Artificial Intelligence: Assignment 1

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1 Genetic Algorithm

```
# iterator
t = 0

# number of epochs
epochs = ...

# initialize algorithm parameters
n = ...
k = ...
m = ...
LR = ...

# initialize probability vector P[i]
for i from 0 to n
    P[i] = 0.5
end

# start genetic algorithm
while t < epochs (or given condition is satisfied) do
    solution_vector = []
    for j from 0 to k
        genes = []
        for i from 0 to n
            # generate population based on the probablistic vector
            if sample_random(0,1) <= P[i]
                genes.append(1)
            end
            else
                genes.append(0)
            end
        end
```

```
        solution_vector.append(genes)
    end

    # initialize next generation
    generation = []

    for j from 0 to k
        # select parents from the generated population
        # which is the solution_vector computed above
        ind1 = select_parent(solution_vectors)
        ind2 = select_parent(solution_vectors)

        # retrieve 2 children from the crossover algorithm
        ch1, ch2 = crossover(ind1, ind2)

        # mutate genes of the children separately
        ch1 = mutate(ch1)
        ch2 = mutate(ch2)

        # store children in current generation
        generation.append(ch1)
        generation.append(ch2)
    end

    # update the solution vectors to be the current generation
    solution_vectors = generation

    # sort the current generation by fitness through the
    # Evaluate method in descending order
    solution_vectors = sorted(solution_vectors, key=Evaluate, reverse=True)

    # update probablistic vector P[i] using the current generation
    for j from 0 to m
        for i from 0 to n
            P[i] = P[i] * (1 - LR) * solution_vectors[j][i] * (LR)
        end
    end

    # update iterator (if epochs stopping criteria is used)
    t += 1

end
```

In GA.py and GAmethods.py can be found a low level implementation of the algorithm, which I did for exercise.

2 Alpha beta pruning

On Figure 1. can be seen the path with corresponding value of 5. As stated in the assignment update the top most layer is the MAX player followed by MIN and etc, which results in MAX - MIN - MAX - MIN - MAX root to leaves for the given tree.

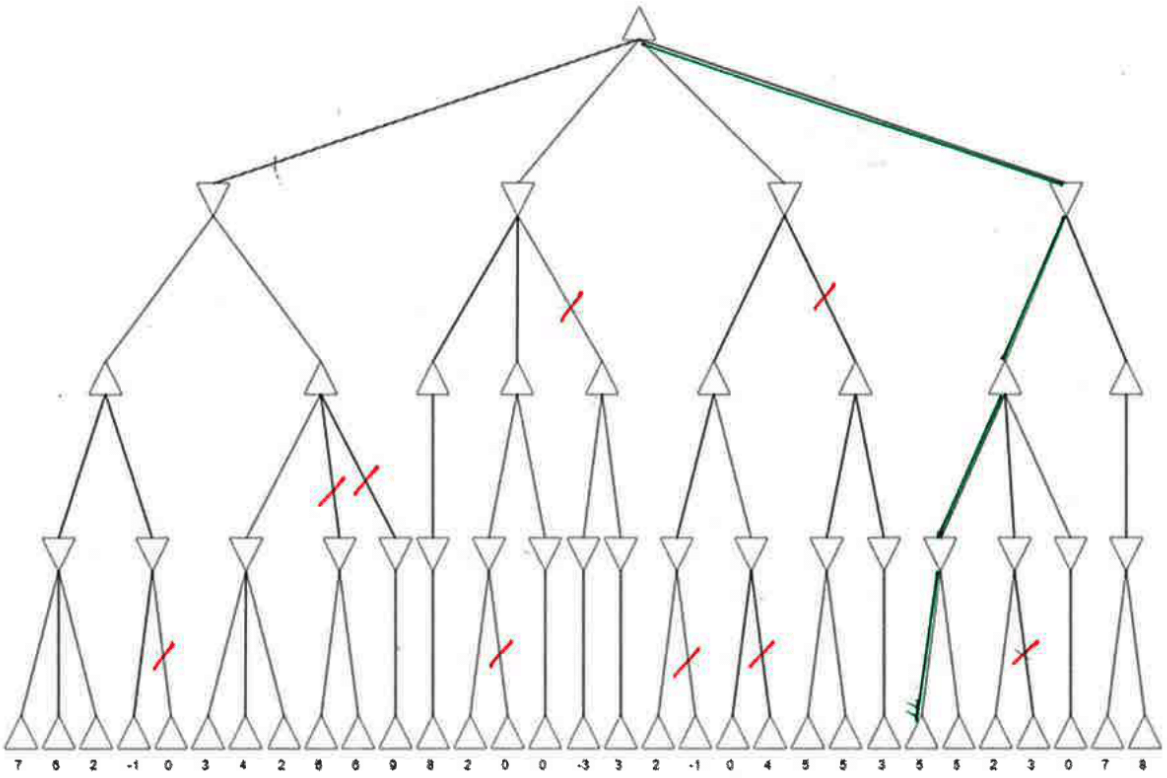

Figure 1: $\alpha - \beta$ *pruning*