KI Service Zentrum by Hasso-Plattner-Institut

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Time Series Forecasting

3.5 Specialized Architectures

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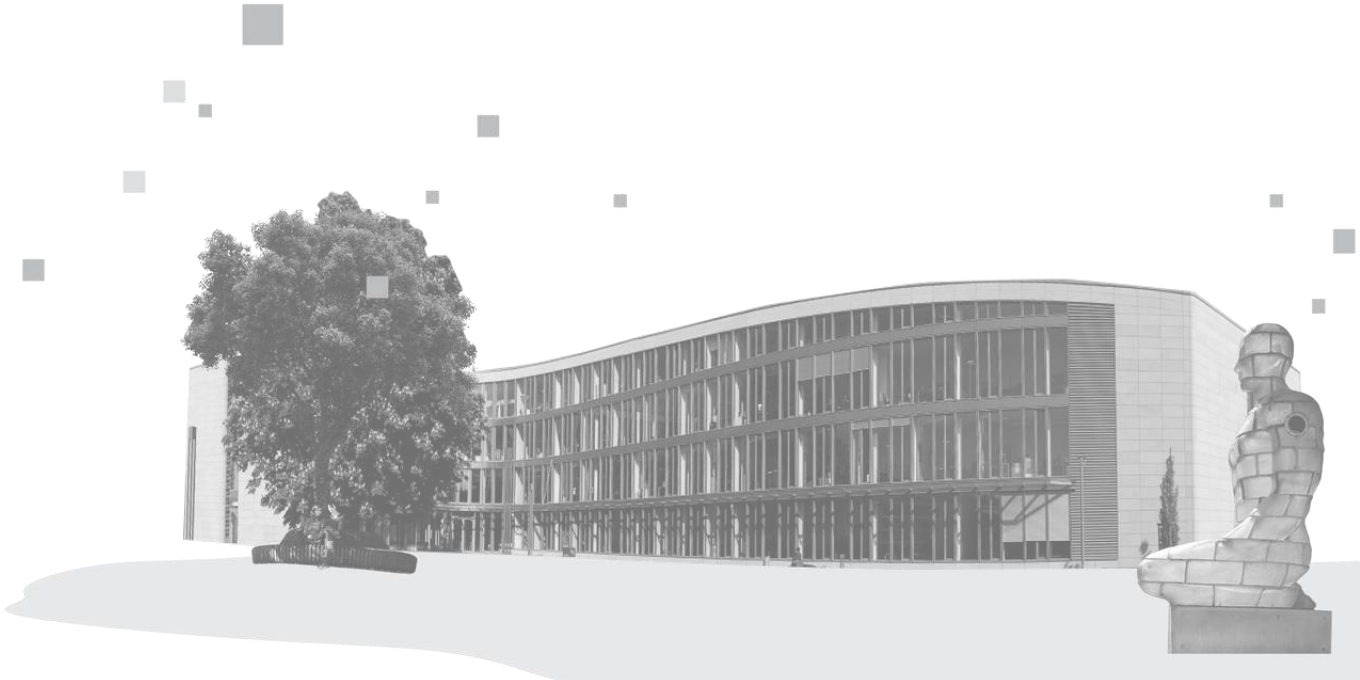


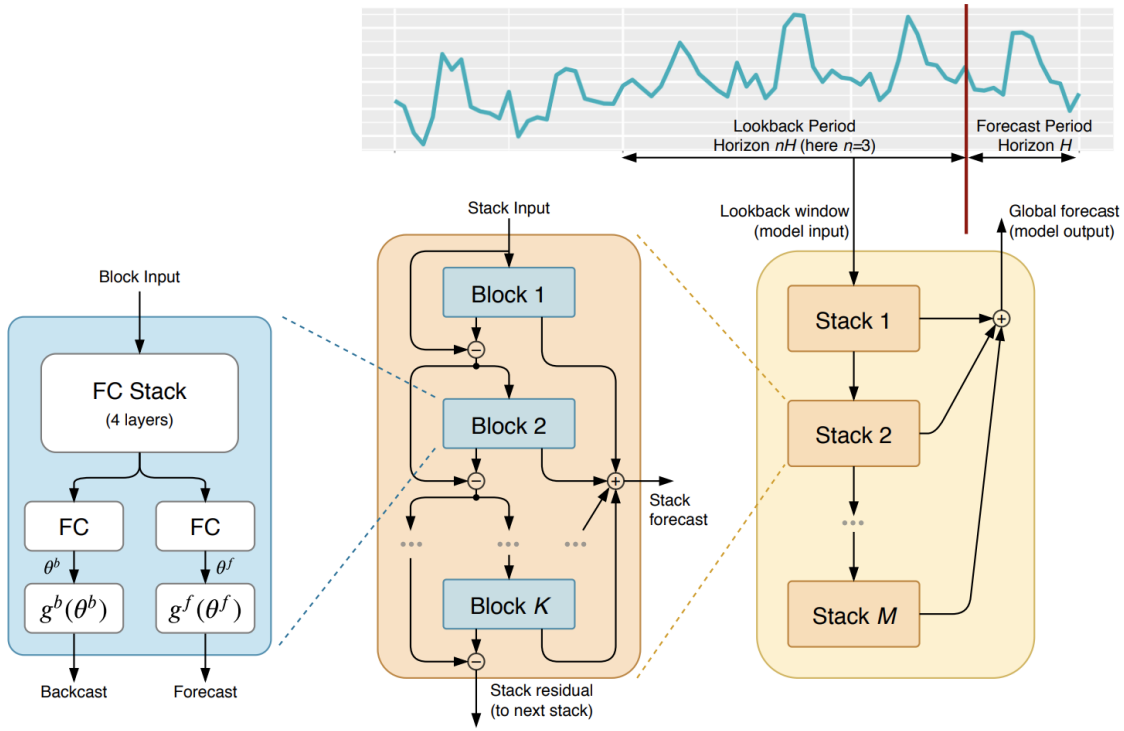
Design IT.
Create Knowledge.

What we'll cover in this video

- Several deep learning architectures designed specifically for forecasting like
  - N-BEATS / N-BEATSx
  - N-HiTS
  - Autoformer
  - DeepAR
  - Informer
  - Temporal Fusion Transformer (TFT)

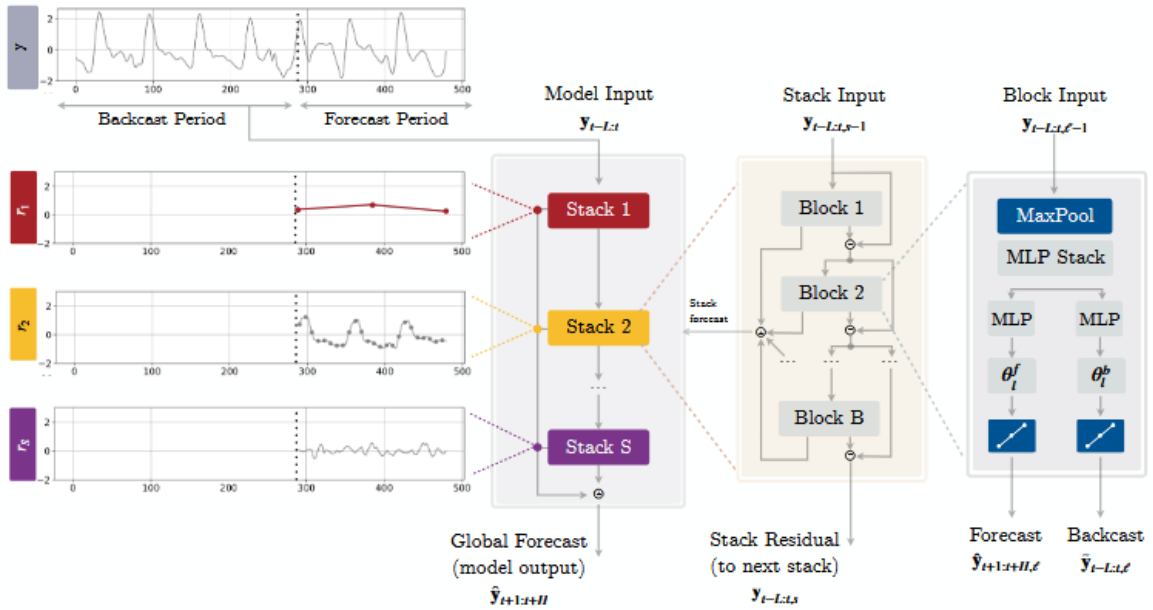
N-BEATS / N-BEATSx

- N-BEATS: Neural basis expansion analysis
- Interpretable deep learning model using backward and forward residual links
- Achieves state-of-the-art accuracy on many benchmark datasets
- N-BEATSx: Extension that incorporates exogenous variables and additional enhancements



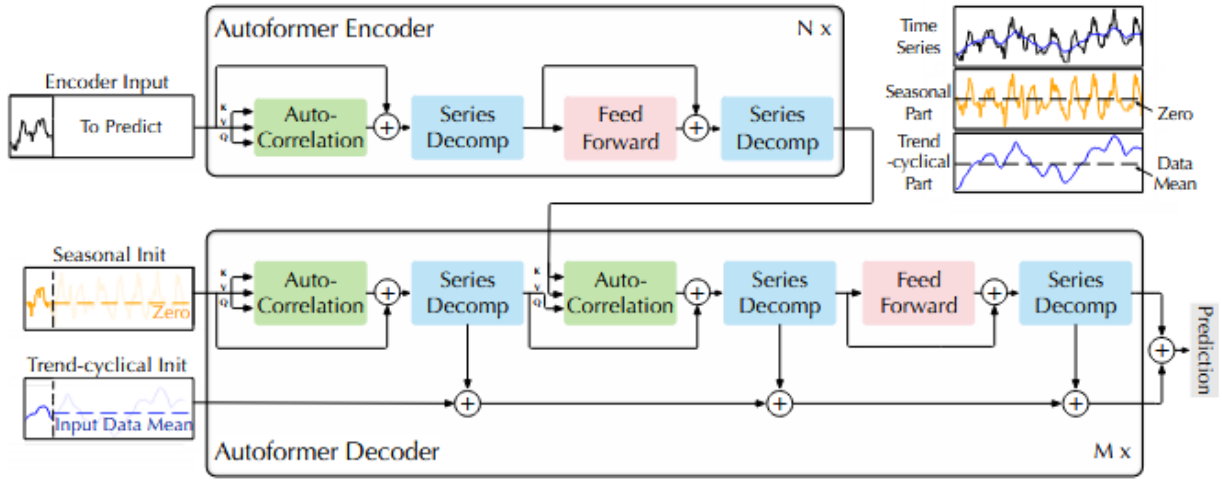
N-HiTS

- Builds on N-BEATS architecture
- Introduces hierarchical interpolation and multi-rate sampling
- Designed to improve forecasting accuracy on long and noisy time series
- Maintains interpretability while enhancing performance



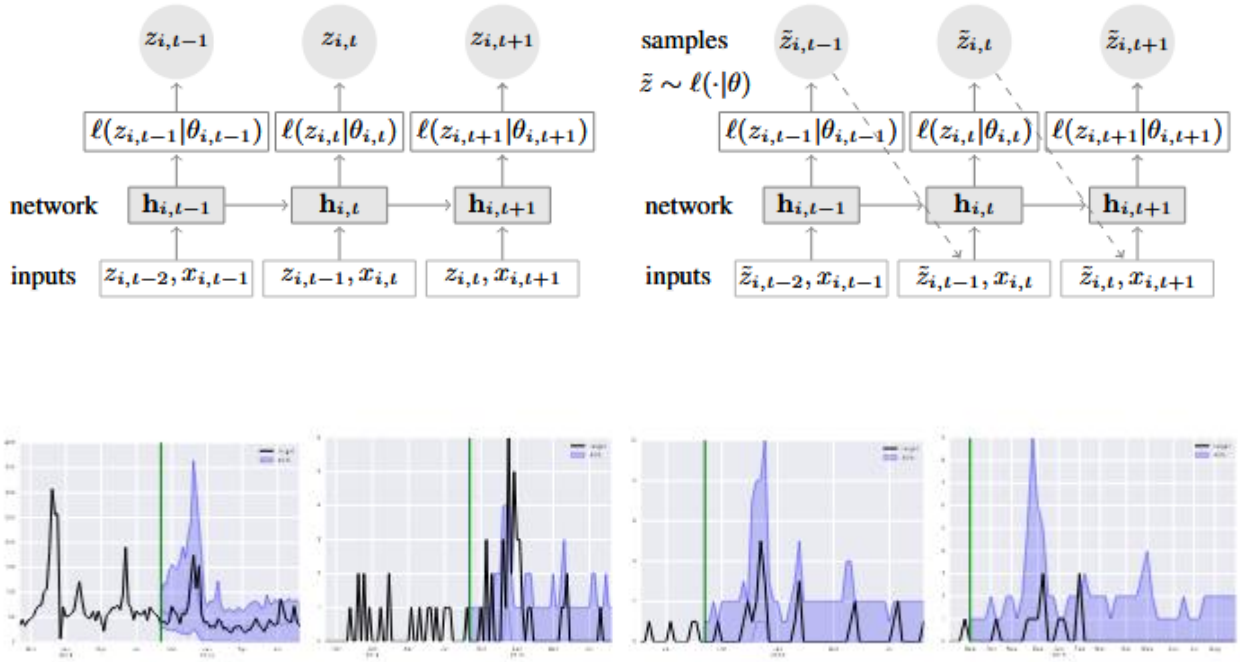
Autoformer

- Transformer-based model tailored for time series forecasting
- Uses seasonal-trend decomposition to separate time series components
- Employs an auto-correlation mechanism to capture long-term dependencies efficiently
- Designed to handle complex temporal patterns with reduced computational cost



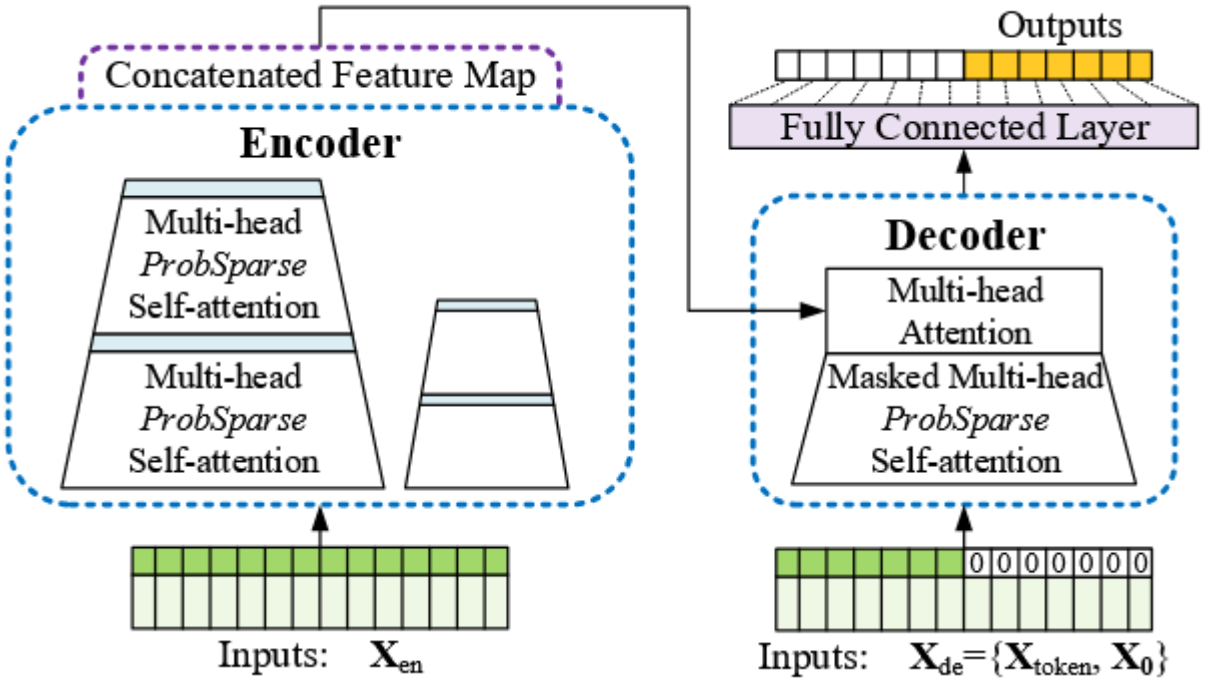
DeepAR

- Probabilistic forecasting model using autoregressive RNNs
- Generates multi-step ahead predictions with uncertainty estimates
- Suitable for large-scale forecasting with many related time series
- Widely used in industry for demand forecasting, inventory management, and more



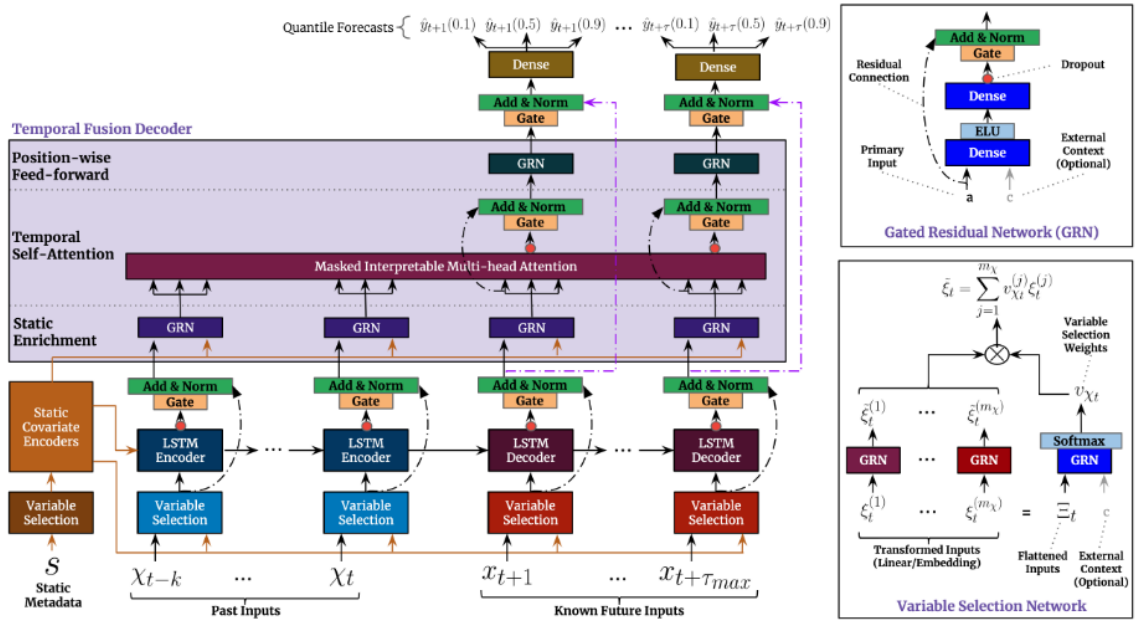
Informer

- Efficient Transformer variant designed for very long time series
- Uses sparse self-attention to reduce computational complexity
- Maintains accuracy while enabling faster training and inference
- Suitable for applications requiring scalability with long input sequences



Temporal Fusion Transformer (TFT)

- Combines attention mechanisms with gating layers and LSTMs
- Designed for interpretable multi-horizon forecasting
- Handles static metadata, known future inputs, and observed inputs
- Provides variable selection and confidence intervals



What we've learnt

- Several specialized deep learning models excel in time series forecasting
- N-BEATS and N-HiTS focus on interpretability and hierarchical pattern extraction
- Autoformer and Informer leverage Transformer innovations for long sequences
- DeepAR provides probabilistic forecasting with uncertainty estimates
- Temporal Fusion Transformer balances accuracy with interpretability and complex inputs