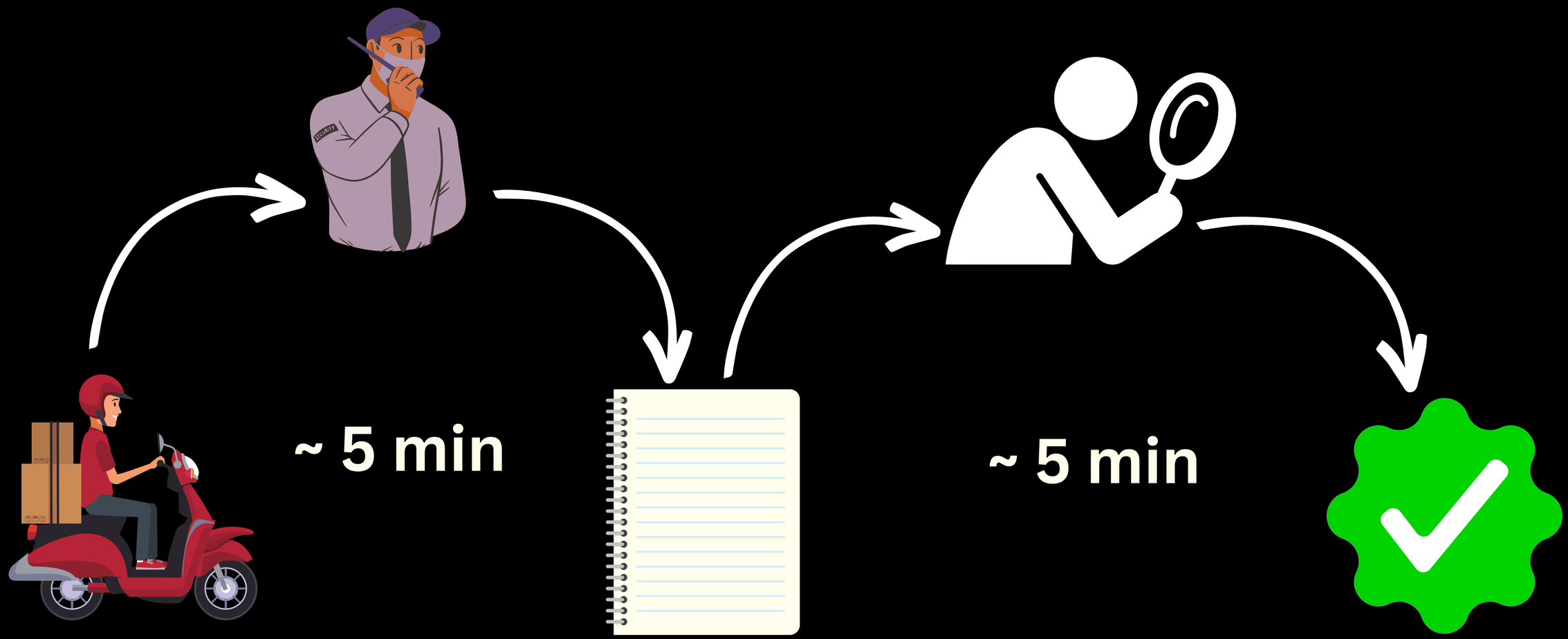
PLAKSHA UNIVERSITY

Optimising Parcel Handling Efficiency

AL3001 | Machine Learning & Pattern Recognition

*most generic & unrealistic AI background we could find...

current scenario.



back of the envelope calculations.

daily parcels received ~ 50

total time to process one parcel ~ 10 mins

meaning...

~ 8 potential human hours wasted
every single day

manual entry is a tedious job.

because no digitisation, possibility of misplacing parcels.

might receive a surprise gift from your loved ones, so possibilty on missing that out!

plaksha is a tech university?

Problem Statement

How can we reliably map the parcel’s recipient from a database of them of a using just the image of the label?

how to solve this?

*and also because it’s a Machine Learning course

Literature Review

[1] Fusion of Global-Local Features for Image Quality Inspection of Shipping Label

Suh, Sungho, Paul Lukowicz, and Yong Oh Lee

2020 25th International Conference on Pattern Recognition (ICPR). IEEE, 2021

[2] Robust Shipping Label Recognition and Validation for Logistics by Using Deep Neural Networks

Suh, Sungho, et al.

2019 IEEE International Conference on Image Processing (ICIP). IEEE, 2019

Classified parcel labels into normal, handwritten & damaged.

successful with 90% accuracy in recognising address & barcode region.

performing OCR on address region to validate it from Google Maps

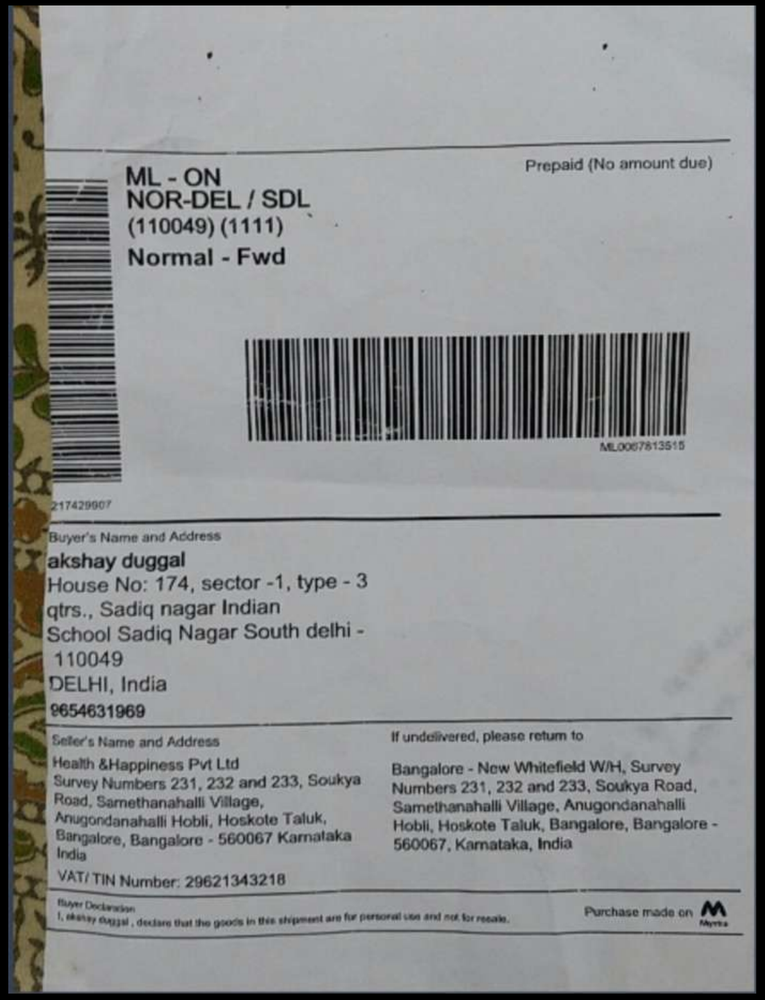
What they don’t do?

private dataset, not released in public.

they don’t leverage the recent advances in NLP.

A BRIEF STRATEGY

Reference Image



ML - ON
NOR-DEL / SDL
(110049) (1111)
Normal - Fwd

Prepaid (No amount due)

ML0067813515

217429907

Buyer's Name and Address
akshay duggal
House No: 174, sector -1, type - 3 qtrs., Sadiq nagar Indian School Sadiq Nagar South delhi - 110049
DELHI, India
9654631969

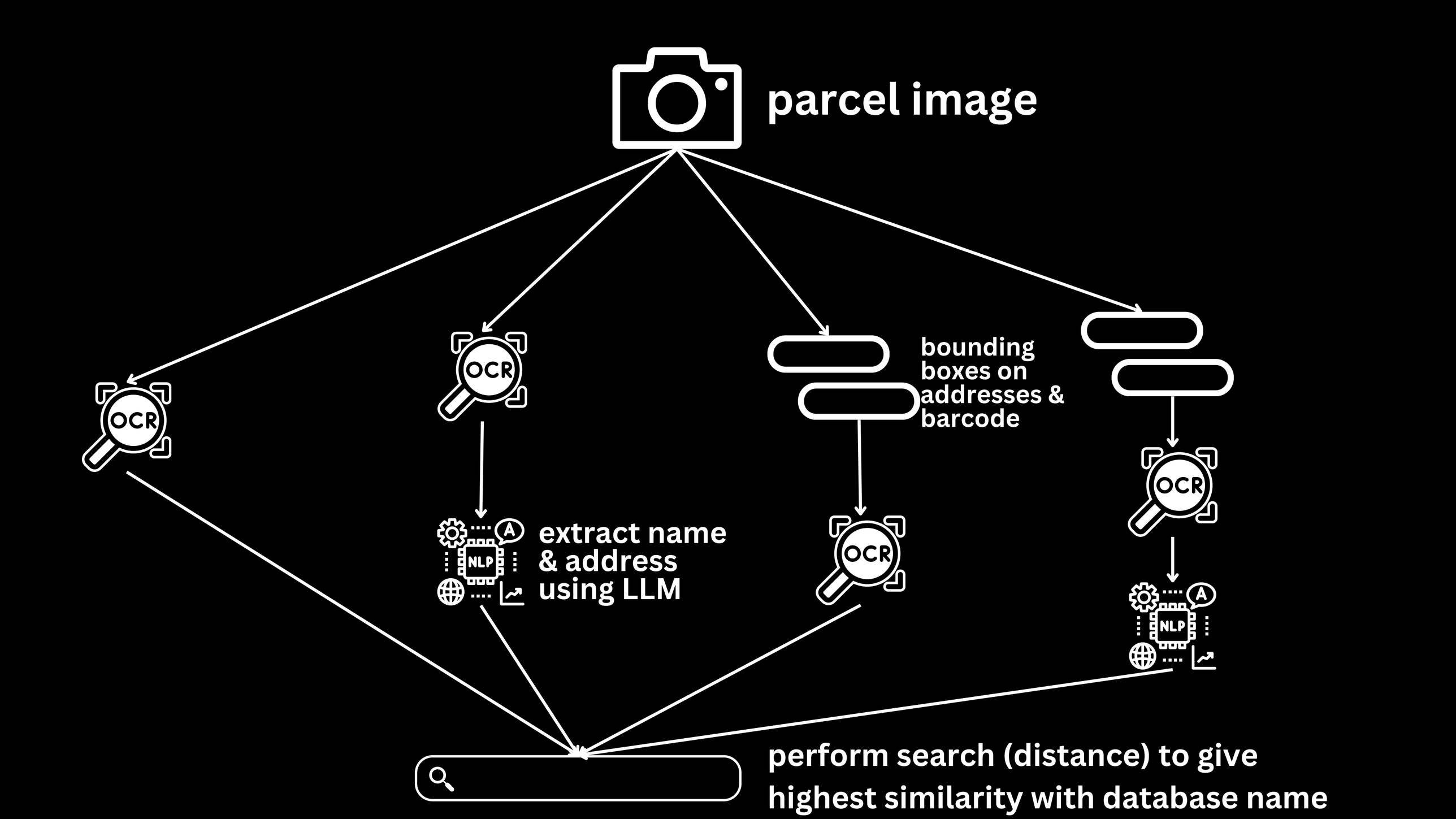
Seller's Name and Address
Health &Happiness Pvt Ltd
Survey Numbers 231, 232 and 233, Soukya Road, Samethanahalli Village, Anugondanahalli Hobli, Hoskote Taluk, Bangalore, Bangalore - 560067 Karnataka India

VAT/ TIN Number: 29621343218

If undelivered, please return to
Bangalore - New Whitefield W/H, Survey Numbers 231, 232 and 233, Soukya Road, Samethanahalli Village, Anugondanahalli Hobli, Hoskote Taluk, Bangalore, Bangalore - 560067, Karnataka, India

Buyer Declaration
I, akshay duggal , declare that the goods in this shipment are for personal use and not for resale.

Purchase made on Myntra


parcel image
OCR
OCR
bounding boxes on addresses & barcode
OCR
NLP
extract name & address using LLM
OCR
OCR
NLP
perform search (distance) to give highest similarity with database name

Dataset and Feature Preprocessing

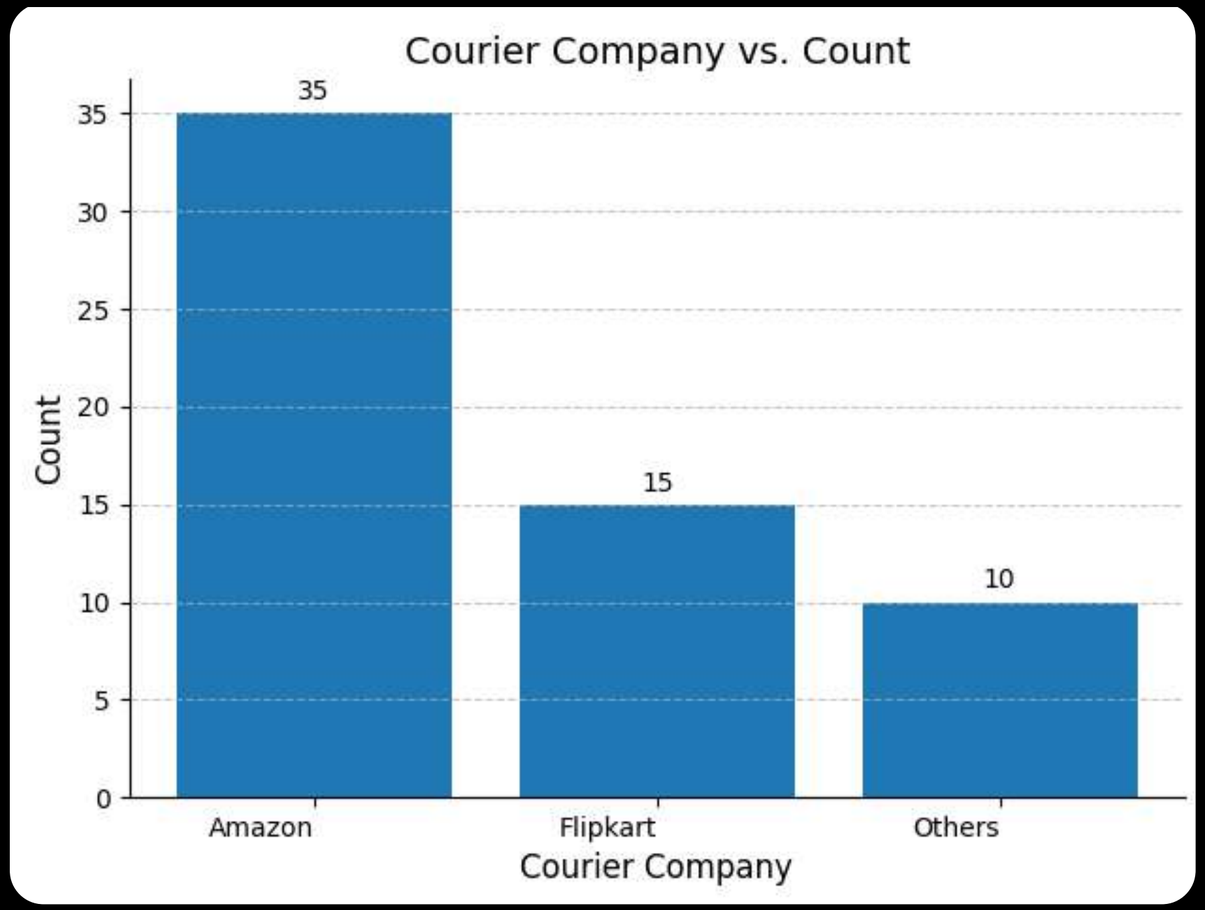
No public dataset available because of privacy reasons.

Manual Data Collection

Tedious ~ Need about 5000 images[1]

Google Images ~ similar parcel images, not scalable

Google Images



dataset of about ~ 60 images ~ 2 hours

heavy biased to labels created of giant e-commerece retailers

Maharashtra, India - 411030

Order Date: Nov 26, 2022
Invoice No: KUR2611-247

KUR2611-247

COD
₹799

EKART

NMBC00136980268

WEIGHT : 0.5 KG Dimensions (cm): 21.5 X 19.5 X 5.5

SKU	Item Name	Qty.	Amount
1	Best Pack Of Women's Long Rayon Dresses Pack! - XL	1	₹799
	Order Total		₹799

Pickup and Return Address:
Fashion Reel
Fashion WZ New IND Delhi, Delhi, India - 110058
Mobile No.: 8199089953

For any query please contact us at:
Phone: 01140846025

This is computer generated document,hence does not required signature.
Note: All disputes are subject to Delhi jurisdiction.Goods once sold will only be taken back or exchanged as per the store's exchange/return policy

---

ML - ON
NOR-DEL / SDL
(110049) (1111)
Normal - Fwd

Prepaid (No amount due)

ML007813515

217429907

Buyer's Name and Address
akshay duggal
House No: 174, sector -1, type - 3
qtrs., Sadiq nagar Indian
School Sadiq Nagar South delhi - 110049
DELHI, India
9654631969

Seller's Name and Address
Health &Happiness Pvt Ltd
Survey Numbers 231, 232 and 233, Soukya Road, Samethanahalli Village, Anugondanahalli Hobli, Hoskote Taluk, Bangalore, Bangalore - 560067 Karnataka India
VAT/TIN Number: 29621343218

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Buyer Declaration:
I, akshay duggal , declare that the goods in this shipment are for personal use and not for resale.

Purchase made on Myntra

To:
Pooja Mishra
Plot #4 65 Pragatibhaya Niwas Plot No 64 65
Rajiv Nagar Sukhani Nagar Hajana Road
Nagpur Nagpur - Maharashtra,IN, , Nagpur,
Nagpur, Maharashtra, India - 441110

Order Date: Apr 19, 2023
Invoice No: KURTI1904-340

KURTI1904-340

COD
₹799

EKART

NMBC00231869885

WEIGHT : 0.5 KG Dimensions (cm): 17.5 X 13 X 8.5

SKU	Item Name	Qty.	Amount
1	Combo Watch	1	₹799
	Order Total		₹799

Pickup and Return Address:
Electro Mela
Trend St new delhi, New Delhi India

Mobile No.: 8342051055

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To:
Somenath
5/1, KC Roychowdhuri Road, PO Helumath,
Behind FORUM RANGOLI MALL, Howrah, WB,
India - 711202
MOBILE NO: **7003685346**

Order Date: **Nov 21, 2022**
Invoice No: 25414EZS

25414EZS

COD
₹1199

ECOM EXP

9515207466

WEIGHT : 0.5 KG Dimensions (cm): 10 X 10 X 10

SKU	Item Name	Qty.	Amount
N/A	Intelligent Photochromic Auto Focus | Anti Blue | Ultra Light Reading Glasses	1	₹1199
	Order Total		₹1199

Pickup and Return Address:
DLS Warehouse 2
DLS Warehouse 2 LAWRENCEROAD Delhi Delhi, Delhi, India - 110035
Mobile No.: 0888976876

This is computer generated document,hence does not required signature.
Note: All disputes are subject to Delhi jurisdiction.Goods once sold will only be taken back or exchanged as per the store's exchange/return policy

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OPPO A16 · ©Gudiya

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1 KG 1 OF 1

SHIP TO:
KOVALEV VLADIMIR
79626759234
KOVALEV VLADIMIR
APARTMENT 98
PACIFIC STREET BUILDING 218V.
680033 KHABAROVSK
RUSSIA

RUS 166 1 – 00

UPS SAVER 1P

TRACKING #: 1Z A75 G18 04 4078 0136

BILLING: P/P
DESC: car dvr 4

INV

ML - ON
NOR-DEL / SDL
(110049) (1111)
Normal - Fwd

Prepaid (No amount due)

ML007813515

217429907

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DELHI, India
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Buyer Declaration:
I, akshay duggal , declare that the goods in this shipment are for personal use and not for resale.

Purchase made on Myntra

To:
Soumi Lata .

28 North Street, Mahiladi Tirunelveli TN, ,
Tirunelveli, TN, India - 627115

Order Date: **Jul 02, 2022**
Invoice No: K0207-667

K0207-667

COD
₹799

EKART

NMBC00113648858

WEIGHT : 0.5 KG Dimensions (cm): 21.5 X 5.5 X 19.5

SKU	Item Name	Qty.	Amount
1	Buy Now! Women's Cotton Traditional Wear Pack! - L	1	₹799
	Order Total		₹799

Pickup and Return Address:
LADY VIBES
M/s LADY VIBE 4298/11 jai market New IND home Delhi,
Delhi, India - 110035
Mobile No.: 8199605433

This is computer generated document,hence does not required signature.
Note: All disputes are subject to Delhi jurisdiction.Goods once sold will only be taken back or exchanged as per the Store's exchange/return policy

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AWB No 3159415204360 **Shirts Fashion**

Delhivery-SS
AGB/GGP
MH 443106

COD
Please collect
Rs.649.00

Order# #14638#

Weight:0.4kg
Order Date:2021-08-04

Ship To:
Jaat ji
Jandu construction company, Sharma building, mateshri Gurmit bank,Dhab
balchana, MH 443106,Ph:7985356006

Product	Qty	Total
Black Jeans With 2 Checked Shirts Combo For Men - XL	1	649.00

Return To:
Shirts Fashion, H.NO.- 991, - Pranladpur Bangar Village Delhi,NCR,110042, Phone : 7042144383

Ship From:
Wizards of the Coast-Toys
927 West Carrier Parkway Suite 200
Grand Prairie, TX
United States, 75050

Ship To:
Amazon.com, FTW1
33333 LBJ FWY
Dallas, TX
United States, 75241-7203

PO# Code39

ASIN:
B08WG1KFY1

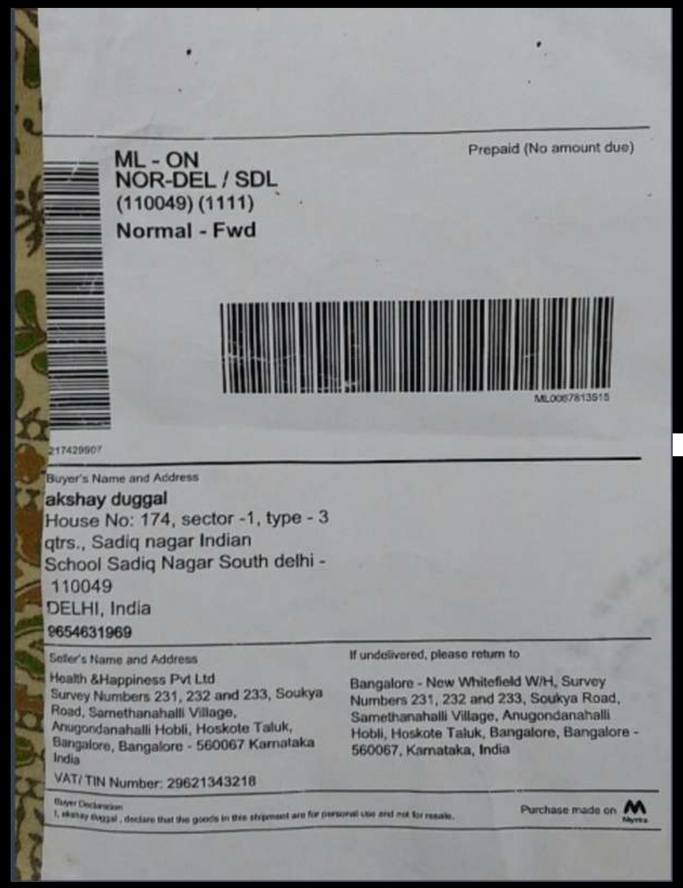
Qty: 1

153EYEAO

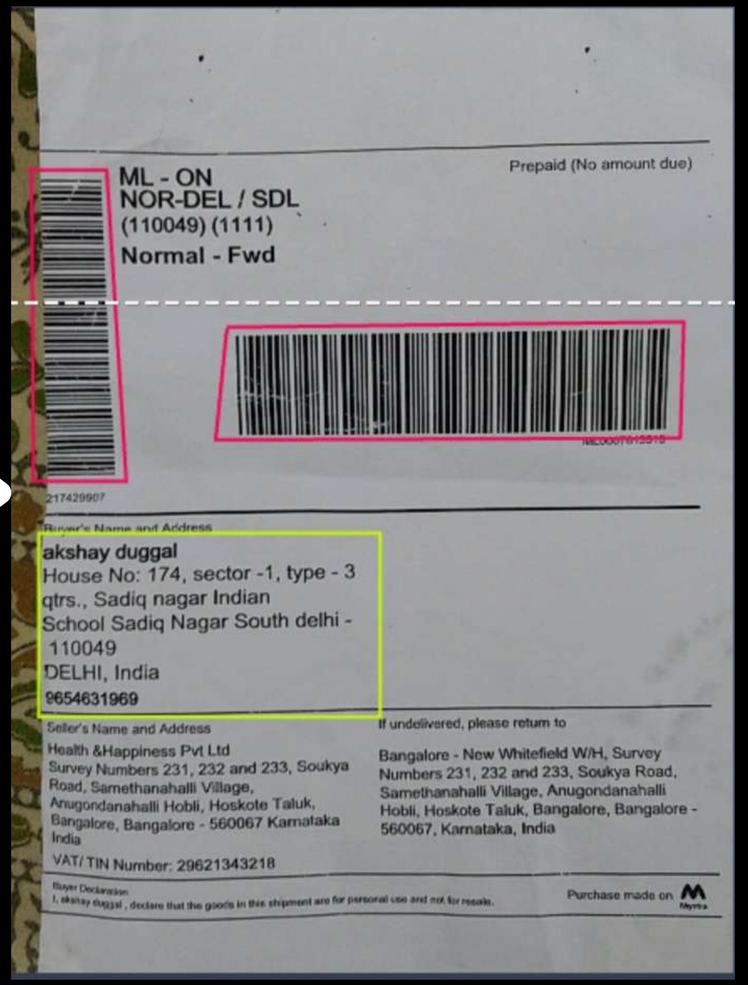
Carton#: 864 of 2000

Amazon Container Code(code128): AMZNCC0000436352143 3

Data Augmentation



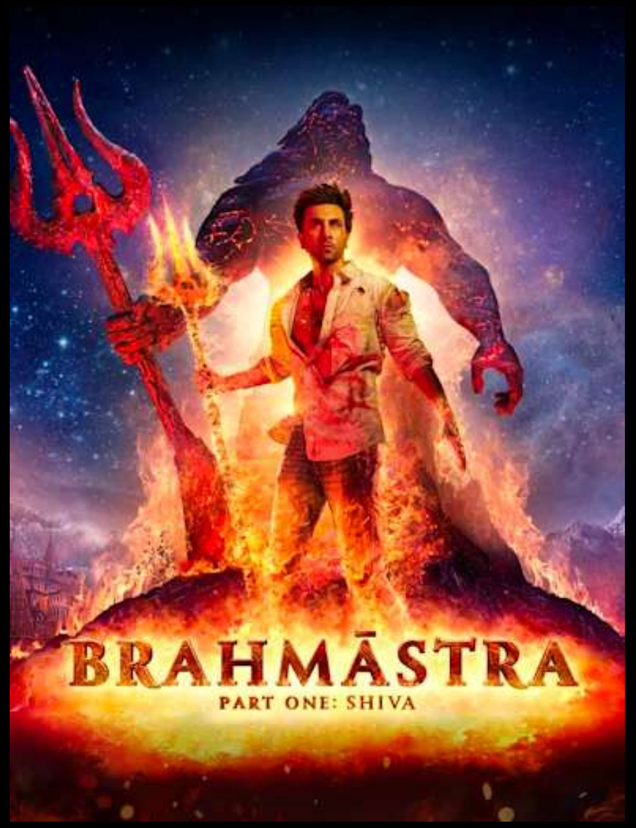
annotation of address & barcodes



YOLOv8 Results

YOLOv8 performs really bad in recognising the address and barcode regions

because dataset is really small ~ 60 images



Synthetic Dataset Creation

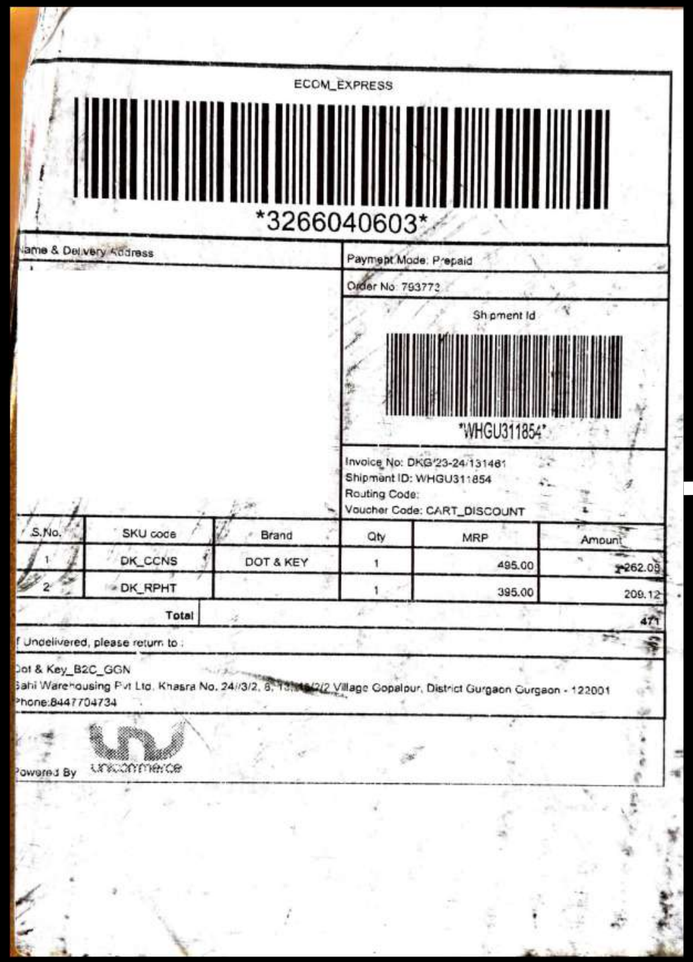
Templates Supported

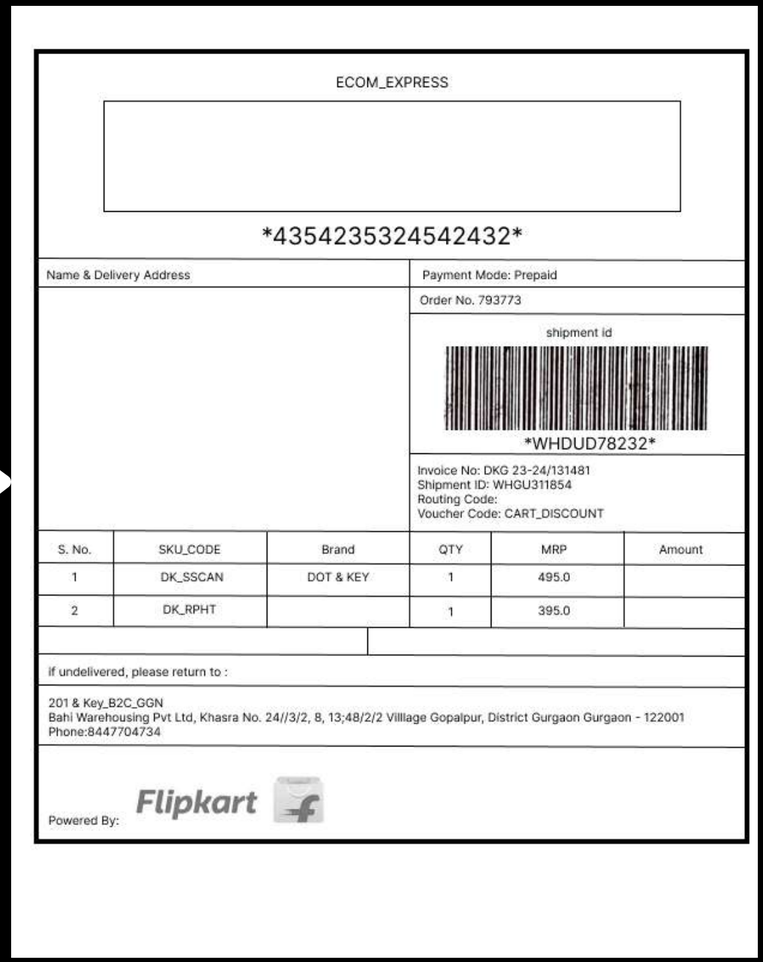
top couriers at Plaksha.

BLUE DART

and many more...

Label Printing and Photo Shoot

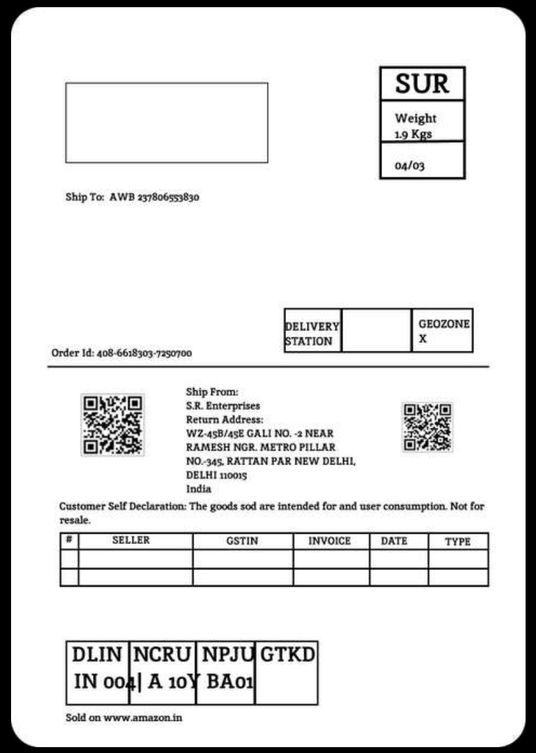




Figma

populate with
random name & address

transformations



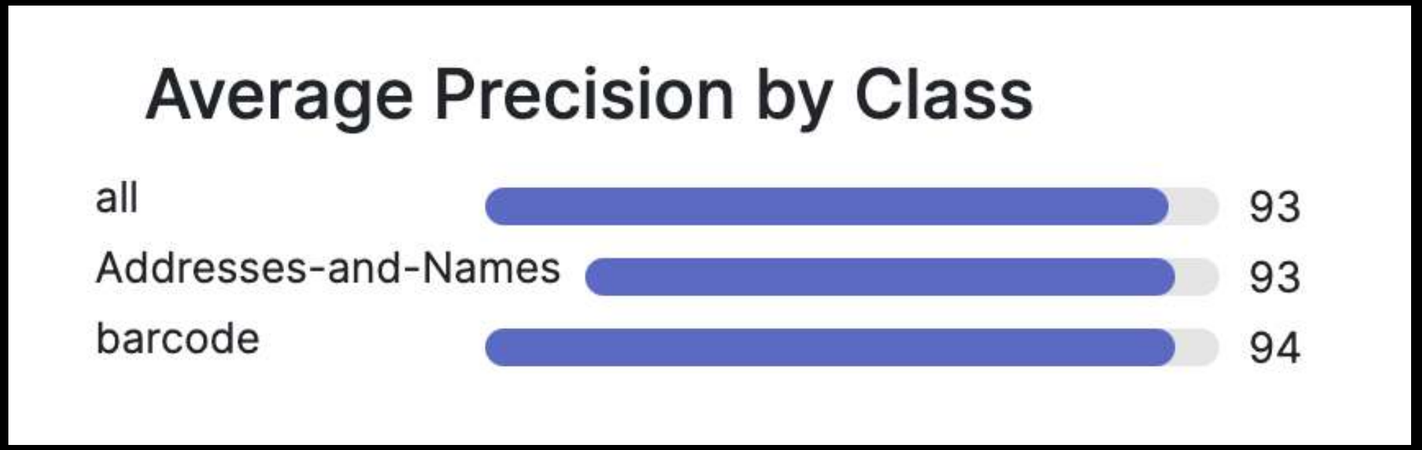
Label Printing and Photo Shoot

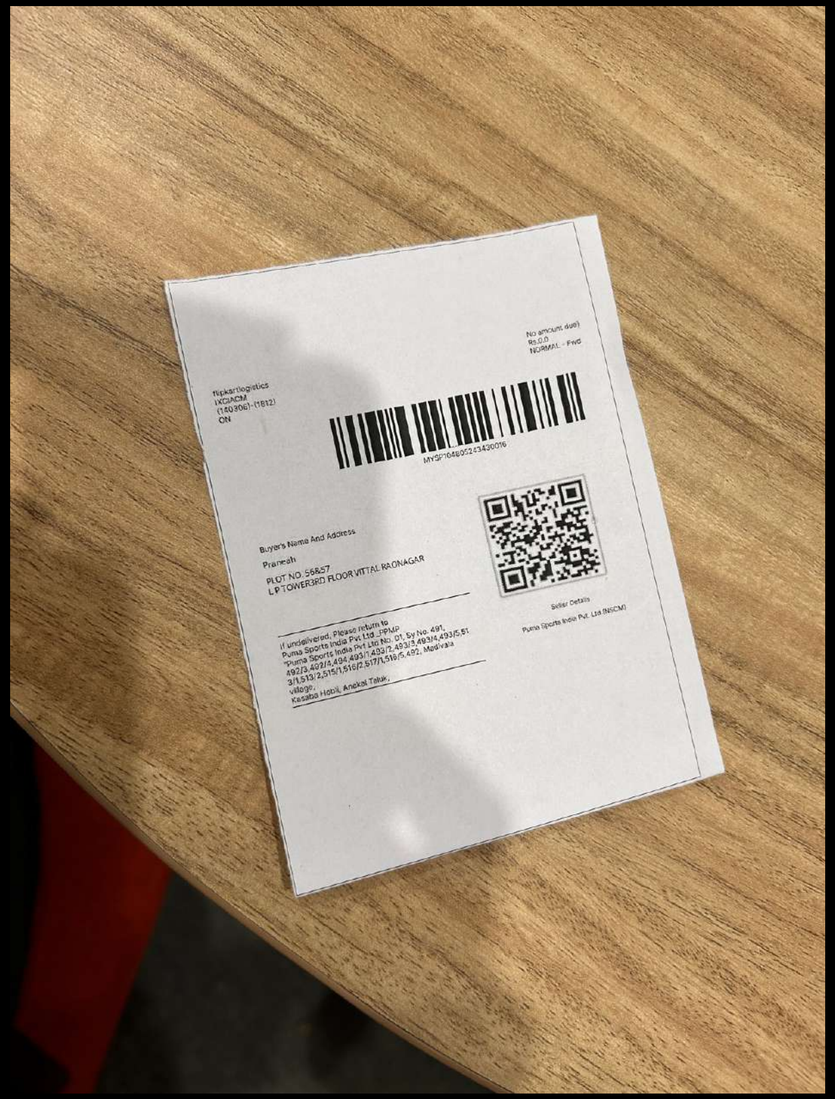
- 100% synthetic datapoint
- Randomly changing fonts, names and addresses
- Since we are generating the image, we know where the barcode and address exists, hence we get automatic bounding box around them

Performance of Model

trained on just the synthetic data

about ≈ 95% accuracy on real life images

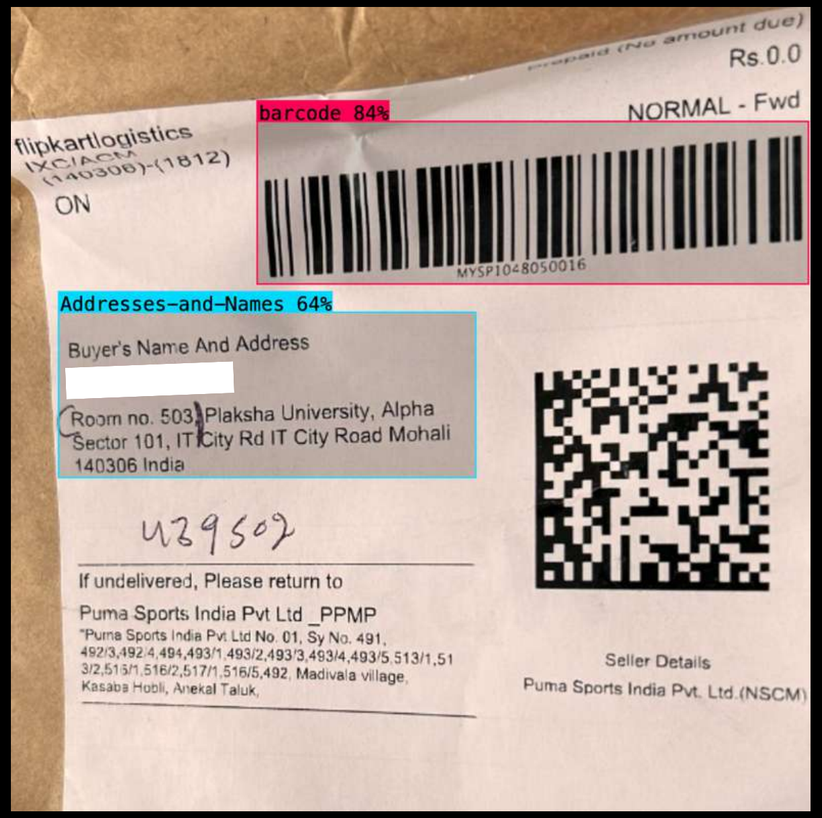




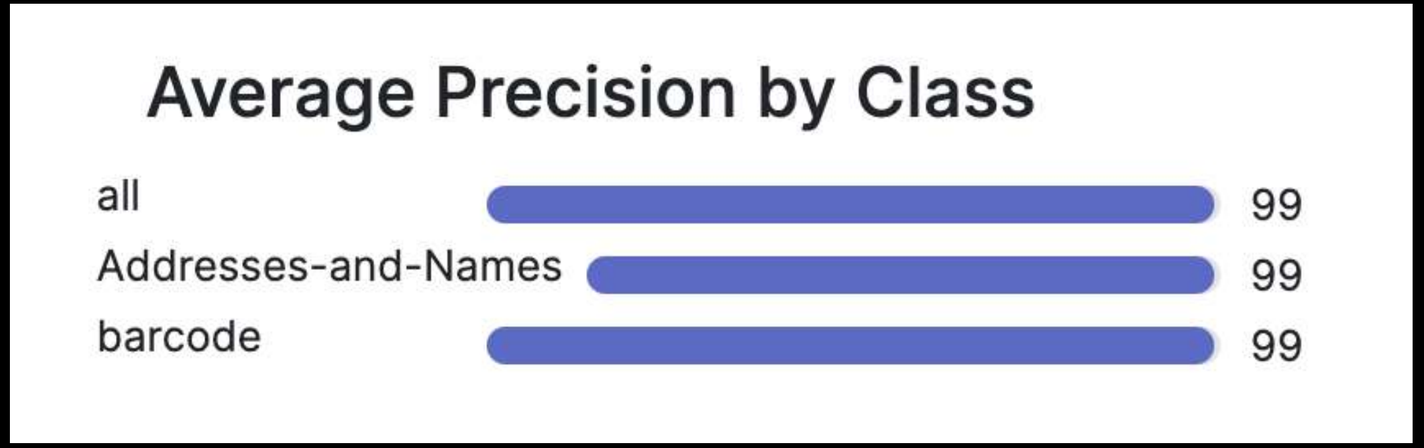
Printed out labels of different courier companies from the synthetic dataset and captured them and included them in the train set, and introduce variations due to different lighting settings and cameras

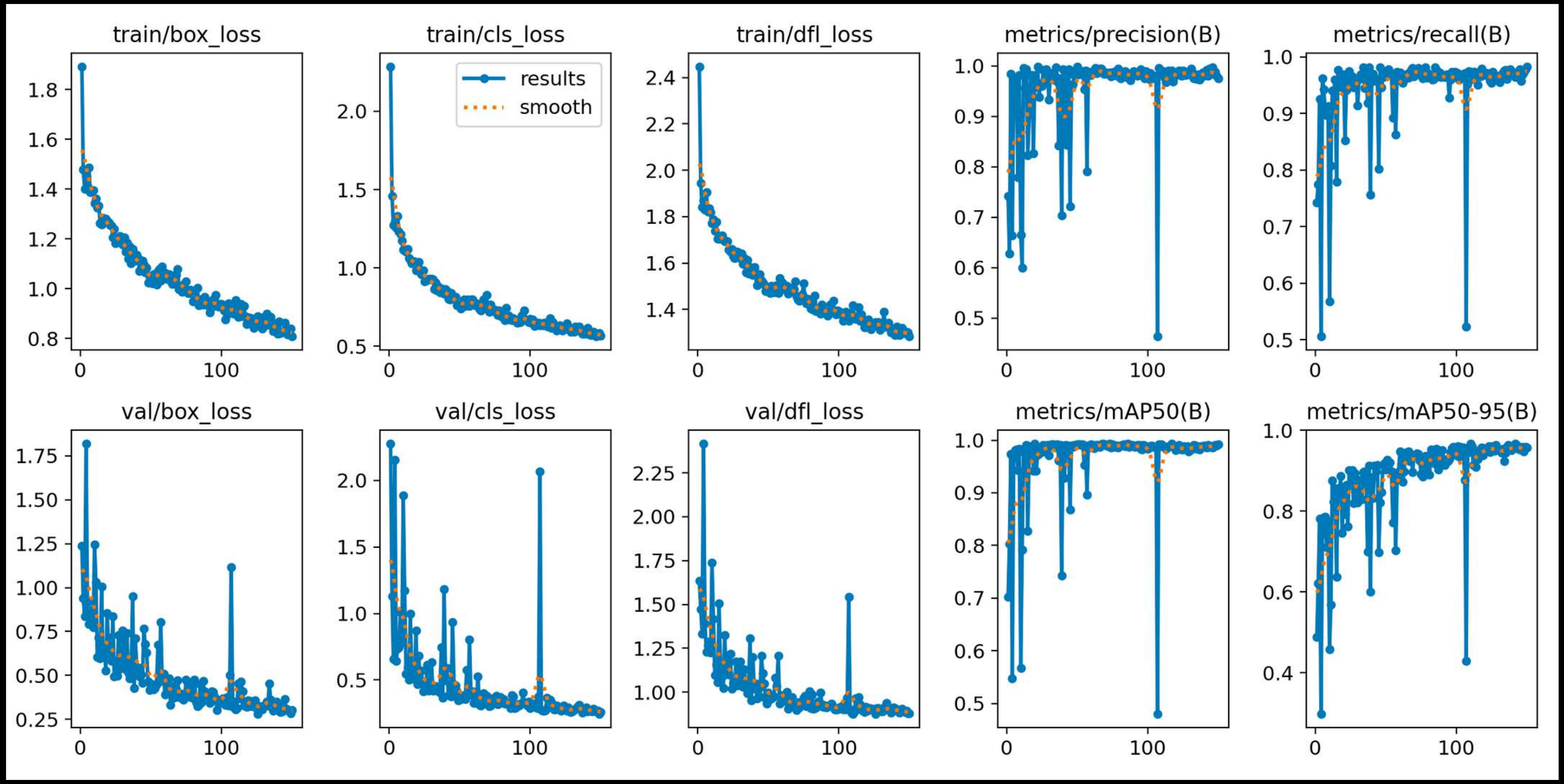
Performance of Model

trained on the synthetic data and real photoshoot



about ≈ 99% accuracy on real life images

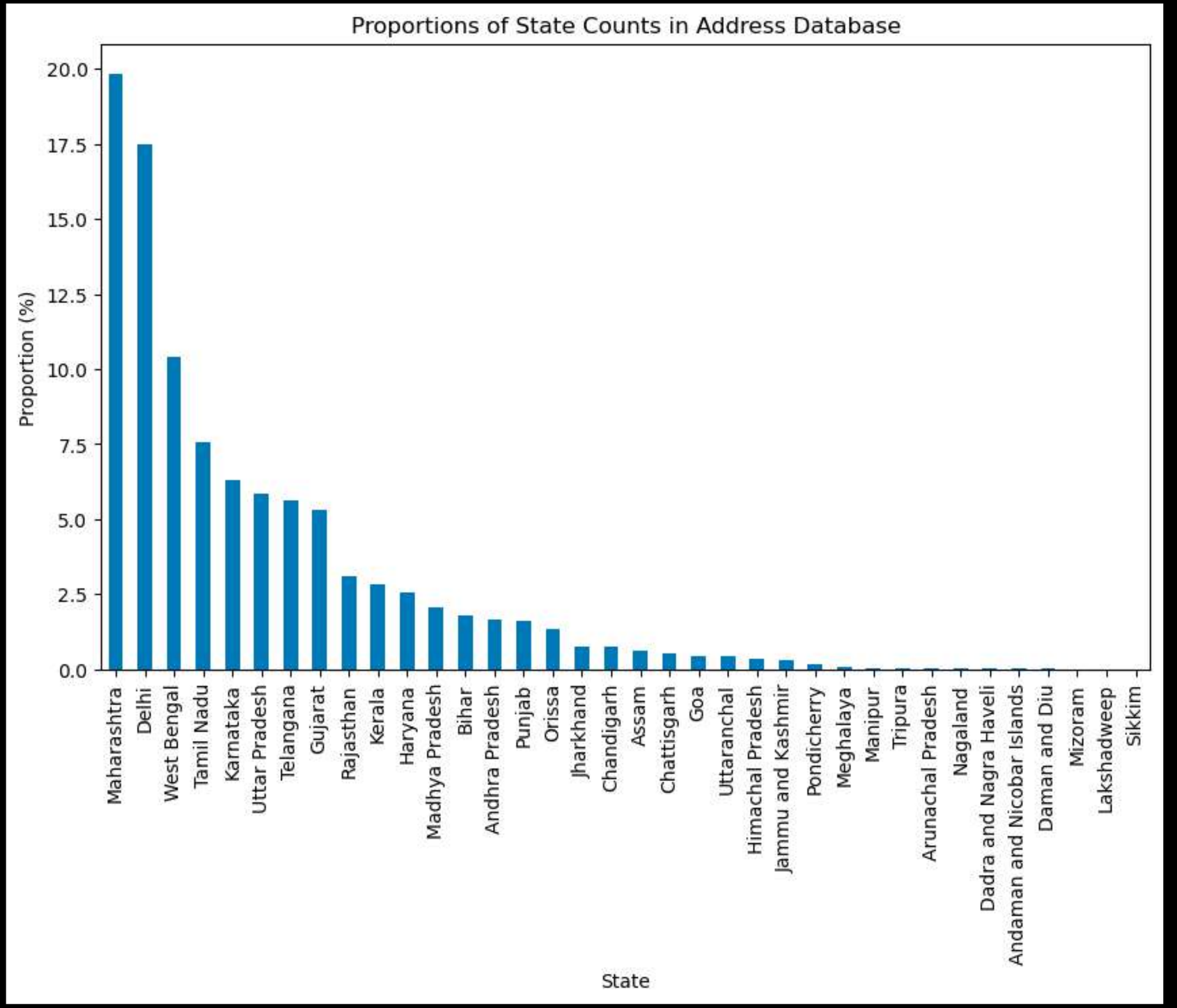


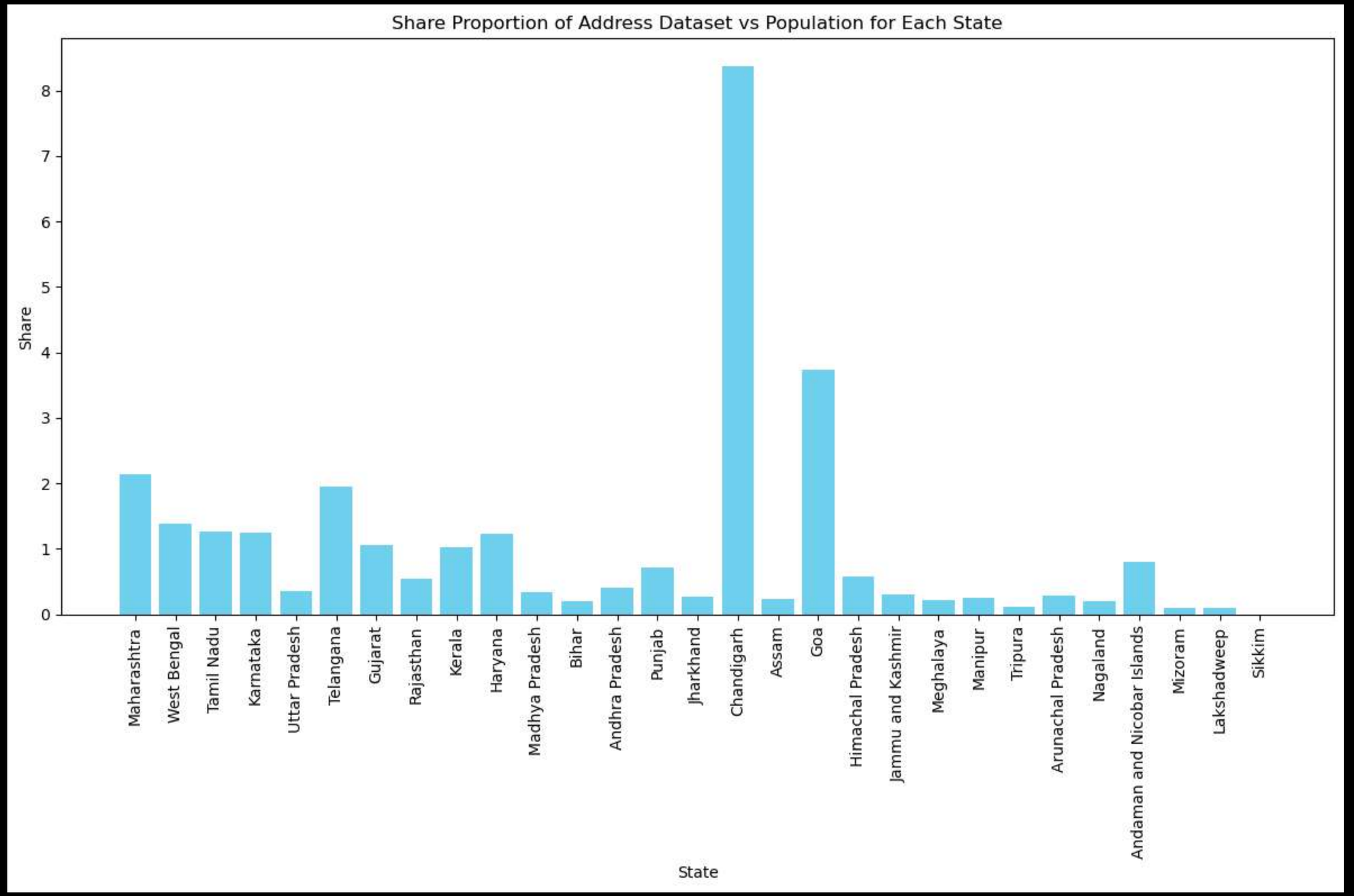

train/box_loss
train/cls_loss
results
smooth
train/dfl_loss
metrics/precision(B)
metrics/recall(B)
val/box_loss
val/cls_loss
val/dfl_loss
metrics/mAP50(B)
metrics/mAP50-95(B)

Dataset of Indian Names and Addresses

Indian Names ~ 60 Thousand Unique Names

Indian Addresses ~ 20 Lakh Indian Addresses


Proportions of State Counts in Address Database
Proportion (%)
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
Maharashtra
Delhi
West Bengal
Tamil Nadu
Karnataka
Uttar Pradesh
Telangana
Gujarat
Rajasthan
Kerala
Haryana
Madhya Pradesh
Bihar
Andhra Pradesh
Punjab
Orissa
Jharkhand
Chandigarh
Assam
Chattisgarh
Goa
Uttaranchal
Himachal Pradesh
Jammu and Kashmir
Pondicherry
Meghalaya
Manipur
Tripura
Arunachal Pradesh
Nagaland
Dadra and Nagra Haveli
Andaman and Nicobar Islands
Daman and Diu
Mizoram
Lakshadweep
Sikkim
State

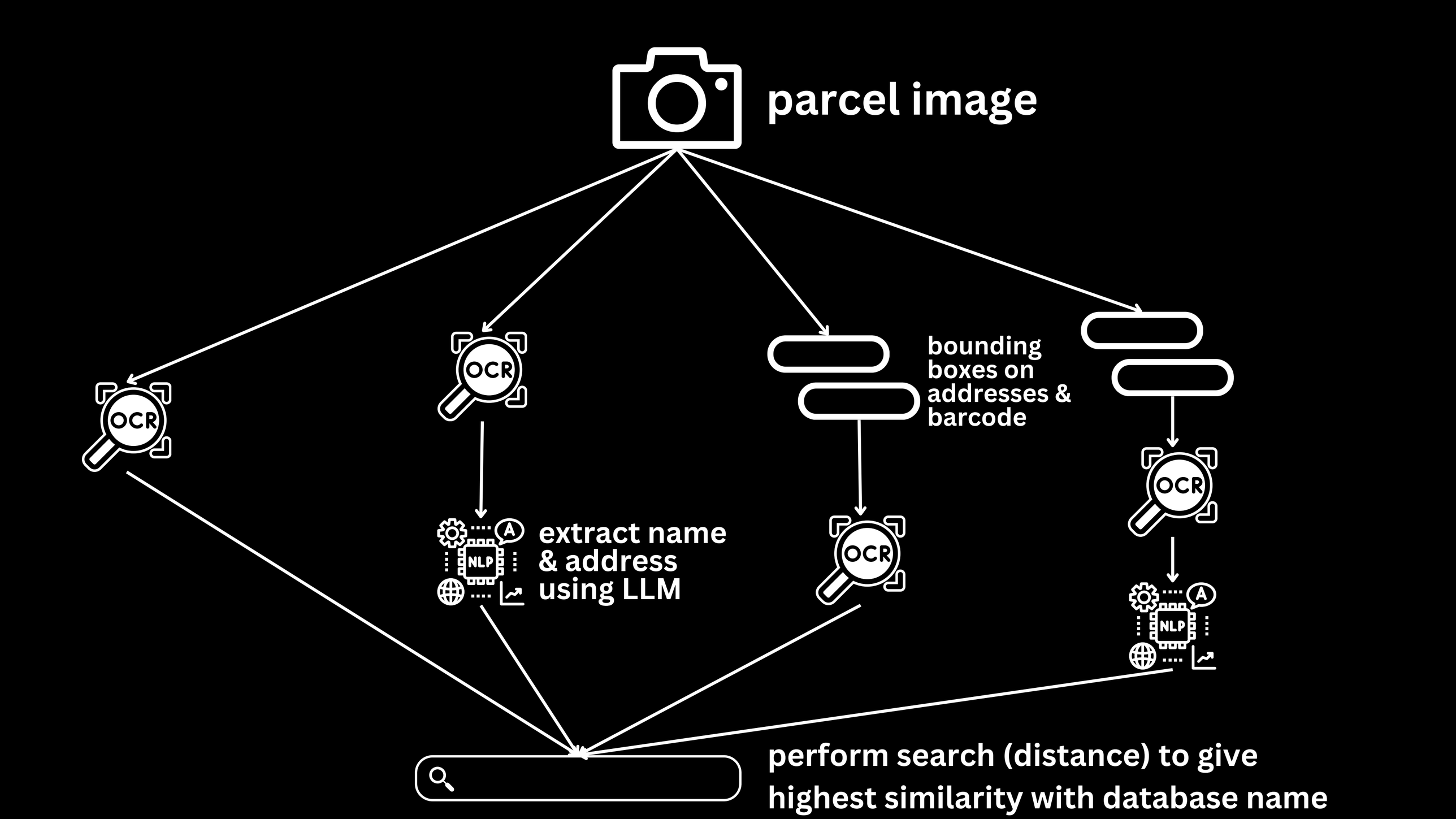

Share Proportion of Address Dataset vs Population for Each State
Share
0
1
2
3
4
5
6
7
8
Maharashtra
West Bengal
Tamil Nadu
Karnataka
Uttar Pradesh
Telangana
Gujarat
Rajasthan
Kerala
Haryana
Madhya Pradesh
Bihar
Andhra Pradesh
Punjab
Jharkhand
Chandigarh
Assam
Goa
Himachal Pradesh
Jammu and Kashmir
Meghalaya
Manipur
Tripura
Arunachal Pradesh
Nagaland
Andaman and Nicobar Islands
Mizoram
Lakshadweep
Sikkim
State

Infinite Dataset Glitch!!

Generate multiple template images for courier companies.

Bounding boxes can be automatically drawn as we know the exact place of barcode and address placement and applying same transformation on them.

Train YOLOv8 Network with this huge dataset!


parcel image
OCR
OCR
bounding boxes on addresses & barcode
OCR
NLP
extract name & address using LLM
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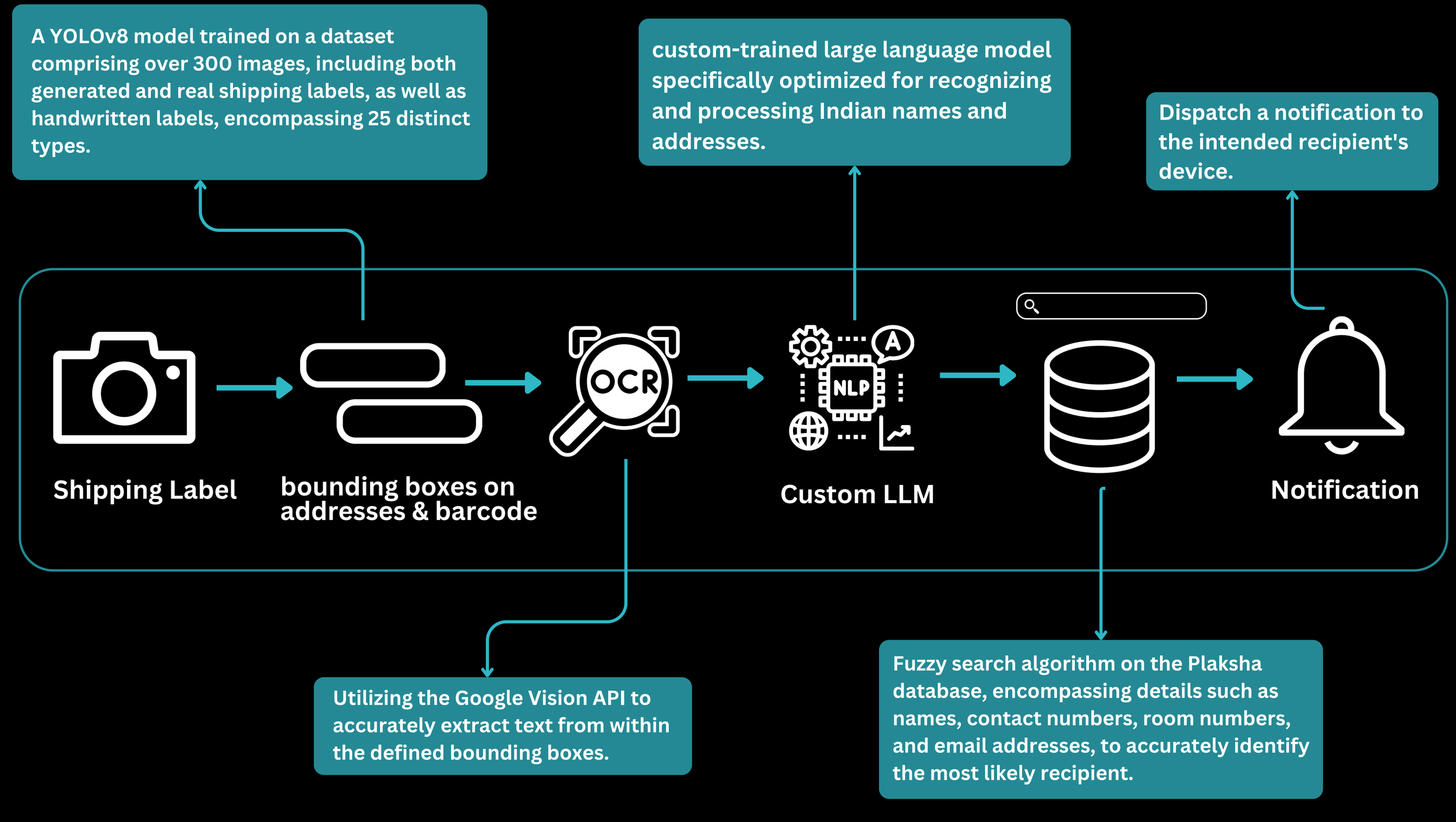
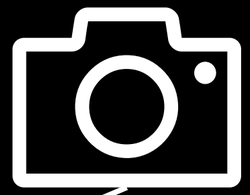
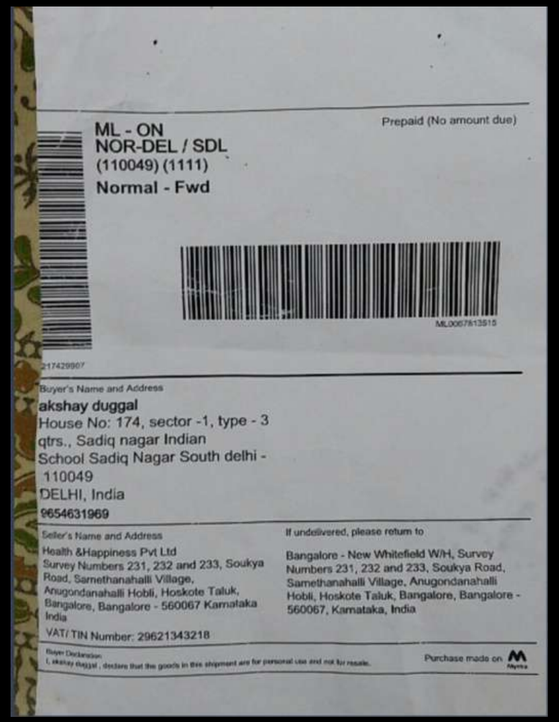
NLP
perform search (distance) to give highest similarity with database name


A YOLOv8 model trained on a dataset comprising over 300 images, including both generated and real shipping labels, as well as handwritten labels, encompassing 25 distinct types.
custom-trained large language model specifically optimized for recognizing and processing Indian names and addresses.
Dispatch a notification to the intended recipient's device.
OCR
NLP
A
Shipping Label
bounding boxes on addresses & barcode
Custom LLM
Notification
Utilizing the Google Vision API to accurately extract text from within the defined bounding boxes.
Fuzzy search algorithm on the Plaksha database, encompassing details such as names, contact numbers, room numbers, and email addresses, to accurately identify the most likely recipient.

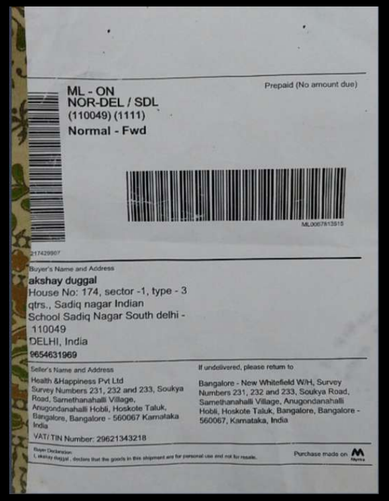


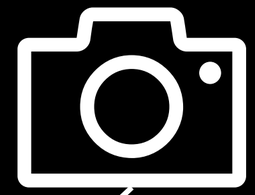
parcel image



perform search (distance) to give highest similarity with database fields

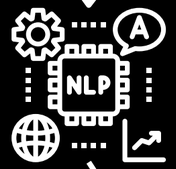
"217429907
ML-ON
NOR-DEL / SDL
(110049) (1111)
Normal - Fwd
Buyer's Name and Address
akshay duggal
House No: 174, sector -1, type - 3
qtrs., Sadiq nagar Indian
School Sadiq Nagar South delhi -
110049
DELHI, India
9654631969
Seller's Name and Address
Health &Happiness Pvt Ltd
Survey Numbers 231, 232 and 233, Soukya
Road, Samethanahalli Village,
Anugondanahalli Hobli, Hoskote Taluk,
Bangalore, Bangalore-560067 Karnataka
India
VAT/ TIN Number: 29621343218
Prepaid (No amount due)
Buyer Declaration
akshay duggal, declare that the goods in this shipment are for personal use and not for resale.
ML0067813515
If undelivered, please return to
Bangalore New Whitefield W/H, Survey
Numbers 231, 232 and 233, Soukya Road,
Samethanahalli Village, Anugondanahalli
Hobli, Hoskote Taluk, Bangalore, Bangalore -
560067, Karnataka, India
Purchase made on M
Myntra 217429907 ML - ON NOR - DEL / SDL (110049) (1111) Normal - Fwd Buyer's Name and Address akshay duggal House No : 174 , sector -1 , type - 3 qtrs . , Sadiq nagar Indian School Sadiq Nagar South delhi - 110049 DELHI , India 9654631969 Seller's Name and Address Health & Happiness Pvt Ltd Survey Numbers 231 , 232 and 233 , Soukya Road , Samethanahalli Village , Anugondanahalli Hobli , Hoskote Taluk , Bangalore , Bangalore - 560067 Karnataka India VAT / TIN Number : 29621343218 Prepaid (No amount due) Buyer Declaration akshay duggal , declare that the goods in this shipment are for personal use and not for resale . ML0067813515 If undelivered , please return to Bangalore New Whitefield W / H , Survey Numbers 231 , 232 and 233 , Soukya Road , Samethanahalli Village , Anugondanahalli Hobli , Hoskote Taluk , Bangalore , Bangalore - 560067 , Karnataka , India Purchase made on M Myntra"





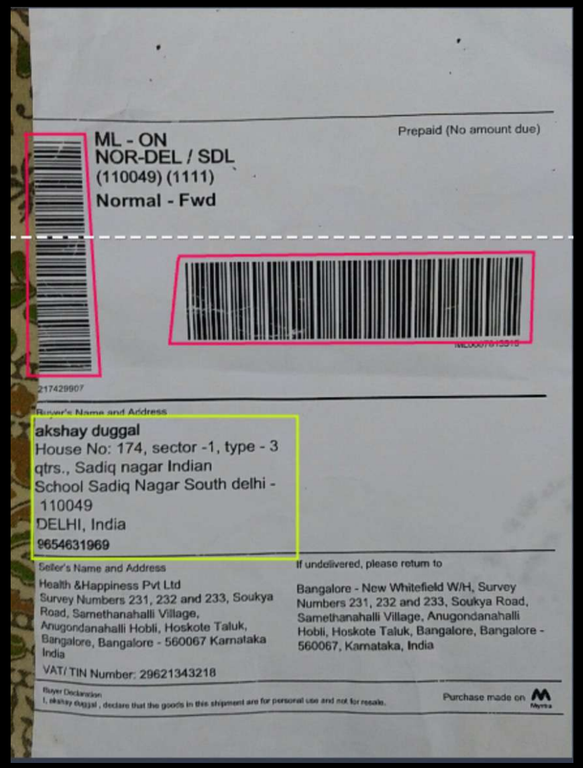
parcel image

Recipient Name: Akshay Duggal
Recipient Address: House No: 174, Sector -1, Type - 3 qtrs., Sadiq Nagar Indian School Sadiq Nagar South Delhi - 110049, Delhi, India

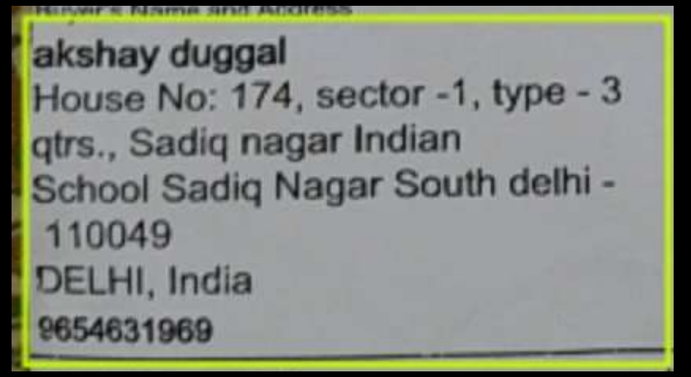


extract name & address using LLM

perform search (distance) to give highest similarity with database name



parcel image

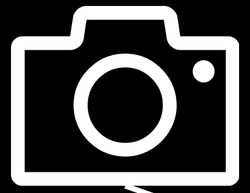


bounding boxes on addresses & barcode

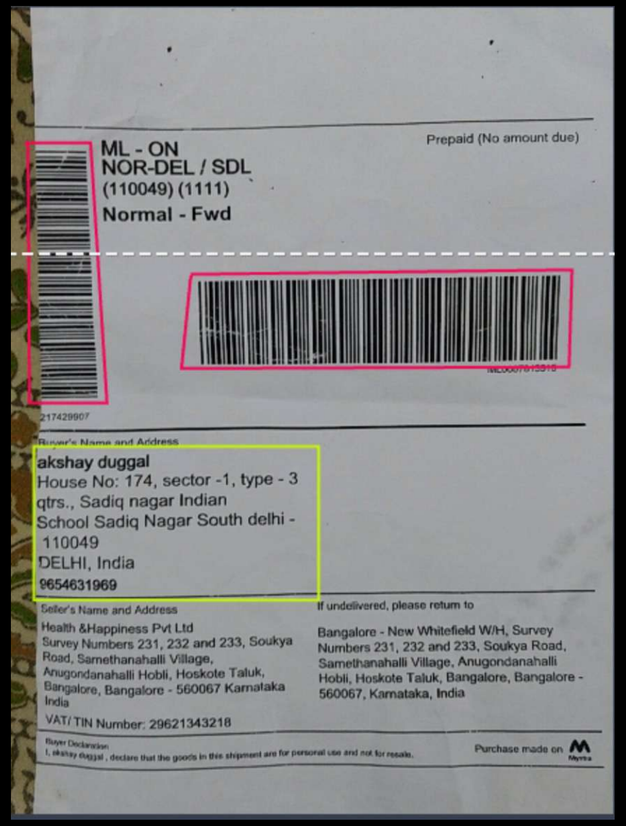
Akshay Duggal
House No: 174, Sector -1, Type - 3 qtrs., Sadiq Nagar Indian School Sadiq Nagar South Delhi - 110049, Delhi, India
9654631969

OCR

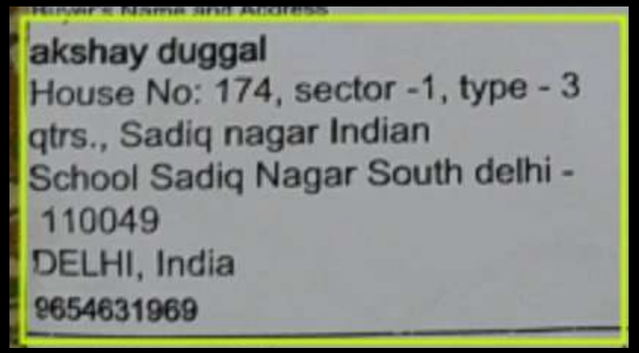
perform search (distance) to give highest similarity with database name



parcel image

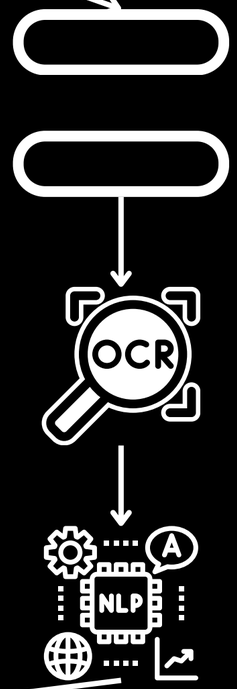


cropped address\



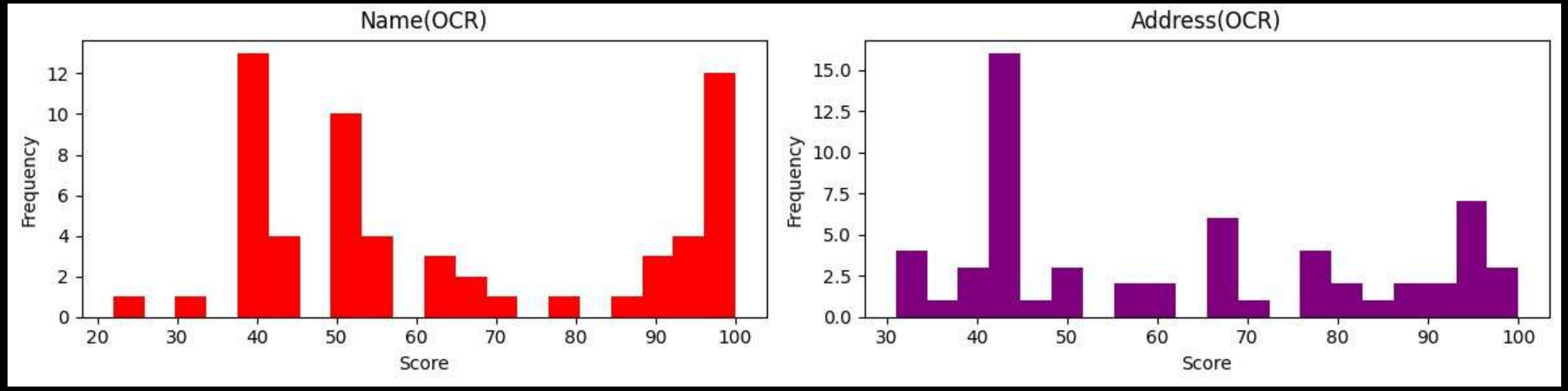
Recipient Name: Akshay Duggal
Recipient Address: House No: 174, Sector -1, Type - 3 qtrs., Sadiq Nagar Indian School Sadiq Nagar South Delhi - 110049, Delhi, India

bounding boxes on addresses & barcode

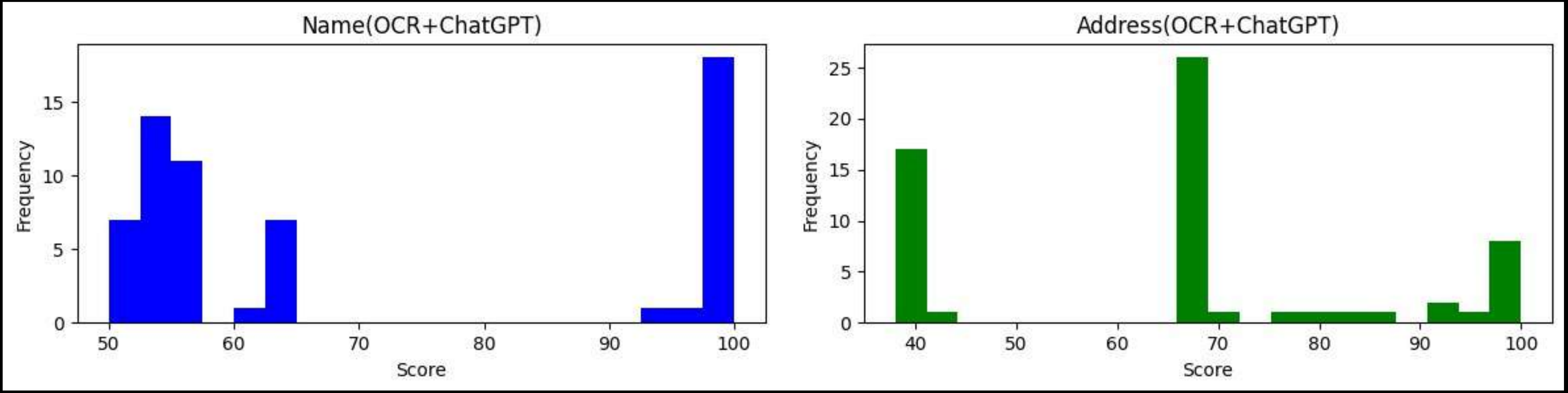


perform search (distance) to give highest similarity with database name

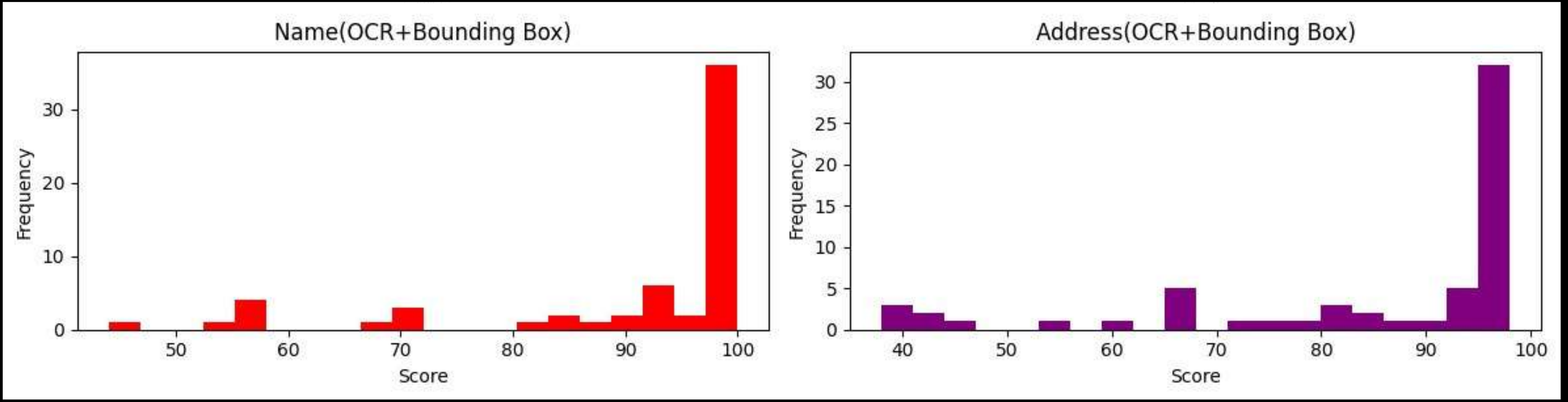
Plain OCR


Name(OCR)
Frequency
Score
0
2
4
6
8
10
12
20
30
40
50
60
70
80
90
100
Address(OCR)
Frequency
Score
0.0
2.5
5.0
7.5
10.0
12.5
15.0
30
40
50
60
70
80
90
100

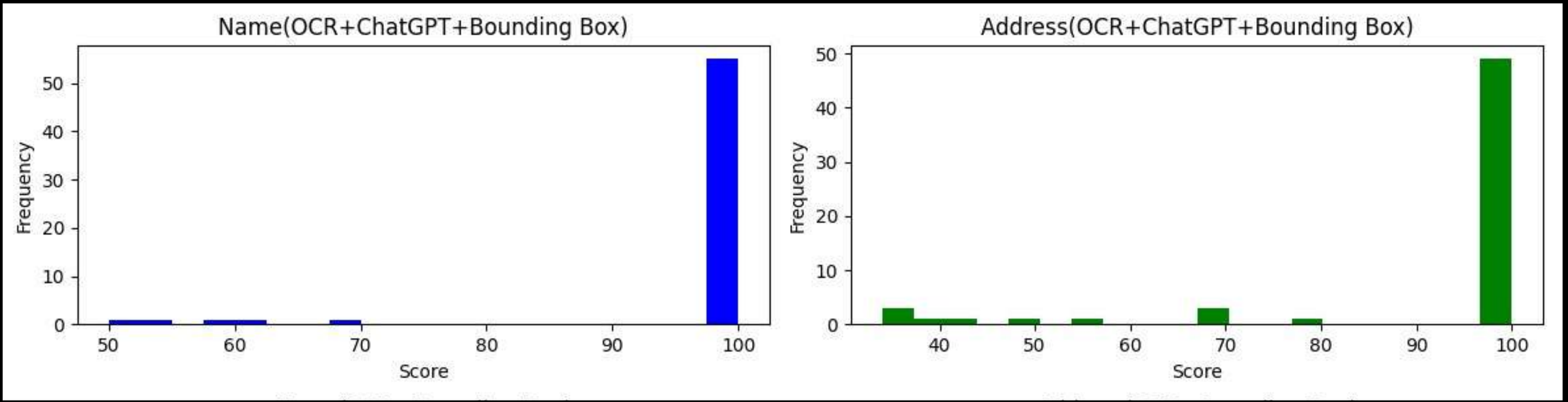
OCR + GPT (name & address extraction)



Bounding Box + OCR



Bounding Box + OCR + GPT (name & address extraction)

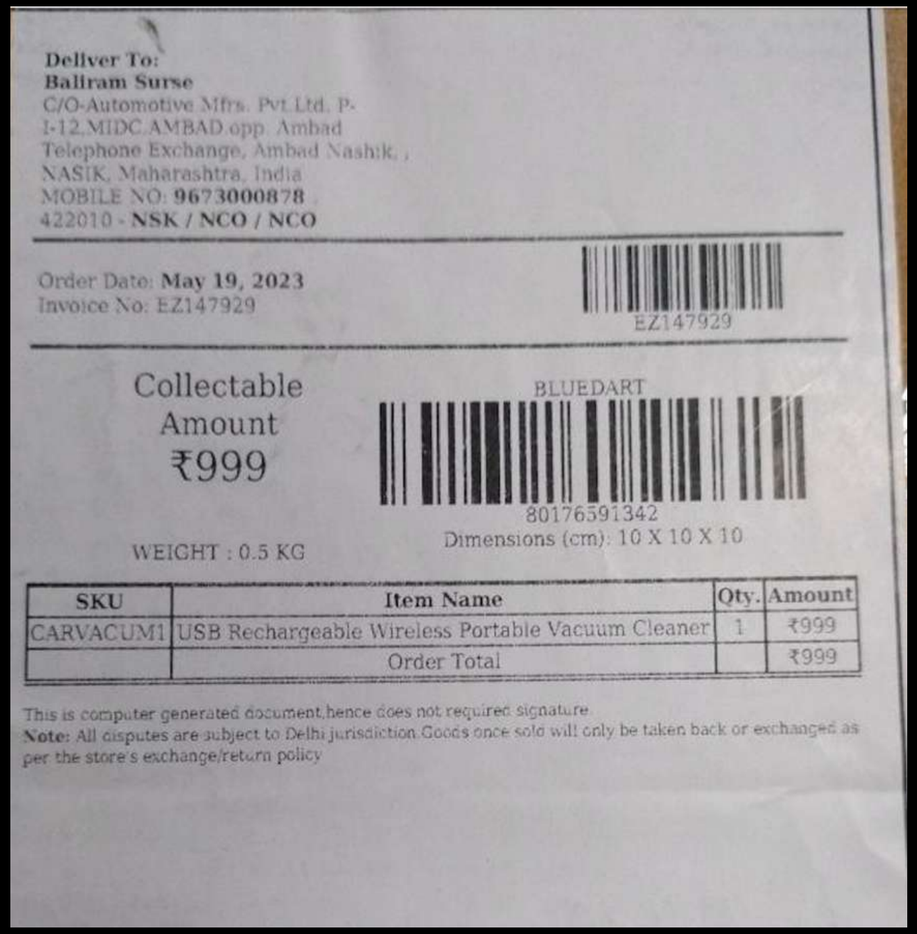


GPT Bias

Recipient name: Mukhametova Irina Rashidovna
Address: Novocheremushkinskaya ul. 87k1.57 korpus 1, Novocheremushkinskaya ulitsa, Yugo-Zapadnyy, administrativnyy okrug 114, Russia

Recipient Name: NOON GAIKWAD
Recipient Address: 304 ANN Heritage CHS Plot No 278/5, Market Yard Road, Behand Laxmi Byo Institute, Near Karnala Bhavan, PANVEL-410206, AMS Heritage CO OP HSG.Society., Panvel- Navi Mumbai, MH, India.

GPT Bias



Deliver To:
Baliram Surse
C/O-Automotive Mfrs. Pvt Ltd. P-
I-12.MIDC.AMBAD.opp. Ambad
Telephone Exchange, Ambad Nashik, ,
NASIK, Maharashtra, India
MOBILE NO: 9673000878 ,
422010 - NSK / NCO / NCO

Order Date: May 19, 2023
Invoice No: EZ147929

EZ147929

Collectable Amount
₹999

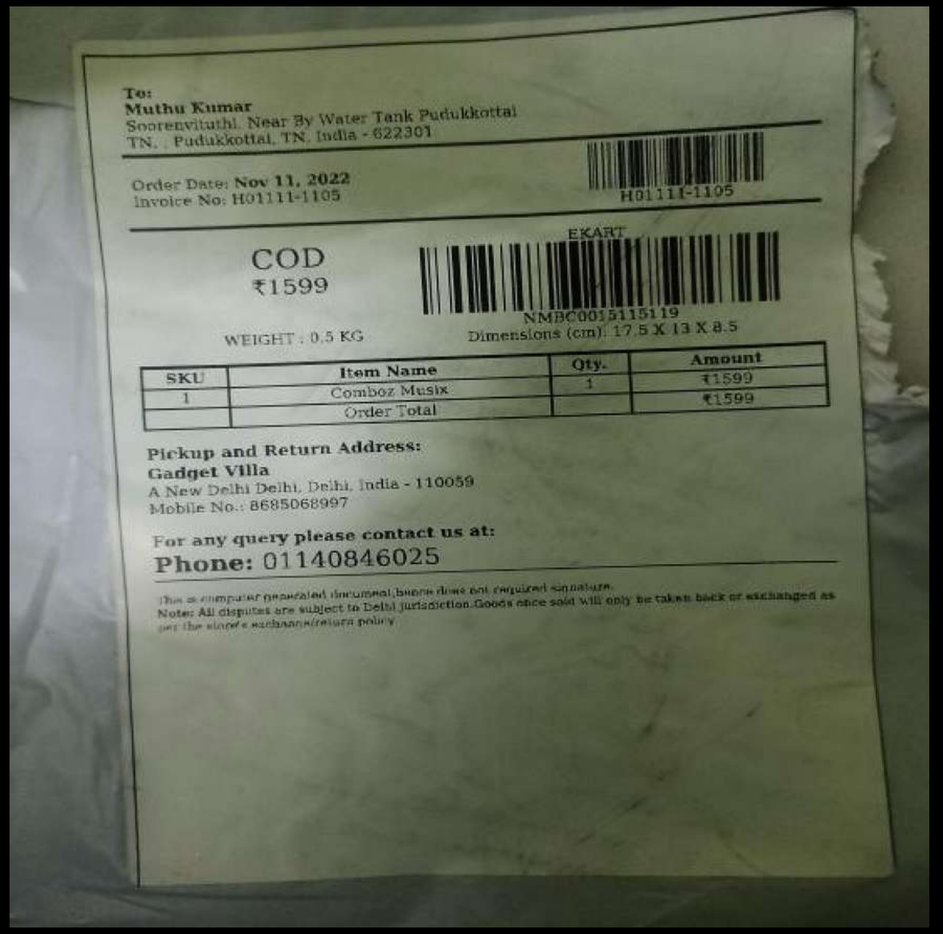
BLUEDART
80176591342

WEIGHT : 0.5 KG
Dimensions (cm): 10 X 10 X 10

SKU	Item Name	Qty.	Amount
CARVACUM1	USB Rechargeable Wireless Portable Vacuum Cleaner	1	₹999
	Order Total		₹999

This is computer generated document,hence does not required signature.
Note: All disputes are subject to Delhi jurisdiction.Goods once sold will only be taken back or exchanged as per the store's exchange/return policy

Recipient Name: Baliram Nashik
Recipient Address: C/O - Automotive Mfrs. Pvt Ltd. P. 1-12.MIDC AMBAD.opp. Ambad Telephone Exchange, Ambad Nashik, NASIK, Maharashtra, India



To:
Muthu Kumar
Soorenvituthl. Near By Water Tank Pudukkottai
TN. , Pudukkottai, TN, India - 622301

Order Date: Nov 11, 2022
Invoice No: H01111-1105

H01111-1105

COD
₹1599

EKART
NMBC0015115119

WEIGHT : 0.5 KG
Dimensions (cm): 17.5 X 13 X 8.5

SKU	Item Name	Qty.	Amount
1	Comboz Mesix	1	₹1599
	Order Total		₹1599

Pickup and Return Address:
Gadget Villa
A New Delhi Delhi, Delhi, India - 110059
Mobile No.: 8685068997

For any query please contact us at:
Phone: 01140846025

This is computer generated document,hence does not required signature.
Note: All disputes are subject to Delhi jurisdiction.Goods once sold will only be taken back or exchanged as per the store's exchange/return policy

Recipient Name: Tot Muthu Kumar
Recipient Address: Soorenvituthl. Near By Water Tank Pudukkottai, TN. Pudukkottai, TN, India -622301

Beyond Plaksha...

a single return could cost about ₹50-150 depending on the size of the parcel.

Unregistered Post ~ 450+ Crores

Registered Post ~ 50+ Crores

NO TRACKING NO RECEIPT NO UPDATES

Falcon 7B is a large language model developed by the Technology Innovation Institute. It's a 7 billion parameters causal decoder-only model, which has been trained on 1,500 billion tokens from a dataset known as RefinedWeb, enhanced with curated corpora.

Falcon-7B

1.5 trillion

Falcon-40B requires ~90GB of GPU memory — that’s a lot, but still less than LLaMA-65B, which Falcon outperforms. On the other hand, Falcon-7B only needs ~15GB, making inference and finetuning accessible even on consumer hardware