<u>Season of Code - 2023</u>
<u>Breakout Genius - Using RL to build AI game master Progress Report</u>

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<u>Progress:</u>

<u>Week 1 :-</u>
- Neural Network, Prediction,
- Binary Classification, Logistic Regression, Cost functions, Gradient descent, Computational Graph, Vectorization,
- Neural network overview, representation, using vectorization for faster computation, Activation Functions, Backpropagation
- Forward propagation in Deep neural network, Parameters and Hyperparameters,

<u>Week 2:-</u>
- Computer detection, Concept of convolution, Padding, stride, Max pooling layer,
- Concept of Residual Networks (ResNets) for faster learning. Use of 1x1 convolution, Inception network, Mobilenet, EfficientNet, Transfer learning, Data augmentation,
- Object localization, target label, Landmark detection, Object detection, Sliding window, Bounding box prediction, Intersection of Union, Anchor boxes, YOLO algorithm integrating all of them, Semantic segmentation with U-Net, Concept of Transpose convolution, integrating this to get U-net.

<u>Week 3&4:-</u>
- Numpy and Tensors, Gradient computing with autograd, gradient descent with Autograd
- Defining model, Loss, Optimizer
- Using linear regression, logistic regression using inbuilt libraries of tensor
- Dataset, Dataloder, Batch training, epochs, Transforms in dataset
- Softmax, Cross entropy, Activation Functions
- Simple feed forward neural network, Convolutional Neural network
- Trial codes for the same can be found [here](#)

Week 5:-
- Meaning of RL problem, Inside RL agent, environment and different functions related to it
- Markov Reward and Decision processes and different forms of Bellman Equation
- Using Dynamic Programming, Policy evaliation, Policy and Value iteration for problems where model is known
- Iterative methods like Monte-Carlo Learning and Temporal-Difference for model unknown problems
- On policy Monte-Carlo, On policy temporal-difference and Off policy Q learning

Week 6:-
- MDPs, exact solution methods and Max-ent RL
- Algorithms for Value iteration and Policy iteration
- Q learning and DQN algorithms

Week 7:-
- Learning control policies directly from input using RL.
- Using Cocvolutional Neural network with Deep Q-Learning
- Visualising the value function, training and stability

Week 8:-
- Coding out the Training model for Atari-game using RL in Google colab. Training code can be found [here](#)
- Coding out the Testing code and obtaining the game playing video given the pretrained PyTorch model. Testing code can be found [here](#)