🚀 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/ca_ancora-ud-train.conllu
✅ Found validation (dev) file: training_data/ca_ancora-ud-dev.conllu
✅ Found test file: training_data/ca_ancora-ud-test.conllu
✅ Loaded 13,123 training sentences.
✅ Loaded 1,709 validation sentences.
✅ Loaded 1,846 test sentences.
Train: 13,123 | Val: 1,709 | Test: 1,846
Vocabulary: 16,085 words | 18 tags

🏗️ BUILDING MODEL

Train DataLoader batches: 7
Validation DataLoader batches: 1
Test DataLoader batches: 1
✅ Model on hpu
✅ Parameters: 4,435,602

🎯 TRAINING ON GAUDI
==

Epoch 1/25

Training: 100%
7/7 [01:13<00:00, 12.57s/it, loss=1.8185, acc=0.2343]
Evaluating: 100%
1/1 [00:09<00:00, 9.48s/it, loss=1.4821, acc=0.5582]
Train Loss: 2.7618 | Train Acc: 0.2343
Val Loss: 1.4821 | Val Acc: 0.5582
Time: 83.1s
✨ New best validation accuracy: 0.5582. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 2/25

Training: 100%
7/7 [00:04<00:00, 1.71it/s, loss=0.8871, acc=0.6340]
Evaluating: 100%
1/1 [00:00<00:00, 3.44it/s, loss=0.7713, acc=0.7571]
Train Loss: 1.1740 | Train Acc: 0.6340
Val Loss: 0.7713 | Val Acc: 0.7571
Time: 4.6s
✨ New best validation accuracy: 0.7571. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 3/25

Training: 100%
7/7 [00:04<00:00, 1.81it/s, loss=0.6225, acc=0.7610]
Evaluating: 100%
1/1 [00:00<00:00, 3.36it/s, loss=0.5199, acc=0.8309]
Train Loss: 0.7334 | Train Acc: 0.7610
Val Loss: 0.5199 | Val Acc: 0.8309
Time: 4.3s
✨ New best validation accuracy: 0.8309. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 4/25

Training: 100%
7/7 [00:04<00:00, 1.76it/s, loss=0.4624, acc=0.8291]
Evaluating: 100%
1/1 [00:00<00:00, 3.49it/s, loss=0.3530, acc=0.8867]
Train Loss: 0.5227 | Train Acc: 0.8291
Val Loss: 0.3530 | Val Acc: 0.8867
Time: 4.5s
✨ New best validation accuracy: 0.8867. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 5/25

Training: 100%
7/7 [00:04<00:00, 1.77it/s, loss=0.3173, acc=0.8801]
Evaluating: 100%
1/1 [00:00<00:00, 3.47it/s, loss=0.2505, acc=0.9219]

Train Loss: 0.3708 | Train Acc: 0.8801
Val Loss: 0.2505 | Val Acc: 0.9219
Time: 4.4s
✨ New best validation accuracy: 0.9219. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 6/25

Training: 100%
7/7 [00:04<00:00, 1.77it/s, loss=0.2350, acc=0.9147]
Evaluating: 100%
1/1 [00:00<00:00, 3.39it/s, loss=0.1880, acc=0.9420]
Train Loss: 0.2686 | Train Acc: 0.9147
Val Loss: 0.1880 | Val Acc: 0.9420
Time: 4.5s
✨ New best validation accuracy: 0.9420. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 7/25

Training: 100%
7/7 [00:04<00:00, 1.79it/s, loss=0.1814, acc=0.9367]
Evaluating: 100%
1/1 [00:00<00:00, 3.37it/s, loss=0.1524, acc=0.9528]
Train Loss: 0.2019 | Train Acc: 0.9367
Val Loss: 0.1524 | Val Acc: 0.9528
Time: 4.3s
✨ New best validation accuracy: 0.9528. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 8/25

Training: 100%
7/7 [00:04<00:00, 1.75it/s, loss=0.1480, acc=0.9509]
Evaluating: 100%
1/1 [00:00<00:00, 3.48it/s, loss=0.1304, acc=0.9600]
Train Loss: 0.1577 | Train Acc: 0.9509
Val Loss: 0.1304 | Val Acc: 0.9600
Time: 4.4s
✨ New best validation accuracy: 0.9600. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 9/25

Training: 100%
 7/7 [00:04<00:00, 1.80it/s, loss=0.1185, acc=0.9604]
Evaluating: 100%
 1/1 [00:00<00:00, 3.49it/s, loss=0.1167, acc=0.9643]
Train Loss: 0.1288 | Train Acc: 0.9604
Val Loss: 0.1167 | Val Acc: 0.9643
Time: 4.3s
✨ New best validation accuracy: 0.9643. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 10/25

Training: 100%
 7/7 [00:04<00:00, 1.74it/s, loss=0.1047, acc=0.9669]
Evaluating: 100%
 1/1 [00:00<00:00, 3.31it/s, loss=0.1079, acc=0.9666]
Train Loss: 0.1093 | Train Acc: 0.9669
Val Loss: 0.1079 | Val Acc: 0.9666
Time: 4.4s
✨ New best validation accuracy: 0.9666. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 11/25

Training: 100%
 7/7 [00:04<00:00, 1.74it/s, loss=0.0914, acc=0.9706]
Evaluating: 100%
 1/1 [00:00<00:00, 3.55it/s, loss=0.1036, acc=0.9678]
Train Loss: 0.0961 | Train Acc: 0.9706
Val Loss: 0.1036 | Val Acc: 0.9678
Time: 4.5s
✨ New best validation accuracy: 0.9678. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 12/25

Training: 100%
 7/7 [00:04<00:00, 1.77it/s, loss=0.0830, acc=0.9738]
Evaluating: 100%
 1/1 [00:00<00:00, 3.46it/s, loss=0.0989, acc=0.9689]
Train Loss: 0.0857 | Train Acc: 0.9738
Val Loss: 0.0989 | Val Acc: 0.9689
Time: 4.4s
✨ New best validation accuracy: 0.9689. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 13/25

Training: 100%
7/7 [00:04<00:00, 1.65it/s, loss=0.0747, acc=0.9761]
Evaluating: 100%
1/1 [00:00<00:00, 2.81it/s, loss=0.0961, acc=0.9702]
Train Loss: 0.0779 | Train Acc: 0.9761
Val Loss: 0.0961 | Val Acc: 0.9702
Time: 4.8s
✨ New best validation accuracy: 0.9702. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 14/25

Training: 100%
7/7 [00:04<00:00, 1.66it/s, loss=0.0729, acc=0.9782]
Evaluating: 100%
1/1 [00:00<00:00, 2.85it/s, loss=0.0929, acc=0.9717]
Train Loss: 0.0721 | Train Acc: 0.9782
Val Loss: 0.0929 | Val Acc: 0.9717
Time: 4.8s
✨ New best validation accuracy: 0.9717. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 15/25

Training: 100%
7/7 [00:04<00:00, 1.64it/s, loss=0.0613, acc=0.9794]
Evaluating: 100%
1/1 [00:00<00:00, 2.82it/s, loss=0.0910, acc=0.9723]
Train Loss: 0.0664 | Train Acc: 0.9794
Val Loss: 0.0910 | Val Acc: 0.9723
Time: 4.8s
✨ New best validation accuracy: 0.9723. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 16/25

Training: 100%
7/7 [00:04<00:00, 1.49it/s, loss=0.0627, acc=0.9808]
Evaluating: 100%
1/1 [00:00<00:00, 2.77it/s, loss=0.0908, acc=0.9722]

Train Loss: 0.0628 | Train Acc: 0.9808
Val Loss: 0.0908 | Val Acc: 0.9722
Time: 5.1s
Validation accuracy did not improve. Epochs without improvement: 1

Epoch 17/25

Training: 100%
 7/7 [00:04<00:00, 1.65it/s, loss=0.0526, acc=0.9815]
Evaluating: 100%
 1/1 [00:00<00:00, 2.79it/s, loss=0.0905, acc=0.9723]
Train Loss: 0.0589 | Train Acc: 0.9815
Val Loss: 0.0905 | Val Acc: 0.9723
Time: 4.8s
Validation accuracy did not improve. Epochs without improvement: 2

Epoch 18/25

Training: 100%
 7/7 [00:04<00:00, 1.66it/s, loss=0.0626, acc=0.9825]
Evaluating: 100%
 1/1 [00:00<00:00, 3.60it/s, loss=0.0899, acc=0.9725]
Train Loss: 0.0568 | Train Acc: 0.9825
Val Loss: 0.0899 | Val Acc: 0.9725
Time: 4.7s
✨ New best validation accuracy: 0.9725. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 19/25

Training: 100%
 7/7 [00:04<00:00, 1.64it/s, loss=0.0629, acc=0.9817]
Evaluating: 100%
 1/1 [00:00<00:00, 3.62it/s, loss=0.0917, acc=0.9722]
Train Loss: 0.0589 | Train Acc: 0.9817
Val Loss: 0.0917 | Val Acc: 0.9722
Time: 4.8s
Validation accuracy did not improve. Epochs without improvement: 1

Epoch 20/25

Training: 100%
7/7 [00:04<00:00, 1.62it/s, loss=0.0648, acc=0.9818]
Evaluating: 100%
1/1 [00:00<00:00, 2.87it/s, loss=0.0893, acc=0.9731]
Train Loss: 0.0584 | Train Acc: 0.9818
Val Loss: 0.0893 | Val Acc: 0.9731
Time: 4.8s
✨ New best validation accuracy: 0.9731. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 21/25

Training: 100%
7/7 [00:04<00:00, 1.66it/s, loss=0.0548, acc=0.9831]
Evaluating: 100%
1/1 [00:00<00:00, 3.58it/s, loss=0.0880, acc=0.9734]
Train Loss: 0.0538 | Train Acc: 0.9831
Val Loss: 0.0880 | Val Acc: 0.9734
Time: 4.7s
✨ New best validation accuracy: 0.9734. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 22/25

Training: 100%
7/7 [00:04<00:00, 1.57it/s, loss=0.0489, acc=0.9841]
Evaluating: 100%
1/1 [00:00<00:00, 2.88it/s, loss=0.0870, acc=0.9739]
Train Loss: 0.0504 | Train Acc: 0.9841
Val Loss: 0.0870 | Val Acc: 0.9739
Time: 5.1s
✨ New best validation accuracy: 0.9739. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 23/25

Training: 100%
7/7 [00:04<00:00, 1.64it/s, loss=0.0474, acc=0.9852]
Evaluating: 100%
1/1 [00:00<00:00, 2.85it/s, loss=0.0879, acc=0.9744]
Train Loss: 0.0475 | Train Acc: 0.9852
Val Loss: 0.0879 | Val Acc: 0.9744
Time: 4.8s
✨ New best validation accuracy: 0.9744. Model saved to best_pos_tagger_model_FOLDER.pt

Epoch 24/25

Training: 100%
 7/7 [00:04<00:00, 1.65it/s, loss=0.0450, acc=0.9859]
Evaluating: 100%
 1/1 [00:00<00:00, 2.82it/s, loss=0.0904, acc=0.9737]
Train Loss: 0.0448 | Train Acc: 0.9859
Val Loss: 0.0904 | Val Acc: 0.9737
Time: 4.8s
Validation accuracy did not improve. Epochs without improvement: 1

Epoch 25/25

Training: 100%
 7/7 [00:04<00:00, 1.78it/s, loss=0.0418, acc=0.9862]
Evaluating: 100%
 1/1 [00:00<00:00, 3.33it/s, loss=0.0903, acc=0.9738]
Train Loss: 0.0432 | Train Acc: 0.9862
Val Loss: 0.0903 | Val Acc: 0.9738
Time: 4.4s
Validation accuracy did not improve. Epochs without improvement: 2

📊 FINAL TEST EVALUATION
==
✅ Loaded best model from best_pos_tagger_model_FOLDER.pt for final evaluation.

Evaluating: 100%
 1/1 [00:10<00:00, 10.26s/it, loss=0.0970, acc=0.9731]
Test Loss: 0.0970
Test Accuracy: 0.9731 (97.31%)

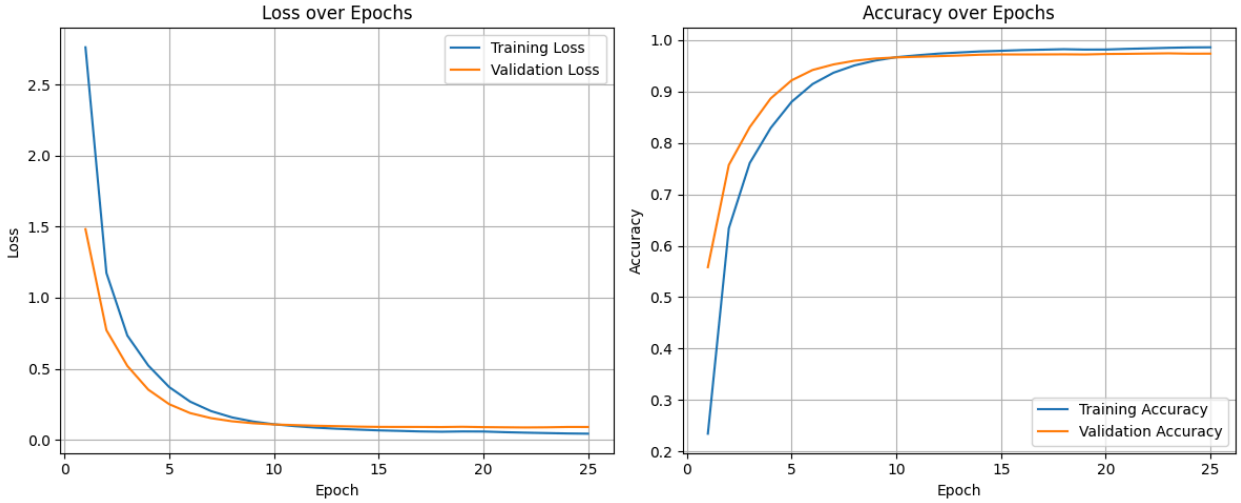
🎉 TRAINING COMPLETE ON GAUDI HPU!
Best Val Acc: 0.9744
Final Test Acc: 0.9731
Final Test Accuracy Classification: 🌟 Excellent! Top-tier performance.

📚 Vocabulary Summary:

 Words: 16,085
 POS tags: 18

Sample words: ['El', 'Tribunal', 'Suprem', '(', ')', 'ha', 'confirmat', 'la', 'condemna', 'a', '...']
POS tags: ['DET', 'PROPN', 'PUNCT', 'AUX', 'VERB', 'NOUN', 'ADP', 'NUM', 'ADJ', 'CCONJ', '_', 'PRON', 'SCONJ', 'ADV', 'SYM', 'PART', 'INTJ']

📈 Metrics plot saved to training_metrics.png



📊 POS Tagging Results (Random Sample from Test Set):

--- Sample Sentence 1 ---

Word	Predicted Tag	Actual Tag	Correct?
A	ADP	ADP	✅
<unk>	PROPN	PROPN	✅
,	PUNCT	PUNCT	✅
l'	DET	DET	✅
avió	NOUN	NOUN	✅
va	AUX	AUX	✅
ser	AUX	AUX	✅
sotmès	VERB	VERB	✅
a	ADP	ADP	✅
una	DET	DET	✅
nova	ADJ	ADJ	✅
inspecció	NOUN	NOUN	✅
de	ADP	ADP	✅
seguretat	NOUN	NOUN	✅
,	PUNCT	PUNCT	✅
però	CCONJ	CCONJ	✅
l'	DET	DET	✅
escala	NOUN	NOUN	✅

va | AUX | AUX | ✅
trigar | VERB | VERB | ✅
més | ADV | ADV | ✅
del | _ | _ | ✅
de | ADP | ADP | ✅
el | DET | DET | ✅
previst | ADJ | ADJ | ✅
perquè | SCONJ | SCONJ | ✅
l' | DET | DET | ✅
aeroport | NOUN | NOUN | ✅
no | ADV | ADV | ✅
tenia | VERB | VERB | ✅
el | DET | DET | ✅
personal | NOUN | NOUN | ✅
femení | ADJ | ADJ | ✅
necessari | ADJ | ADJ | ✅
per | ADP | ADP | ✅
registrar | VERB | VERB | ✅
les | DET | DET | ✅
dones | NOUN | NOUN | ✅
del | _ | _ | ✅
de | ADP | ADP | ✅
el | DET | DET | ✅
passatge | NOUN | NOUN | ✅
. | PUNCT | PUNCT | ✅

--- Sample Sentence 2 ---
Word | Predicted Tag | Actual Tag | Correct?

Això | PRON | PRON | ✅
significa | VERB | VERB | ✅
que | SCONJ | SCONJ | ✅
s' | PRON | PRON | ✅
ha | AUX | AUX | ✅
aplicat | VERB | VERB | ✅
la | DET | DET | ✅
projecció | NOUN | NOUN | ✅
de | ADP | ADP | ✅
la | DET | DET | ✅
suma | NOUN | NOUN | ✅
de | ADP | ADP | ✅
vots | NOUN | NOUN | ✅
obtinguts | ADJ | ADJ | ✅
en | ADP | ADP | ✅

les | DET | DET | ✅
eleccions | NOUN | NOUN | ✅
, | PUNCT | PUNCT | ✅
cosa | NOUN | NOUN | ✅
que | PRON | PRON | ✅
ha | AUX | AUX | ✅
significat | VERB | VERB | ✅
que | SCONJ | SCONJ | ✅
la | DET | DET | ✅
proposició | NOUN | NOUN | ✅
no | ADV | ADV | ✅
de | ADP | ADP | ✅
llei | NOUN | NOUN | ✅
hagi | AUX | AUX | ✅
<unk> | VERB | VERB | ✅
. | PUNCT | PUNCT | ✅

--- Sample Sentence 3 ---
Word | Predicted Tag | Actual Tag | Correct?

Per | ADP | ADP | ✅
això | PRON | PRON | ✅
, | PUNCT | PUNCT | ✅
_ | PRON | PRON | ✅
afirma | VERB | VERB | ✅
que | SCONJ | SCONJ | ✅
el | DET | DET | ✅
compromís | NOUN | NOUN | ✅
que | PRON | PRON | ✅
_ | PRON | PRON | ✅
pren | VERB | VERB | ✅
des | ADP | ADP | ✅
de | ADP | ADP | ✅
Convergència | PROPN | PROPN | ✅
Democràtica | PROPN | PROPN | ✅
<unk> | PROPN | PROPN | ✅
és | AUX | AUX | ✅
el | DET | DET | ✅
d' | ADP | ADP | ✅
' | PUNCT | PUNCT | ✅
un | DET | DET | ✅
compromís | NOUN | NOUN | ✅
d' | ADP | ADP | ✅
<unk> | PROPN | NOUN | ❌

entre | ADP | ADP | ✅
ambdós | NUM | NUM | ✅
tipus | NOUN | NOUN | ✅
d' | ADP | ADP | ✅
institucions | NOUN | NOUN | ✅
' | PUNCT | PUNCT | ✅
. | PUNCT | PUNCT | ✅

--- Sample Sentence 4 ---
Word | Predicted Tag | Actual Tag | Correct?

En | ADP | ADP | ✅
principi | NOUN | NOUN | ✅
no | ADV | ADV | ✅
està | AUX | AUX | ✅
previst | ADJ | ADJ | ✅
incrementar | VERB | VERB | ✅
el | DET | DET | ✅
professorat | NOUN | NOUN | ✅
, | PUNCT | PUNCT | ✅
però | CCONJ | CCONJ | ✅
sí | NOUN | NOUN | ✅
que | SCONJ | SCONJ | ✅
s' | PRON | PRON | ✅
<unk> | VERB | VERB | ✅
les | DET | DET | ✅
hores | NOUN | NOUN | ✅
<unk> | ADJ | ADJ | ✅
. | PUNCT | PUNCT | ✅

--- Sample Sentence 5 ---
Word | Predicted Tag | Actual Tag | Correct?

Aquesta | DET | DET | ✅
visita | NOUN | NOUN | ✅
ha | AUX | AUX | ✅
estat | AUX | AUX | ✅
promoguda | VERB | VERB | ✅
a | ADP | ADP | ✅
instàncies | NOUN | NOUN | ✅
dels | _ | _ | ✅
de | ADP | ADP | ✅
els | DET | DET | ✅
empresaris | NOUN | NOUN | ✅

més	ADV	ADV	✅
<unk>	ADJ	ADJ	✅
d'	ADP	ADP	✅
<unk>	PROPN	PROPN	✅
,	PUNCT	PUNCT	✅
que	PRON	PRON	✅
mantenen	VERB	VERB	✅
una	DET	DET	✅
estreta	ADJ	ADJ	✅
relació	NOUN	NOUN	✅
amb	ADP	ADP	✅
les	DET	DET	✅
comarques	NOUN	NOUN	✅
de	ADP	ADP	✅
Tarragona	PROPN	PROPN	✅
pel	_	_	✅
per	ADP	ADP	✅
el	DET	DET	✅
fet	NOUN	NOUN	✅
de	ADP	ADP	✅
<unk>	_	_	✅
tenir	VERB	VERB	✅
hi	PRON	PRON	✅
la	DET	DET	✅
segona	ADJ	ADJ	✅
residència	NOUN	NOUN	✅
.	PUNCT	PUNCT	✅

🧠 Analysis of Sample POS Tagging Results:

Total words analyzed in samples: 161
Correct predictions in samples: 160
Incorrect predictions in samples: 1
Sample Accuracy: 99.38%

--- Performance on Unknown (<unk>) Words ---
Total <unk> words in samples: 9
Correct <unk> predictions: 8
Incorrect <unk> predictions: 1
Accuracy on <unk> words: 88.89%
Observation: The model shows some ability to guess tags for unknown words, which is good.

--- Common Tagging Errors (Predicted -> Actual) ---
  - Predicted 'PROPN' but was actually 'NOUN': 1 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 show a high level of accuracy and consistency. The model generalizes well to unseen sentences.

1
Python 3 (ipykernel) | Idle
Saving completed
Mode: Command
Ln 1, Col 1
Tagger_Using_Folder.ipynb
1