ENHANCED INTEGRATED MULTIMODEL FOR MEDICINE DETECTION, TEXT EXTRACTION, AND DUPLICATE RECOGNITION USING YOLOV8 AND PADDLEOCR

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ABSTRACT

This paper introduces an advanced integrated model that merges YOLOv8 for medicine detection and PaddleOCR for text extraction, facilitating efficient identification of pharmaceuticals and extraction of critical information (batch number, MRP, expiration date), while flagging duplicate entries. It includes detailed training, confusion matrix analysis, and prediction images to demonstrate its efficacy in pharmaceutical applications.

I.   INTRODUCTION

Efficient identification and data extraction from medicine packages are pivotal in pharmaceutical management. This paper presents a model that employs YOLOv8 for accurate medicine identification and PaddleOCR for precise text extraction, followed by the detection of duplicate entries.

1. YOLOv8 Model for Medicine Detection:

Utilizing YOLOv8's exceptional accuracy and real-time object detection capabilities, the model efficiently localizes medicines in images. Custom-trained on a diverse medicine dataset, the model precisely identifies medicine containers, enabling subsequent text extraction.

2. Model Training:

The model is trained on a 10GB dataset for custom area detection, using yolov8s.pt as the pre-trained model. With a batch size of 32 and 14 training epochs, it demonstrates improved performance, especially in predicting new types of medicine strips.

epoch	train/box_loss	train/cls_loss	train/dfl_loss	metrics/precision(B)	metrics/recall(B)	metrics/mAP50(B)	metrics/mAP50-95(B)	val/box_loss	val/cls_loss	val/dfl_loss	lr/pg0	lr/pg1	lr/pg2
0	1.5768	1.726	1.4549	0.8905	0.90552	0.94345	0.62535	1.2078	0.70583	1.1493	0.070145	0.0033172	0.0033172
1	1.2175	0.77677	1.151	0.94888	0.97483	0.98845	0.68603	1.0986	0.55688	1.0919	0.039706	0.0062116	0.0062116
2	1.1855	0.74453	1.1356	0.85779	0.79834	0.89091	0.57852	1.2178	0.8791	1.1726	0.0088271	0.008666	0.008666
3	1.1874	0.75355	1.1444	0.91944	0.93513	0.96542	0.66615	1.1157	0.65556	1.111	0.00802	0.00802	0.00802
4	1.139	0.69915	1.1337	0.95635	0.97059	0.98701	0.69176	1.051	0.58167	1.0761	0.00802	0.00802	0.00802
5	1.1175	0.64179	1.1532	0.94041	0.92857	0.97288	0.65362	1.1684	0.64055	1.1528	0.00736	0.00736	0.00736
6	1.097	0.61114	1.136	0.95647	0.92437	0.97827	0.66716	1.146	0.62844	1.1157	0.0067	0.0067	0.0067
7	1.023	0.56704	1.0981	0.94472	0.93487	0.98229	0.69291	1.0769	0.56881	1.098	0.00604	0.00604	0.00604
8	0.9589	0.52295	1.0561	0.97713	0.9937	0.99351	0.77577	0.86894	0.45835	0.98754	0.00538	0.00538	0.00538
9	0.89729	0.48017	1.027	0.98311	0.9916	0.98952	0.79508	0.79449	0.4102	0.95892	0.00472	0.00472	0.00472
10	0.83154	0.44393	0.99444	0.99357	0.9937	0.99348	0.80974	0.76858	0.38413	0.94616	0.00406	0.00406	0.00406
11	0.76863	0.40621	0.96394	0.99166	1	0.99447	0.83264	0.70342	0.36097	0.92385	0.0034	0.0034	0.0034
12	0.72069	0.38066	0.94594	0.99579	0.99393	0.99498	0.84203	0.68327	0.34156	0.90522	0.00274	0.00274	0.00274
13	0.6559	0.34881	0.91486	0.99989	1	0.995	0.87454	0.58178	0.30548	0.87294	0.00208	0.00208	0.00208
14	0.60005	0.32275	0.89881	1	0.99606	0.995	0.88775	0.54582	0.28263	0.86178	0.00142	0.00142	0.00142

train/box_loss

train/cls_loss

train/dfl_loss
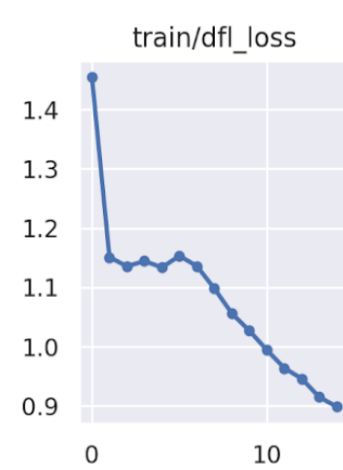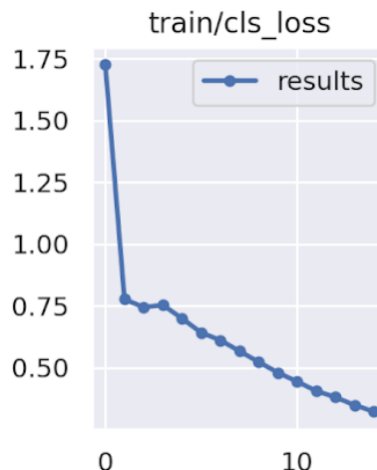
3. PaddleOCR for Text Extraction:

Following YOLOv8's localization, PaddleOCR extracts crucial information (batch number, MRP, expiration date) from identified regions. Its robustness in recognizing diverse text styles ensures accurate extraction of vital details.

Duplicate Text Recognition To prevent redundancy in extracted text, the model employs a mechanism to compare the extracted text with existing records. By implementing similarity analysis, the system identifies and flags instances where similar text has been previously recorded. This functionality aids in avoiding duplicate entries and ensures data integrity.

4. Duplicate Text Recognition:

To ensure data integrity, the model compares extracted text with existing records, flagging instances of redundancy. This functionality prevents duplicate entries, enhancing data reliability.

5. Implementation and Results:

The integrated model is evaluated on a diverse medicine image dataset, showcasing high accuracy in medicine detection. Real-world scenarios highlight its effectiveness in streamlining pharmaceutical data management.
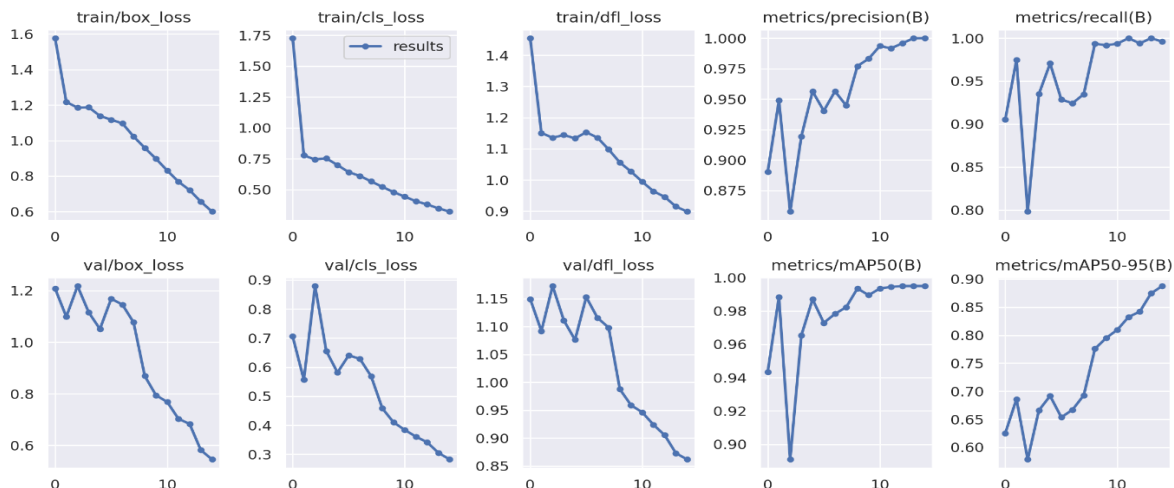
II.   CONFUSION MATRIX AND MODEL PERFORMANCE

This section comprehensively analyzes model performance using precision, recall, and F1-score metrics, especially focusing on medicine detection categories.
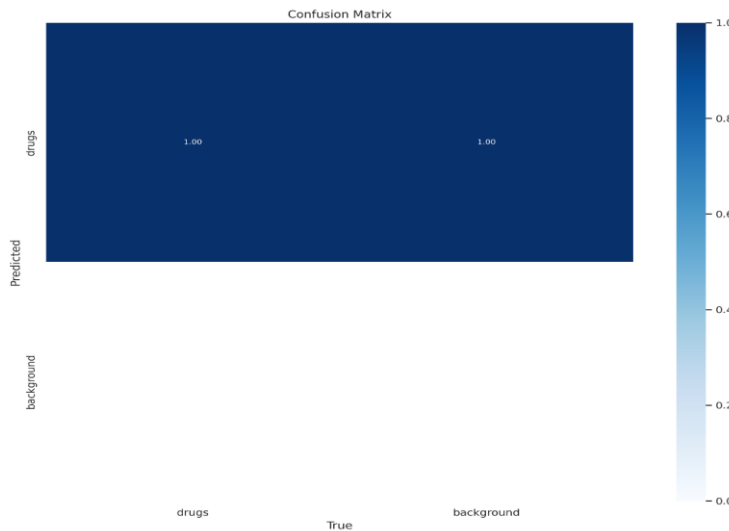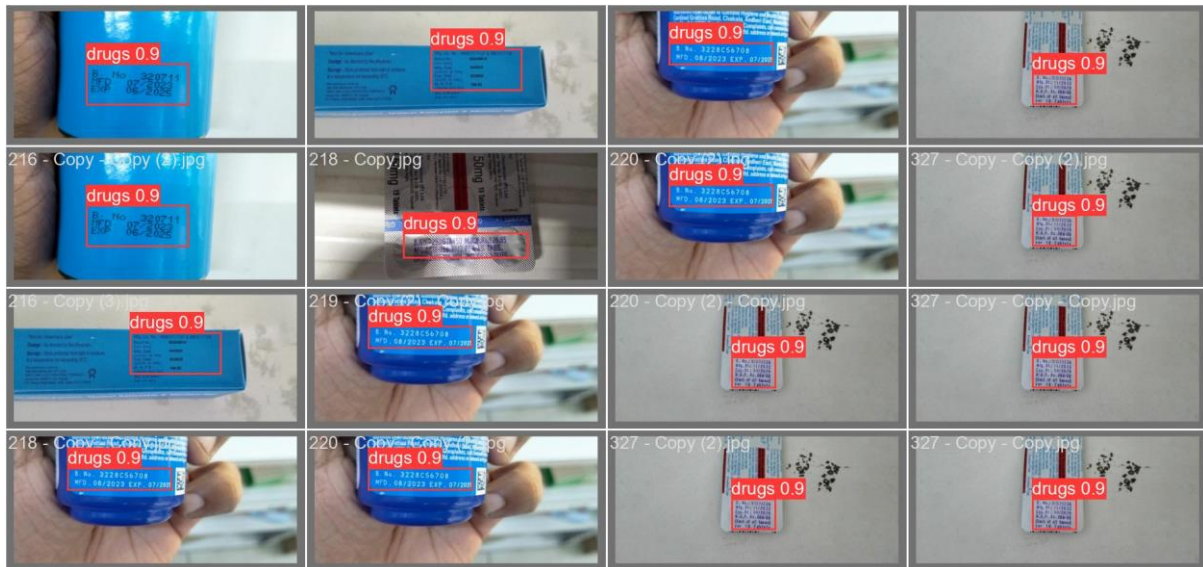

III.   MODEL RESULT

Presenting sample prediction images exemplifying the model's accuracy in medicine detection and text extraction.

Sample Of prediction Images

IV.   CONCLUSION

The integrated model leveraging YOLOv8 and PaddleOCR demonstrates potential in pharmaceutical data processing, ensuring efficient identification, information extraction, and data integrity maintenance.

V.   FUTURE WORK

Future enhancements aim to improve performance by incorporating additional features, diversifying training data, and advancing duplicate text recognition techniques, extending the model's applicability in broader pharmaceutical domains.

VI.   REFERENCES

[1]   https://github.com/PaddlePaddle/PaddleOCR/

[2]   Home - Ultralytics YOLOv8 Docs