

## GAUDI INITIALIZATION

- ✓ Habana frameworks loaded
- ✓ Using device: hpu
- ✓ HPU device count: 8

## LOADING DATA

Enter path to the directory containing CoNLL-U files (e.g., /path/to/UD\_English-EWT):  
training\_data

- ✓ Found training file: training\_data/wo\_wtb-ud-train.conllu
- ✓ Found validation (dev) file: training\_data/wo\_wtb-ud-dev.conllu
- ✓ Found test file: training\_data/wo\_wtb-ud-test.conllu
- ✓ Loaded 1,188 training sentences.
- ✓ Loaded 449 validation sentences.
- ✓ Loaded 470 test sentences.

Train: 1,188 | Val: 449 | Test: 470

Vocabulary: 1,683 words | 18 tags

## BUILDING MODEL

Train DataLoader batches: 1

Validation DataLoader batches: 1

Test DataLoader batches: 1

- ✓ Model on hpu
- ✓ Parameters: 2,592,146

## TRAINING ON GAUDI

Epoch 1/25

Training: 100%

1/1 [00:33<00:00, 33.25s/it, loss=2.8949, acc=0.0410]

Evaluating: 100%

1/1 [00:07<00:00, 7.76s/it, loss=2.7913, acc=0.1902]

Train Loss: 2.8949 | Train Acc: 0.0410

Val Loss: 2.7913 | Val Acc: 0.1902

Time: 41.0s

🌟 New best validation accuracy: 0.1902. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 2/25

-----

Training: 100%

1/1 [00:01<00:00, 1.20s/it, loss=2.6253, acc=0.2059]

Evaluating: 100%

1/1 [00:00<00:00, 3.31it/s, loss=2.5671, acc=0.2769]

Train Loss: 2.6253 | Train Acc: 0.2059

Val Loss: 2.5671 | Val Acc: 0.2769

Time: 1.5s

✨ New best validation accuracy: 0.2769. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 3/25

-----

Training: 100%

1/1 [00:00<00:00, 1.72it/s, loss=2.5595, acc=0.2763]

Evaluating: 100%

1/1 [00:00<00:00, 4.43it/s, loss=2.7225, acc=0.2885]

Train Loss: 2.5595 | Train Acc: 0.2763

Val Loss: 2.7225 | Val Acc: 0.2885

Time: 0.8s

✨ New best validation accuracy: 0.2885. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 4/25

-----

Training: 100%

1/1 [00:00<00:00, 1.88it/s, loss=2.4895, acc=0.3107]

Evaluating: 100%

1/1 [00:00<00:00, 4.72it/s, loss=2.1810, acc=0.3423]

Train Loss: 2.4895 | Train Acc: 0.3107

Val Loss: 2.1810 | Val Acc: 0.3423

Time: 0.7s

✨ New best validation accuracy: 0.3423. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 5/25

-----

Training: 100%

1/1 [00:00<00:00, 1.88it/s, loss=2.1758, acc=0.3362]

Evaluating: 100%

1/1 [00:00<00:00, 4.47it/s, loss=2.2658, acc=0.3252]

Train Loss: 2.1758 | Train Acc: 0.3362

Val Loss: 2.2658 | Val Acc: 0.3252

Time: 0.8s

Validation accuracy did not improve. Epochs without improvement: 1

Epoch 6/25

-----

Training: 100%

1/1 [00:00<00:00, 1.81it/s, loss=2.1871, acc=0.3545]

Evaluating: 100%

1/1 [00:00<00:00, 4.42it/s, loss=1.7064, acc=0.4619]

Train Loss: 2.1871 | Train Acc: 0.3545

Val Loss: 1.7064 | Val Acc: 0.4619

Time: 0.8s

🌟 New best validation accuracy: 0.4619. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 7/25

-----

Training: 100%

1/1 [00:00<00:00, 1.78it/s, loss=1.7035, acc=0.4732]

Evaluating: 100%

1/1 [00:00<00:00, 4.68it/s, loss=1.5876, acc=0.5047]

Train Loss: 1.7035 | Train Acc: 0.4732

Val Loss: 1.5876 | Val Acc: 0.5047

Time: 0.8s

🌟 New best validation accuracy: 0.5047. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 8/25

-----

Training: 100%

1/1 [00:00<00:00, 1.93it/s, loss=1.6435, acc=0.4904]

Evaluating: 100%

1/1 [00:00<00:00, 4.83it/s, loss=1.4734, acc=0.5459]

Train Loss: 1.6435 | Train Acc: 0.4904

Val Loss: 1.4734 | Val Acc: 0.5459

Time: 0.7s

🌟 New best validation accuracy: 0.5459. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 9/25

-----

Training: 100%

1/1 [00:00<00:00, 1.98it/s, loss=1.5251, acc=0.5239]

Evaluating: 100%

1/1 [00:00<00:00, 4.39it/s, loss=1.3586, acc=0.5874]

Train Loss: 1.5251 | Train Acc: 0.5239

Val Loss: 1.3586 | Val Acc: 0.5874

Time: 0.7s

✨ New best validation accuracy: 0.5874. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 10/25

-----

Training: 100%

1/1 [00:00<00:00, 1.98it/s, loss=1.3829, acc=0.5764]

Evaluating: 100%

1/1 [00:00<00:00, 4.97it/s, loss=1.2795, acc=0.6005]

Train Loss: 1.3829 | Train Acc: 0.5764

Val Loss: 1.2795 | Val Acc: 0.6005

Time: 0.7s

✨ New best validation accuracy: 0.6005. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 11/25

-----

Training: 100%

1/1 [00:00<00:00, 1.98it/s, loss=1.2973, acc=0.5958]

Evaluating: 100%

1/1 [00:00<00:00, 4.95it/s, loss=1.1452, acc=0.6401]

Train Loss: 1.2973 | Train Acc: 0.5958

Val Loss: 1.1452 | Val Acc: 0.6401

Time: 0.7s

✨ New best validation accuracy: 0.6401. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 12/25

-----

Training: 100%

1/1 [00:00<00:00, 1.98it/s, loss=1.1712, acc=0.6333]

Evaluating: 100%

1/1 [00:00<00:00, 4.87it/s, loss=1.0578, acc=0.6733]

Train Loss: 1.1712 | Train Acc: 0.6333

Val Loss: 1.0578 | Val Acc: 0.6733

Time: 0.7s

✨ New best validation accuracy: 0.6733. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 13/25

-----

Training: 100%

1/1 [00:00<00:00, 1.85it/s, loss=1.0877, acc=0.6647]

Evaluating: 100%

1/1 [00:00<00:00, 4.85it/s, loss=1.0182, acc=0.6819]

Train Loss: 1.0877 | Train Acc: 0.6647

Val Loss: 1.0182 | Val Acc: 0.6819

Time: 0.8s

✨ New best validation accuracy: 0.6819. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 14/25

-----

Training: 100%

1/1 [00:00<00:00, 1.97it/s, loss=1.0380, acc=0.6784]

Evaluating: 100%

1/1 [00:00<00:00, 4.97it/s, loss=0.9691, acc=0.7013]

Train Loss: 1.0380 | Train Acc: 0.6784

Val Loss: 0.9691 | Val Acc: 0.7013

Time: 0.7s

✨ New best validation accuracy: 0.7013. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 15/25

-----

Training: 100%

1/1 [00:00<00:00, 1.90it/s, loss=0.9778, acc=0.6989]

Evaluating: 100%

1/1 [00:00<00:00, 4.78it/s, loss=0.9093, acc=0.7153]

Train Loss: 0.9778 | Train Acc: 0.6989

Val Loss: 0.9093 | Val Acc: 0.7153

Time: 0.7s

✨ New best validation accuracy: 0.7153. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 16/25

-----

Training: 100%

1/1 [00:00<00:00, 1.98it/s, loss=0.9162, acc=0.7202]

Evaluating: 100%

1/1 [00:00<00:00, 4.60it/s, loss=0.8655, acc=0.7310]

Train Loss: 0.9162 | Train Acc: 0.7202

Val Loss: 0.8655 | Val Acc: 0.7310

Time: 0.7s

✨ New best validation accuracy: 0.7310. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 17/25

-----

Training: 100%

1/1 [00:00<00:00, 1.99it/s, loss=0.8653, acc=0.7332]

Evaluating: 100%

1/1 [00:00<00:00, 4.92it/s, loss=0.8407, acc=0.7363]

Train Loss: 0.8653 | Train Acc: 0.7332

Val Loss: 0.8407 | Val Acc: 0.7363

Time: 0.7s

✨ New best validation accuracy: 0.7363. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 18/25

-----

Training: 100%

1/1 [00:00<00:00, 1.99it/s, loss=0.8385, acc=0.7380]

Evaluating: 100%

1/1 [00:00<00:00, 4.80it/s, loss=0.8213, acc=0.7393]

Train Loss: 0.8385 | Train Acc: 0.7380

Val Loss: 0.8213 | Val Acc: 0.7393

Time: 0.7s

✨ New best validation accuracy: 0.7393. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 19/25

-----

Training: 100%

1/1 [00:00<00:00, 1.96it/s, loss=0.8121, acc=0.7469]

Evaluating: 100%

1/1 [00:00<00:00, 4.99it/s, loss=0.7863, acc=0.7502]

Train Loss: 0.8121 | Train Acc: 0.7469

Val Loss: 0.7863 | Val Acc: 0.7502

Time: 0.7s

✨ New best validation accuracy: 0.7502. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 20/25

-----

Training: 100%

1/1 [00:00<00:00, 2.01it/s, loss=0.7759, acc=0.7583]

Evaluating: 100%

1/1 [00:00<00:00, 4.90it/s, loss=0.7369, acc=0.7653]

Train Loss: 0.7759 | Train Acc: 0.7583

Val Loss: 0.7369 | Val Acc: 0.7653

Time: 0.7s

🌟 New best validation accuracy: 0.7653. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 21/25

-----

Training: 100%

1/1 [00:00<00:00, 1.99it/s, loss=0.7280, acc=0.7746]

Evaluating: 100%

1/1 [00:00<00:00, 4.91it/s, loss=0.6913, acc=0.7837]

Train Loss: 0.7280 | Train Acc: 0.7746

Val Loss: 0.6913 | Val Acc: 0.7837

Time: 0.7s

🌟 New best validation accuracy: 0.7837. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 22/25

-----

Training: 100%

1/1 [00:00<00:00, 1.97it/s, loss=0.6777, acc=0.7879]

Evaluating: 100%

1/1 [00:00<00:00, 4.92it/s, loss=0.6554, acc=0.7952]

Train Loss: 0.6777 | Train Acc: 0.7879

Val Loss: 0.6554 | Val Acc: 0.7952

Time: 0.7s

🌟 New best validation accuracy: 0.7952. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 23/25

-----

Training: 100%

1/1 [00:00<00:00, 1.99it/s, loss=0.6310, acc=0.8026]

Evaluating: 100%

1/1 [00:00<00:00, 4.98it/s, loss=0.6256, acc=0.8079]

Train Loss: 0.6310 | Train Acc: 0.8026

Val Loss: 0.6256 | Val Acc: 0.8079

Time: 0.7s

🌟 New best validation accuracy: 0.8079. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 24/25

-----

Training: 100%

1/1 [00:00<00:00, 1.91it/s, loss=0.6008, acc=0.8107]

Evaluating: 100%

1/1 [00:00<00:00, 4.98it/s, loss=0.5976, acc=0.8158]

Train Loss: 0.6008 | Train Acc: 0.8107

Val Loss: 0.5976 | Val Acc: 0.8158

Time: 0.7s

🌟 New best validation accuracy: 0.8158. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

Epoch 25/25

-----

Training: 100%

1/1 [00:00<00:00, 1.99it/s, loss=0.5629, acc=0.8250]

Evaluating: 100%

1/1 [00:00<00:00, 4.93it/s, loss=0.5725, acc=0.8238]

Train Loss: 0.5629 | Train Acc: 0.8250

Val Loss: 0.5725 | Val Acc: 0.8238

Time: 0.7s

🌟 New best validation accuracy: 0.8238. Model saved to best\_pos\_tagger\_model\_FOLDER.pt

 FINAL TEST EVALUATION

=====

✅ Loaded best model from best\_pos\_tagger\_model\_FOLDER.pt for final evaluation.

Evaluating: 100%

1/1 [00:08<00:00, 8.17s/it, loss=0.5667, acc=0.8240]

Test Loss: 0.5667

Test Accuracy: 0.8240 (82.40%)

🎉 TRAINING COMPLETE ON GAUDI HPU!

Best Val Acc: 0.8238

Final Test Acc: 0.8240

Final Test Accuracy Classification:  Decent. Room for improvement.

 Vocabulary Summary:


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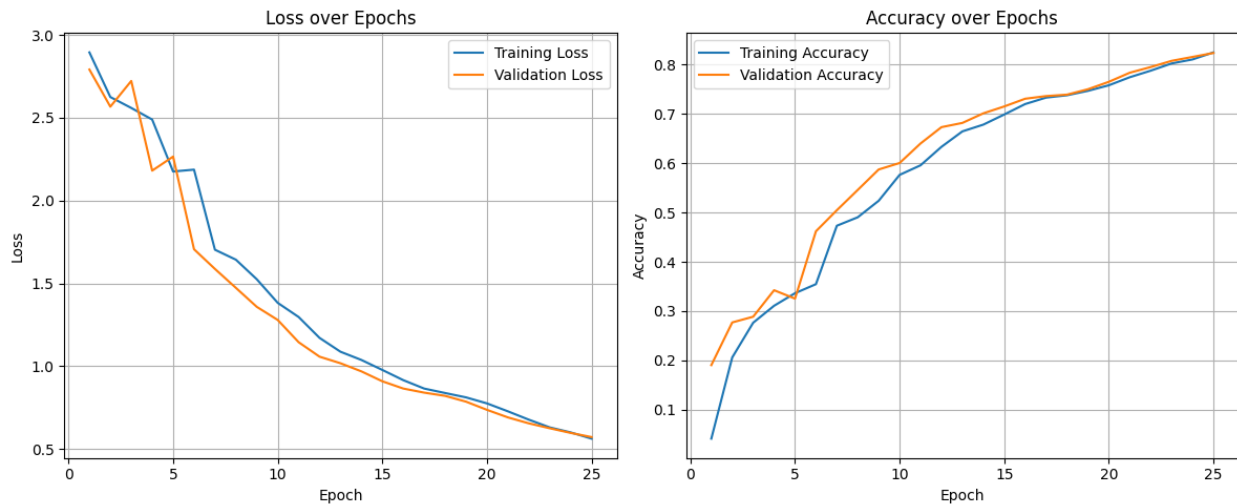
Words: 1,683

POS tags: 18



Sample words: ['Ci', 'wàllu', 'xay', 'Kajoor', 'moo', 'mu', 'a', 'doonoon', 'Senegaal', '.', '...']  
 POS tags: ['ADP', 'NOUN', 'PROPN', '\_', 'PRON', 'AUX', 'VERB', 'PUNCT', 'DET', 'CCONJ', 'PART', 'SCONJ', 'ADV', 'NUM', 'INTJ', 'ADJ', 'SYM']

 Metrics plot saved to training\_metrics.png



 POS Tagging Results (Random Sample from Test Set):

--- Sample Sentence 1 ---

Word | Predicted Tag | Actual Tag | Correct?

Su	SCONJ	SCONJ	✓
dee	VERB	VERB	✓
ni	ADP	ADV	✗
ko	PRON	PRON	✓
yenn	SCONJ	DET	✗
<unk>	NOUN	NOUN	✓
yi	PRON	DET	✗
di	AUX	AUX	✓
<unk>	VERB	VERB	✓
<unk>	NOUN	NOUN	✓
xarala	NOUN	NOUN	✓
<unk>	NOUN	ADV	✗
mooy	_	_	✓
mu	PRON	PRON	✓
a	AUX	AUX	✓
di	AUX	VERB	✗
<unk>	NOUN	VERB	✗
xelu	NOUN	NOUN	✓

nit	NOUN	NOUN	✓
ñi	DET	DET	✓
ba	SCONJ	SCONJ	✓
ñu	PRON	PRON	✓
<unk>	VERB	VERB	✓
xool	NOUN	VERB	✗
,	PUNCT	PUNCT	✓
<unk>	NOUN	VERB	✗
<unk>	NOUN	ADV	✗
mbir	NOUN	NOUN	✓
yi	PRON	PRON	✓
leen	PRON	PRON	✓
wër	VERB	VERB	✓
.	PUNCT	PUNCT	✓

--- Sample Sentence 2 ---

Word	Predicted Tag	Actual Tag	Correct?
-----			
<unk>	NOUN	NOUN	✓
Senegaal	PROPN	PROPN	✓
askan	NOUN	NOUN	✓
wu	PRON	PRON	✓
Yàlla	VERB	PROPN	✗
<unk>	NOUN	VERB	✗
la	AUX	AUX	✓
,	PUNCT	PUNCT	✓
<unk>	NOUN	NOUN	✓
nit	NOUN	NOUN	✓
ñu	PRON	PRON	✓
am	VERB	VERB	✓
<unk>	NOUN	NOUN	✓
lañu	AUX	AUX	✓
,	PUNCT	PUNCT	✓
am	VERB	VERB	✓
<unk>	NOUN	NOUN	✓
,	PUNCT	PUNCT	✓
gëm	NOUN	VERB	✗
Yàlla	NOUN	PROPN	✗
.	PUNCT	PUNCT	✓

--- Sample Sentence 3 ---

Word	Predicted Tag	Actual Tag	Correct?
-----			
<unk>	NOUN	NOUN	✓

yi	PRON	DET	✗
wone	VERB	VERB	✓
nañu	AUX	AUX	✓
ne	SCONJ	SCONJ	✓
benn	DET	DET	✓
<unk>	NOUN	NOUN	✓
bii	PRON	PRON	✓
nga	PRON	PRON	✓
xam	VERB	VERB	✓
ne	SCONJ	SCONJ	✓
moo	_	_	✓
mu	PRON	PRON	✓
a	AUX	AUX	✓
<unk>	VERB	VERB	✓
mbooleem	NOUN	NOUN	✓
<unk>	NOUN	NOUN	✓
bu	PRON	ADP	✗
<unk>	VERB	NOUN	✗
bi	DET	DET	✓
dafa	_	_	✓
da	AUX	AUX	✓
mu	PRON	PRON	✓
waroon	VERB	VERB	✓
a	PART	PART	✓
am	VERB	VERB	✓
<unk>	NOUN	NOUN	✓
ab	DET	DET	✓
<unk>	NOUN	NOUN	✓
ak	CCONJ	CCONJ	✓
ag	DET	DET	✓
<unk>	NOUN	NOUN	✓
gu	PRON	PRON	✓
amul	VERB	VERB	✓
<unk>	NOUN	NOUN	✓
.	PUNCT	PUNCT	✓

--- Sample Sentence 4 ---

Word	Predicted Tag	Actual Tag	Correct?
-----			
Boroom	NOUN	NOUN	✓
xam-xam	NOUN	NOUN	✓
yu	PRON	PRON	✓
bari	VERB	VERB	✓
yu	PRON	PRON	✓

dul	ADP	AUX	✗
tënk	NOUN	VERB	✗
seen	DET	DET	✓
bopp	NOUN	NOUN	✓
ci	ADP	ADP	✓
ne	CONJ	CONJ	✓
<unk>	NOUN	ADV	✗
daño	_	_	✓
da	AUX	AUX	✓
ñu	PRON	PRON	✓
war	VERB	VERB	✓
a	PART	PART	✓
nekk	VERB	VERB	✓
ñu	PRON	PRON	✓
<unk>	VERB	VERB	✓
,	PUNCT	PUNCT	✓
nangu	VERB	VERB	✓
nañu	AUX	AUX	✓
ne	CONJ	CONJ	✓
am	VERB	VERB	✓
na	AUX	AUX	✓
<unk>	NOUN	NOUN	✓
ju	PRON	PRON	✓
man	VERB	VERB	✓
lépp	PRON	PRON	✓
ju	PRON	PRON	✓
sabab	VERB	VERB	✓
<unk>	NOUN	NOUN	✓
<unk>	NOUN	NOUN	✓
bi	DET	DET	✓
.	PUNCT	PUNCT	✓

--- Sample Sentence 5 ---

Word	Predicted Tag	Actual Tag	Correct?
<unk>	PROP	DET	✗
firnde	VERB	NOUN	✗
lu	PRON	PRON	✓
am	VERB	VERB	✓
solo	NOUN	NOUN	✓
lu	PRON	ADP	✗
<unk>	VERB	PROP	✗
<unk>	_	PROP	✗
mu	PRON	PRON	✓

ngi	AUX	AUX	✓
bawoo	VERB	VERB	✓
ci	ADP	ADP	✓
<unk>	NOUN	NOUN	✓
bu	PRON	ADP	✗
<unk>	VERB	PROPN	✗
ak	CCONJ	CCONJ	✓
<unk>	NOUN	PROPN	✗
bi	PRON	PRON	✓
nekk	VERB	VERB	✓
ci	ADP	ADP	✓
<unk>	NOUN	NOUN	✓
ji	DET	DET	✓
.	PUNCT	PUNCT	✓

#### 🧠 Analysis of Sample POS Tagging Results:

Total words analyzed in samples: 148

Correct predictions in samples: 121

Incorrect predictions in samples: 27

Sample Accuracy: 81.76%

#### --- Performance on Unknown (<unk>) Words ---

Total <unk> words in samples: 34

Correct <unk> predictions: 22

Incorrect <unk> predictions: 12

Accuracy on <unk> words: 64.71%

Observation: The model shows some ability to guess tags for unknown words, which is good.

#### --- Common Tagging Errors (Predicted -> Actual) ---

- Predicted 'NOUN' but was actually 'VERB': 6 times
- Predicted 'NOUN' but was actually 'ADV': 3 times
- Predicted 'VERB' but was actually 'PROPN': 3 times
- Predicted 'PRON' but was actually 'ADP': 3 times
- Predicted 'PRON' but was actually 'DET': 2 times

Observation: Specific tag confusions indicate areas for model refinement or more diverse training data for those tags.

#### --- Overall Sample Quality Assessment ---

Conclusion: The sample predictions are generally good, with some minor errors. The model performs solidly.

