We are passionate about railways

Florian Auer (Director of Technology)
• 10 years work experience in railway infrastructure
• Head of Life Cycle Management ÖBB
• PhD on “How to reduce wear in sharp curves”

Krzysztof Wilczek (Head of Track Analytics)
• 5 year work experience in railway infrastructure
• Life Cycle Management Track SBB
• Head of data laboratory SBB
Track Challenges

Traffic Load
Total Cost of Ownership
Reliability
Availability of Skilled Workers
Service Life
What is smart track maintenance?

Business innovation is the creation of substantial new value for customers and the firm by creatively changing one or more dimensions of the business system.¹)

In business, a disruptive innovation is an innovation that creates a new market and value network and eventually disrupts an existing market and value network, displacing established market-leading firms, products, and alliances.²)

¹) Sawhney, Wolcott, and Arroniz (2006)  
²) Ab Rahman, Airini; et al. (2017).
Mechanizing maintenance processes

- Tamping
- Ballast Management
- Stabilisation and Consolidation
- Ballast Bed Cleaning
- Formation Rehabilitation
- Material Logistics
- Renewal and Laying of Tracks and Turnouts
- Mobile Rail Treatment
- Measurement
- Installation and Maintenance of Overhead Lines
- Special Tasks
Gartner Hype Cycle for Emerging Technologies, 2017

- Virtual Assistants
- IoT Platform
- Smart Robots
- Edge Computing
- Augmented Data Discovery
- Smart Workspace
- Brain-Computer Interface
- Quantum Computing
- Neuromorphic Hardware
- 4D Printing
- Smart Dust
- Connected Home
- Deep Learning
- Machine Learning
- Autonomous Vehicles
- Nanoflave Electronics
- Cognitive Computing
- Blockchain
- Commercial UAVs (Drones)
- Conversational User Interfaces
- Volumetric Displays
- Digital Twin
- Service-Oriented Analytics (SOA)
- 5G
- Human Augmentation
- Deep Reinforcement Learning
- Artificial General Intelligence
- Enterprise Taxonomy and Ontology Management
- Software-Defined Security
- Augmented Reality
- Virtual Reality

Plateau will be reached in:
- less than 2 years
- 2 to 5 years
- 5 to 10 years
- more than 10 years

As of July 2017
Technology trends driving track maintenance

Energy

Data

Autonomous Systems
#1 gas station to charging station
Track maintenance goes electric

- Electric & hydraulic power transmission
- Electric power transmission
- Battery powered operation
Being clean pays off

Unimat 09-32/4S Dynamic E³ (Krebs Bau, CH)

CO₂-reduction

-286,39 kg/h

Cost reduction

-130,73 CHF/h

(Diesel costs - electricity costs + logistics costs + maintenance costs + CO₂ reduction)
#2 measure what matters
Measure machine performance
Measure ballast

\[ \nu_{squeezing} = \text{const.} \]

\[ \Delta l_4 = e \cdot \sin(\omega \cdot t) \]

\[ P \leq P_{\text{max}} \]

friction element

90° = \frac{\pi}{2}

\[ x_{\text{tine}} = l_1 \cdot \beta \]
Measure distance
Measure track location

Fixpoint measuring system: from 5km/h to 100 km/h
#3 autonomous systems
Detecting objects
The Assistant

- Mapping turn-out on the fly
- Precise tamping recommendation
- Obstacle detection
- Autonomous tamping
The era of digitalization is a fantastic opportunity for railway to increase our competitive advantages over other means of transport.

However, to exploit this potential we need to look beyond our own domain expertise.

Transformation towards digital railways
One more thing ...
There's an app for that

game.plassertheurer.com