AI Sudoku Solver

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Problem Statement

Create a model that is able to accurately find and read a sudoku board from an image, solve and then display the solution back to the original image in the previously missing spaces on the board.

What is Sudoku?

- Sudoku is a logic-based, combinatorial number-placement puzzle
- The objective is to fill a 9 × 9 grid with digits so that each column, each row, and each of the nine 3 × 3 subgrids that compose the grid contain all of the digits from 1 to 9.

	4		2		1		6	
9		5				3		7
5		7		8		1		4
	1						9	
		1				6		
			7		5			
6		8	9		4	5		3

Process

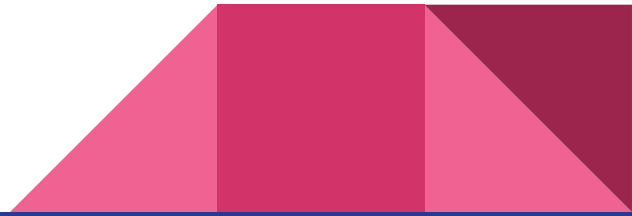
Digit Detection Model	Sudoku Solver	OpenCV Implementation
Create a CNN that's able to accurately read in and predict the correct value of a digit.	Read in a 9x9 sudoku board and be able to solve the board accurately and efficiently using backtracking.	Take the input image, apply various preprocessing steps, and take the solved board solution and print it back to the original board from the original picture.

Digit Detection

- Created a CNN model to read in and determine the numbers from board
- Ended up using MNIST dataset, didn’t want to focus on training an accurate model for too long.
- Model accuracy = 98%

Sudoku Solver

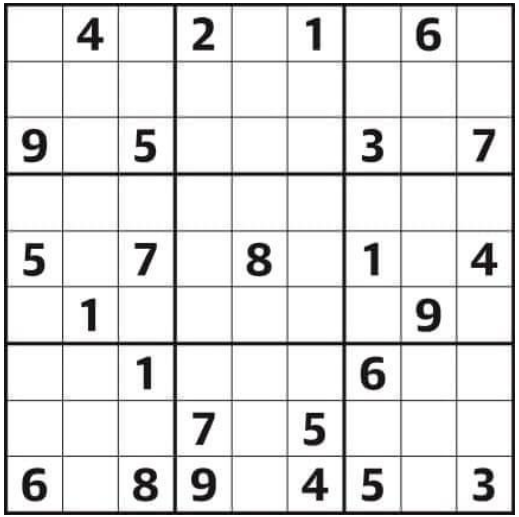
- Various functions that read in a given board
- Finds empty cells to solve for
- Determines if board has a solution
- Solves board using a method called back tracking



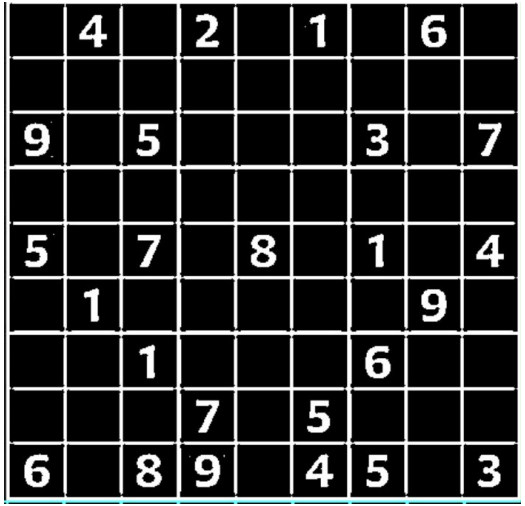
OpenCV Implementation

- Resizes image
- Contours and contrast image to find board and help with determining digits
- Splits image into a 9x9 square to run model on
- Once solved, displays the solved puzzle back to the original image

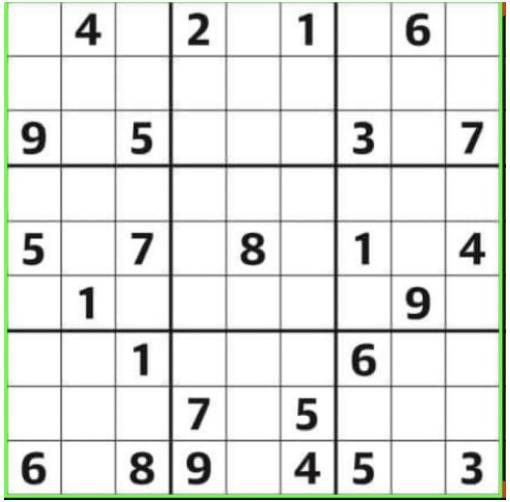
Implementation



Original image

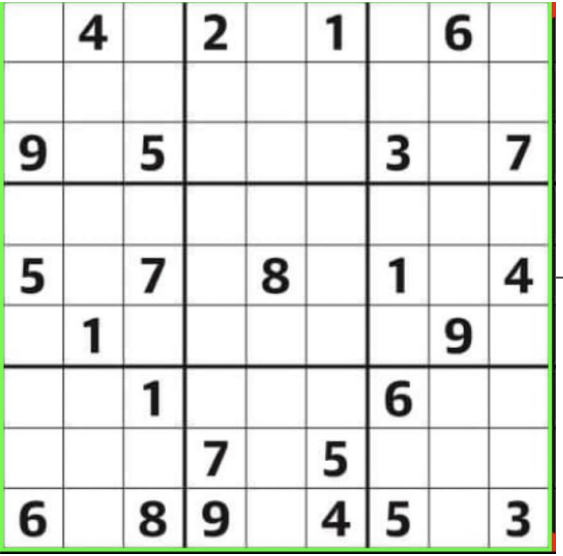


Contour of image

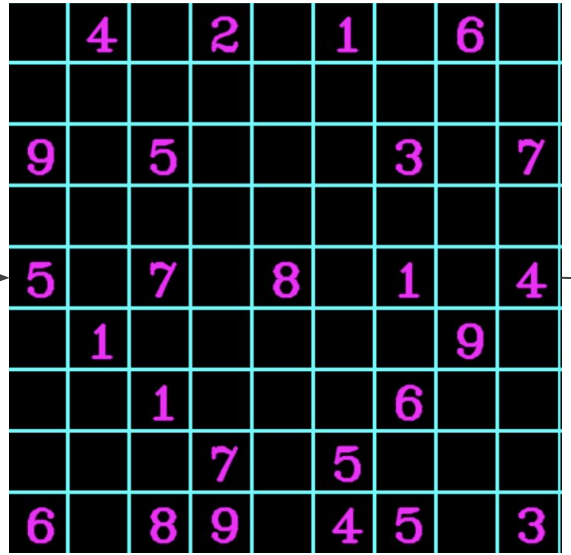


Determining board from contour

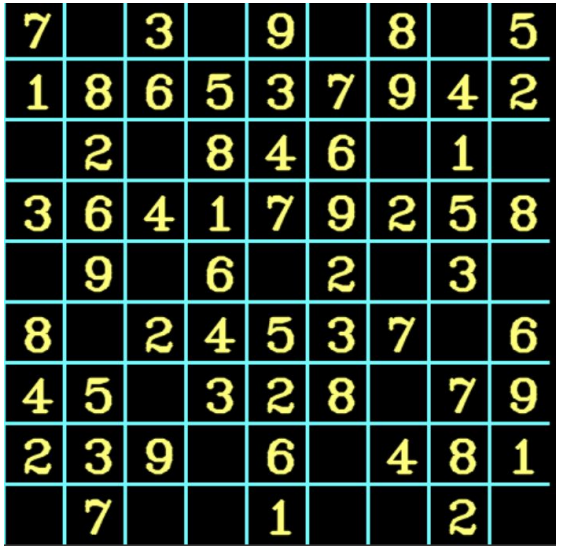
Implementation



Determined board

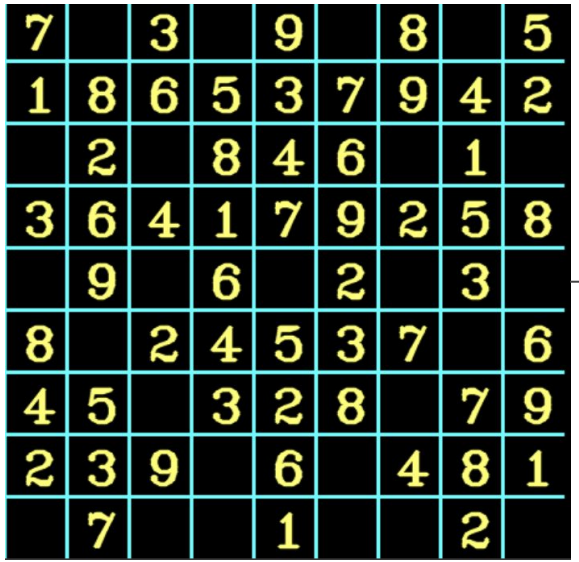


Digit Determination

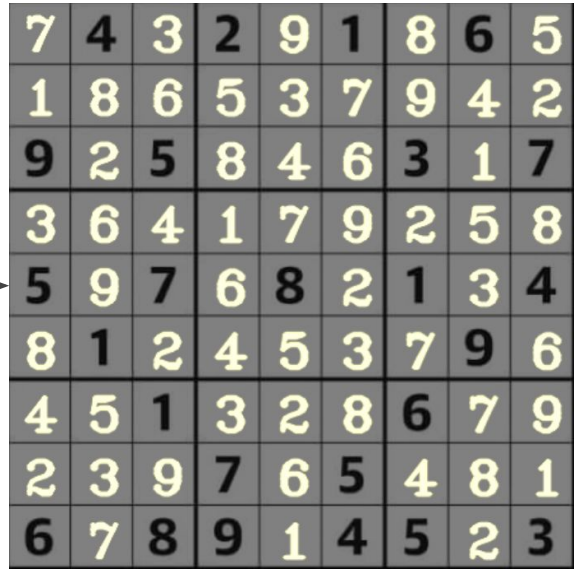


Solved board

Implementation



Solved board



Solved board displayed back to original image!

What’s Next?

- Some photos don’t work as well as others in regards to digit recognition
- Some fonts makes it hard to distinguish between certain numbers
- Wasn’t able to implement an application feature due having to use colab currently. Lots of dependencies that wasn’t able to get smoothly running. Definitely the main focus and most important thing that I would like to focus on with some more time available.