KI Service Zentrum by Hasso-Plattner-Institut

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Time Series Forecasting

3.1 Using Deep Learning for Forecasting

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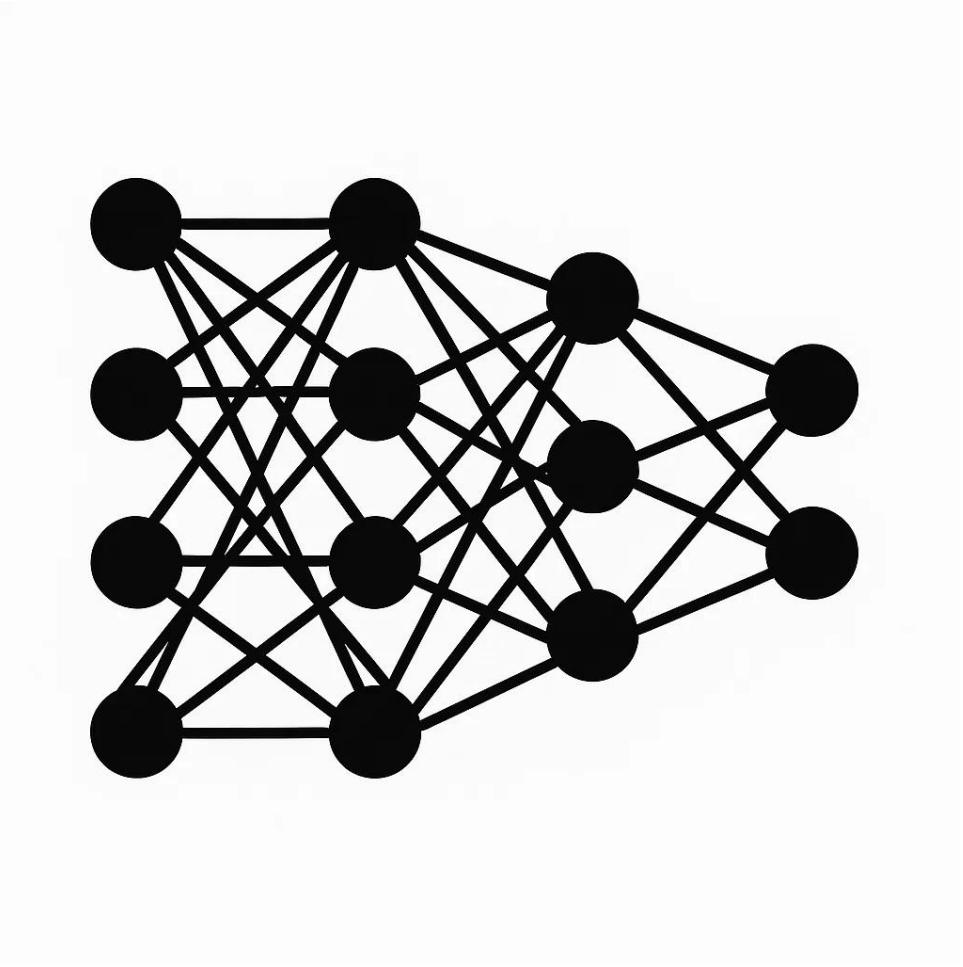
Design IT.
Create Knowledge.

What we'll cover in this video

- Why deep learning is a game changer for time series forecasting
- What feed-forward neural networks (MLPs) are and how they work
- The strengths and limits of MLPs for forecasting tasks

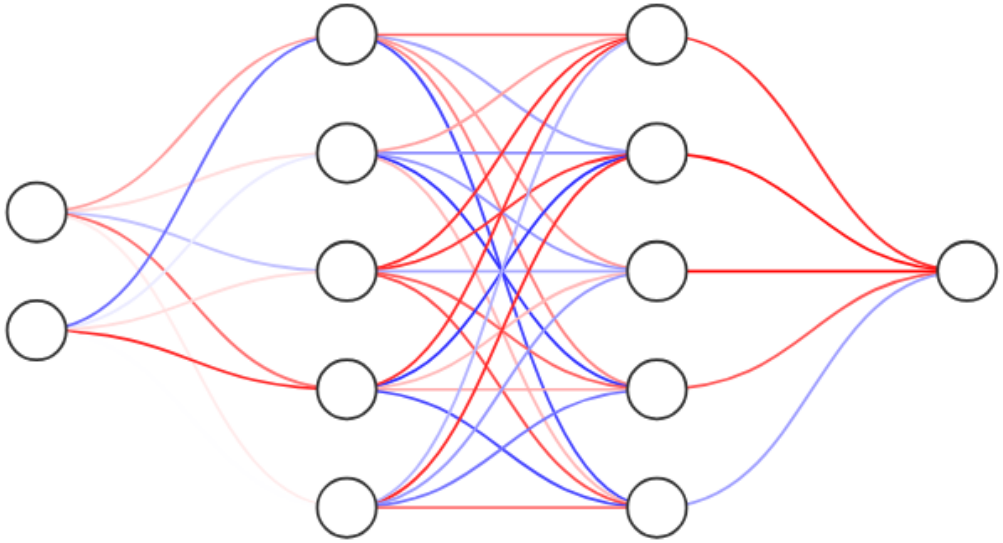
Why use Deep Learning?

- Models complex nonlinear relationships effortlessly
- Learns useful features automatically from raw data
- Scales well with large datasets and multiple inputs
- Can incorporate external factors and multivariate series
- Challenges: needs more data, longer training time, less interpretability



What Are Feed-Forward Networks?

- Also called Multilayer Perceptrons (MLPs)
- Layers of neurons with weighted connections
- Data flows one way: input → hidden layers → output
- Each neuron applies a nonlinear activation function
- Fixed-size input, no memory of previous time steps



What Are Feed-Forward Networks?

- **Strengths**:
  - Simple architecture, easy to implement and train
  - Good baseline for forecasting projects
  - Can handle multivariate inputs and engineered features
- **Limitations**:
  - No built-in temporal memory or sequence modeling
  - Requires manual feature engineering to capture time dependencies
  - Often outperformed by specialized models like RNNs and CNNs

What we've learnt

- Deep learning can model complex, nonlinear relationships in time series data
- Feed-forward networks (MLPs) are a simple, flexible type of neural network
- MLPs work well as baseline models but lack inherent sequence memory
- For temporal dependencies, more specialized networks like RNNs and CNNs are needed (coming up next!)