

# Genome - SD1

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# Problem Being Addressed

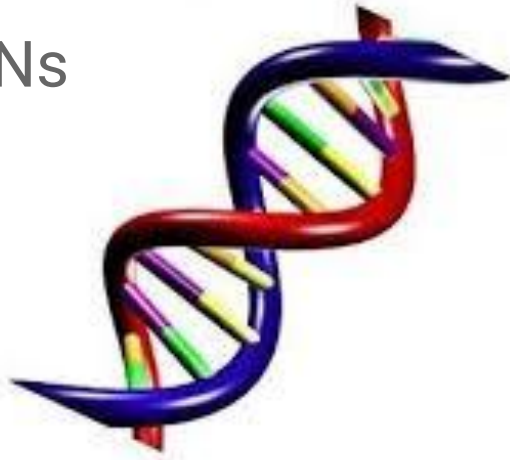
Finding optimal model parameters for Deep learning Convolutional Neural Networks (CNN) require:

- extensive manual testing
- expensive resources



# Proposed Solution

Implement a Genetic Algorithm to quickly find optimal model parameters for Deep Learning CNNs



# Software / Tools used

- Genetic Algorithm
- Tensorflow
- Keras
- CNN model architecture
- Python
- Jupyter notebook / IDE
- Colab notebook
- GCP VMs



- Optimization
- Classification (GBML)
- Human Comparable Design

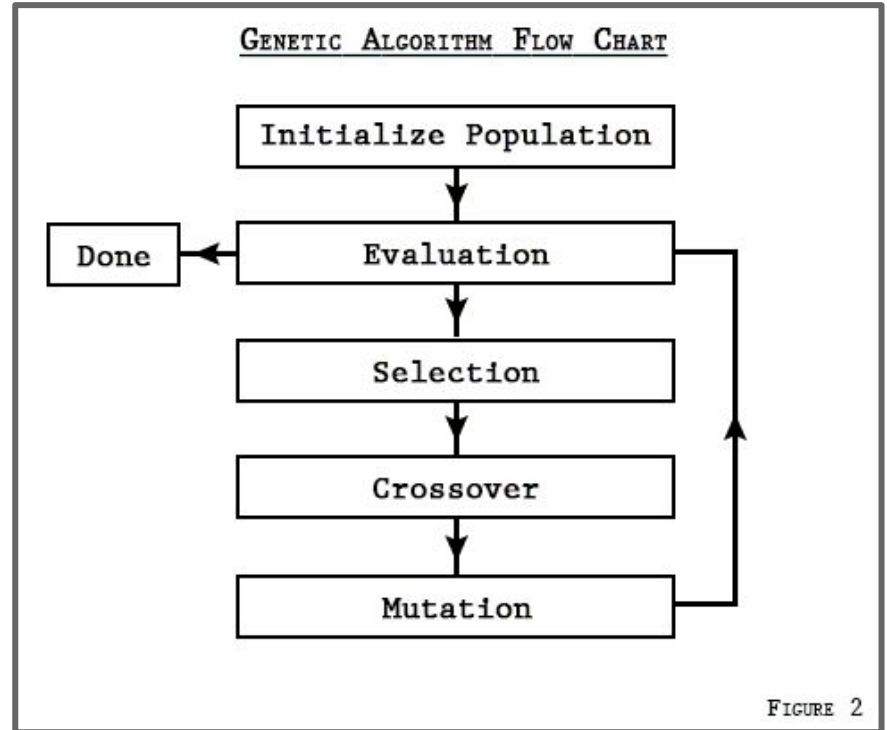


Google Cloud Platform



# Approach

- Genetic Algorithm
  - Parameters: Population Size, Generations



# Approach

- Create baseline model
- Hyperparameters -
  - Create variables for Genetic Algorithm to optimize
  - Batch Size, Activation Function, Optimizer
- Others: Learning rate, Dropout

```
BatchList = [32, 64, 128, 256]
Optimizers = ['Adam', 'Nadam', 'Adadelata', 'Adamax']
Activations = ['relu', 'tanh', 'selu', 'elu']
```

Input (fixed)

C: Convolutional Layer  
P: Max Pooling

(Pair)

Flatten

Dense1()

Dense2()

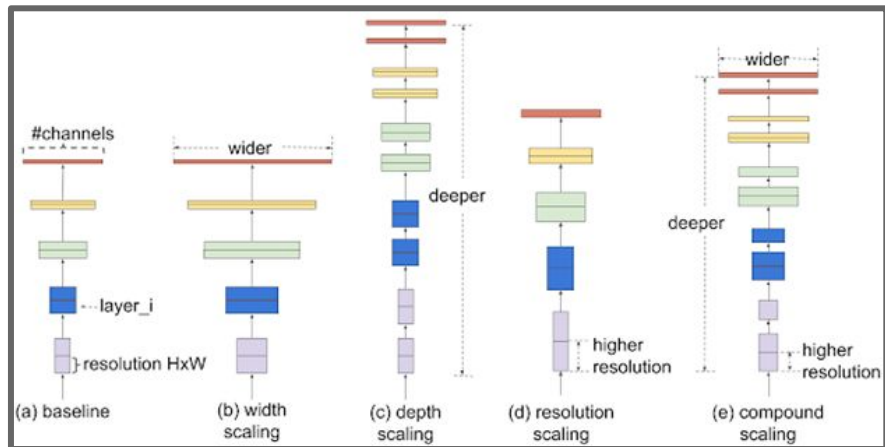
Output(fixed)

Baseline model

# Approach

- Layers -

- Compound scaling
- Varying number of Pairs & layers in each Pair



Input (fixed)

C: Convolutional Layer  
P: Max Pooling

(Pair)

C: Convolutional Layer  
P: Max Pooling

(Pair)

C: Convolutional Layer  
P: Max Pooling

(Pair)

Flatten

Dense1()

Dense2()

Output(fixed)

Input (fixed)

C: Convolutional Layer  
C: Convolutional Layer  
C: Convolutional Layer  
P: Max Pooling

(Pair)

C: Convolutional Layer  
P: Max Pooling

(Pair)

C: Convolutional Layer  
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P: Max Pooling

(Pair)

Flatten

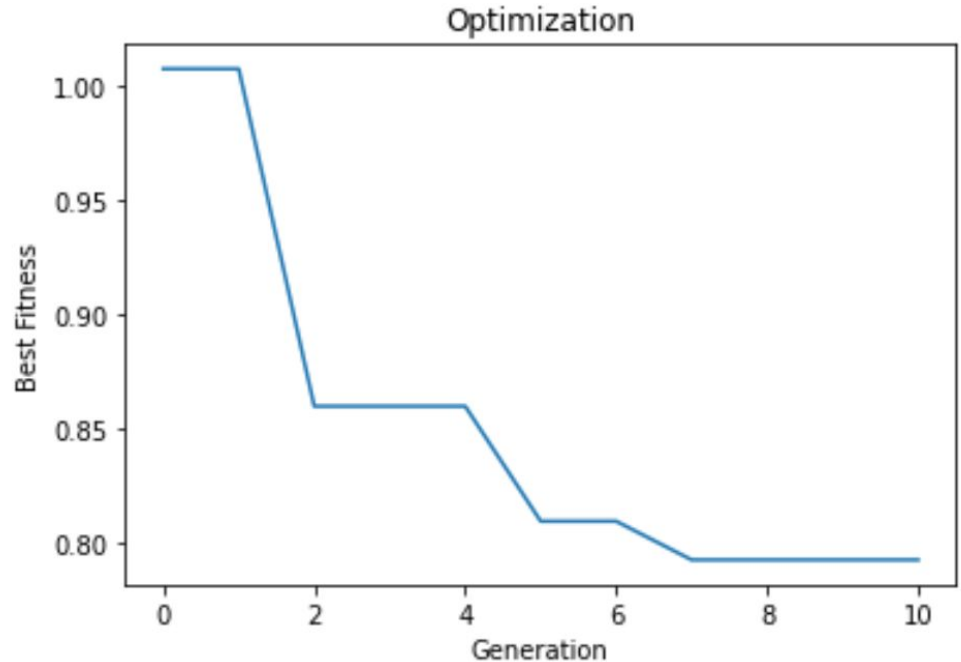
Dense1()

Dense2()

Output(fixed)

# Results

- Genetic Algorithm by nature will move towards the fittest / optimal solution
- Validation Loss gradually decreases
- Best Model / Parameters are stored







# In Progress / Next Steps

- Improvement:
  - Add more hyper parameter variables
  - Improve algorithm with other techniques
- Testing:
  - Test on new Datasets
  - Run with larger population size, generations & epochs
- Compare results with other Research Algorithms