Download Base Project

https://github.com/zenzen0014/nn_deep_learn/tree/master/scripts

Download ATOM

https://atom.io/

Index.html

```
<script type="text/javascript">
  let nn;//neural network

  $("#start").click(function(){

    lr = $("#lr").val();
    e = $("#epoch").val();

    generate_ai(lr, e);
  })

  function generate_ai(lr, e){//lr learning rate, e epoch
    let training_data = [{
      inputs: [0.05, 0.1],
      outputs: [0.99]
    }];
    let start_time = Date.now();
```

Index.html

```
let start_time = Date.now();

nn = new NeuNet(
  2, 2, 1, 1,// i, h1, h2, T
  [
    [0.2, -0.3],//w1 w2
    [0.15, -0.5]//w3 w4
  ],
  [1, 1],//b1
  [
    [-0.4, 0.3]//w5 w6
  ],
  [0.5],//b2
  [
    [0.25]//w7
  ],
  [1]//b3
)
```

Index.html

```
    for(n = 0; n < e; n++){ //e
      for(i = 0; i < 50; i++){
        a = nn.training(training_data[0].inputs, training_data[0].outputs)
      }
      nn.setLearningRate(lr);// lr
      y = nn.prediction(training_data[0].inputs);
      let elapsed_time = (Date.now() - start_time)/1000;

      if(n == (e-1)){
        $("#mse").val(`${a[0].toFixed(4)} %`);
        $("#output").val(`${y[0].toFixed(4)}`);
        $("#etime").val(`${elapsed_time} seconds`);
      }
    }
  }

</script>
```

sketch.js

sketch.js

```
class ActivationFunction {
    constructor(func, dfunc) {
        this.func = func;
        this.dfunc = dfunc;
    }
}

let sigmoid = new ActivationFunction(
    x => 1 / (1 + Math.exp(-x)),
    y => y * (1 - y)
);
```

sketch.js

sketch.js

```
class NeuNet {
    constructor(
        ilayer,
        hlayer,
        Hlayer,
        olayer,
        weight_ih = null,
        hbias = null,
        weight_hh = null,
        Hbias = null,
        weight_ho = null,
        obias = null
    ) {
        if (ilayer instanceof NeuNet) {
            let lyr = ilayer;
            this.input_nodes = lyr.input_nodes;
            this.hidden_nodes = lyr.hidden_nodes;
            this.Hidden_nodes = lyr.Hidden_nodes;
            this.output_nodes = lyr.output_nodes;

            this.weight_ih = lyr.weight_ih.copy();
            this.weight_hh = lyr.weight_hh.copy();
            this.weight_ho = lyr.weight_ho.copy();

            this.hbias = lyr.hbias.copy();
            this.Hbias = lyr.Hbias.copy();
            this.obias = lyr.obias.copy();
        } else {⋯}
        this.setLearningRate();
        this.setActivationFunction();
    }
```

sketch.js

sketch.js

```
class NeuNet {
    constructor(…) {
        if (ilayer instanceof NeuNet) {…
        } else {
            this.input_nodes = ilayer;
            this.hidden_nodes = hlayer;
            this.Hidden_nodes = Hlayer;
            this.output_nodes = olayer;
            this.weight_ih = new Matrix(this.hidden_nodes, this.input_nodes);
            this.weight_hh = new Matrix(this.Hidden_nodes, this.hidden_nodes);
            this.weight_ho = new Matrix(this.output_nodes, this.Hidden_nodes);
            this.hbias = new Matrix(this.hidden_nodes, 1);
            this.Hbias = new Matrix(this.Hidden_nodes, 1);
            this.obias = new Matrix(this.output_nodes, 1);

            let wih = Matrix.subtract_array(weight_ih, this.hidden_nodes, this.input_nodes);
            let bih = Matrix.fromArray(hbias);
            let whh = Matrix.subtract_array(weight_hh, this.Hidden_nodes, this.hidden_nodes);
            let bhh = Matrix.fromArray(Hbias);
            let who = Matrix.subtract_array(weight_ho, this.output_nodes, this.Hidden_nodes);
            let bho = Matrix.fromArray(obias);

            this.weight_ih = wih;
            this.weight_hh = whh;
            this.weight_ho = who;
            this.hbias = bih;
            this.Hbias = bhh;
            this.obias = bho;
        }
        this.setLearningRate();
        this.setActivationFunction();
    }
```

sketch.js

```
setLearningRate(LearningRate = 0.1) {
    this.LearningRate = LearningRate;
}

setActivationFunction(func = sigmoid) {
    this.ActFunc = func;
}

prediction(input_array) {
    let inputs = Matrix.fromArray(input_array);

    let hidden = Matrix.multiply(this.weight_ih, inputs);
    hidden.add(this.hbias);
    hidden.map(this.ActFunc.func);

    let Hidden = Matrix.multiply(this.weight_hh, hidden);
    Hidden.add(this.Hbias);
    Hidden.map(this.ActFunc.func);

    let output = Matrix.multiply(this.weight_ho, Hidden);
    output.add(this.obias);
    output.map(this.ActFunc.func);

    return output.toArray();
}
```

sketch.js

sketch.js

```
training(input_array, target_array) {
    let inputs = Matrix.fromArray(input_array);

    let hidden = Matrix.multiply(this.weight_ih, inputs);
    hidden.add(this.hbias);
    hidden.map(this.ActFunc.func);

    let Hidden = Matrix.multiply(this.weight_hh, hidden);
    Hidden.add(this.Hbias);
    Hidden.map(this.ActFunc.func);

    let outputs = Matrix.multiply(this.weight_ho, Hidden);
    outputs.add(this.obias);
    outputs.map(this.ActFunc.func);

    let targets = Matrix.fromArray(target_array);
    // Calculate the error ==> ERROR = TARGETS - OUTPUTS
    let output_errors = Matrix.subtract(targets, outputs);

    // let gradient = outputs * (1 - outputs);
    let gradients = Matrix.map(outputs, this.ActFunc.dfunc);
    gradients.multiply(output_errors);
    gradients.multiply(this.LearningRate);

    // Calculate deltas
    let Hidden_T = Matrix.transpose(Hidden);
    let weight_ho_deltas = Matrix.multiply(gradients, Hidden_T);
    this.weight_ho.add(weight_ho_deltas);
    this.obias.add(gradients);
```

sketch.js

sketch.js

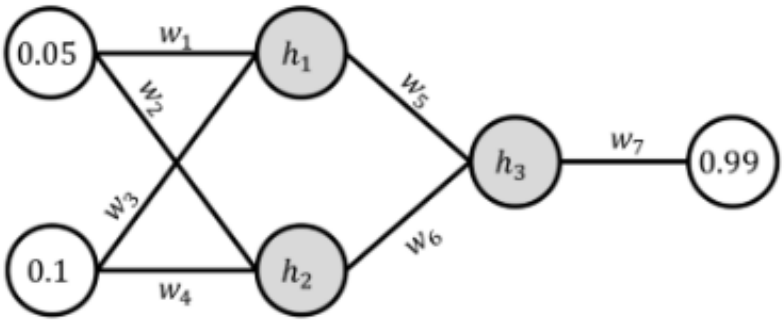
```
// let gradient = outputs * (1 - outputs);
let gradients = Matrix.map(outputs, this.ActFunc.dfunc);
gradients.multiply(output_errors);
gradients.multiply(this.LearningRate);

// Calculate deltas
let Hidden_T = Matrix.transpose(Hidden);
let weight_ho_deltas = Matrix.multiply(gradients, Hidden_T);
this.weight_ho.add(weight_ho_deltas);
this.obias.add(gradients);

// Calculate the hidden layer errors
let who_t = Matrix.transpose(this.weight_ho);
let Hidden_errors = Matrix.multiply(who_t, output_errors);

// Calculate hidden gradient
let Hidden_gradient = Matrix.map(Hidden, this.ActFunc.dfunc);
Hidden_gradient.multiply(Hidden_errors);
Hidden_gradient.multiply(this.LearningRate);


// Calculate deltas
let hidden_T = Matrix.transpose(hidden);
let weight_hh_deltas = Matrix.multiply(Hidden_gradient, hidden_T);
this.weight_hh.add(weight_hh_deltas);
this.Hbias.add(Hidden_gradient);

// Calculate the hidden layer errors
let whh_t = Matrix.transpose(this.weight_hh);
let hidden_errors = Matrix.multiply(whh_t, output_errors);
```

sketch.js

sketch.js

```
    // Calculate deltas
    let hidden_T = Matrix.transpose(hidden);
    let weight_hh_deltas = Matrix.multiply(Hidden_gradient, hidden_T);
    this.weight_hh.add(weight_hh_deltas);
    this.Hbias.add(Hidden_gradient);

    // Calculate the hidden layer errors
    let whh_t = Matrix.transpose(this.weight_hh);
    let hidden_errors = Matrix.multiply(whh_t, output_errors);

    // Calculate hidden gradient
    let hidden_gradient = Matrix.map(hidden, this.ActFunc.dfunc);
    hidden_gradient.multiply(hidden_errors);
    hidden_gradient.multiply(this.LearningRate);

    // Calcuate input->hidden deltas
    let inputs_T = Matrix.transpose(inputs);
    let weight_ih_deltas = Matrix.multiply(hidden_gradient, inputs_T);

    this.weight_ih.add(weight_ih_deltas);
    this.hbias.add(hidden_gradient);


    $("#w1").val(this.weight_ih.data[0][0].toFixed(4));
    $("#w2").val(this.weight_ih.data[0][1].toFixed(4));
    $("#w3").val(this.weight_ih.data[1][0].toFixed(4));
    $("#w4").val(this.weight_ih.data[1][1].toFixed(4));
    $("#w5").val(this.weight_hh.data[0][0].toFixed(4));
    $("#w6").val(this.weight_hh.data[0][1].toFixed(4));
    $("#w7").val(this.weight_ho.data[0][0].toFixed(4));

    return output_errors.toArray();
}
```

Run index.html



$w_1 = 0.2$
$w_2 = -0.3$
$w_3 = 0.15$
$w_4 = -0.5$
$w_5 = -0.4$
$w_6 = 0.3$
$w_7 = 0.25$
$b_1 = 1\ (in\ h_1 \& h_2)$
$b_2 = 0.5\ (in\ h_3)$
$b_3 = 1\ (in\ T)$

Learning Rate

0.1

Epoch

200

START

Output

0.9799

MSE

0.0101 %

Elapsed Time

0.544 seconds

W1

0.2522

W2

-0.1955

W3

0.2643

W4

-0.2715

W5

0.7044

W6

1.5971

W7

1.4512

Submit tugas via email :

zendi.Iklima@mercubuana.ac.id

Dengan menyertakan link github dan Screenshoot hasil running index.html anda masing-masing dengan mail subject:

JST_SP_T1_R2_NIM_NAMA

Paling lambat tanggal **30 Agustus 2019 23:59**

Contoh pengiriman email