Building a Sudoku Solver

ML/AI @ SSN Coding Club: Meet 4

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Part 1: Simple Image Classifier

Scan to ask questions anonymously

...or just ask away in Teams chat!

Sudoku Solver - Structuring an ML Project

A project that uses machine learning to solve a sudoku puzzle given an image of it.

A very general overview for structuring an ML project:

1. Research how existing versions of the project work and find **limitations**, ways to improve performance (for example, improved models with faster inference).
2. Break down the problem into **smaller components**, test them separately, integrate them into a **pipeline**.
3. Finalise the pipeline, convert it from notebooks into a Python script.
4. Use a web server like Flask to make a UI that requests an image from the user and execute the pipeline to display the solved puzzle.
5. Document your code in a GitHub repo.

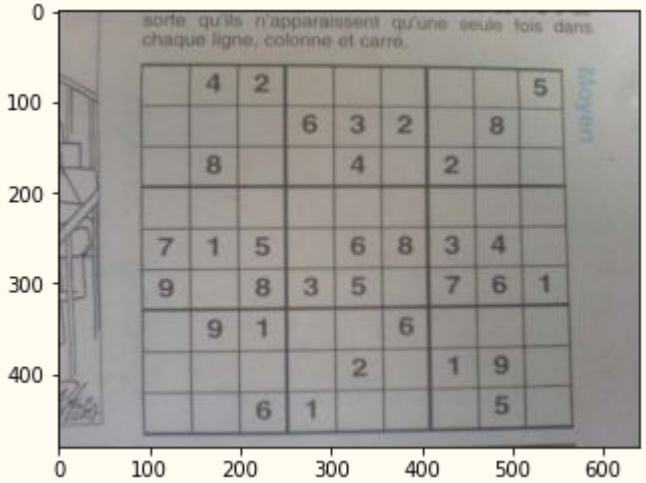
Stages in the project:

1. Finding the largest square in the image
2. Unskewing the image
3. Extracting the cells
4. Deciding if each cell contains a digit or not
5. Applying an ML model like CNN to find the digits
6. Solving the sudoku

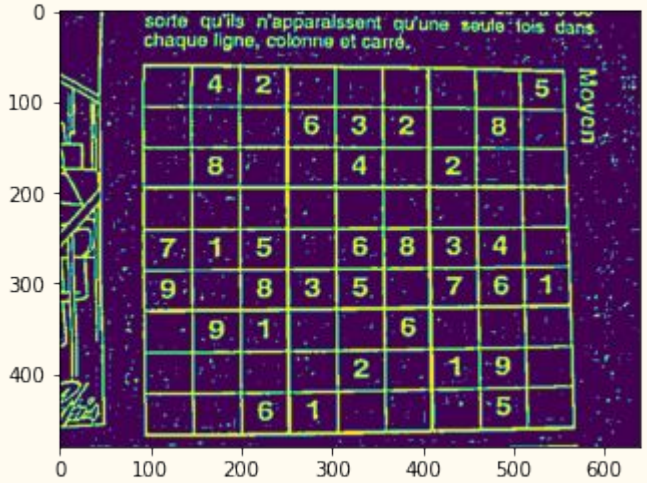
- Steps 1-3 uses Image Processing, 4 and 5 uses Machine/Deep learning, 6 uses (CP-style) algorithms.
- Steps 1-4 will be covered in this meet. 5 and 6 will be covered in the upcoming meet.

Steps 1 & 2

Original Image (Resized - 288 x 288)

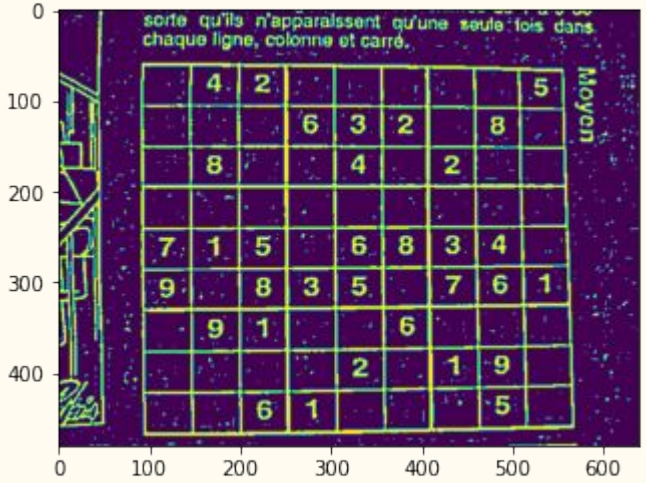


After Adaptive Thresholding

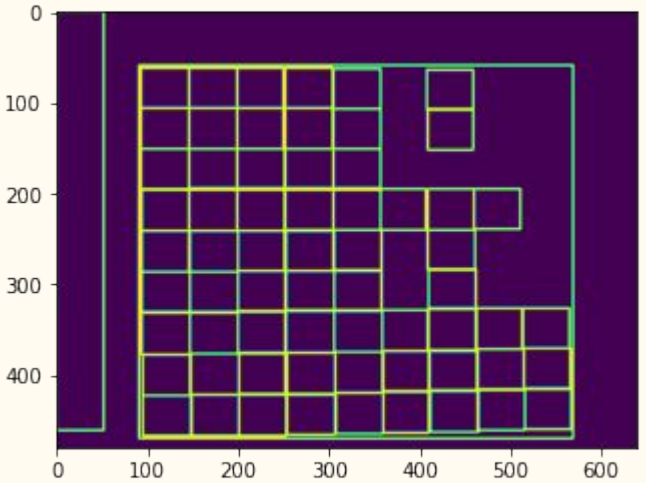


Steps 1 & 2

After Adaptive Thresholding

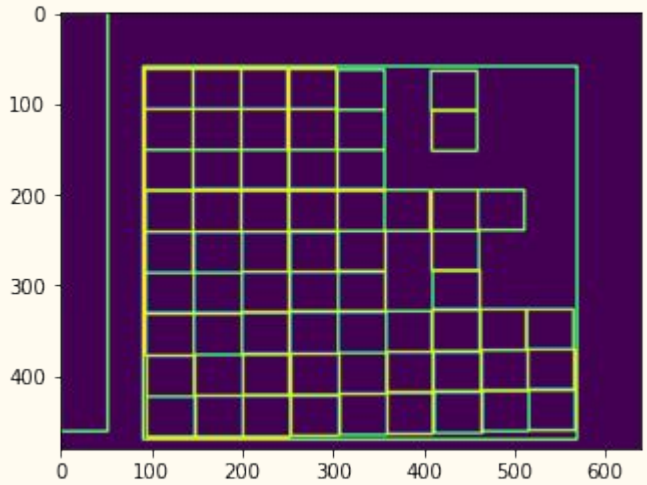


Detect All Contours. Retain Largest Few

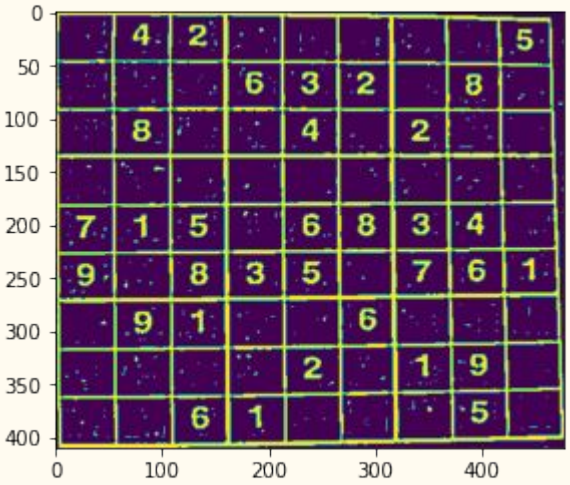


Steps 1 & 2

Detect All Contours

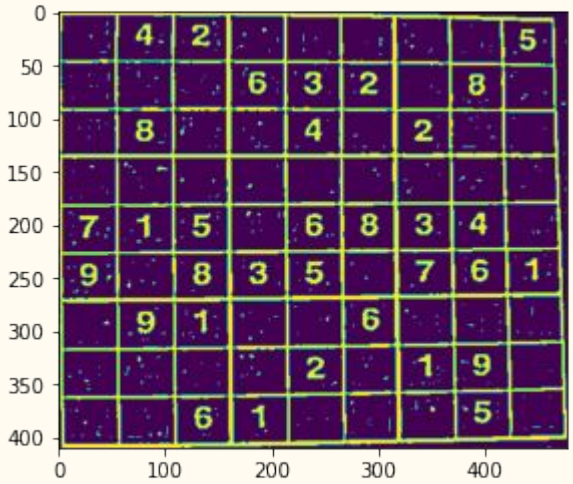


Get the largest rectangular contour. That's the sudoku box!

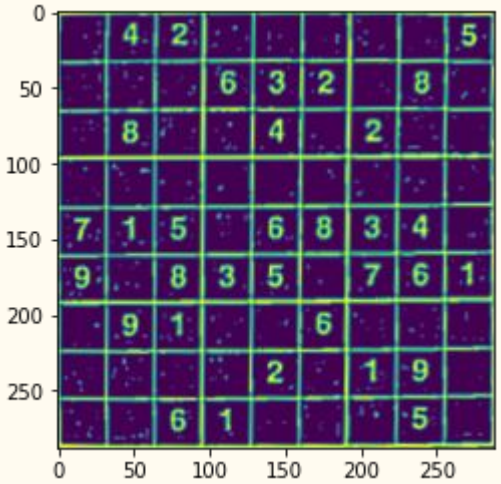


Steps 1 & 2

Skewed Sudoku Box



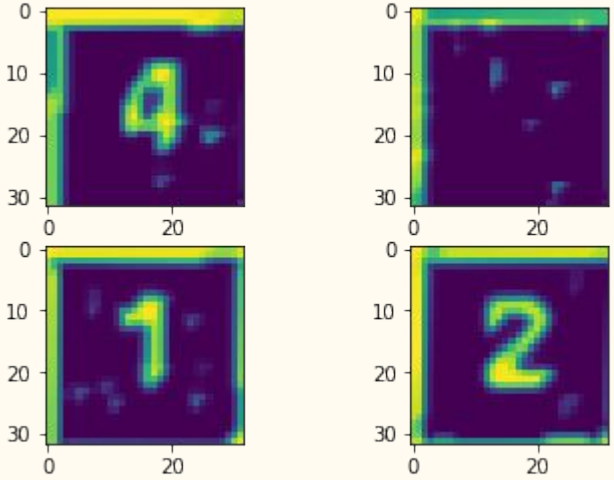
Perspective Warping - Get a Birds-Eye Top-Down View



Step 3

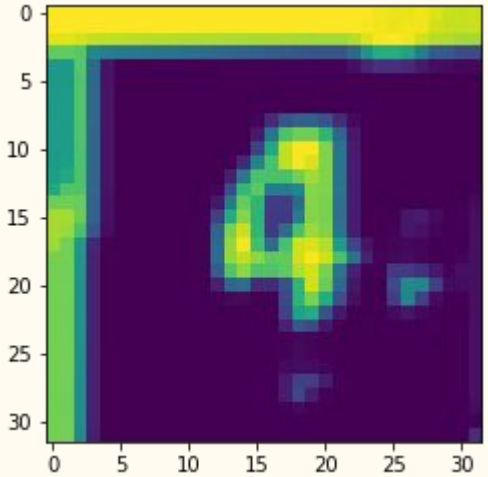
Divide the image-area into 81 (9x9) equal cells.

Use these cells for digit recognition. Now we train a classifier to classify if a cell **contains a digit in it or not.**



Step 4

Some cells may have digits, others may not, here is an example of a cell with a digit. Now for those cells, we train a classifier to classify what digit it is (1-9).



Thank you