The Future of the telecom companies business with AI: Challenges & Opportunities

Session 2 „AI in the Telecommunications Industry", Panel

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Challenges (focus on Network Operations / 5G)

1. Use cases	**Why:** no a priori known rules → in-situ learned knowledge **What:** joint resource optimization radio PNF/VNF, sliced network operation, anomaly detection / diagnosis in *complex, dynamic* networks (5G)
2. Data & context availability	amount / quality, (un)structure, privacy, operator / (multi-)vendor cooperation
3. AI/ML technology	many different ML algorithm types for Closed-Loop Automation
4. Spatial distribution	distributed vs. centralized learning (delay requirements) → coordination, transfer of data / knowledge
5. Legacy NM (silos)	• architecture: legacy interfaces, policy implementation with rules • platform: diversity of SW platforms and silo'ed SW components
6. Human / machine interface	• domain (telco expert) & AI/ML (data scientist) knowledge • man / machine worksplit → traceability, controllability & education → trust

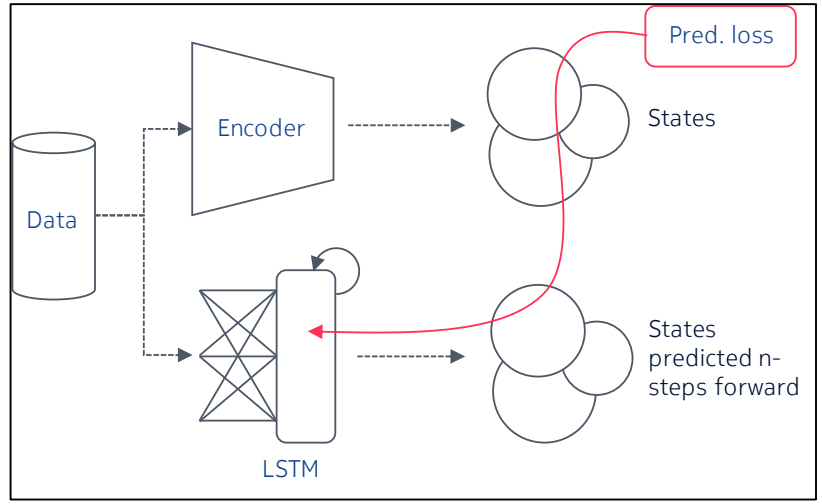
Opportunities (focus on Network Operations / 5G)

1. New use cases (e.g. IIOT)	• deployment scenarios: application & network data fusion → mutual influence application ←→ network • service scenarios: 1 application using eMBB & cMTC
2. Data & context availability	network functions as high quality probes (multi-vendor)
3. AI/ML technology	telco-adaptated ML algorithms → multi-vendor target setting & pipelining
4. Spatial distribution	(AI/ML-specific) processing capabilities (ultra far edge, (far) edge, central cloud) → multi-vendor abstractions (APIs)
5. „AI/ML-friendly“ NM	• AI/ML-adapted interfaces (e.g., qualitative assessment / network states, training mode, model / knowledge sharing, intent) • unified Analytics / ML “engine”, ML libraries
6. Human / machine interface	Symbiosis *human* (domain knowledge, intuition; knowledge transfer) ←→ *machine* (parallelized processing; trending): augmented intelligence, transfer learning, intent

5G Slice Analytics & Diagnostics @ 5G-MONARCH Hamburg seaport testbed

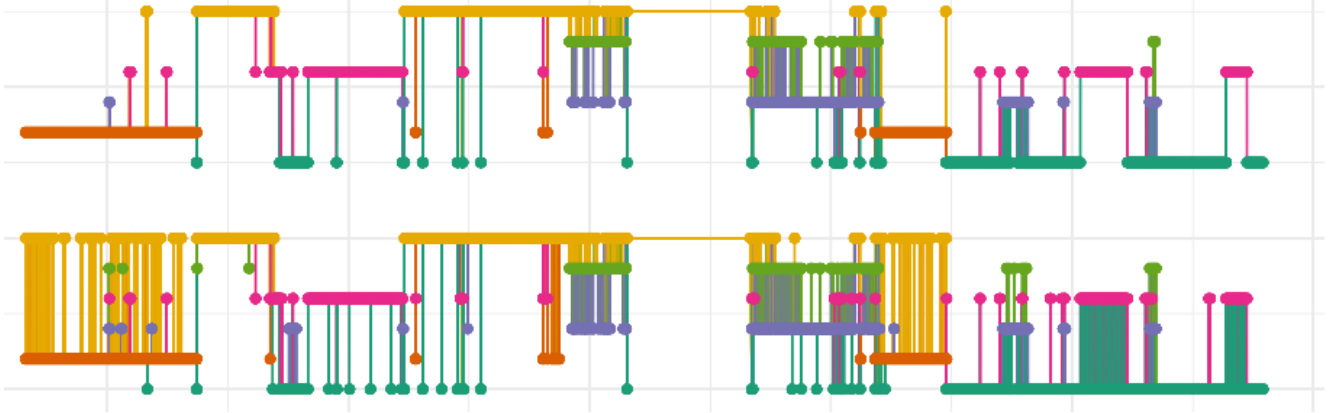
- Problem statement
  - Network slicing has additional dimensions wrt. RAN management automation
  - For resource allocation optimization and SLA assurance, slicing-aware prediction methods are required
  - Hamburg seaport testbed: evaluate concepts in a controlled environment (ground truth available; closed-loop automation possible)
- Results
  - Slice-aware Network Element (NE) state model: quantization of NE KPIs into a selected number of states
  - States → Long-Short Term Memory (LSTM) Recurrent Neural Network (RNN) → State Prediction

NE state prediction and validation



Predicted states (T+3):

Original states:



- State A: eMBB (UL, DL) + IoT (UL, DL)
- State B: eMBB (DL) + IoT (DL)
- State C: eMBB
- State D: eMBB + IoT (UL)
- State E: URLLC (UL, DL)
- State F: URLLC (DL)

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