Railway Inspection with Deep Learning.

Marcel Zurkirchen, SBB AG

Infrastructure Condition Monitoring.

Wire Geometry

Catenary Infrastructure

Wire Condition

Enviroment Information

Rail Condition

Track Geometry

Rail Fastenings

23’000 Defects p.a.

51 Track Inspectors

2 Diagnostic Vehicle

250 Defect Types

Safety. Availabilty. Costs. Know-how.

SBB Diagnostic Vehicle and Coach.

Production Speed up to 200 Km/h

18 installed High-Speed Camera Systems

with a Data Output of 10 GB/Km

→ BIG DATA.

Geometry

- Forms, Shapes
- Types
- Switch

Artefacts

- Dirt, Garbage
- Leaves
- Chewing gum

Weather

- Rain, Snow, Ice
- Fog, Humidity
- Sun, Clouds

Harsh Environmental Conditions.

AISI

Artificial Intelligence Schienen Inspektion.

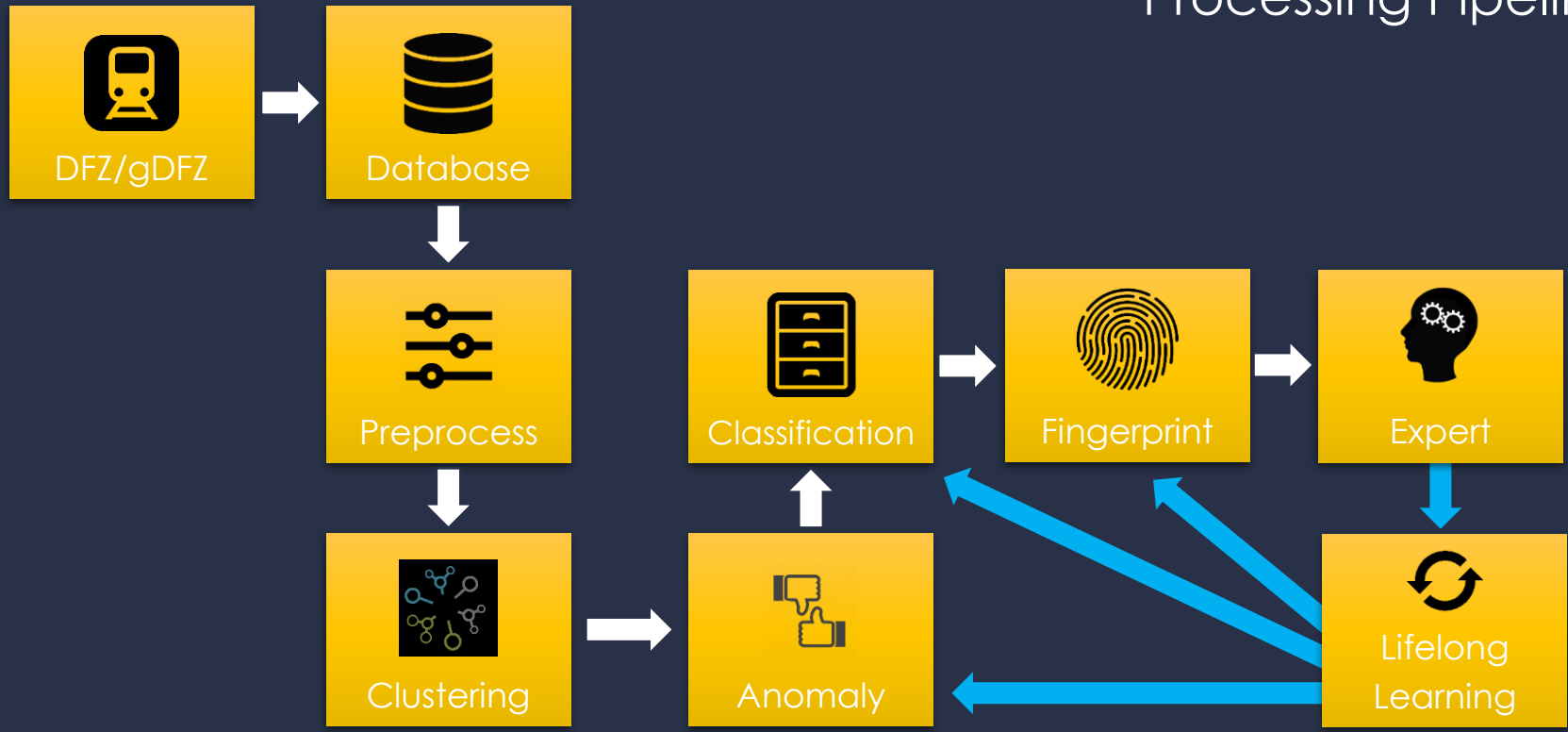
SBB CFF FFS

csem

Defect Detection

Fingerprinting

Processing Pipeline.



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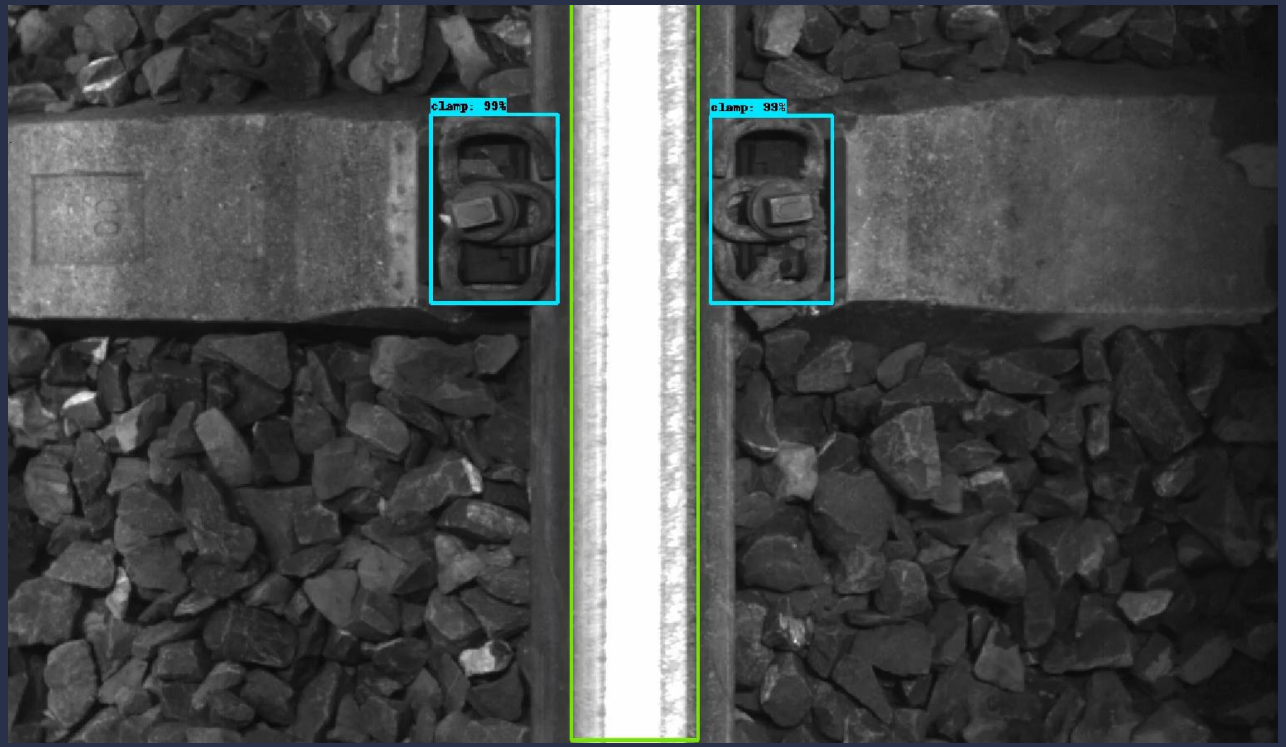
Preprocessing.



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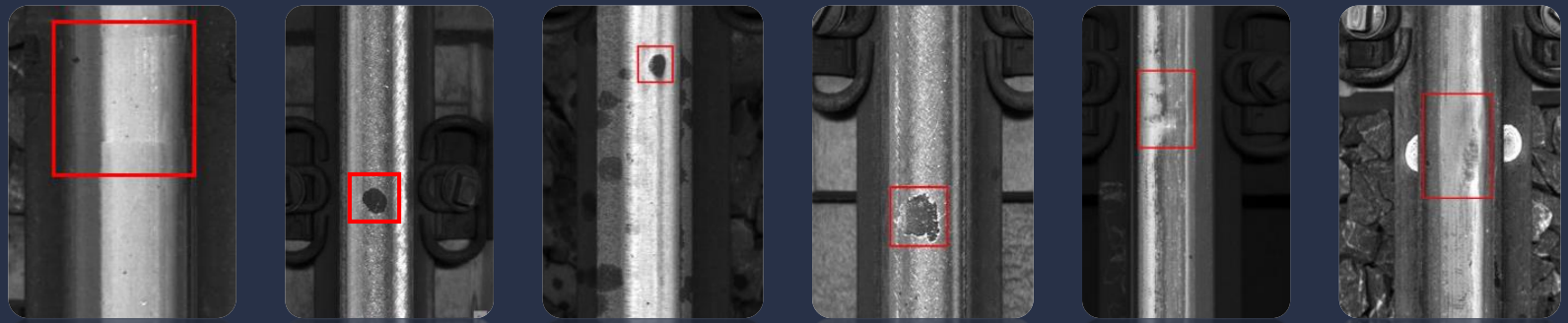
Classification.



Welding | Plastic Particle | Surface defect | Chewing gum | Squat | Wheel slip

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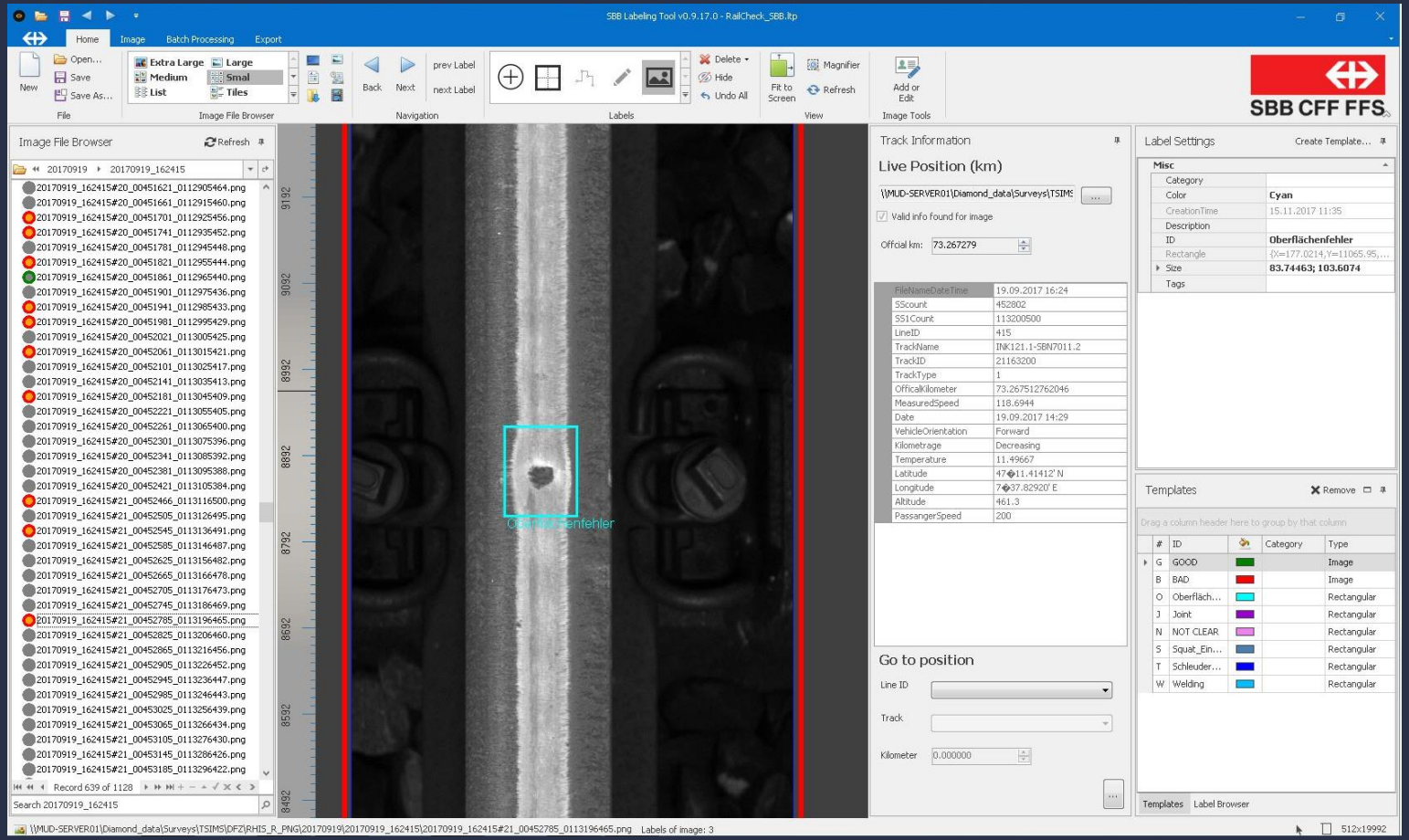
Data Labelling.



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Experts, Know-how and Crowd Labelling.

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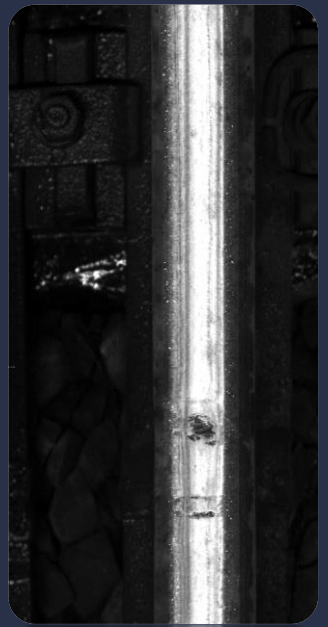
Fingerprinting.

= ?



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Evolution of a Defect.

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FALSE POSITIVES.

(WITHOUT FINGERPRINTING, PER KM)

	Tunnels	Open Track
Classical Algorithms (10 years optimized)	160	20
	-95%	-50%
Neural Network (after initial training)	10	10

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Improving Predictive Maintenance.

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Zürich, Switzerland