MAGGIE CAO

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SIMPLE SHAPES CLASSIFICATION USING CNN

Problem:
- To classify the simple shapes of triangles, circles, squares and rectangles.

Solution:
- A nine-layered convolutional neural network model trained for approximately 3 hours. Using a test set of 20,000 images, the model performed at 90% accuracy with 1% loss on unscaled images and 80% accuracy with 3% loss on scaled images.   Improvements:
- To increase generalization for unscaled and uncropped images, improve on data augmentation function.
- Use regions of interest pooling to detect the shapes through an additional RNN layer.

Technologies:
- Keras, Tensorflow, Numpy, Google Cloud, Scikit-learn, Multiprocessing, OpenCV, GPU computing, Nvidia.

DDOS ANALYSIS: MIRAI BOTNET

Problem:
- To execute the malware Mirai locally between two Linux servers and analyze the code.
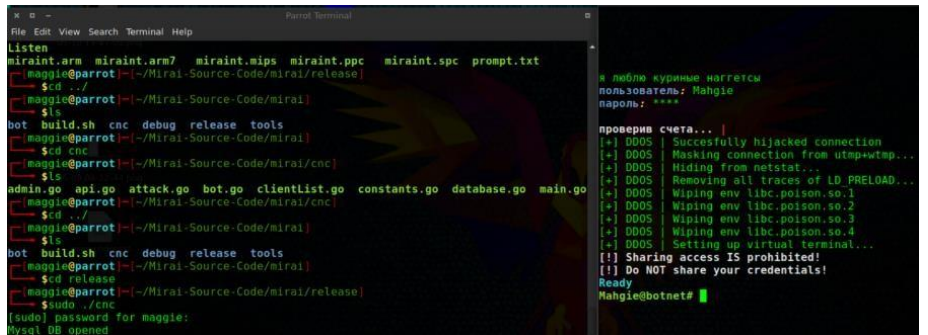
Solution:
- By cross-compiling ARM processors, the mySQL commander was listening for bots to connect via IoT vulnerabilities.

Improvements:
- No bots connected to the commander, could it be server configuration issues?

Technologies:
- mySQL, Linux

SYSTEMS PROGRAMMING

Uniq emulator:
- Prints out all the unique lines from a file using delimiters and a copy of the original buffer.

Running child processes:
- Executes child processes and waits for a child under a set time frame.

Grep emulator:
- Searches text patterns of files using multi-threading.

Pipe emulator:
- Emulates pipes using popen and pclose for child and parent processes. Signal Handler:
- Ignores SIGUP And SIGQUIT signals and then executes another program.
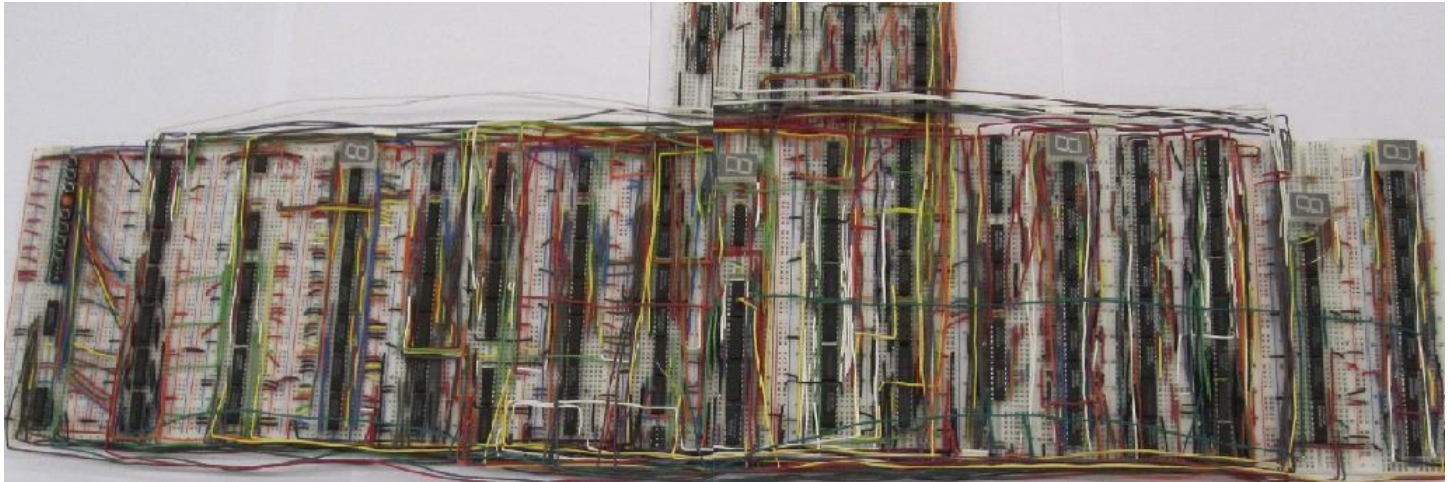
GOOGLE CODE JAM

Alien Language:

- Finds the number of words that matches the Alien language pattern. Minimum Scalar Product:
- Finds the minimum scalar product between two vectors.

Rotate Connect-K:

- Board class of two players where each player can rotate the board once with a connect-k winner horizontally, vertically and diagonally.

SIMPLE ENIGMA MACHINE

Problem:

- To create a digital logic implementation of the Enigma machine from letters A-H.

Solution:

- A design consisting of multiplexers, and gates, xor gates, or gates, push buttons and digit displays.

Improvements:

- Use a programmable memory chip to reduce the number of gates. Technologies:
- Analog logic

MICROCONTROLLER PARALLEL PARK CAR

Problem:

- To wirelessly control the directions of the car and to automatically parallel park between two objects.

Solution:

- A mini-robotic car consisting of a gearbox, IR sensors, motors, a Xbee shield and a 180-degree servo.
- Program implemented in Arduino that can wirelessly control the car and parallel park between two objects.

Technologies:

- Robotics, Arduino