

201720970\_권대한

$X_1 = 1.2$   $X_2 = 5.9$   $X_3 = 2.3$   $X_4 = 0.2$   $Y = 13$

각 입출력 데이터는 다음과 같으며, Hidden Node 1, 2, Output Node 1 의 Activation Function 이 각 Sigmoid, Hyperbolic Tangent, Leaky RELU 이다.

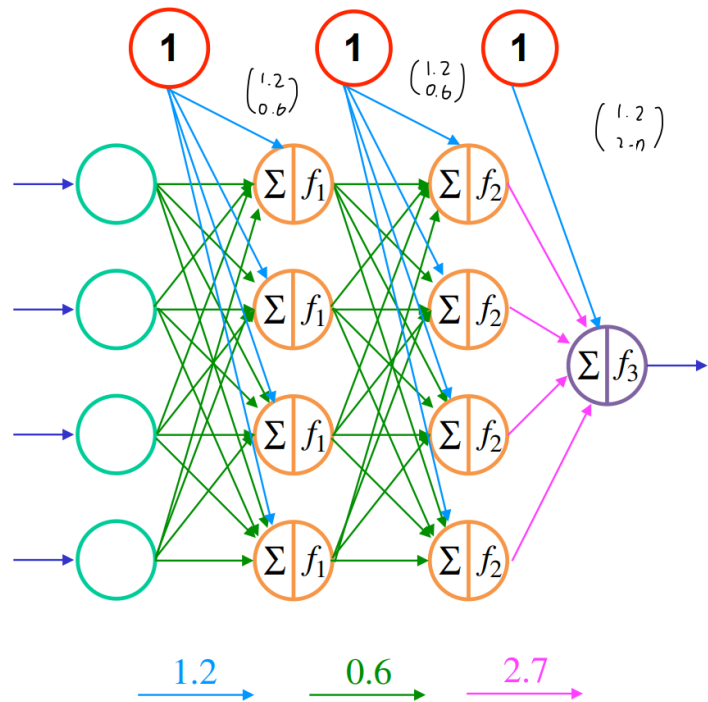
Feed Forward NN 의 Loss 값을 구하여라. (입력 데이터가 1 개이므로  $y - \hat{y}$  이 되겠다.)

	$X_1$	$X_2$	$X_3$	$X_4$	$Y$
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$
<b>k</b>	<b>1.2</b>	<b>5.9</b>	<b>2.3</b>	<b>0.2</b>	<b>13</b>
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$

SSSE

$$\text{Loss}(y_k, \hat{y}_k) = ?$$

$$f_1(z) = \frac{1}{1 + e^{-z}}, \quad f_2(z) = \tanh(z), \quad f_3(z) = \max(0.1z, z)$$



<코드>

```
forward_exer1 <- function(x)

{

  f.1 <- function(z)

  {

    1 / (1 + exp(-z))

  }

  f.2 <- function(z)

  {

    tanh(z)

  }

  f.3 <- function(z)

  {

    pmax(0.1 * z, z)

  }

  a.0 <- x

  b.1 <- c(rep(1.2, 4)) %>% matrix(., nrow = 4)

  b.2 <- b.1

  b.3 <- 1.2

  w.1 <- c(rep(0.6, 16)) %>% matrix(., ncol = 4)

  w.2 <- w.1

  w.3 <- c(rep(2.7, 4)) %>% matrix(., ncol = 4)

  a.1 <- (b.1 + w.1 %*% a.0) %>% f.1 %>% `colnames<-`("a.1") %>% print(.)

  a.2 <- (b.2 + w.2 %*% a.1) %>% f.2 %>% `colnames<-`("a.2") %>% print(.)

  a.3 <- (b.3 + w.3 %*% a.2) %>% f.3 %>% `colnames<-`("a.3") %>% print(.)

  (13 - a.3) / 1 %>% `colnames<-`("Loss") %>% print(.)

}

c(1.2, 5.9, 2.3, 0.2) %>% matrix(., nrow = 4) %>% forward_exer1
```

<출력 결과>

```
> forward_exer1 <- function(x)
+ {
+   f.1 <- function(z)
+   {
+     1 / (1 + exp(-z))
+   }
+   f.2 <- function(z)
+   {
+     tanh(z)
+   }
+   f.3 <- function(z)
+   {
+     pmax(0.1 * z, z)
+   }
+   a.0 <- x
+   b.1 <- c(rep(1.2, 4)) %>% matrix(., nrow = 4)
+   b.2 <- b.1
+   b.3 <- 1.2
+   w.1 <- c(rep(0.6, 16)) %>% matrix(., ncol = 4)
+   w.2 <- w.1
+   w.3 <- c(rep(2.7, 4)) %>% matrix(., ncol = 4)
+   a.1 <- (b.1 + w.1 %**% a.0) %>% f.1 %>% `colnames<-`("a.1") %>% print(.)
+   a.2 <- (b.2 + w.2 %**% a.1) %>% f.2 %>% `colnames<-`("a.2") %>% print(.)
+   a.3 <- (b.3 + w.3 %**% a.2) %>% f.3 %>% `colnames<-`("a.3") %>% print(.)
+   ((13 - a.3) / 1) %>% `colnames<-`("Loss") %>% print(.)
+ }
>
> c(1.2, 5.9, 2.3, 0.2) %>% matrix(., nrow = 4) %>% forward_exer1
      a.1
[1,] 0.9990518
[2,] 0.9990518
[3,] 0.9990518
[4,] 0.9990518
      a.2
[1,] 0.9985011
[2,] 0.9985011
[3,] 0.9985011
[4,] 0.9985011
      a.3
[1,] 11.98381
      Loss
[1,] 1.016188
```