REAL-WORLD CHESS POSITION RECOGNITION USING DEEP LEARNING

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Problem

- Real-world challenges: Perspective distortion, lighting, orientation.

- Our Goal: Photo → FEN String → Stockfish Engine

Our Methodology

- 1 – Piece Detection

- 2 – Corner Detection & Warping

- 3 – Orientation with OCR

- 4 – FEN and Stochfish Engine

Piece Detection

- We tried to identify all pieces and their classes (12 Classes).

- We trained YOLOv11s and RT-DETR models.

- We extended the Chess Pieces Dataset (9500 images) from Roboflow using photos we took

Original Image

Results

YOLOv11 Prediction
(best.pt)

RT-DETR Prediction
(best.pt)

mAP50 = 0.891

mAP50 = 0.879

Corner Detection

- Dataset: We labeled more than 1000 images manually (Ordered corners: a1-a8-h1-h8).

- Approach 1 (Failed):ResNet-18 (Regression).

    – Goal: Learn corners and orientation of the table using fixed point order.

    – Result: Low accuracy on real-world data.

- Approach 2 (Success): YOLO-Pose

    – Method: Treating board corners like "human joints."

    – Result: High precision, ready for warping

Corner Detection Results
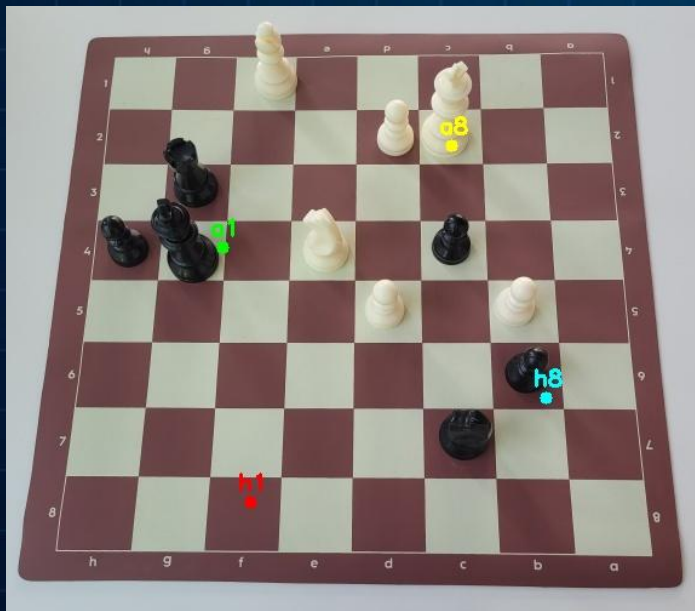
Resnet-18

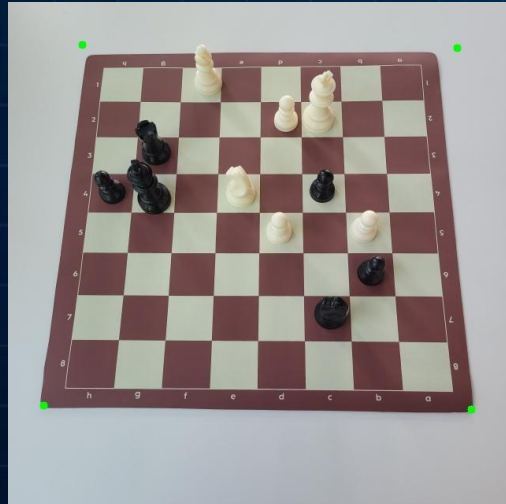Average Euclidean Error (Ordered): 0.501
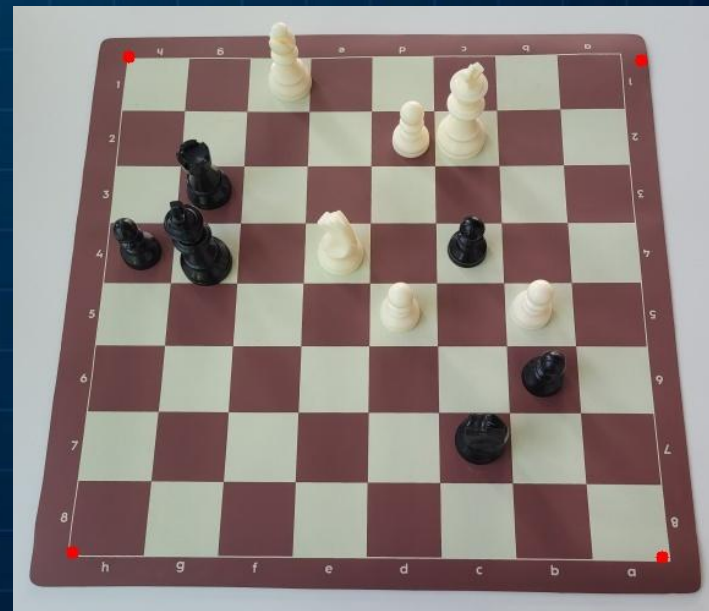
Yolo-pose

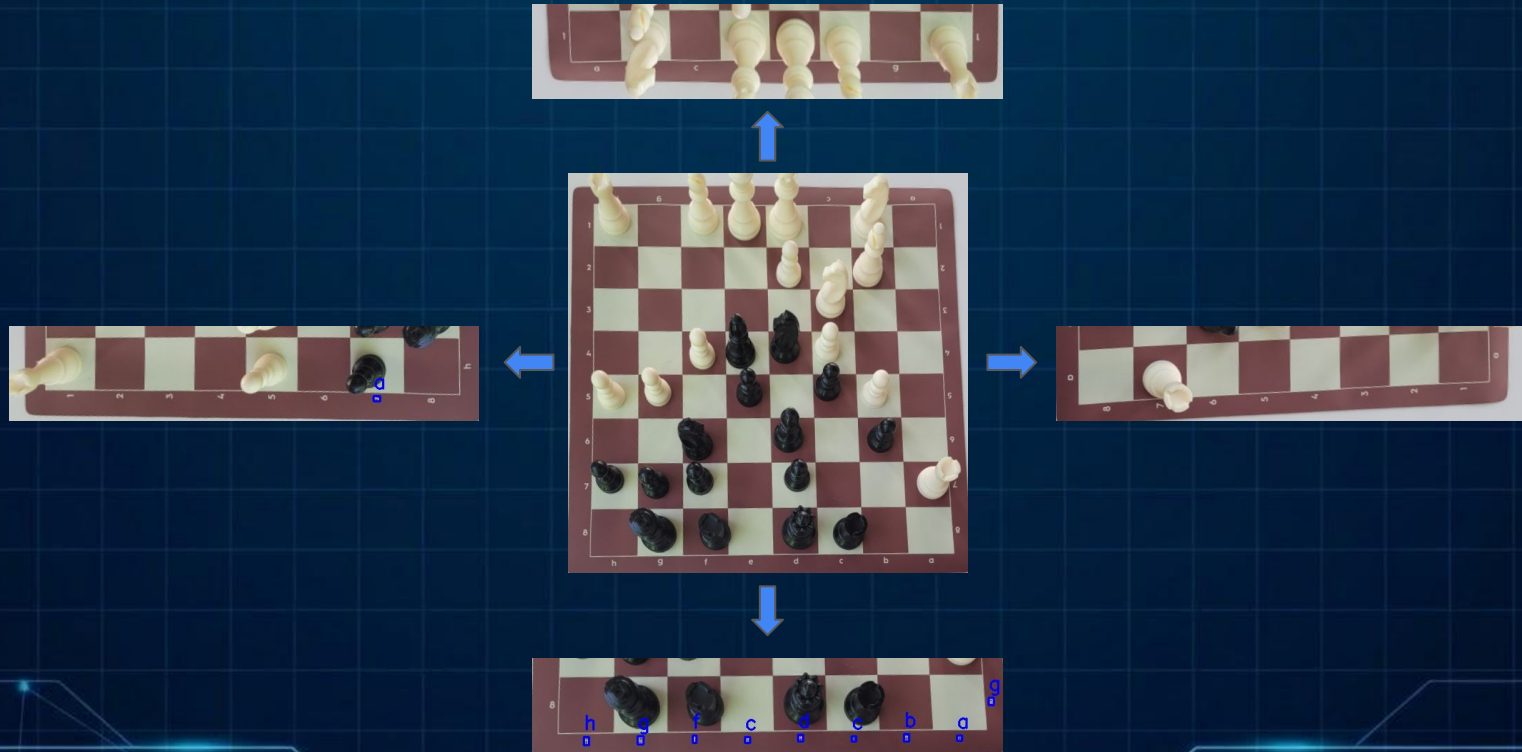Average Euclidean Error (Ordered): 0.035

Image Warping
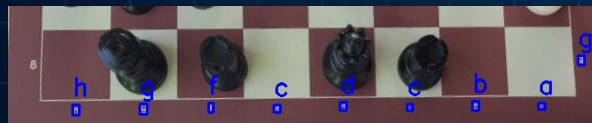
Wide Warping

- Improve corner estimate
- Orientation detection with OCR

Orientation Detection With OCR

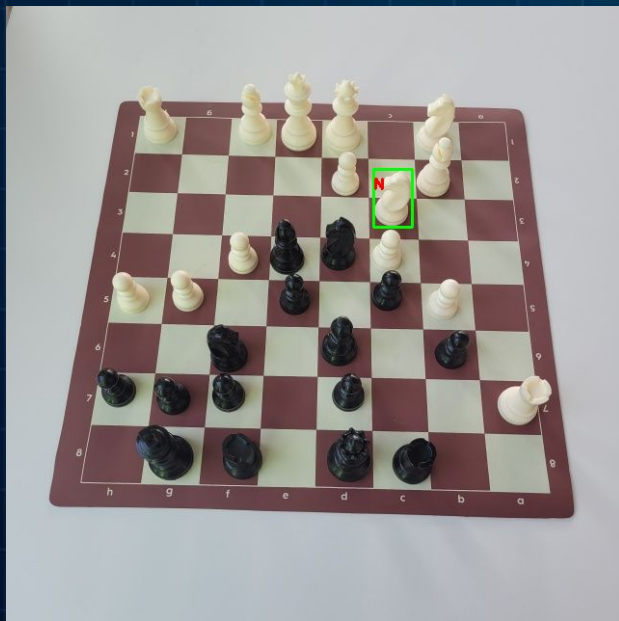# Outlier Detection With RANSAC and White Edge Estimate
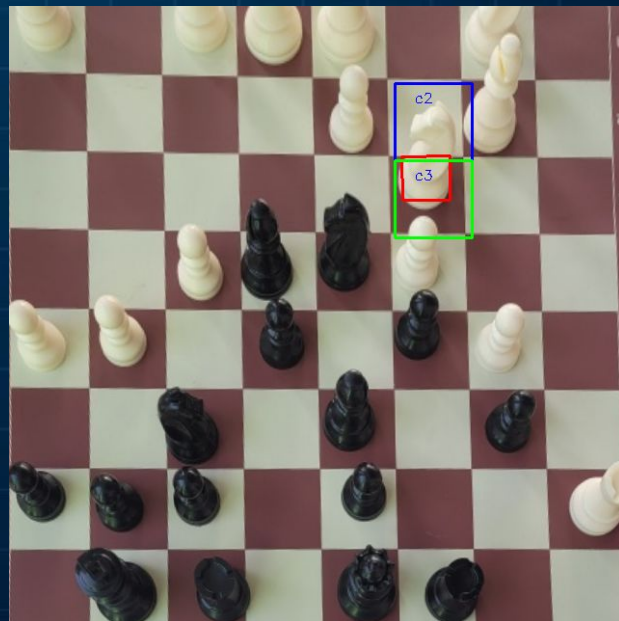

The edge with most detections

Pairwise combinations:

Normal Order: 1
Reverse Order: 26

Locating Pieces on Warped Board

YOLO Detection on Original Image

Cropped and Transformed Detection Box

FEN Generation and Stockfish Analysis

Fen notation:

2rq1rk1/R2p1ppp/
1p1b1n2/1Pp1p1PP/
2PnbP2/1RN5/
3P4/1N1QKB1R

Stockfish Analysis

For White

Best Move: Nxe4
CP: -143

For Black

Best Move: Bxh1
CP: -741

● 88% of the squares predicted correctly on test dataset

THANK YOU
Questions?