

## Summary of Results

### SliceNet networking session

#### "Artificial Intelligence - New Solutions for Real-time Service Delivery"

ICT 2018 – Vienna, 5 December 2018

The key question of the networking session was:

**How can Artificial Intelligence be used for developing and implementing real-time service delivery solutions?**

More than 40 participants seated at 6 tables explored answers to this question in two innovation café discussion rounds. They generated the following ideas:

#### Service creation and delivery based on AI

- There is a **large demand for fast service delivery**, even provision of services on demand, which automatically adapt to current situation in the service delivery environment.
- Main points are time **critical assessment and forecast**. For **critical infrastructures**, such as public safety services, resilience of services is the most important aspect.
- The only possibility to establish such services is to **continuously learn from similar operational services** via machine learning and incremental learning.

#### Personalized services and enhanced user experience

- AI-based data analytics could be used to **meet individual needs of users**.
- A crucial question is **data ownership and access control to data**, including data storage, exchange, and management.
- A potential solution is to **anonymize the data** in a way it can still be properly analysed to provide the personalized services.
- The challenge is to **properly anonymize a very large amount of data** to train the AI models.
- To convince end users to allow access to their data, even anonymized, the main point is to **ensure trust among the end users** in entities and processes related to data analytics.

#### Predictive analytics

- Predictive analytics could be used, e.g., in water management and network management.
- An important area is **predictive maintenance**, including: AI for dynamic inspection; sensors for identifying required maintenance; remote maintenance of machines; control loops for better error concealment.
- Monitoring, prediction and improvement of **human-robot interaction** via AI could increase workplace safety in factories.
- **Movement prediction** for augmented reality/virtual reality based viewing of **360 degree video**, in order to enable the rendering of a correct view on an AR headset when the user is turning his head. AI is used to predict head movement (~200ms) and prepare, which frames to offer up next based on neck movement.

- **Prediction of user behaviour:** application areas include energy consumption and network management.
- **Supply chain management:** Synchronised information between different nodes in a supply chain based on analysed and predicted patterns.
- AI can be used for **management of dynamicity** and for the **prediction of system behaviour** that is difficult to model. Examples of AI-based predictions in uncertain dynamic environments include resource management and movement/logistic predictions.
- Using **reinforcement learning** for dealing with uncertainty in real-time service delivery.
- **Multi-agent behaviour** is a key issue, which could benefit from AI-based coordination among independent systems based on predictive analytics.
- An **example of a difficult predictive model** would be predicting when particular areas are at risk of flooding due to combinations of many factors, like, e.g., weather, land use, tides, and snowfall.
- Several examples of appropriate **decision support roles for AI** were discussed, including: predicting user demands, resource allocation and management, financial forecasts as well as better understanding of users and the user interface.

### AI and people

- Capturing and embedding **employee experience** in systems to reduce dependencies on expensive experienced employees.
- Reducing people involvement in work processes to increase personal leisure time.
- AI-supported **real-time analysis of people's facial expressions** and body language to support success in negotiations and meetings as well as optimise reactions and responses.

### Context awareness

- Context awareness includes **information and decision options** to be presented through the appropriate interface in the most suitable way to the user.

### Robotics

- **Physical training usage scenario:** AI-based robots could be used as opponents for martial arts training. The advantage would be that the robot, unlike a human opponent, cannot get hurt and could control movements in order not to hurt the user. The robot also doesn't get tired, as long as it has battery power.
- **Bionic robots:** AI could enable robots to learn movements of animals, e.g. the running technique of a cheetah. Initially, it may be unclear what the usage scenarios for such a technology would be. How to use these robot functionalities could be discovered in a next step.
- **Context-aware robots:** application areas include, e.g., infrastructure inspection and operation in disaster scenarios, e.g. firefighting/ rescue operations in a fire (buildings, tunnels).

### Public safety

- **Crisis management:** AI could be used for monitoring of floods combined with real-time analysis and prediction of the flood situation.

### Language processing

- AI could be used for better understanding and processing of natural languages and auto-translation between different languages.
- **Automated real-time translation:** An AI-based real-time translation service could be used at international face-to-face or online conferences, allowing each participant to speak their respective native language.

### Network slicing

- AI can be used for network slicing to **adapt to various devices** and learn the pattern of **user behaviour and configuration**.
- Machine learning can be used to **scale up and scale down slices**.
- Network Functions Virtualization (NFV) in combination with machine learning could enable **new slice-based network services**.

### Real time vs not real time

- **What is real time:** 1 minute, 1 second, 1 millisecond?
- AI in non-real time relates to service design and AI in real-time relates to **service operation**. AI helps in both designing and implementing the service. AI execution is real time. AI learning is not real time. Incremental training is important.

### Grey box testing

- **Black box** is where there is no knowledge or model; **white box** is where this is a full model; **grey box** is where there is partial model. AI is useful for filling the gaps when there is limited knowledge and a partial model. A model based part could be combined with an AI driven part.

### AI-based real-time service examples

- Detection of **3D events** in space and time.
- Building efficiency related to **physical information**, e.g. in a building environment or regarding engineering knowledge and human behaviour as well as on-time management.
- Real-time **auctions**.
- Management of **healthcare resources** in a crisis.
- AI used for **reward-based decisions**.
- Real time **error checking**.
- Real time **error concealment**.
- AI in **quality control systems** in manufacturing.

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