DEUTSCHE TELEKOM AG
INDIVIDUAL SOLUTIONS & PRODUCTS
OPTIMIZED PREDICTIVE PLANNING WITH KNIME

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OPTIMIZED PREDICTIVE PLANNING WITH KNIME
FROM BUSINESS PROBLEM TO MODELING AND IMPLEMENTATION
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FROM BUSINESS PROBLEM TO MODELING AND IMPLEMENTATION

- Business problem
- Decision elements
- Underlying data
- Modelling
- Implementation
OPTIMIZED PREDICTIVE PLANNING WITH KNIME
FROM BUSINESS PROBLEM TO MODELING AND IMPLEMENTATION
BUSINESS PROBLEM

planning section

resource costs

- order backlog
- sales funnel
- unknown business
- Manuell planning time is too high in relation to the budget
- Consideration of the planning part with the highest resource requirements and lowest validity

highest optimization potential
OPTIMIZED PREDICTIVE PLANNING WITH KNIME
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DECISION ELEMENTS

Regression Modell

Cluster & Similarities

Probability of orders
OPTIMIZED PREDICTIVE PLANNING WITH KNIME
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business problem  decision elements  underlying data  modelling  implementation
EXAMPLES OF UNDERLYING DATA

Customer Dimension
- Sales Region
- Letter of Intent True/False

System Information
- Duration per Stage
- Number of offer versions

Time Dimension
- Quarter of the planned project start
- Condition per Stage

Financial Information
- project volume
- term of contract

Technology & Portfolio
- technology portfolio
- ITIL Type
EVOLUTION OF THE MODEL FROM SIMPLE TO COMPLEX

1. Random Forest Learner

2. Python & Keras Network Learner
EVOLUTION OF THE MODEL FROM SIMPLE TO COMPLEX

<table>
<thead>
<tr>
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<th>Random Forest Learner</th>
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<tbody>
<tr>
<td>1</td>
<td>Easy to implement</td>
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<tr>
<td></td>
<td>+ Can handle categorical values</td>
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<tr>
<td></td>
<td>+ No special data preparation required</td>
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<tr>
<td></td>
<td>+ Successful training even with smaller data sets</td>
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<td></td>
<td>Retrain creates a new model each time</td>
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<td>- Small changes in the training data set can have a big impact on the model.</td>
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<thead>
<tr>
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<th>Python &amp; Keras Network Learner</th>
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<tr>
<td>2</td>
<td>Retrain optimizes the existing model</td>
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<td></td>
<td>+ Can recognize even complex relationships</td>
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<tr>
<td></td>
<td>+ Stable result even after retrain</td>
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<td></td>
<td>High resource requirements for training</td>
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<tr>
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<td>- Special data preparation required</td>
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<tr>
<td></td>
<td>- Scaling to range from -1 to 1 required</td>
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<tr>
<td></td>
<td>- Requires sufficient data for initial training</td>
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<td>(approx. 1,000 data rows per feature)</td>
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OPTIMIZED PREDICTIVE PLANNING WITH KNIME
FROM BUSINESS PROBLEM TO MODELING AND IMPLEMENTATION

business problem

decision elements

underlying data

modelling

implementation
PLATFORM ARCHITECTURE

Sources

Data Warehouse

Temporary raw data

Metadata

Historical data

Dimensional data

...
- execution times of individual Extract Load Transform (ETL) processes are defined in metadata management
- each transaction is traceable system-wide
- workflows of the individual processes read metadata, metadata controls workflows of individual processes
## ADDITIONAL FRAMEWORKS SUPPORTING DEEP LEARNING

<table>
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<th>Framework</th>
<th>Description</th>
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| **Python & Anaconda** |   - Installation of Python & custom Anaconda environment  
   - Defining the Uniform Configuration for the KNIME Server Executor         |
| **TensorFlow**   |   - Underlying framework  
   - Currently as CPU version, GPU planned 2nd half of 2019                  |
| **Keras**       |   - Implemented with Tensorflow backend                                     |
OPTIMIZED PREDICTIVE PLANNING WITH KNIME

→ Increase of accuracy of forecast and decrease of resources needed
THANK YOU FOR YOUR ATTENTION.