

## CW (TensorFlow, Metoda gradientu)

```
import random

import tensorflow as tf

import numpy as np

np.random.seed(50)

def init():

    X = tf.Variable(np.random.uniform(-10,10), trainable=True)

    Y = tf.Variable(np.random.uniform(-10,10), trainable=True)

    return X, Y

def function(X,Y):

    return (3*X**4+4*X**3-12*X**2+12*Y**2-24*Y)

X, Y= init1()

min=function(X.numpy(),Y.numpy())

for i in range(5):

    optimizer = tf.optimizers.SGD(learning_rate=0.01, momentum=0.99)

    for epoch in range(1000):

        optimizer.minimize(lambda: function(X,Y), var_list=[X, Y])

        print((function(X, Y)).numpy(), X.numpy(), Y.numpy(), end="\r")

    print(X.numpy(), Y.numpy(), function(X,Y).numpy())

    X, Y= init1()
```