X - Input data with, shape (68.401, 13) per Dataset
 - Y – Target variable, shape (68.401, 1) per Dataset

Structur of data

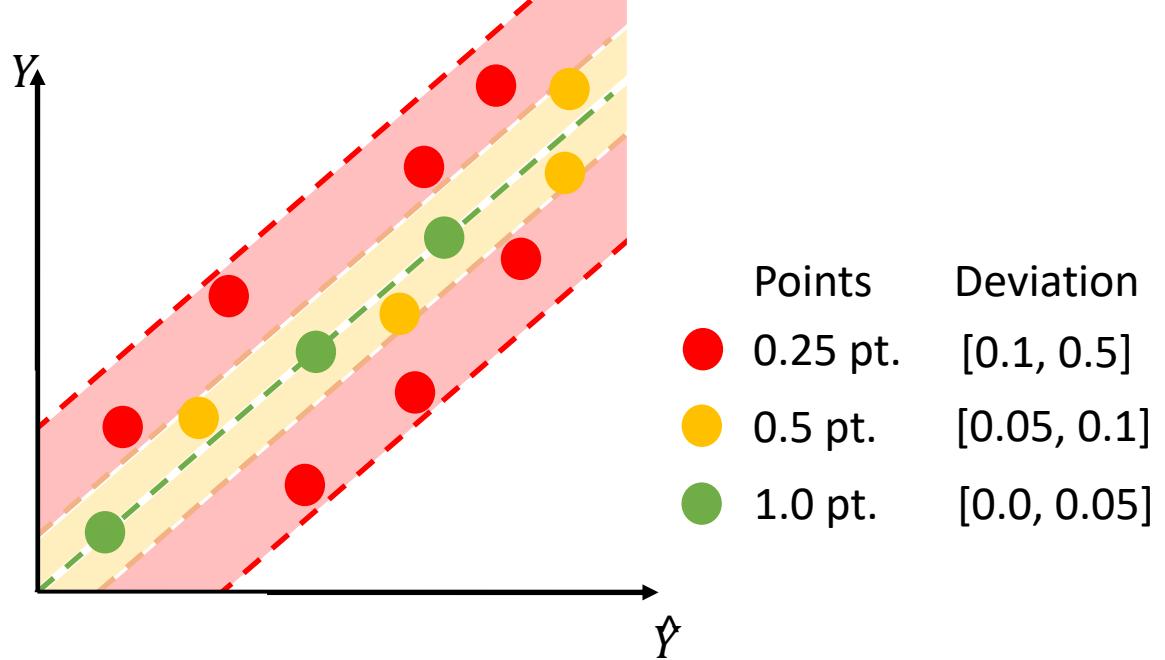




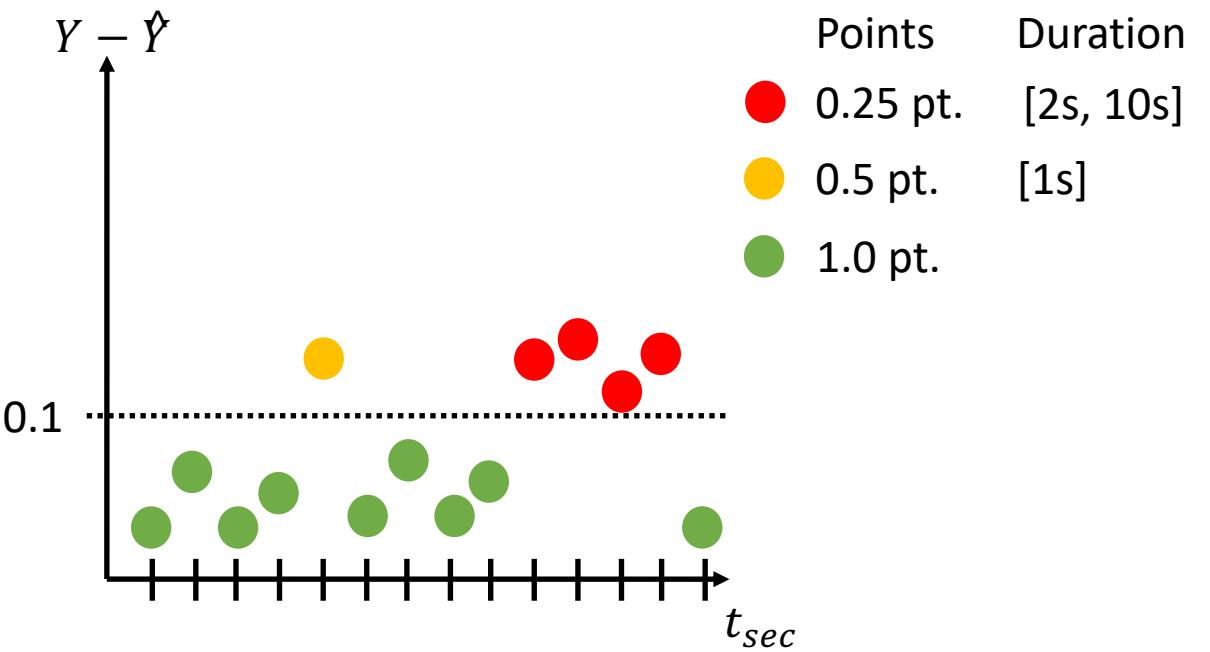
Challenge

Evaluation metrics

Weighted Absolute Error



Error Duration



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Have fun!