Attention Mechanism and Transformers

Video 2: Working of Encoder Decoder in Training and Testing Phase

Analytics Vidhya

Functioning of an Encoder Decoder

Translate the following to German:

X - "how are you" ⟶ **y_true** - "wei geht es dir"

Functioning of an Encoder Decoder

1. Vectorize the data for ease of understanding

X = "how are you" ⟶ **y_true** = "<START> wei geht es dir <END>"

Functioning of an Encoder Decoder

2. Vectorize the input and output using One-Hot Encoding

X = (x1, x2 ,x3) ⟶ **y_true** = (y0_true, y1_true, y2_true, y3_true, y4_true, y5_true)

Analytics Vidhya

Functioning of an Encoder Decoder

For the input X (English)

‘How’ → **x1**: [1 0 0]

‘are’ → **x2**: [0 1 0]

‘you’ → **x3**: [0 0 1]

For the output y_true (German)

‘<START>’ → **y0_true**: [1 0 0 0 0 0]

‘Wie’ → **y1_true**: [0 1 0 0 0 0]

‘geht’ → **y2_true**: [0 0 1 0 0 0]

‘es’ → **y3_true**: [0 0 0 1 0 0]

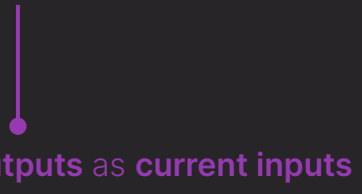
‘dir’ → **y4_true**: [0 0 0 0 1 0]

‘<END>’ → **y5_true**: [0 0 0 0 0 1]

Analytics Vidhya

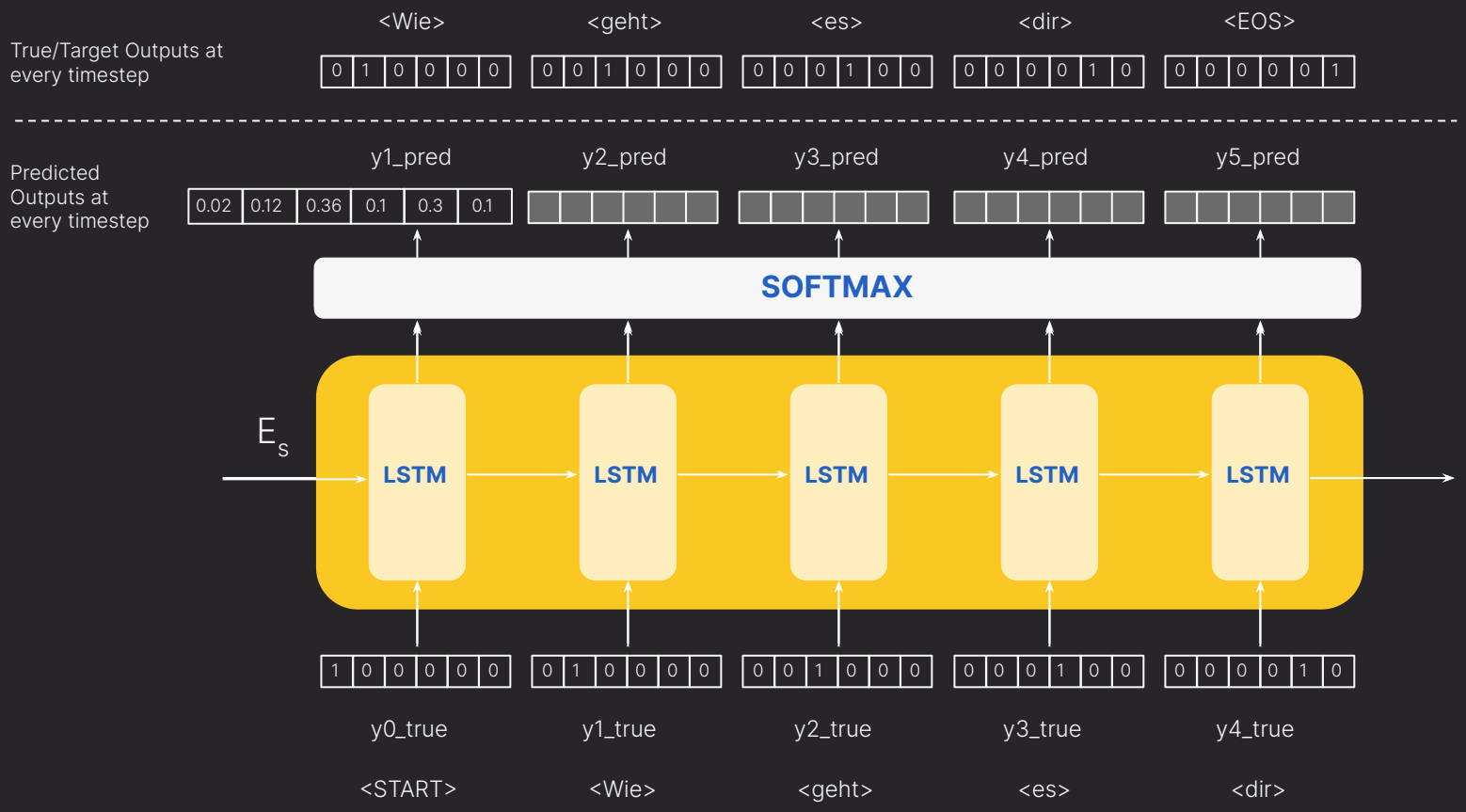
The Decoder in Training Phase

- Decoders perform better when trained through “**Teacher Forcing**”.

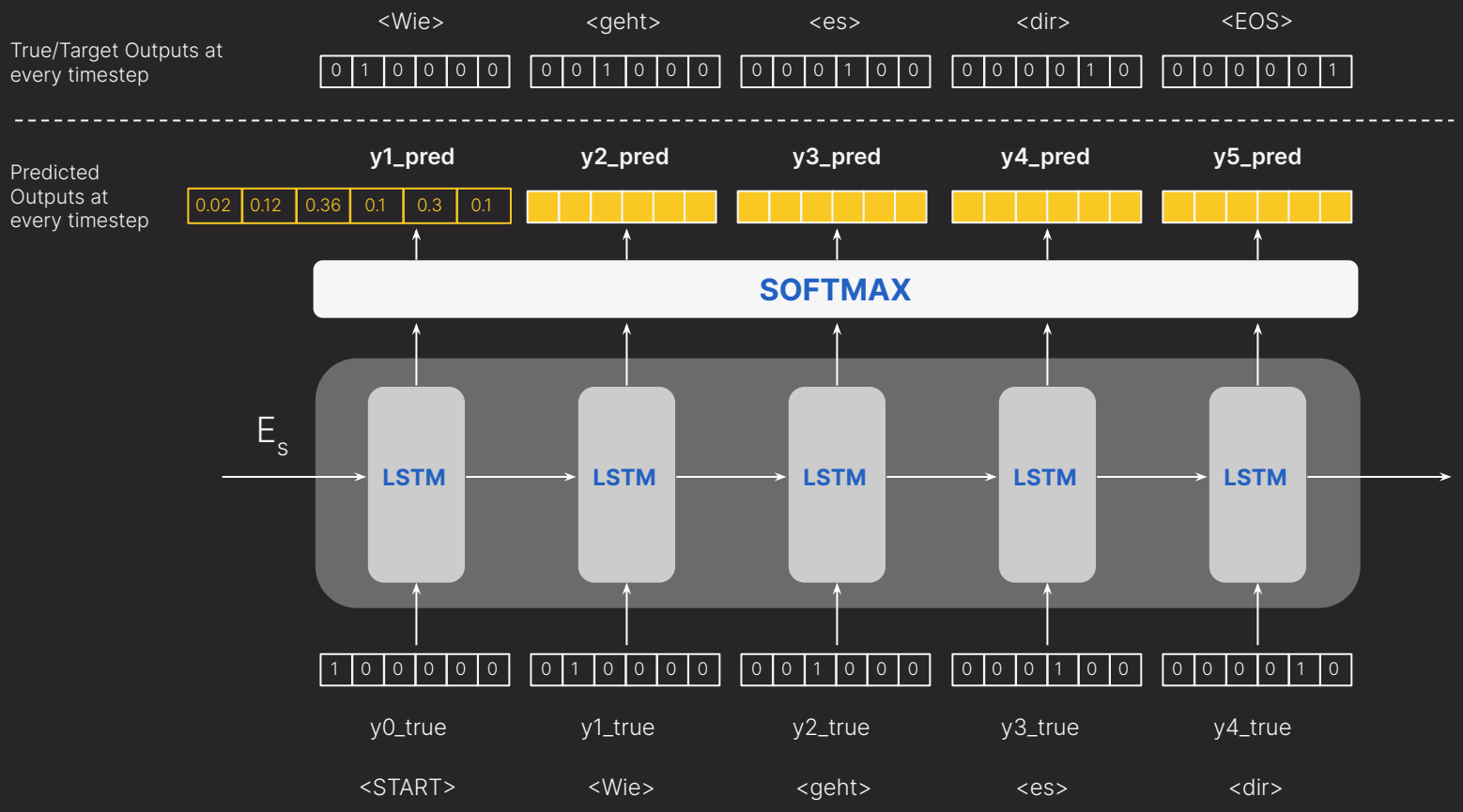


- Decoders work differently in training and testing phase unlike an encoder

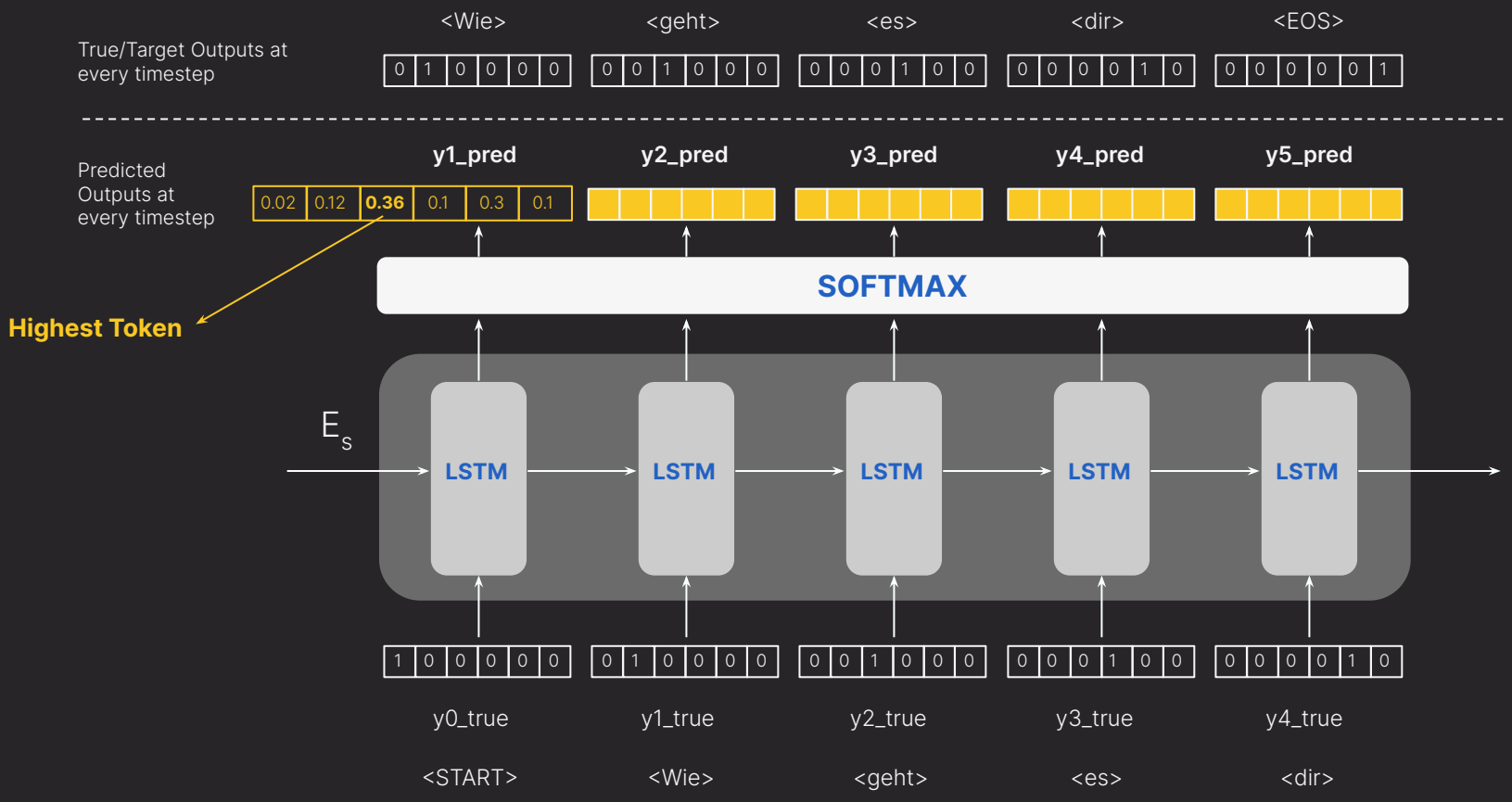
The Decoder in Training Phase

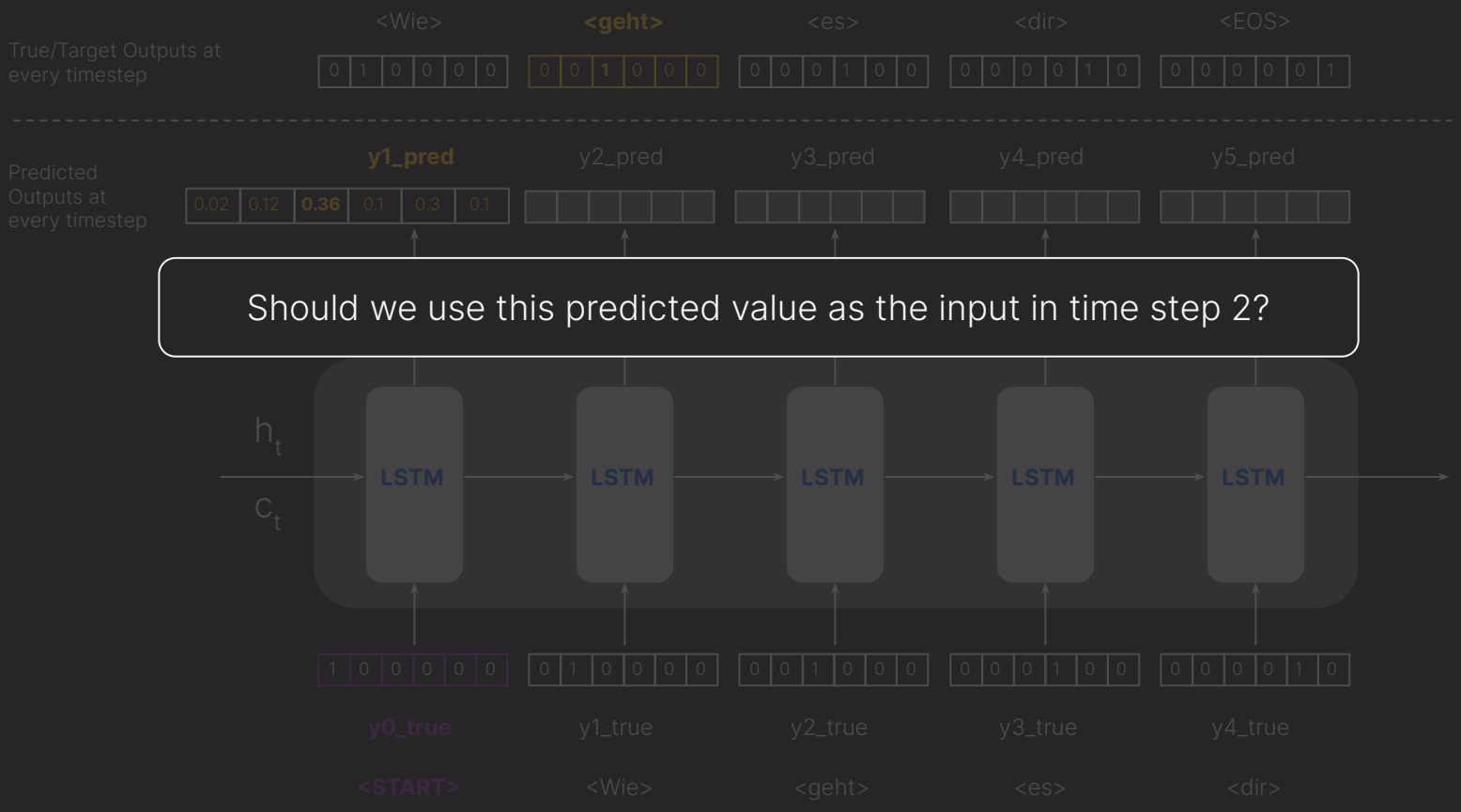


The Decoder in Training Phase

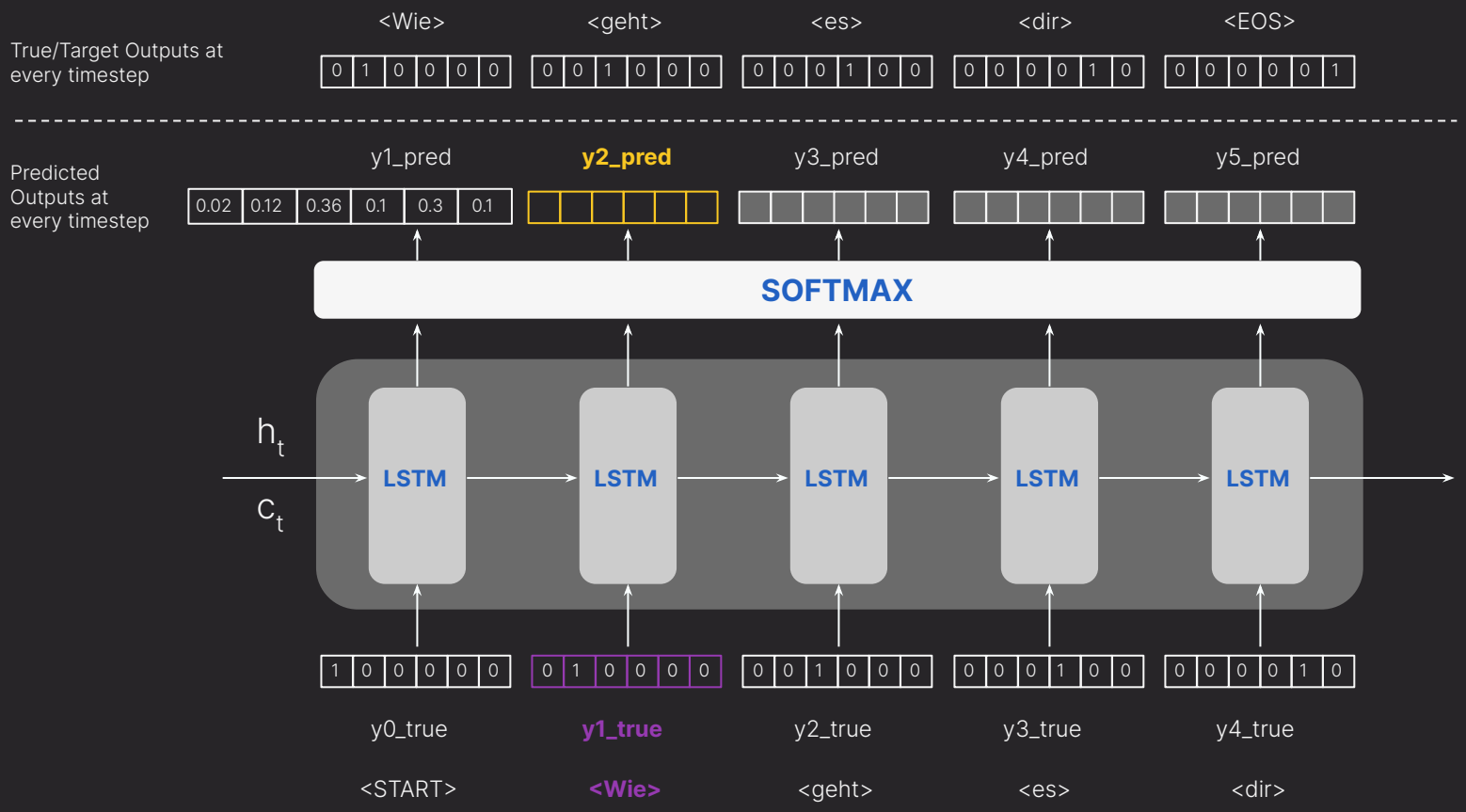


The Decoder in Training Phase




True/Target Outputs at every timestep
<Wie>
<geht>
<es>
<dir>
<EOS>
Predicted Outputs at every timestep
y1_pred
y2_pred
y3_pred
y4_pred
y5_pred
0.02
0.12
0.36
0.1
0.3
0.1
Should we use this predicted value as the input in time step 2?
h_t
c_t
LSTM
LSTM
LSTM
LSTM
LSTM
y0_true
y1_true
y2_true
y3_true
y4_true
<START>
<Wie>
<geht>
<es>
<dir>

Teaching Force



Backpropogation

Analytics Vidhya

- Loss is calculated on predicted outputs from each time step.
- Errors are backpropagated through time and the parameters are updated.
- **CCE loss function** is used between **Y_true and Y_pred**.

- Y_true = **[y0_true, y1_true, y2_true, y3_true, y4_true, y5_true]**
- Y_pred = **['<START>', y1_pred, y2_pred, y3_pred, y4_pred, y5_pred]**

Analytics Vidhya

Up Next: Encoder-Decoder for Headline Extraction