

gamblers__problem

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[ ]: #!/usr/bin/env python

"""
Entrega #4 - Dynamic Programming - Value iteration Gambler's Problem

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"""

import numpy as np
import matplotlib.pyplot as plt

print(__doc__)

class Gambler:
    """
    Class Gambler.
    Have all methods needed to implement the Gambler's problem
    with value iteration.
    """

    def __init__(self, prob, iterations, theta=0.00000001):
        self.value = np.zeros(101) # Set a list of 100 values 0
        self.reward = np.zeros(101) # Set a list of 100 values 0
        self.reward[100] = 1 # Set 1 on the last element
        self.values_recorded = []
        self.pi = []
        self.prob = prob
        self.iterations = iterations
        self.theta = theta

    def value_iteration(self):
        """
        Value iteration, for estimating policy.
        Theta will determine accuracy of estimation
        """
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delta = 0
self.pi = []
p = np.zeros(101)
while delta < self.theta:
    for capital in range(1,100):
        # Store the previous value of current state
        previous_value = self.value[capital]
        # Bet value with minimum of 1 and maximum of 100 - capital
        for bet in range(1, min(capital, 100 - capital)+1):
            # Calculates the value of a bet(action) from a current
↪ amount of money(state)
            p[bet] = self.prob*(self.reward[capital + bet] + self.
↪ value[capital + bet]) + (1-self.prob)*(self.reward[capital - bet] + self.
↪ value[capital - bet])
            # Update the maximum value
            self.value[capital] = max(p)
            # Update delta
            delta = max(delta, abs(previous_value - self.value[capital]))
            # Store the new optimal policy
            self.pi.append(np.argmax(p))
        # Store the new values
        self.values_recorded.append(self.value.copy())

def compute(self):
    """
    Compute the successive iterations and the final policy
    """
    for _ in range(self.iterations):
        self.value_iteration()
        self.plot_results()

def plot_results(self):
    """
    Plot on a graph the value function by successive iterations and the
↪ final policy
    """
    plt.subplot(2, 1, 1)
    for data in self.values_recorded:
        plt.plot(data[:99])
    labels = ['Iteration {}'.format(i+1) for i in range(len(self.
↪ values_recorded))]
    legend = plt.legend(labels, loc='center left', bbox_to_anchor=(1, 0.5))
    plt.gca().add_artist(legend)
    plt.xlabel('Capital')
    plt.ylabel('Value Estimates')
    plt.subplot(2, 1, 2)
    plt.bar(range(99), self.pi, align='center', alpha=0.5)

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plt.xlabel('Capital')
plt.ylabel('Final Policy')
plt.show()

if __name__ == "__main__":
    g = Gambler(0.4, 10)
    g.compute()

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