Amazon ML Challenge Finale

NeuralNinjas

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Problem Statement

The challenge is to build a machine learning model that extracts entity values, such as weight, volume, and dimensions, etc., directly from product images

Why not OCR+NER?

- Unable to interpret unlabeled values
- Fails to capture spatial context & positional meaning

Data Preprocessing:

- Replaced entity values having invalid units with “NA“ (e.g., horsepower)
- Replaced range with max value (e.g., [24, 30] volt with 30 volt)

Image				
Entity Name	**Depth**	**Width**	**Voltage**	**Wattage**
Train Label	15 cm	9 cm	50 volt	3.0 horsepower
Accurate Label	NA	32 cm	NA	NA

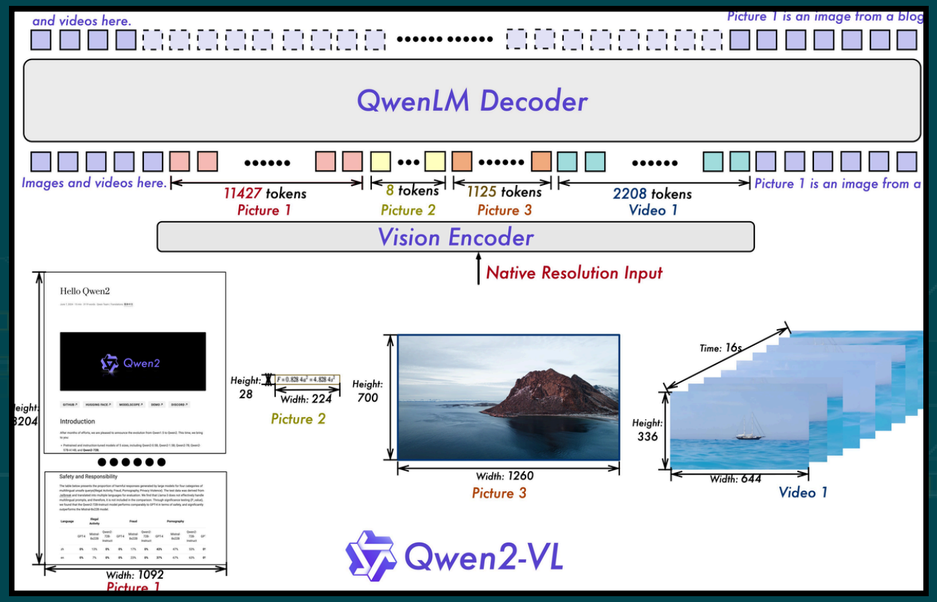
Our Approach

Model

Why Qwen2VL model?

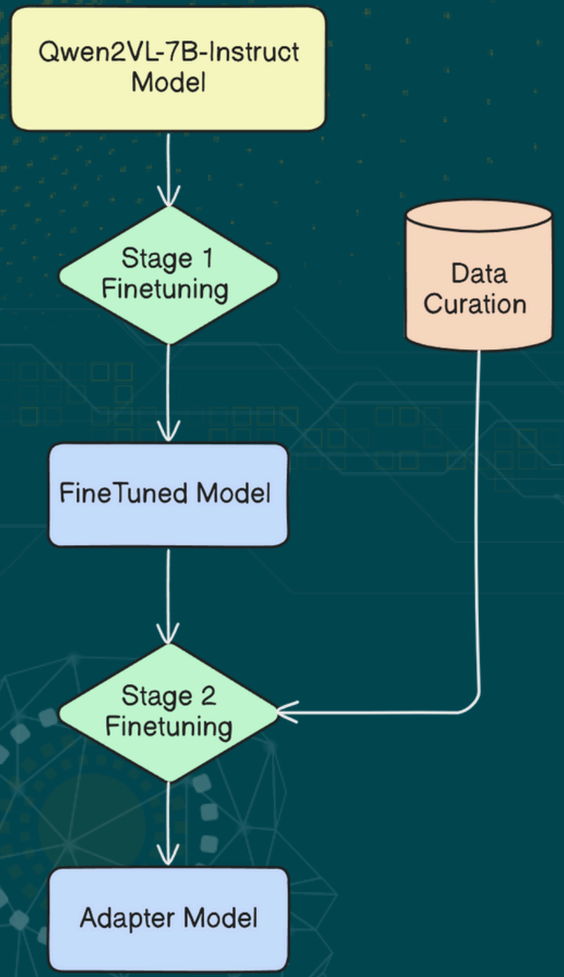
1) Pre-trained on VQA and OCR datasets
2) Vision-Language Alignment
3) Dynamic Resolution
4) Open-Source

Base Model: **Qwen2VL-7B-Instruct**



Benchmark	InternVL2-8B	MiniCPM-V2.6	GPT-4o-mini	Qwen2-VL-7B
$DocVQA_{test}$	91.6	90.8	-	94.5
OCRBench	794	852	785	845

Two Stage Learning



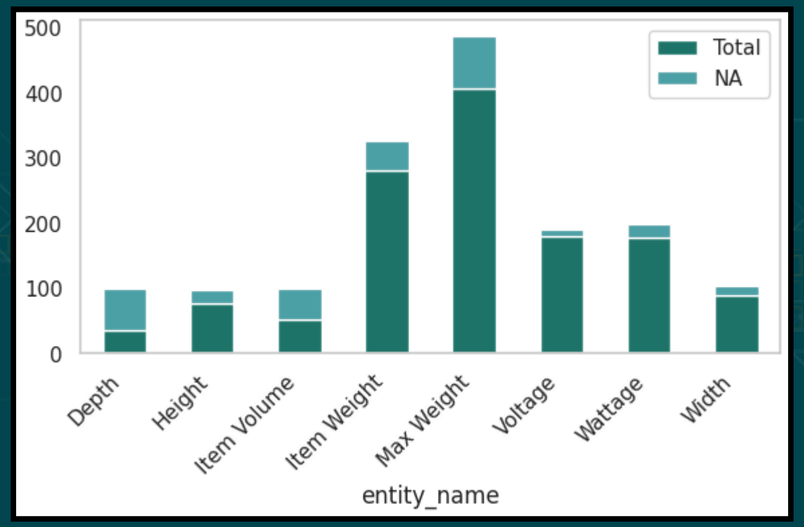
First Stage: Fine-tuned on 20k samples

- Adapted to the domain of product images and entity extraction
- Learned broad patterns and relationships

"Garbage in, Garbage out"

Data Curation:

- Curated 1600 samples
- Assigned "NA" when entity value was absent in an image
- Corrected inaccurate entity values



Second Stage: Fine-tuned on curated Dataset

- Refined model's understanding
- Corrected biases introduced by noisy labels

FineTuning Setup

Base Model: Qwen2VL-7B-Instruct
Fine-Tuning Method: QLoRA- 8 bit
Prompt: What is the {entity_name}?
Learning Rate: 5e-5
Compute: 2 A100 40GB
Post Processing:

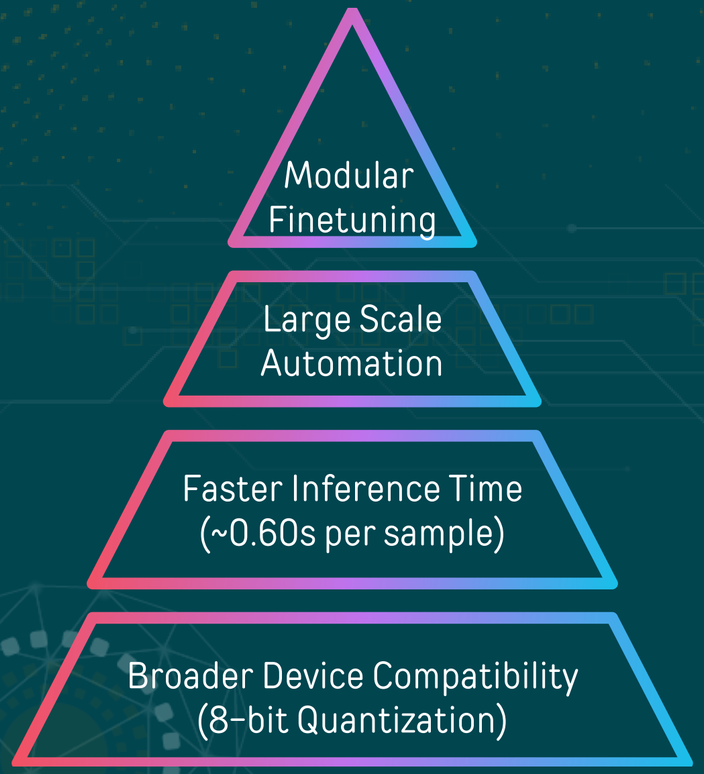
- Corrected invalid entity units
- Replaced “NA” values with empty string

Hyperparameter	Stage 1	Stage 2
Epochs	3	30
Batch Size	8	4
Gradient Accumulation	8	4
LR Scheduler	Cosine	ReduceLROnPlateau

Results

Model / FineTuning Method Qwen2VL-7B-Instruct (M0)	F1 Score
Baseline Qwen2VL-7B-Instruct AWQ (M1)	0.617
Fine-Tuned M0 model on 10k samples (M2)	0.678
Fine-Tuned M0 model on 20k samples (M3)	0.679
Fine-Tuned M3 model on curated 1600 samples (M4)	**0.865**

Scalability



Future Scope