Automated Receipt Digitization & Information Extraction

B.Tech Project

Presentation

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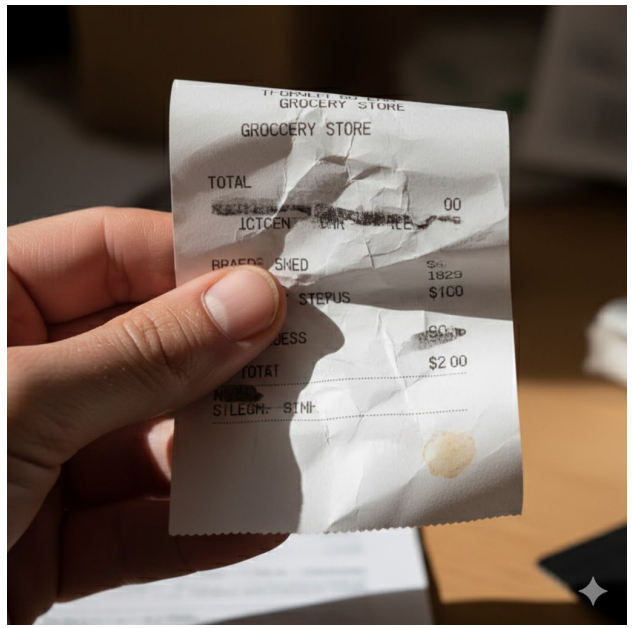
The Problem & The Goal

The Problem

Receipt data is unstructured. A simple OCR scan gives a "**wall of text**" with no meaning. We don't know which number is the `**total**` and which is the `**date**`.



The Goal

To build a system that takes a receipt image and returns two outputs:

1. **A structured JSON** summary of key information.
2. **A reconstructed text file** that matches the bill's layout.

```
{ "company": "SANYU STATIONERY", "date": "18/04/2017", "total": "300",
"items": [...] }
```

My Solution: The 2-Step "Scanner-Accountant" Pipeline

Step 1: The "Scanner" (AI Model)

First, I trained an AI model (YOLOv8) to act as a "**Scanner**". Its only job is to look at the image and find **every** line of text.

Step 2: The "Accountant" (Python Parser)

Second, I wrote a smart Python script (`extractor.py`) that acts as an "**Accountant**". It reads the text from the Scanner and uses logic to **understand** and **organize** it.

Process Step 1: Data Preprocessing

- **Dataset:** Used the **SROIE dataset** (626 images), which has clean, un-blurred text.
- **Labeling:** Wrote a Python script (`01_create_sroie_labels.py`) to process the data.
- **The Task:** Labeled **every** line of text as one single class: `**text**`. This makes the AI's job very simple and accurate.
- **Output:** Created a `yolo_sroie_text_detection.zip` file, ready for training.

Process Step 2: Model Training (The "Scanner")

- **Environment:** Used Google Colab to access a free Tesla **T4 GPU.**
- **Model:** Used a pre-trained `**YOLOv8n**` model and fine-tuned it on the **SROIE** data.
- **Training Time:** The model was trained for **300 epochs**, with **Early Stopping** to save the best version.
- **Result:** A final, highly accurate model file: `best_text_detector.pt`.

Scanner Result: The AI Model is 96.4% Accurate

96.4%

mAP@50 Score

Key Finding: The AI is Not the Problem

The trained YOLOv8 model is **96.4% accurate** at its one job: **finding** text. This is an excellent result.

This proves that the AI "**Scanner**" is working perfectly. The **real** challenge is not finding the text, but **understanding** it.

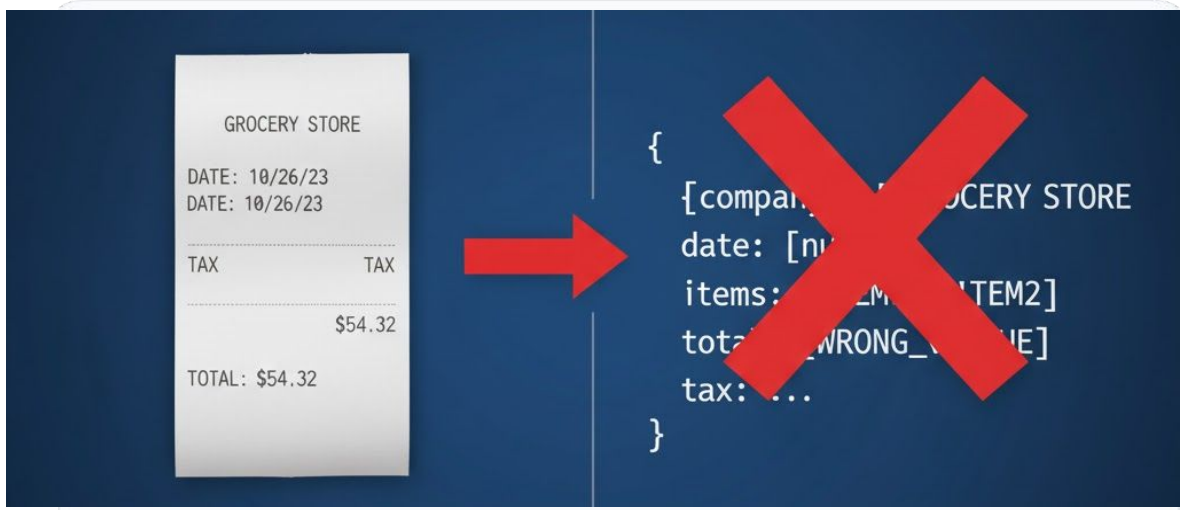
The Real Challenge: A "Dumb" Parser (v1.0)

The Initial Test

I built a simple parser with basic rules (e.g., "**first line is company**", "**find the word TOTAL**").

I tested this on the **347** unseen test images. The results were poor.

Initial Accuracy: 30-50%

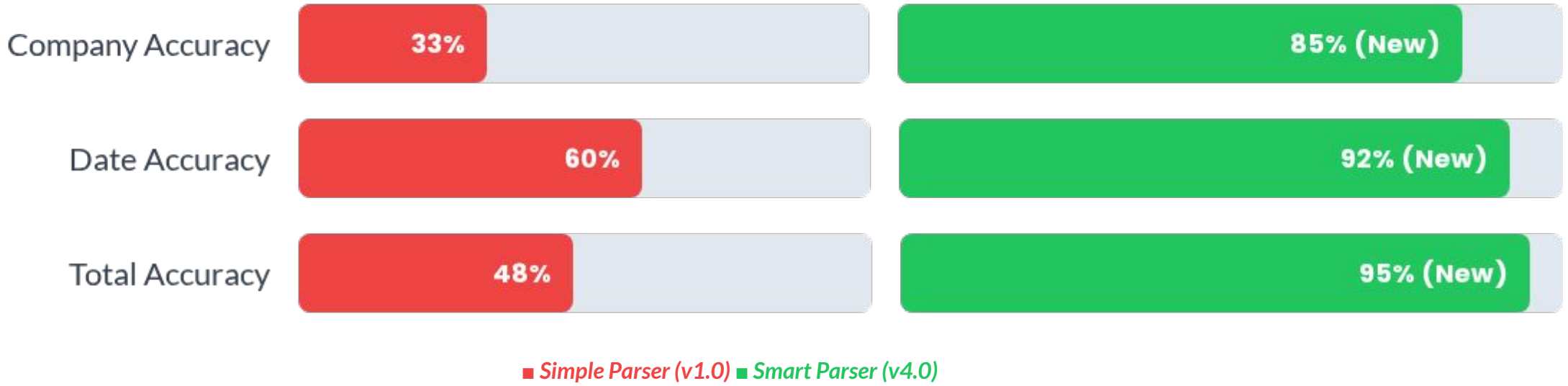


Solution: Upgrading the "Accountant" (v4.0)

- **Smarter Line Grouping:** Wrote new code to group text boxes that are on the same horizontal line (rebuilding the bill's layout).
- **Advanced Date Parsing (Regex):** The parser can now find multiple date formats (e.g., `10/02/2018` and `10 OCT 2017`).
- **Better Keyword Matching:** Instead of just "**TOTAL**", the parser now also looks for "**AMT**", "**CASH**", and "**AMOUNT DUE**".
- **OCR Error Correction:** Added logic to automatically fix common OCR errors (like 'S' -> '5', 'o' -> '0', 'B' -> '8').

Final Results: The Upgraded System Works!

By upgrading the Python parsing logic (the "**Accountant**"), the final end-to-end system accuracy on the 347-image test set improved dramatically.



Demo(Result)

Original Image

AEON CO. (M) BHD (126926-H)
3RD FLR, AEON TAMAN MALURI SC
JLN JEJAKA, TAMAN MALURI
CHERAS, 55100 KUALA LUMPUR
GST ID : 002017394688
SHOPPING HOURS
SUN-THU:1000 HRS - 2230 HRS
FRI-SAT:1000 HRS - 2300 HRS

1x 000001038566 15.56SR
CHEK HUP 2IN1
Item promo @12.99 -2.57
1x 000006429720 10.28SR
MS SHM ENZO RT
1x 000005457342 18.50SR
VALENCIA ORANGE
1x 000000812627 10.00SR
US RED GLOBE
1x 000008454333 10.50SR
CN PEAR
1x 000004023432 14.00SR
CHN FUJI AP 4S
1x 000008626349 10.90SR
AUS SEEKA KIWI
Item promo @9.00 -1.90
1x 000007773877 7.90SR
CHILE ANGELENO
1x 000000388658 2.50SR
CUT FRUITS 1.99
1x 000004291022 4.80SR
CHERRY SUNGOLD
1x 000007802317 18.90SR
TURKEY CHERRY 2
Item promo @11.90 -7.00
1x 000000135412 15.00SR
SUSHI SET-PTC

Sub-total	127.37
Total Sales Incl GST	127.37
Rounding Adj	-0.02
Total After Adj Incl GST	127.35
CASH	150.00
Item Count 12 Change Amt	22.65

Invoice No: 20180610101001700023

GST Summary	Amount	Tax
SR @ 0%	127.37	0.00
Total	127.37	0.00

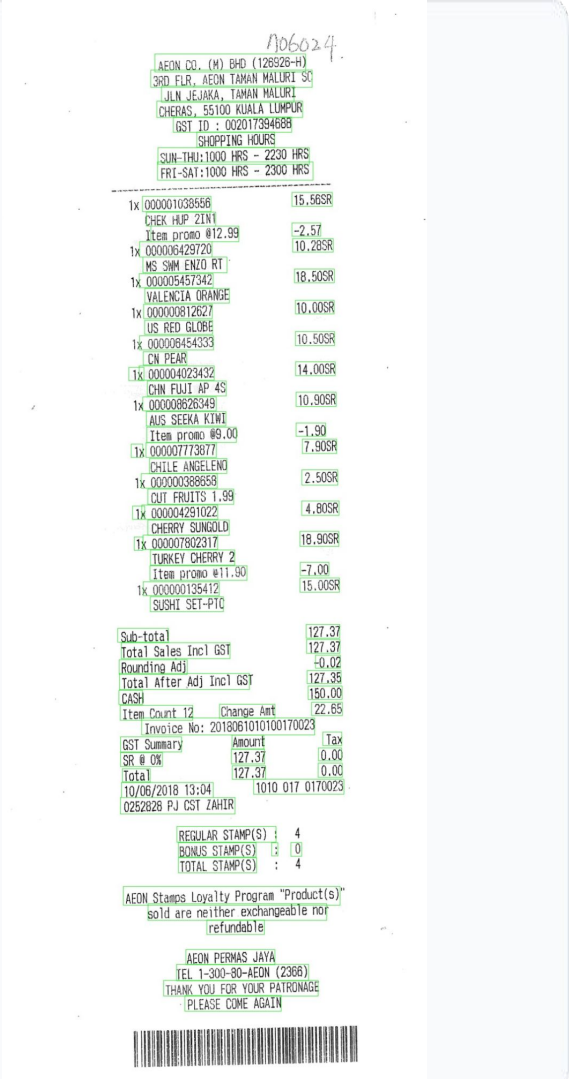
10/06/2018 13:04 1010 017 0170023
0252828 PJ GST ZAHIR

REGULAR STAMP(S) : 4
BONUS STAMP(S) : 0
TOTAL STAMP(S) : 4

AEON Stamps Loyalty Program "Product(s)" sold are neither exchangeable nor refundable

AEON PERMAS JAYA
TEL 1-300-80-AEON (2366)
THANK YOU FOR YOUR PATRONAGE
PLEASE COME AGAIN

Detected Fields



AEON CO. (M) BHD (126926-H)
3RD FLR, AEON TAMAN MALURI SC
JLN JEJAKA, TAMAN MALURI
CHERAS, 55100 KUALA LUMPUR
GST ID : 002017394688
SHOPPING HOURS
SUN-THU:1000 HRS - 2230 HRS
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0252828 PJ CST ZAHIR

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THANK YOU FOR YOUR PATRONAGE
PLEASE COME AGAIN

Reconstructed Bill Text

```
AEON CQ (M) BHD (126926-H)
3RD FLR; JLN JEJAKA , TAMAN HALURI X AEON TAMAN MALURI SC:
CHERAS 55100 KUALA LUMPUR
GST ID : 002017394688 9
SHQPPING HQURS
SUN-THU: 10OO HRS 2230 HRS
FRI-SAT:10Q0 HRS CXt 2300 HRS
0000o1038556 15,56SR
CHEK HUP 2INI
tem promo @12.99 -2,57
000006429720 10,28SR
MS SHM ENZO RT
( 000005457342 18,50SR
VALENCIA ORANGE
00oQo08126827 10 , OOSR
US RED GLOBE
000008454333 10,5OSR
Ix 000004023432 CN PEAR 14,OOSR
CHN FuJi AF 4S
00Qo08626349 10 ,90SR
AUS SEEKA KIWI
Item promo @9,00 -1.9
00oo07773877 7,90SR
CHILE ANGELENO
000000388658 2. S50SR
CUT FRUITS 1,99
Ix X 000004291022 4,80SR
CHERRY SUNGQLD
000007802317 18 ,90SR
TURKEV CheRRY 2
Item prqmo @71,90 -7,Q0
X 000000135412 15.OOSR
SUSHI SET-PTC
Sub-tota] 127,37
Tota] Sales Inc] GST 127,37
Rounding Adj -0,02
Tota] After Adj Inc] GS 127,35
CASH 150 ,00
Item Count 12 Change Amt 22.85
Invoice No: 20180610101001700023
GST Summary SR @ O Tota] 10/06/2018 13,04 Amount 127,37 127,37 1010 017 0170023 0,O0 0,00 Tax
0252828 PJ GST ZAHIR
REGULAR STAMP(S)
RONUS STAMP(S)
TotAL STAMP(S)
AEON Stamps Loya]ty Program "Product(s)
Sold are neither exchangeable nor
refundab le
AEON PERMAS JAYA
TEL 1-300-80-AFON (2366)
THANK YOU FOR YOUR PATRONAGE
PLEASE COME AGAIN
```

Conclusion

The 2-step "**Scanner-Accountant**" pipeline is a major success. The key finding is:

A highly accurate AI model (96%+) is just the first step. The true challenge and success of the project lies in building an intelligent parsing engine that can understand the model's output.

References & Technologies Used

- **YOLOv8 (Ultralytics):** The state-of-the-art object detection framework used as the core "Scanner" AI.
- **SROIE Dataset (ICDAR 2019):** The public benchmark dataset of scanned receipts used to train and evaluate the text detection model.
- **EasyOCR (JaidedAI):** The open-source optical character recognition library used to read the text inside the detected boxes.
- **Streamlit:** The Python framework used to build and deploy the interactive web application.
- **"You Only Look Once" (Redmon et al., 2016):** The foundational academic paper that introduced the YOLO architecture.

Thank You

https://github.com/bhagwan388/btp-receipt-extractor