10.3강 여러개의 변수 : 코딩하기

보스턴 집값 데이터를 모델로 표현하기

10.3.html

```html
<!DOCTYPE html>
<html>

<head>
    <title>TensorFlow.js Tutorial - lemon</title>

    <!-- Import TensorFlow.js -->
    <script
src="https://cdn.jsdelivr.net/npm/@tensorflow/tfjs@1.0.0/dist/tf.min.js"
></script>
    <script src="10.3.js"></script>

</head>

<body>
    <script>
        // 1. 과거의 데이터를 준비합니다.
        var 온도 = [20, 21, 22, 23];
        var 판매량 = [40, 42, 44, 46];
        var 원인 = tf.tensor(온도);
        var 결과 = tf.tensor(판매량);

        // 2. 모델의 모양을 만듭니다.
        var X = tf.input({ shape: [1] });
        var Y = tf.layers.dense({ units: 1 }).apply(X);
        var model = tf.model({ inputs: X, outputs: Y });
        var compileParam = { optimizer: tf.train.adam(), loss:
tf.losses.meanSquaredError }
        model.compile(compileParam);

        // 3. 데이터로 모델을 학습시킵니다.
        //          var fitParam = {epochs: 100}
```

```javascript
        var fitParam = {
            epochs: 200,
            callbacks: {
                onEpochEnd: // 콜백 함수 얼마나 실행되었는가를 볼 수 있다
                    function (epoch, logs) { // epoch, logs
                        console.log('epoch', epoch, logs, 'RMSE=>',
Math.sqrt(logs.loss)); // loss : 얼마나 잘 학습되었느냐 0에 가까울 수록 학습이 잘 되
었는지 알 수 있다.
                }
            }
        } // loss 추가 예제
        model.fit(원인, 결과, fitParam).then(function (result) {

            // 4. 모델을 이용합니다.
            // 4.1 기존의 데이터를 이용
            var 예측한결과 = model.predict(원인);
            예측한결과.print();

        });

        // 4.2 새로운 데이터를 이용
        // var 다음주온도 = [15,16,17,18,19]
        // var 다음주원인 = tf.tensor(다음주온도);
        // var 다음주결과 = model.predict(다음주원인);
        // 다음주결과.print();
    </script>
</body>

</html>
```

10.3.js

```javascript
var 보스톤_원인 = [
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[13.3],
[16.7],
[12],
[14.6],
[21.4],
[23],
[23.7],
[25],
[21.8],
[20.6],
[21.2],
```

```
    [19.1],
    [20.6],
    [15.2],
    [7],
    [8.1],
    [13.6],
    [20.1],
    [21.8],
    [24.5],
    [23.1],
    [19.7],
    [18.3],
    [21.2],
    [17.5],
    [16.8],
    [22.4],
    [20.6],
    [23.9],
    [22],
    [11.9],
  ];
```

데이터 확인

> 보스톤_결과
← (506) [Array(1), ►Array(1), …]

> 보스톤_원인
← (506) [Array(13), ►3), Array(13), …]

수정 : 10.3.html

```html
<!DOCTYPE html>
<html>

<head>
    <title>TensorFlow.js Tutorial - lemon</title>

    <!-- Import TensorFlow.js -->
    <script
src="https://cdn.jsdelivr.net/npm/@tensorflow/tfjs@1.0.0/dist/tf.min.js"
></script>
    <script src="10.3.js"></script>

</head>

<body>
    <script>
        // 1. 과거의 데이터를 준비합니다.
        var 원인 = tf.tensor(보스톤_원인);
        var 결과 = tf.tensor(보스톤_결과);

        // 2. 모델의 모양을 만듭니다.
        var X = tf.input({ shape: [13] }); // 입력 데이터 13개로 변경
        var Y = tf.layers.dense({ units: 1 }).apply(X); // 예측하고 싶은 데이
터는 1개
        var model = tf.model({ inputs: X, outputs: Y });
        var compileParam = { optimizer: tf.train.adam(), loss:
tf.losses.meanSquaredError }
        model.compile(compileParam);

        // 3. 데이터로 모델을 학습시킵니다.
        //        var fitParam = {epochs: 100}
        var fitParam = {
            epochs: 200,
            callbacks: {
                onEpochEnd: // 콜백 함수 얼마나 실행되었는가를 볼 수 있다
                    function (epoch, logs) { // epoch, logs
                        console.log('epoch', epoch, logs, 'RMSE=>',
Math.sqrt(logs.loss)); // loss : 얼마나 잘 학습되었느냐 0에 가까울 수록 학습이 잘 되
었는지 알 수 있다.
                    }
            }
        } // loss 추가 예제
```

```
            model.fit(원인, 결과, fitParam).then(function (result) {

                // 4. 모델을 이용합니다.
                // 4.1 기존의 데이터를 이용
                var 예측한결과 = model.predict(원인);
                예측한결과.print();

            });

            // 4.2 새로운 데이터를 이용
            // var 다음주온도 = [15,16,17,18,19]
            // var 다음주원인 = tf.tensor(다음주온도);
            // var 다음주결과 = model.predict(다음주원인);
            // 다음주결과.print();
        </script>
    </body>

</html>
```

결과

```
> var weights = model.getWeights();
< undefined
> weight[0].arraySync();
⊗ ▶Uncaught ReferenceError: weight is not defined
       at <anonymous>:1:1
> weights[0].arraySync
< ƒ (){return q(this.shape,this.dataSync())}
> weights[0].arraySync();
< ▼(13) [Array(1), Array(1), Array(1), Array(1), Array(1), Array(1), A
    Array(1)] ⓘ
    ▶0: [-0.09237650781869888]
    ▶1: [0.049959696829319]
    ▶2: [-0.0340472087264061]
    ▶3: [2.8160560131073]
    ▶4: [1.1568901538848877]
    ▶5: [5.33442258348389]
    ▶6: [-0.01277688704431057]
    ▶7: [-0.9985707402229309]
    ▶8: [0.18591724336147308]
    ▼9: Array(1)
        0: -0.0114661223237753
        length: 1
      ▶[[Prototype]]: Array(0)
    ▶10: [-0.43011751770973206]
    ▶11: [0.011936183087527752]
    ▶12: [-0.4608995318412781]
      length: 13
    ▶[[Prototype]]: Array(0)
> weights[1].arraySync();
< ▶[4.244620323181152]
```