Regression

Example : pokemon

Pokemon(1)

- Read data

```python
df = pd.read_csv('pokemon.csv')
x = np.array(df['cp'])
y = np.array(df['cp_new'])

x = np.reshape(x, (x.size, 1))
y = np.reshape(y, (y.size, 1))
x = x.astype(np.float32)
y = y.astype(np.float32)
x = torch.tensor(x)
y = torch.tensor(y)
```

```
tensor([[384.],
        [366.],
        [353.],
        [338.],
        [242.],
        [129.],
        [ 10.],
        [ 25.],
        [ 24.],
        [161.],
        [114.],
        [333.],
        [132.],
        [ 60.],
        [ 42.],
        [ 91.],
        [139.],
```

Pokemon(2)

- Set model

```python
class regression(nn.Module):
    def __init__(self, input_dim, output_dim):
        super().__init__()
        self.linear = nn.Linear(input_dim, output_dim)

    def forward(self, x):
        return self.linear(x)

model = regression(1,1)
opt = optim.Adagrad(model.parameters(), lr = 0.1)
```

AdaGrad

- 約束學習率
- 隨學習的次數調整學率

$$W_{i+1} = W_i - \eta \frac{\color{red}{1}}{\color{red}{\sqrt{n + \epsilon}}} \frac{\partial L}{\partial W}$$

$$n = \sum_{r=1}^{t} \left(\frac{\partial L_r}{\partial W_r}\right)^2$$

$$W_{i+1} = W_i - \eta \frac{1}{\sqrt{\sum_{r=1}^{t} \left(\frac{\partial L_r}{\partial W_r}\right)^2 + \epsilon}} \frac{\partial L}{\partial W}$$

Pokemon(3)

- train

```python
losses = []
epoch = 50
#pre = model(x)

#train
for i in range(epoch+1):
    pre_y = model(x)
    lossf = nn.MSELoss()
    loss = lossf(y, pre_y)
    loss.backward()

    opt.step()
    opt.zero_grad()

    losses.append(loss)
    if i%10 == 0:
        print("epoch : {}, loss : {}".format(i, loss))
```
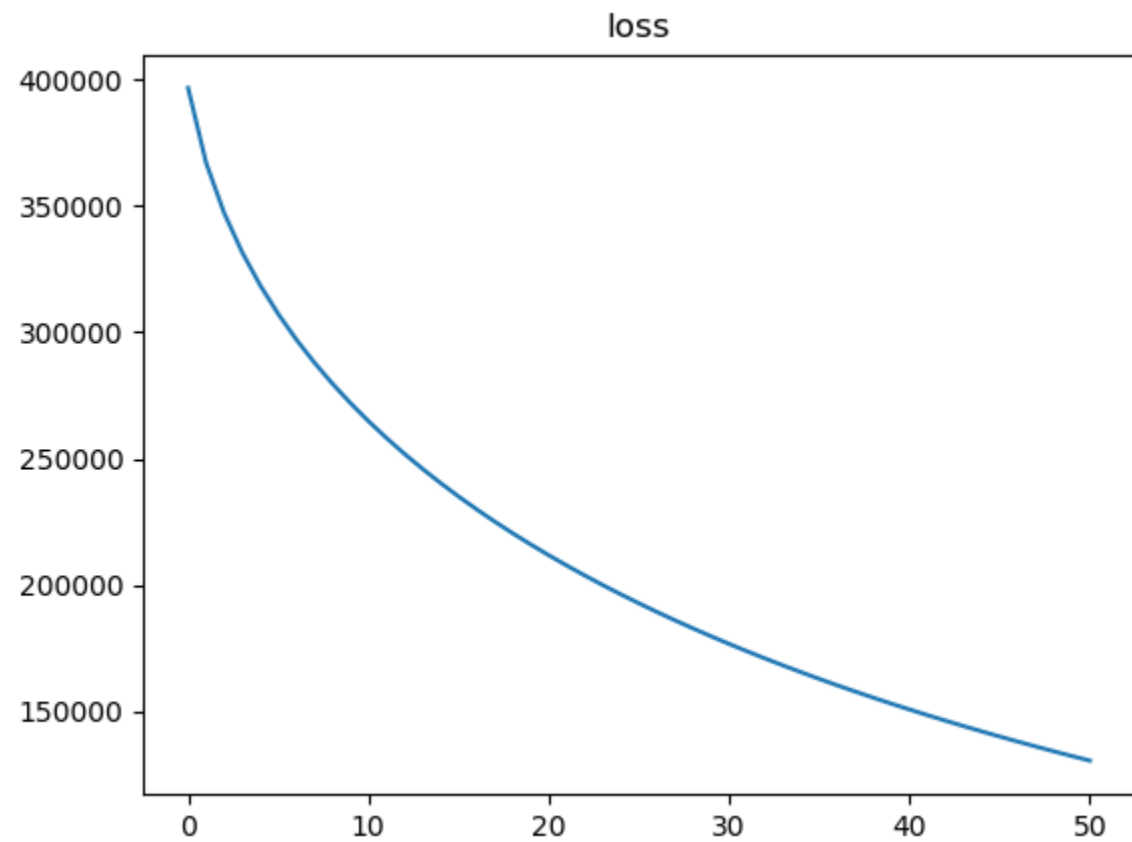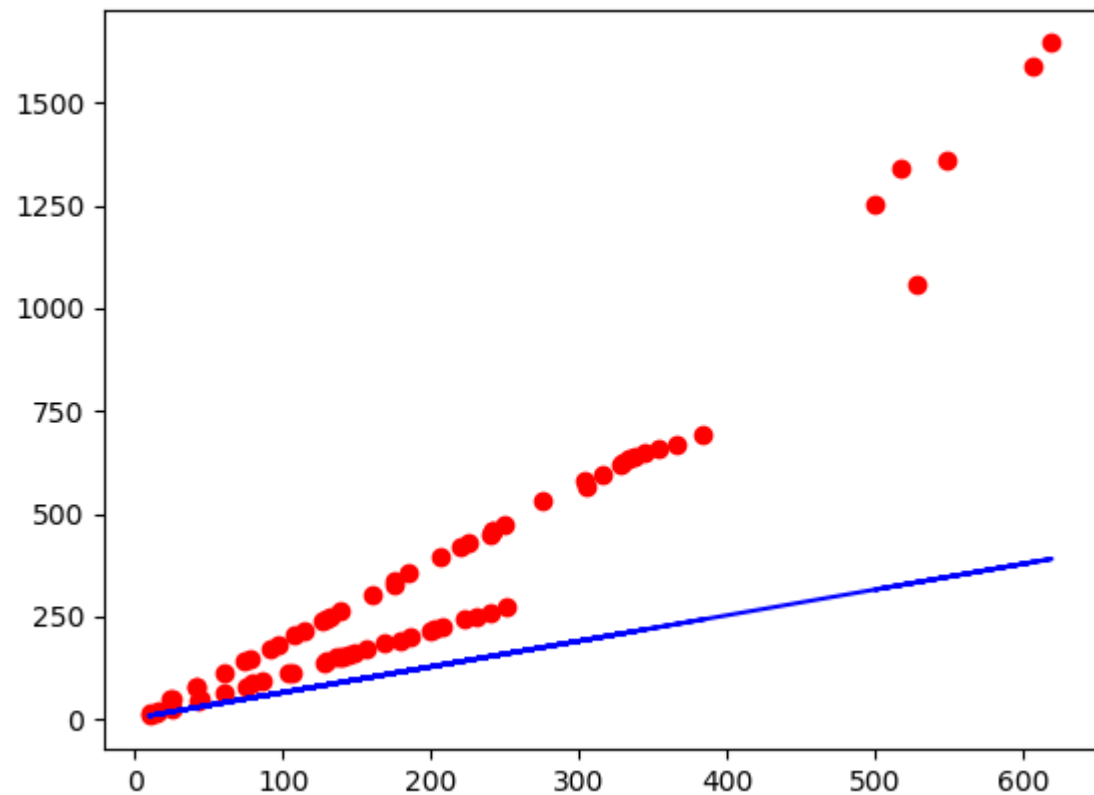
Pokemon(4)

- Draw

```python
pre = model(x).detach().numpy()

plt.figure(1)
plt.plot(losses)
plt.title("loss")

plt.figure(2)
plt.plot(x, y, 'ro')
plt.plot(x, pre, 'b')
plt.show()
```

Pokemon(5)

- result

Example : SAT / GPA

Result