

Computer Vision: Intelligent Document Processing

Date: 05/07/2022



Outline

- 1) What has been done:
 - 1) Running the API on all the subject datasets and Analysis. → Done on standard datasets. Basic Analysis on Tableau available without tesseract.
 - 2) Blog \rightarrow 70% done.
- 2) What is pending:
 - 1) Running the APIs on the custom datasets.
 - 2) Thorough analysis of all the results on Tableau.
 - 2) Blog \rightarrow 30% pending. (Results of all the dataset to be added, and observations to be added).
- 3) Observations
 - 1) KPIs
 - 2) Summary of the Preprocessing steps applied.
- 4) Next Steps



Data Sets

S. No.	Dataset Name	Size	Google	Amazon	Tesseract
1	Noisy Office 2007	144	✓	✓	√
2	Smart Doc QA 2015	4260	✓	1	✓
3	SROIE 2019	1000	1	1	✓
	Account Used:		Dhiraj's trial account	Sigmoid's trainee account + Abhjeet's personal account (760 rs bill approval?)	

Basic Results available on Tableau

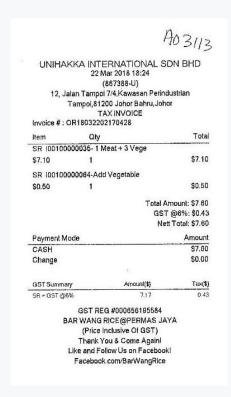


KPIs

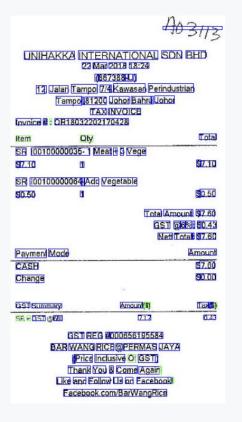
Category	KPI	Description	Observation	
API's own score	Mean Confidence Score	API's own score	Both are similar	
Dependent on the order of the text	WER	(No. of edits)/(total number of words in ground truth)	Amazon is better (~10% offset)	
	CER	(No. of edits)/(total number of characters in ground truth)		
Not Dependent on the order of the text	Jaccard Index	len(intersection)/len(union)	Both are similar (Google is slightly better)	
order of the text	Cosine Similarity	Convert the text to vector using countvectorizer.		

- 1) Google sorts the text from left to right. (Block wise)
- 2) Amazon sorts the text from top to bottom. (line wise)

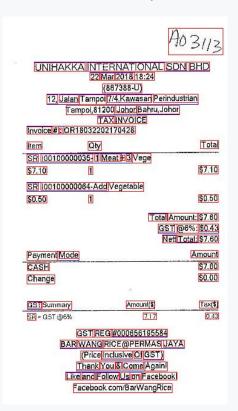




Google Output

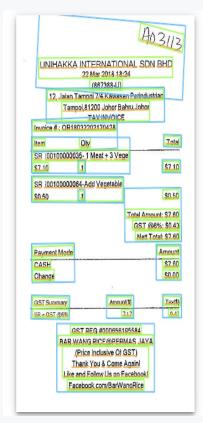


Amazon Output

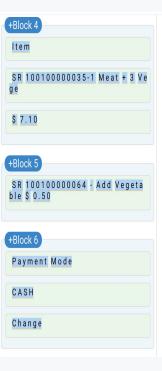




Google Output

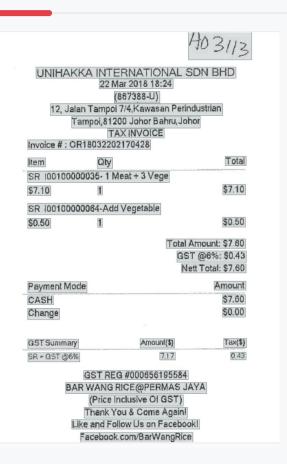


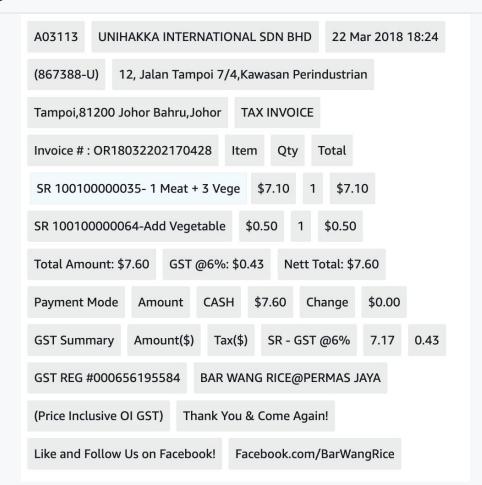














Original Image

A03113

Total

LINIHAKKA INTERNATIONAL SON BHD 22 Mar 2018 18:24 (867388-U)

12. Jalan Tampoi 7/4. Kawasan Perindustrian Tampoi,81200 Johor Bahru, Johor

TAX INVOICE Invoice #: OR18032202170428

Item

QN

SR 100100000035-1 Meat + 3 Vege

\$7.10	1	\$7.10
SR 1001000	000064-Add Veg	petable
\$0.50	1	\$0.50
		Total Amount: \$7.60
		GST @6%: \$0.43
		Nett Total: \$7.60

Payment Mode Amount CASH \$7.60 Change \$0.00

GST Summary Amount(\$) Tax(\$) SR = GST @6% 717 0.43

> GST REG #000656195584 BAR WANG RICE@PERMAS JAYA (Price Inclusive Of GST) Thank You & Come Again! Like and Follow Us on Facebook! Facebook.com/BarWangRice

Ground Truth

UNIHAKKA INTERNATIONAL SDN BHD 22 MAR 2018 18:24 (867388-U) 12, JALAN TAMPOI 7/4, KAWASAN PERINDUSTRIAN TAMPOI.81200 JOHOR BAHRU.JOHOR TAX INVOICE INVOICE #: OR18032202170428 ITEM QTY TOTAL SR I00100000035- 1 MEAT + 3 VEGE \$7.10 \$7.10 SR I00100000064-ADD VEGETABLE \$0.50 \$0.50 TOTAL AMOUNT: \$7.60 GST @6%: \$0.43 NETT TOTAL: \$7.60 PAYMENT MODE **AMOUNT** CASH \$7.60 CHANGE \$0.00 GST SUMMARY AMOUNT(\$) TAX(\$) SR - GST @6% 7.17 0.43 GST REG #000656195584 BAR WANG RICE@PERMAS JAYA (PRICE INCLUSIVE OF GST) THANK YOU & COME AGAIN! LIKE AND FOLLOW US ON FACEBOOK!

FACEBOOK.COM/BARWANGRICE

Google Output A03113 UNIHAKKA INTERNATIONAL SDN BHD 22 Mar 2018 18:24 (867388-U) 12, Jalan Tampoi 7/4, Kawasan Perindustrian Tampoi, 81200 Johor Bahru, Johor TAX INVOICE Invoice #: OR18032202170428 Oty Item SR 100100000035-1 Meat + 3 Vege \$7.10 SR 100100000064-Add Vegetable \$0.50 Payment Mode CASH Change **GST Summary** SR - GST 6% Amount(\$) 7.17 Total \$0.50 Total Amount: \$7.60 GST @6%: \$0.43 Nett Total: \$7.60 GST REG #000656195584 BAR WANG RICE@PERMAS JAYA (Price Inclusive of GST) Thank You & Come Again! Like and Follow Us on Facebook! Facebook.com/BarWangRice \$7.10 Amount \$7.60 \$0.00 Tax(\$)

0.43

Amazon Output UNIHAKKA INTERNATIONAL SDN BHD 22 Mar 2018 18:24 (867388-U) 12, Jalan Tampoi 7/4, Kawasan Perindustrian Tampoi.81200 Johor Bahru.Johor TAX INVOICE Invoice # : OR18032202170428 Item Qty Total SR 100100000035- 1 Meat- + 3 Vege \$7.10 \$7.10 SR 100100000064-Add Vegetable \$0.50 \$0.50 Total Amount: \$7.60 GST @6%: \$0.43 Nett Total: \$7.60 Payment Mode Amount CASH \$7.60 Change \$0.00 **GST Summary** Amount(\$) Tax(\$) SR 7 17 0.43 GST REG #000656195584 BAR WANG RICE@PERMAS JAYA (Price Inclusive OI GST) Thank You & Come Again!

Like and Follow Us on Facebook!

SIGMOID

Facebook.com/BarWangRice

Ground Truth:

unihakka international sdn bhd 22 mar 2018 18 24 867388 u 12 jalan tampoi 7 4 kawasan perindustrian tampoi 81200 johor bahru johor tax invoice invoice # or18032202170428 item gty total sr i00100000035 1 meat + 3 vege 7 10 1 7 10 sr i00100000064 add vegetable 0 50 1 0 50 total amount 7 60 gst 6 0 43 nett total 7 60 payment mode amount cash 7 60 change 0 00 gst summary amount tax sr gst 6 7 17 0 43 gst reg #000656195584 bar wang rice permas jaya price inclusive of gst thank you & come again like and follow us on facebook facebook com barwangrice'

Google Output:

'a03113 unihakka international sdn bhd 22 mar 2018 18 24 867388 u 12 jalan tampoi 7 4 kawasan perindustrian tampoi 81200 johor bahru johor tax invoice invoice # or18032202170428 oty item sr 100100000035 1 meat + 3 vege 7 10 sr 100100000064 add vegetable 0 50 payment mode cash change 1 gst summary sr gst 6 1 amount 7 17 total 0 50 total amount 7 60 gst 6 0 43 nett total 7 60 gst reg #000656195584 bar wang rice permas jaya price inclusive of ast thank you & come again like and follow us on facebook facebook com barwangrice 7 10 amount 7 60 0 00 tax 0 43

Amazon Output:

'ad3113 unihakka international sdn bhd 22 mar 2018 18 24 867388 u 12 jalan tampoi 7 4 kawasan perindustrian tampoi 81200 johor bahru johor tax invoice invoice # or18032202170428 item qty total sr 100100000035 1 meat + 3 vege 7 10 1 7 10 sr 100100000064 add vegetable 0 50 1 0 50 total amount 7 60 gst 6 0 43 nett total 7 60 payment mode amount cash 7 60 change 0 00 gst summary amount tax sr 7 17 0 43 gst reg #000656195584 bar wang rice permas jaya price inclusive oi gst thank you & come again like and follow us on facebook facebook com barwangrice'

API	CER	WER	Mean Confidence	Cosine Similarity	Jaccard	
Google	28.4	44.5	92.2	0.97	0.5	
Amazon	2.9	5.4	96.8	0.97	0.5 SIGN	101D

Preprocessing Steps Applied and Tried

S. No.	Noise Type	Treatment	
1.	Motion Blurr / Out of Focus Blurr	Sharpening using 2D convolution	
2.	Motion Blurr / Out of Focus Blurr	Convolution and Deconvolution	
3.	Watermark	Contrast and brightness adjustment	
4.	Watermark	Morphological Filtering (Shrinking and growing pixels)	
5.	Any	Aligning and zooming the image using openCV	



Next Steps

- 1) Reading research papers.
- 2) Watermark/stamp removing deep learning model
 - a) Creation of the dataset: using python code/ppt
 - b) Input: Image having, Output: Cleaned image
- 3) Blur removing Deep Learning Model.



Future Scope

While looking for how to deal with the deblurring the images, we came across some implementations that can be applied for treating the image to see more improvement in OCR APIs' performance.

- DL Based Image deblurring survey paper
- Convolutional Neural Networks for Direct Text Deblurring
- Learning to Super-Resolve Blurry Face and Text Images
- L0-Regularized Intensity and Gradient Prior for Deblurring Text Images and Beyond

