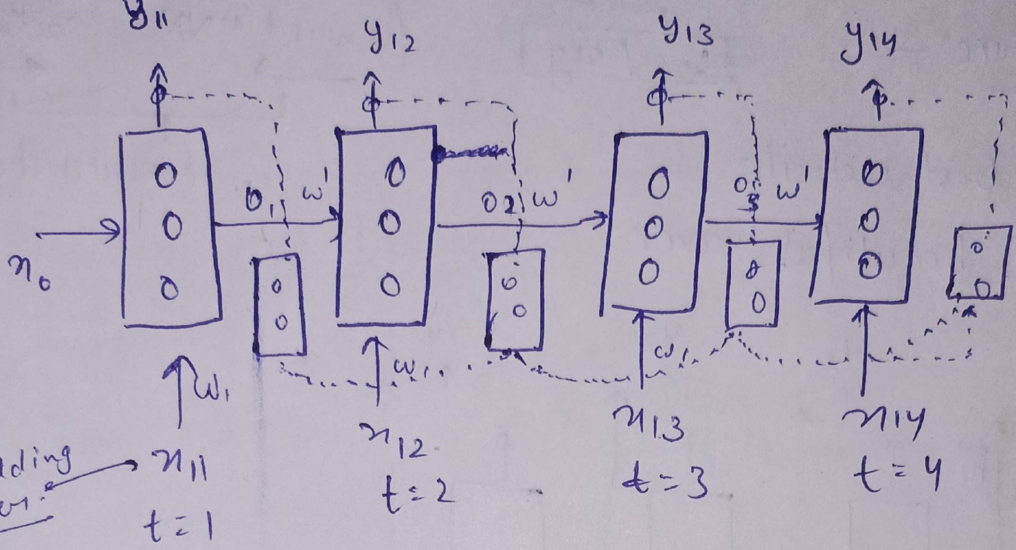
Bidirectional LSTM RNN :

Predicting the next word → o/p value

① KRISH likes to eat ___ in Bangalore



embedding layer → x_{11}

convert word into vector → Many to Many RNN

[NER] → Named entity recognition

Nitish → person
Gurugram → locatⁿ / place } → chatbot

ORG/LOCTⁿ (Ambiguity)

ex:

NER [I love Amazon, it is a great website
I love Amazon, it is a beautiful river } (BiRNN)

means : I love Amazon, it is a beautiful river

I love amazon, it is a great website

Mai agar sirf itna hi Padhta hu Tho Mujhe lagega ye Amazon ya Tho koi organisatⁿ ya River/locatⁿ
Mai Jab tak aage ka it is a great website ya beautiful river Nahi Padhunga Tabtak नहीं समझ आएगा यानि It is a great website / beatuiful river

Jo ki input है वो I love amazon yani output ko affect krr rha hai Tho yaha pe BiRNN Kaam aata hai !!

→ **Bidirectional RNN (BiRNN)** ek aisa RNN hota hai Jo Sequence Ko dono directions Me process Karta hai!!

- forward direction → left to Right
- Backward direction → Right to left

Iss Model Ko past + future dono content milta hai.

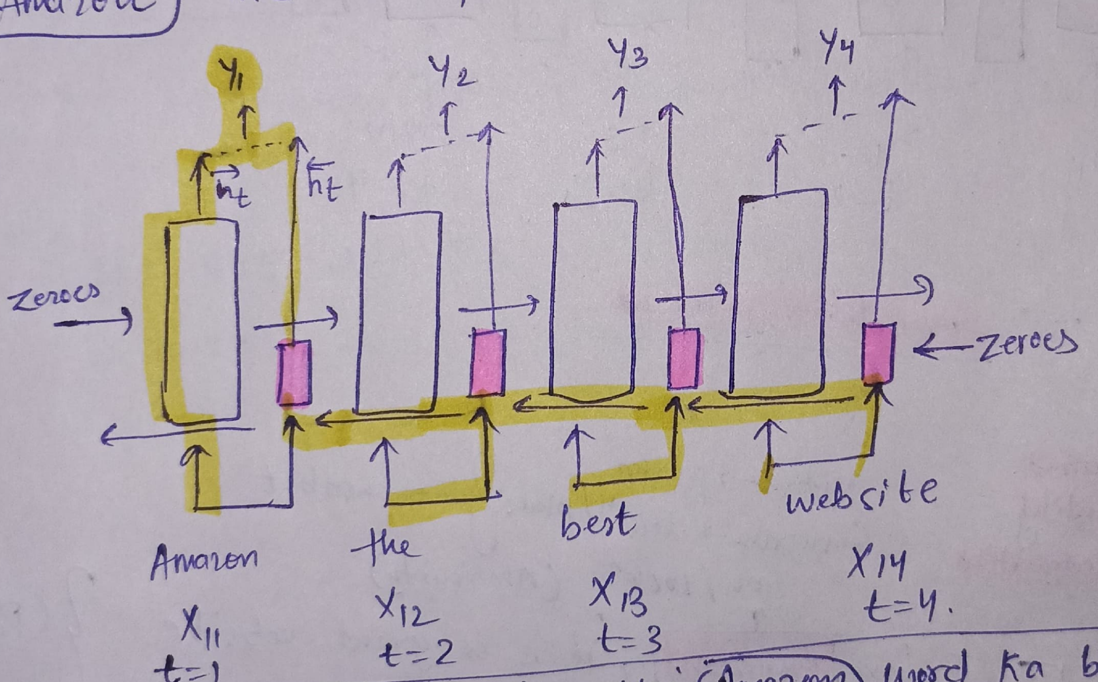
BiRNN Architecture :

Amazon, [Loc / org]

forward RNN → ← Backward → concatenate.

[Amazon] the best website

[Amazon] the beautiful river



yellow mark represent → Y_1 Ko calculate Krne Mai (Amazon) word ka bhi contribution aaya The, best, website ka bhi aaya since website word bhi aaya. Iska matlab we r taking about organisation. not location.

means → because of bidirectional information flow future Mai Jo Input aane waale hai unka bhi Idea mil Jaa rha hai Time stamp t

$$\overrightarrow{h_t} = \tanh\left(\overrightarrow{W}\overrightarrow{h_{t-1}} + \overrightarrow{U}x_t + \overrightarrow{b}\right)$$

$$\overleftarrow{h_t} = \tanh\left(\overleftarrow{W}\overleftarrow{h_{t+1}} + \overleftarrow{U}x_t + \overleftarrow{b}\right)$$

$$y_t = \sigma\left(V\left[\overrightarrow{h_t}, \overleftarrow{h_t}\right] + b\right)$$

V → weight, $\overrightarrow{h_t}$ → forward, $\overleftarrow{h_t}$ → backward, b → bias

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Application and Drawbacks

1. NER.
2. POS tagging.
3. Machine Translation.
4. Sentiment Analysis.
5. Time-Series forecasting.

Drawbacks:
- complexity → 190 → 380 → Training Time bhi badhega → overfit
- latency issue → for real in speech recognition.

Where Bidirectional is used?

- Speech Recognition
- Text classification
- Sentiment Analysis
- Machine Translation
- NER
- POS tagging