Christian Hidber

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AzureML@Geberit

Big data – small world: lessons learned

4/23/2018

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The Subject: heavy rainfall

Link (https://www.youtube.com/watch?v=cxAUoXTUtS8)

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Our focus: flat roof drainage

Link

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The challenges

manage the water level on the roof
control & steer the water flow
find the right dimensions
save & reliable

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23.04.2018

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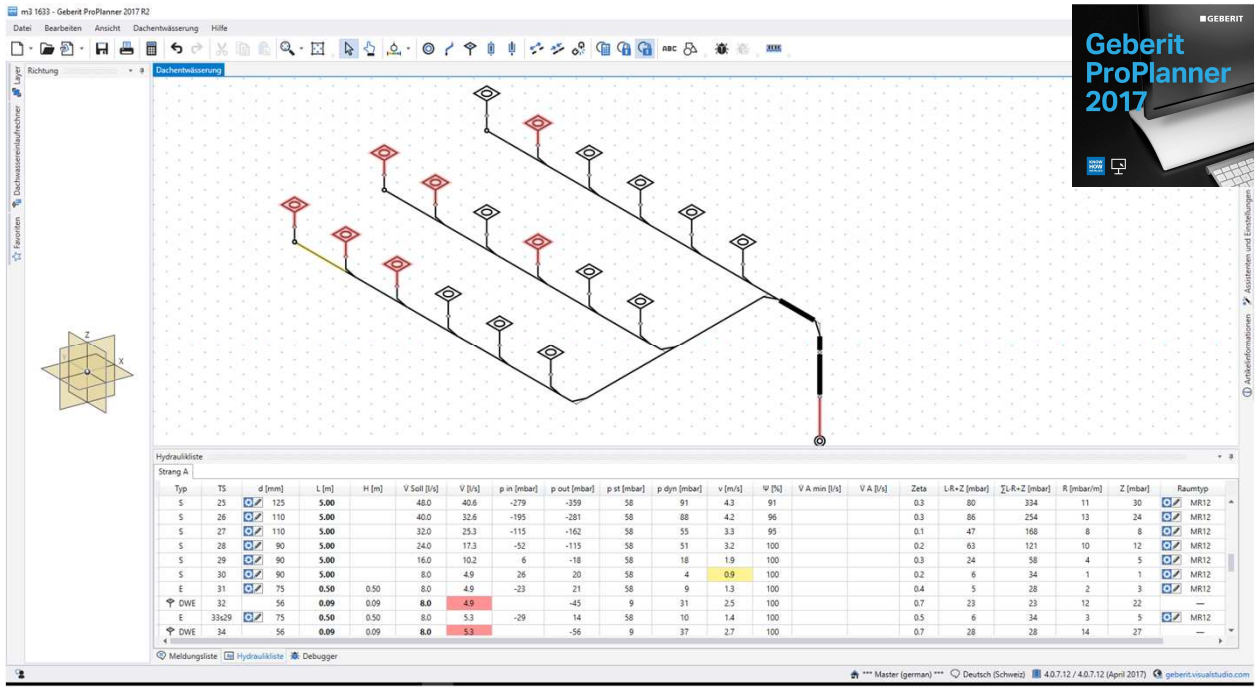
Finding the “right” dimensions

Finding the “right” dimensions



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What if….

- Collapsing pipes
- Collapsing roofs
- Clogged pipes
- Façade damages

Figure 1: Magic Mart Storefront, Credit: Mike Kalasnik, Flickr. Public Use. No Changes Made.


Figure 4: Magic Mart scene at the time of SGH arriving to the scene. Courtesy, SGH. Inc.

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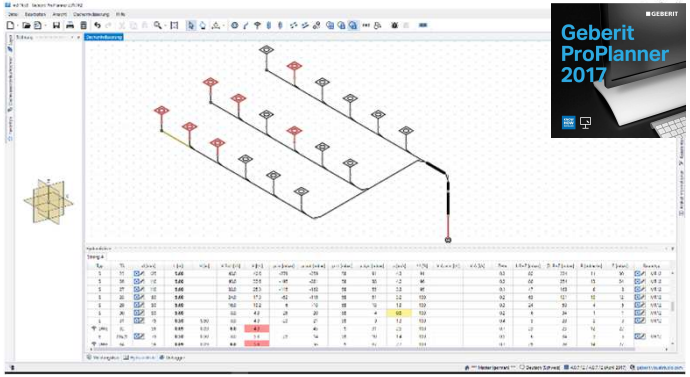
The problem of the «right» dimensions

- Finding the «right» diameter is difficult
- Validating is «easy» (hydraulic simulation)
- Only heuristic algorithms are known

=> Calculation as an ML-based assistant



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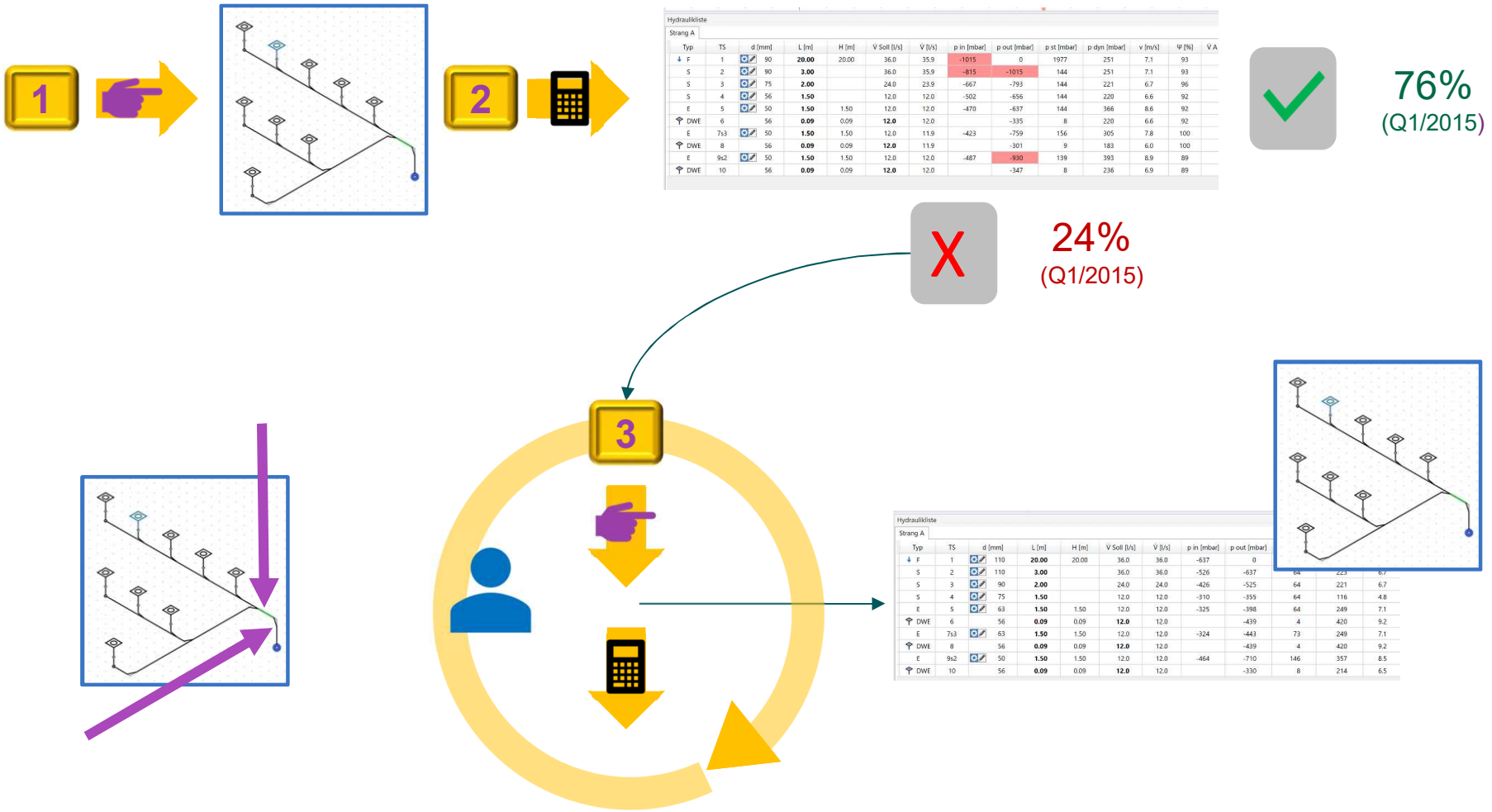
Planning process (conventional)



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Planning process (towards ML)

Features (input)

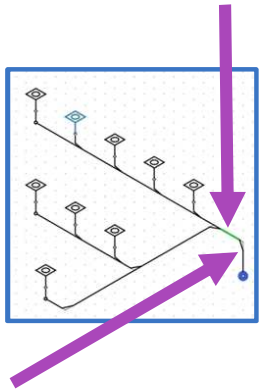
Hydraulikliste

Strang A

Typ	TS		d [mm]	L [m]	H [m]	V Soll [l/s]	V [l/s]	p in [mbar]	p out [mbar]	p st [mbar]	p dyn [mbar]	v [m/s]	Ψ [%]	V A
F	1		90	**20.00**	20.00	36.0	35.9	-1015	0	1977	251	7.1	93	
S	2		90	**3.00**		36.0	35.9	-815	-1015	144	251	7.1	93	
S	3		75	**2.00**		24.0	23.9	-667	-793	144	221	6.7	96	
S	4		56	**1.50**		12.0	12.0	-502	-656	144	220	6.6	92	
E	5		50	**1.50**	1.50	12.0	12.0	-470	-637	144	366	8.6	92	
DWE	6		56	**0.09**	0.09	**12.0**	12.0		-335	8	220	6.6	92	
E	7s3		50	**1.50**	1.50	12.0	11.9	-423	-759	156	305	7.8	100	
DWE	8		56	**0.09**	0.09	**12.0**	11.9		-301	9	183	6.0	100	
E	9s2		50	**1.50**	1.50	12.0	12.0	-487	-930	139	393	8.9	89	
DWE	10		56	**0.09**	0.09	**12.0**	12.0		-347	8	236	6.9	89	

Predict diameters
for neuralgic pipes

Set diameters
on neuralgic pipes



Labels (output)

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Planning process (towards ML)

Features (input)


Hydraulikliste

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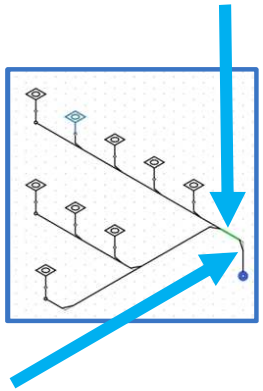

Labels (output)

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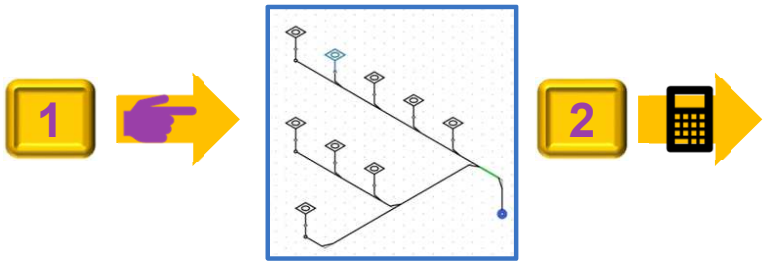
Planning process (ML based)



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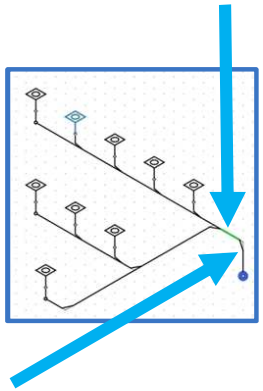

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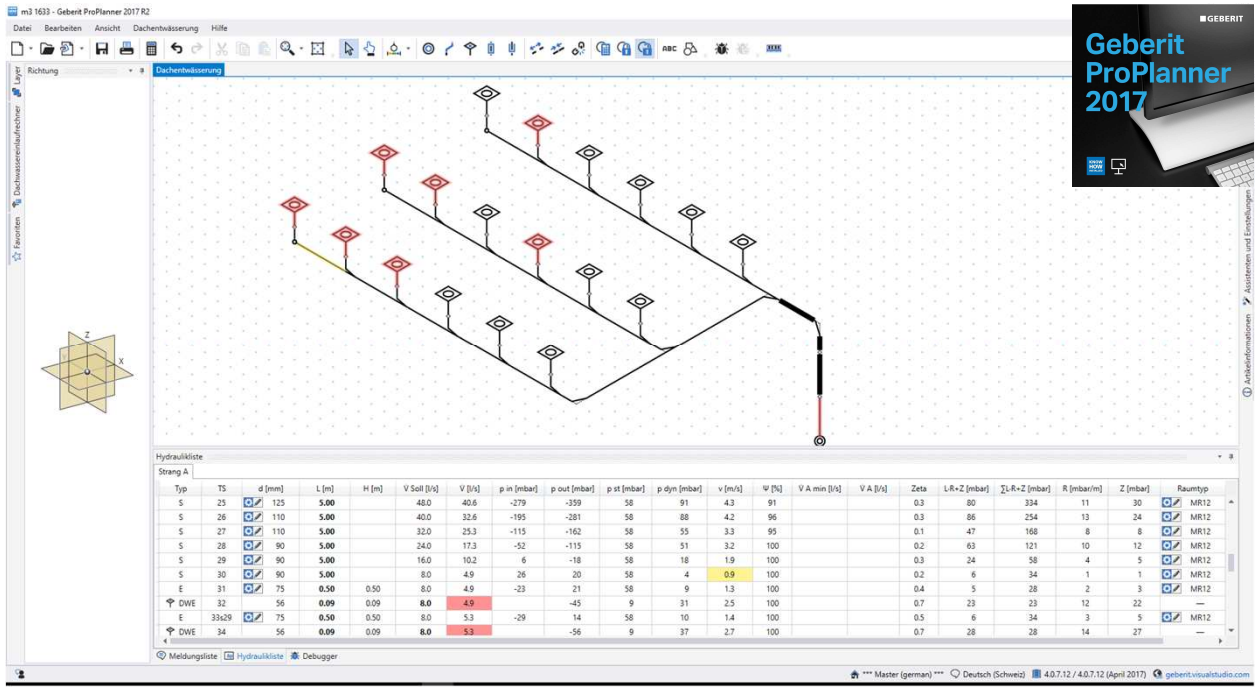
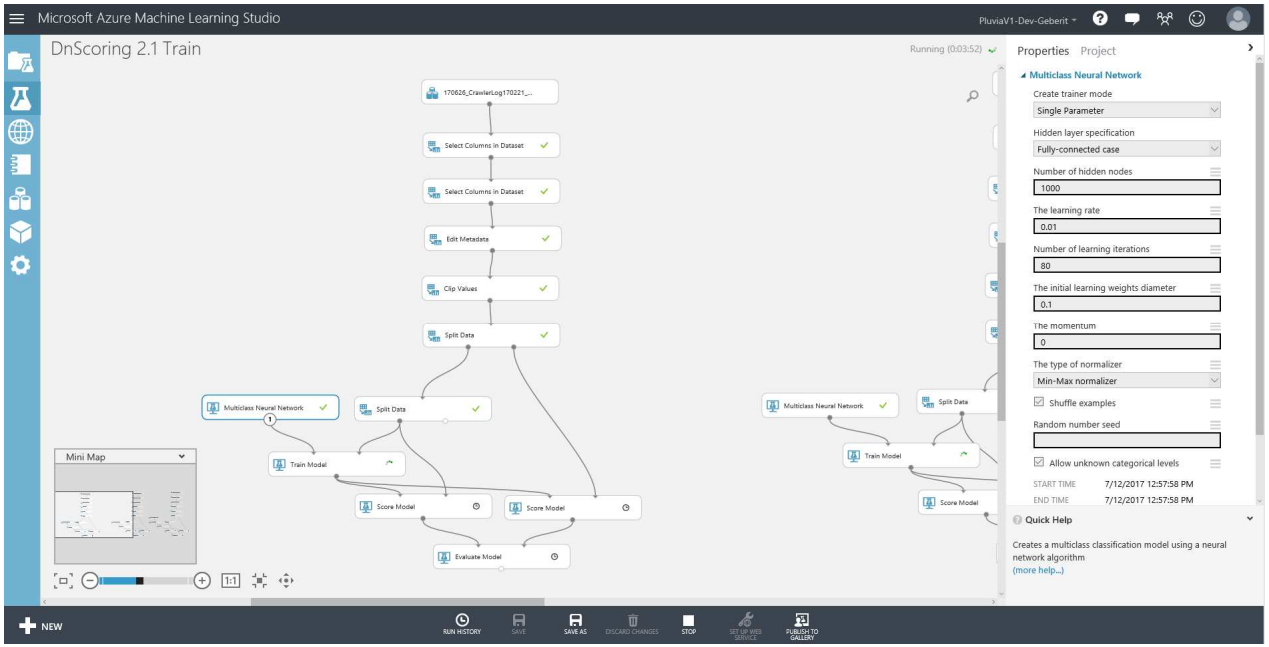
Machine Learning based calculation (Demo)



Implementation in Azure ML (demo)

- Team
- Data
- Algorithms
- Training
- Deployment



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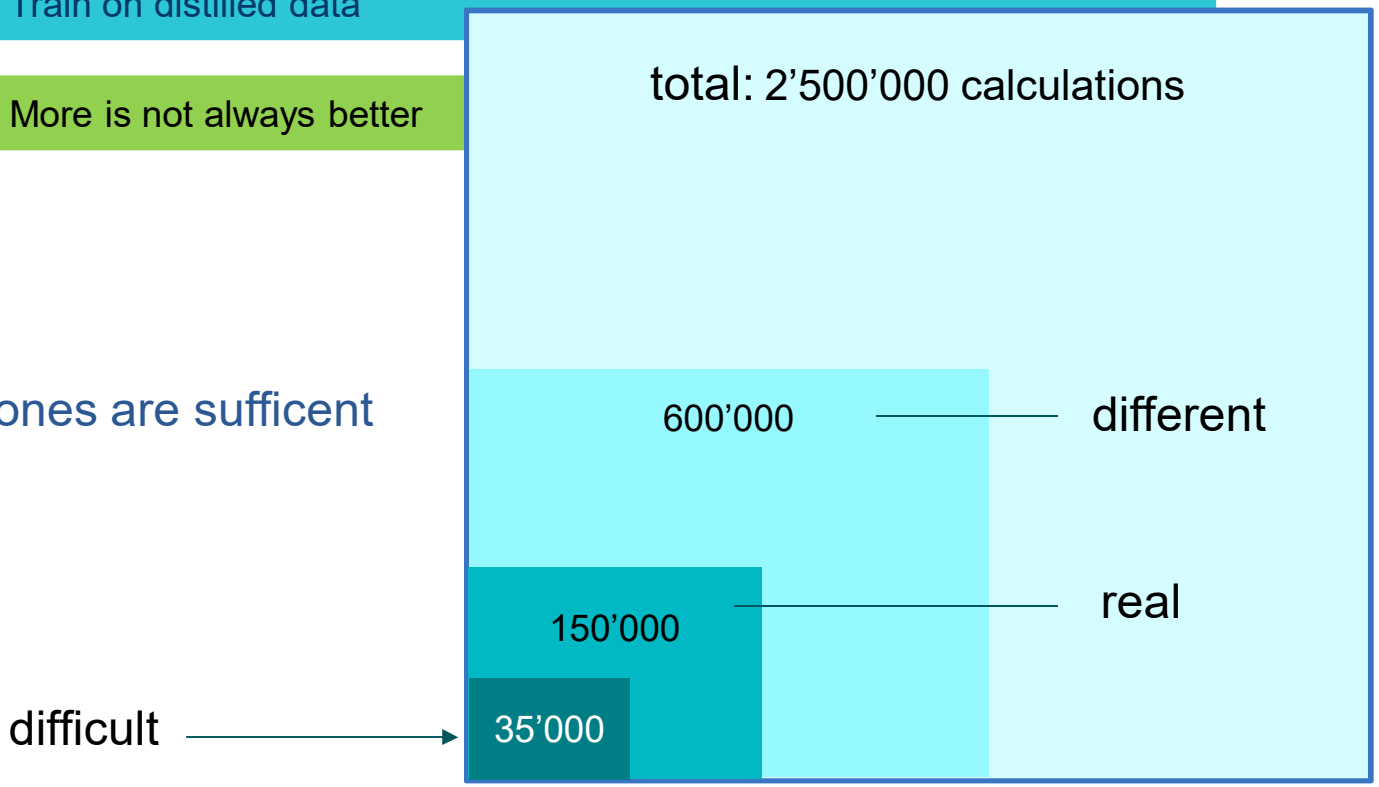
Challenge 1: Data distillation

Problem	Training takes too long
Solution	Train on distilled data
Learning	More is not always better

- The «difficult» ones are sufficent
- CPU load



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Challenge 2: Big data – small world

Problem	error rate too high

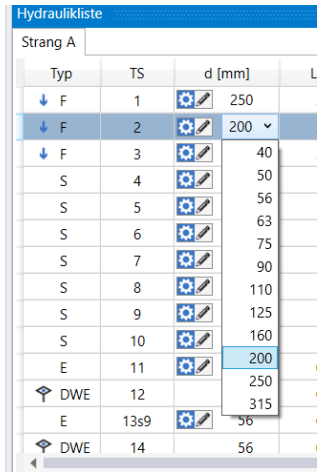
Approach: more data, more training

Challenge 2: Big data – small world (continued)

Problem	Error rate too high
Solution	Change the problem
Learning	Look for a different problem formulation

predicting diameters ✓ 60%

predicting direction ✓ 72%



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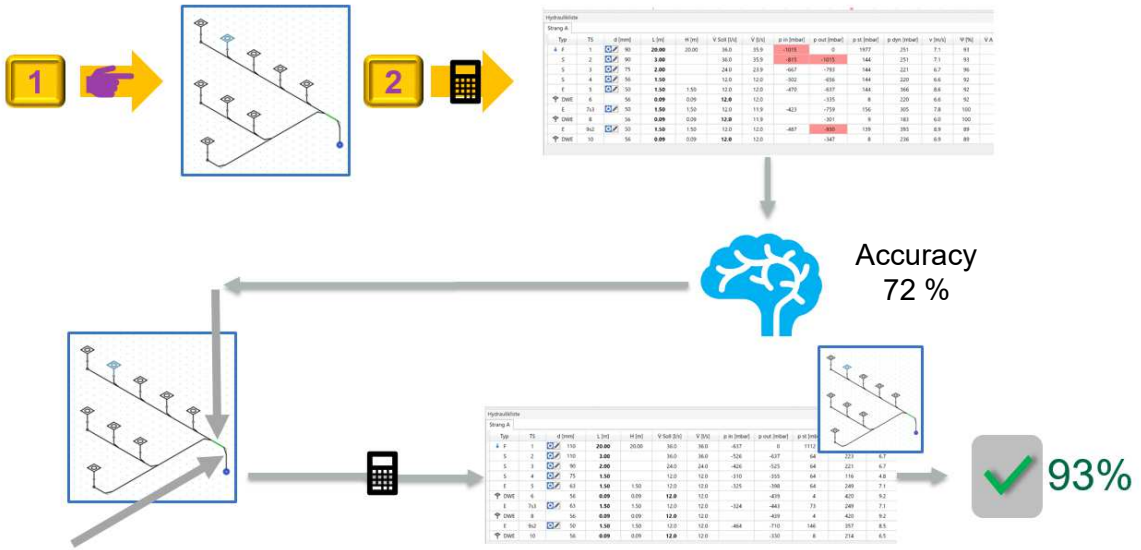
Challenge 3: model improvement (perfect algorithms)

Problem	Would better algorithms / params help ?



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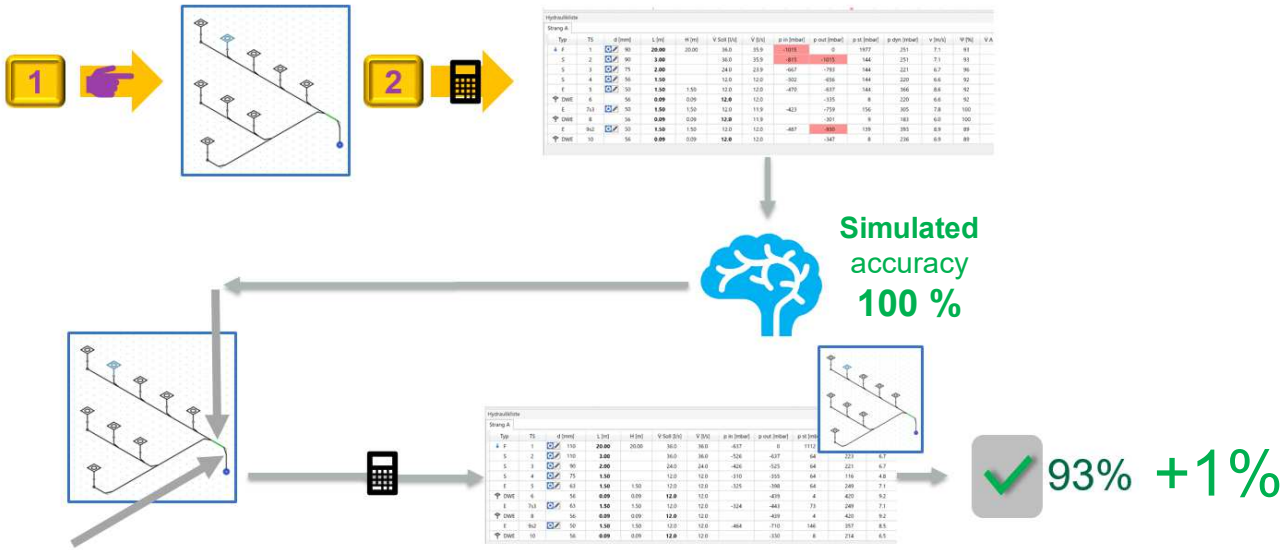
Challenge 3: model improvement (perfect algorithms)

Problem	Would better algorithms / params help ?
Solution	Ceiling analysis
Learning	Small improvement only by retraining with better algorithms / params



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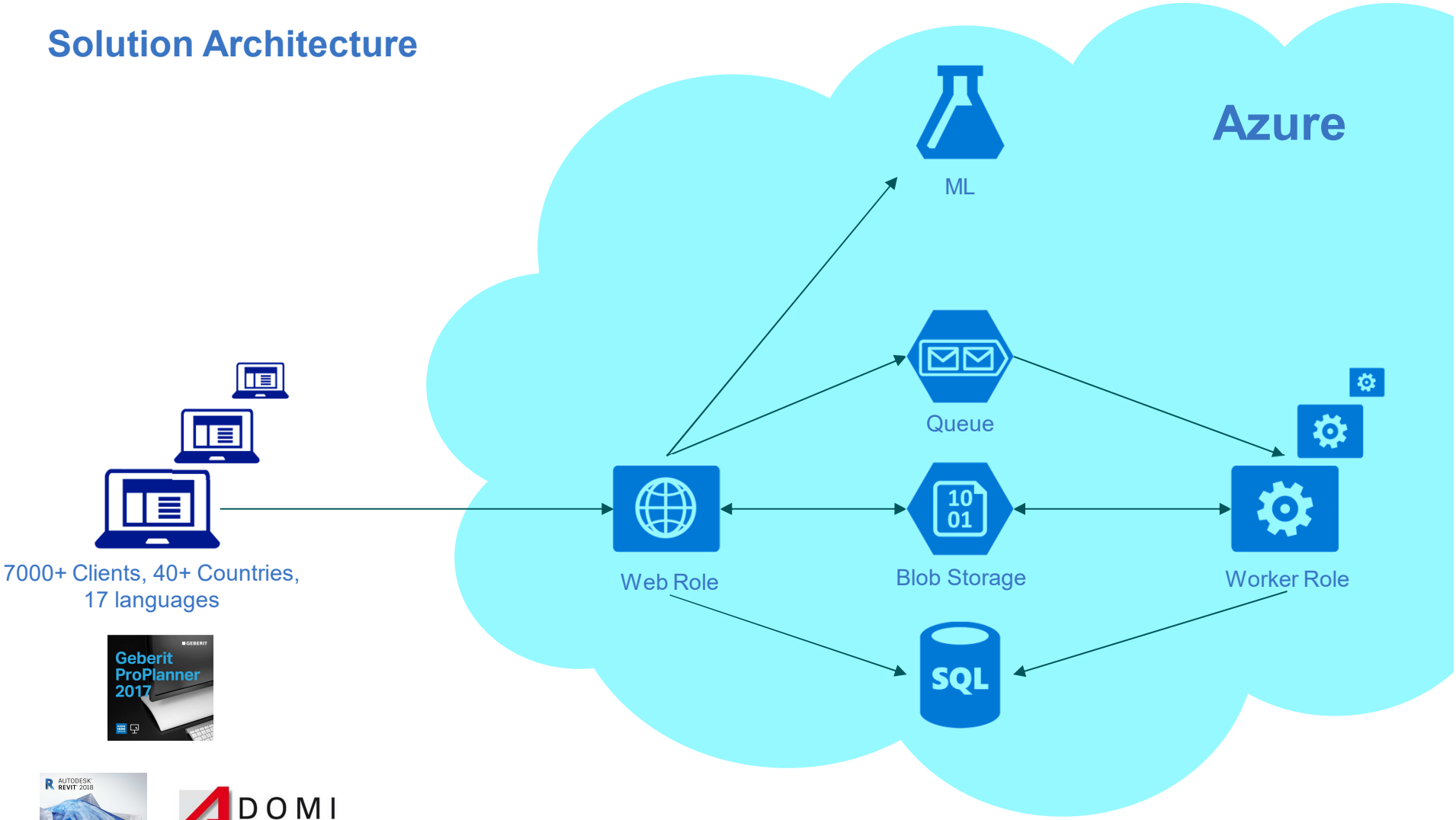
Solution Architecture



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Summary

- Azure ML based solution increases success rate to 93%
- Ceiling analysis safes a lot of time
- Azure ML easy, but problem difficult
- Team-structure shaped the approach
- Calculation “as a service”

About Geberit
The globally operating Geberit Group is a European leader in the field of sanitary products. Geberit operates as an integrated group with a very strong local presence in most European countries, providing unique added value when it comes to sanitary technology and bathroom ceramics. The production network encompasses more than 30 production facilities, of which six are located overseas. The Group is headquartered in Rapperswil-Jona, Switzerland. With around 12,000 employees in around 50 countries, Geberit generated net sales of CHF 2.8 billion in 2016. The Geberit shares are listed on the SIX Swiss Exchange and since 2012, have been included in the SMI (Swiss Market Index).

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Thank you !

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Link (https://www.youtube.com/watch?v=k74ZbpKS7wU)

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