DDA3020 Assignment 1
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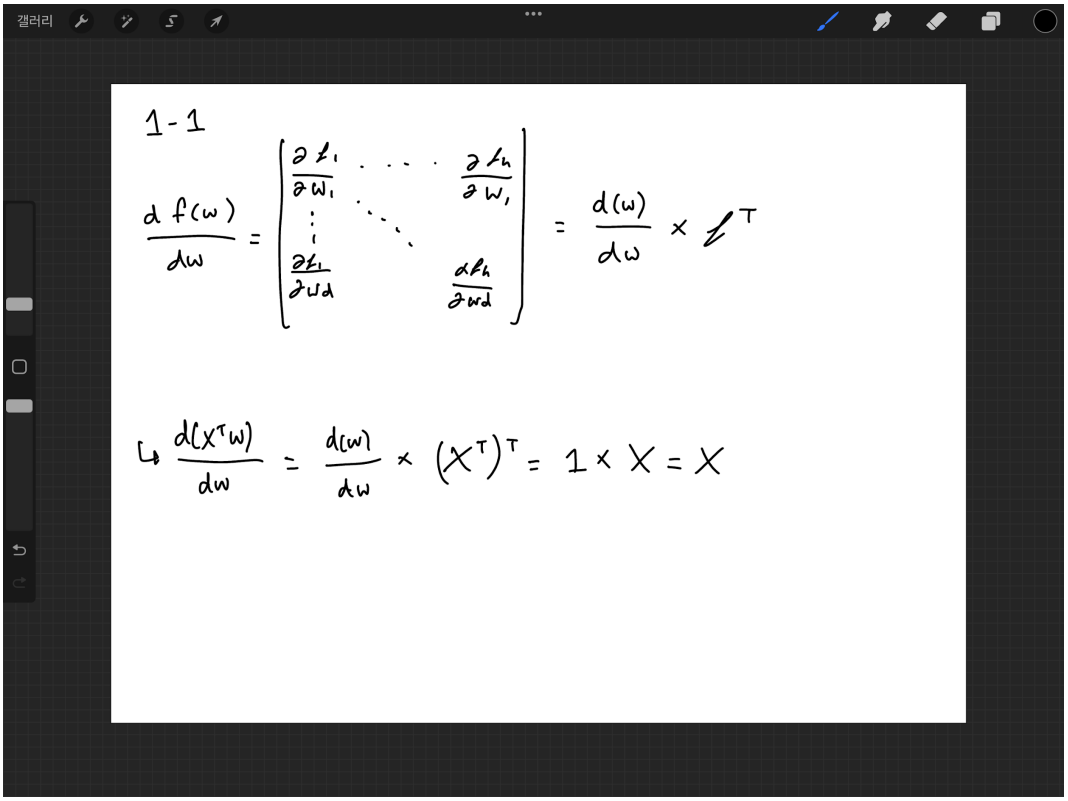
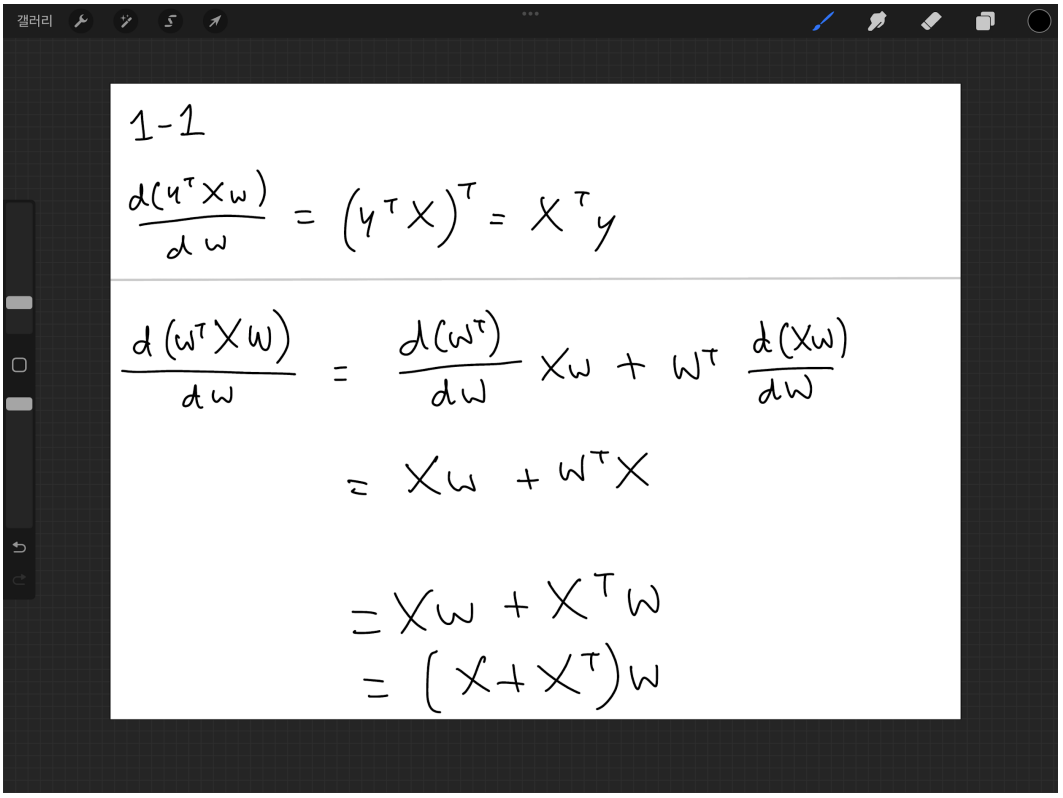
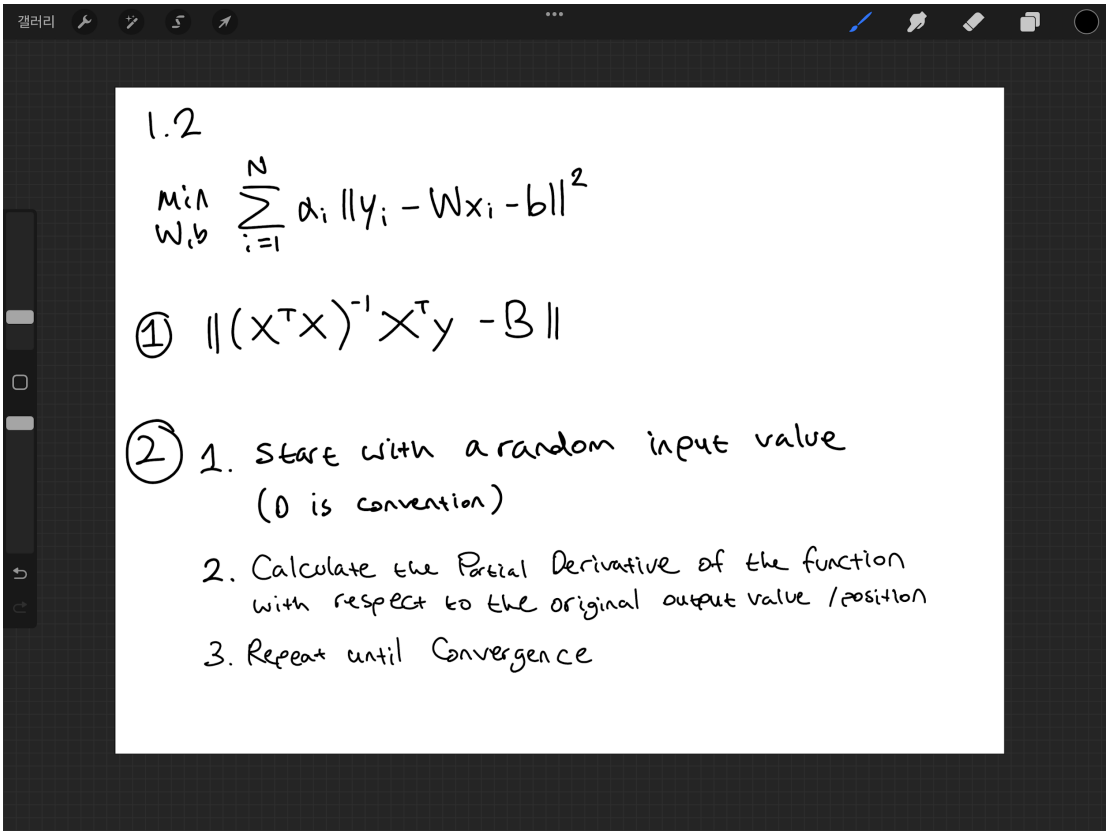
1-1)

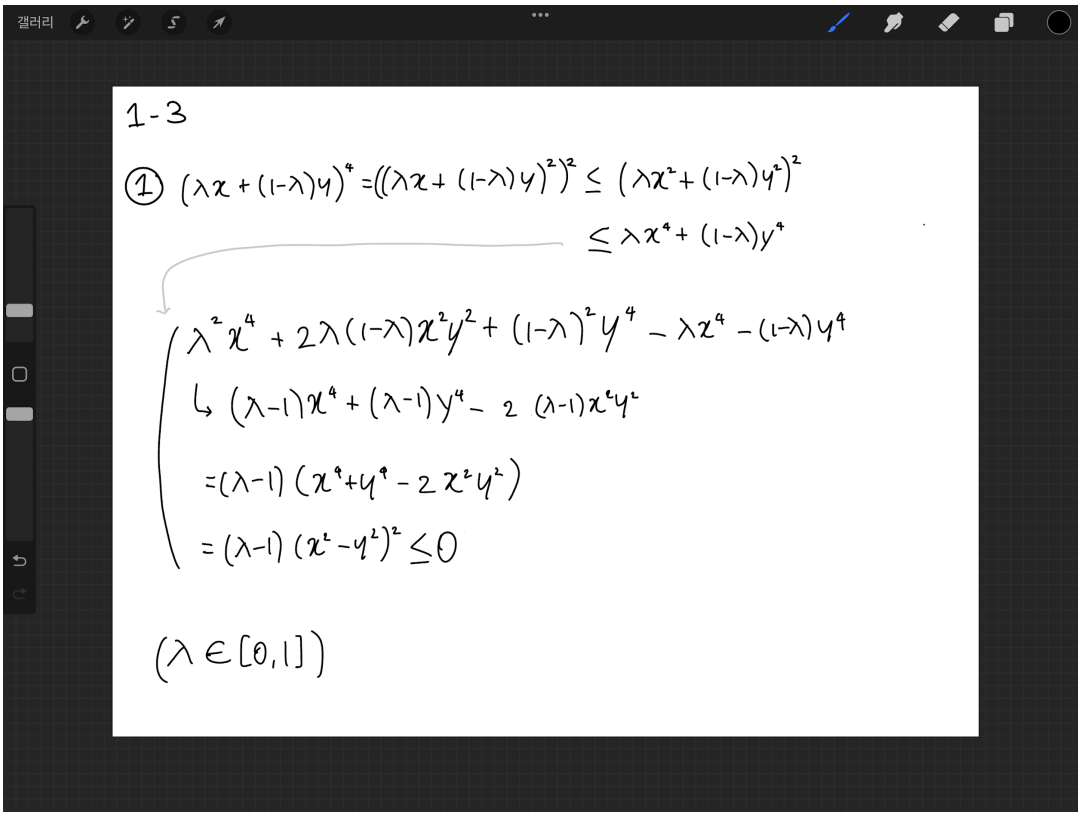


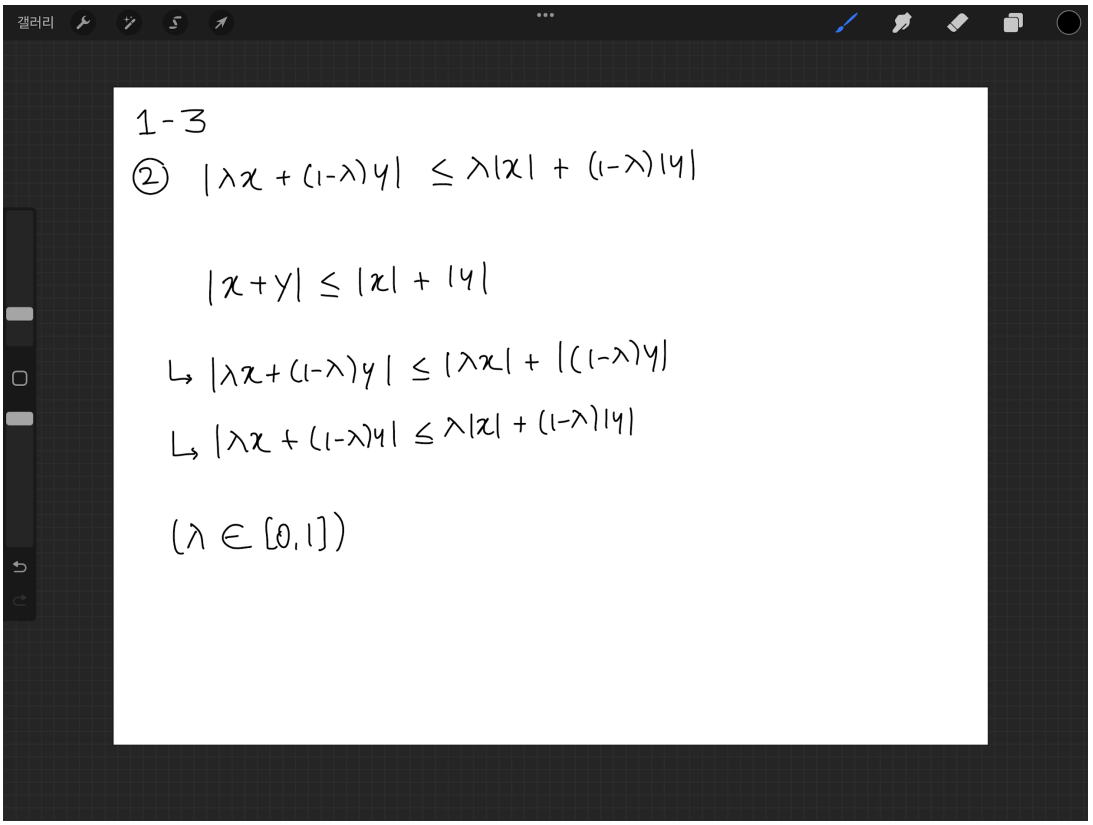


1-2)

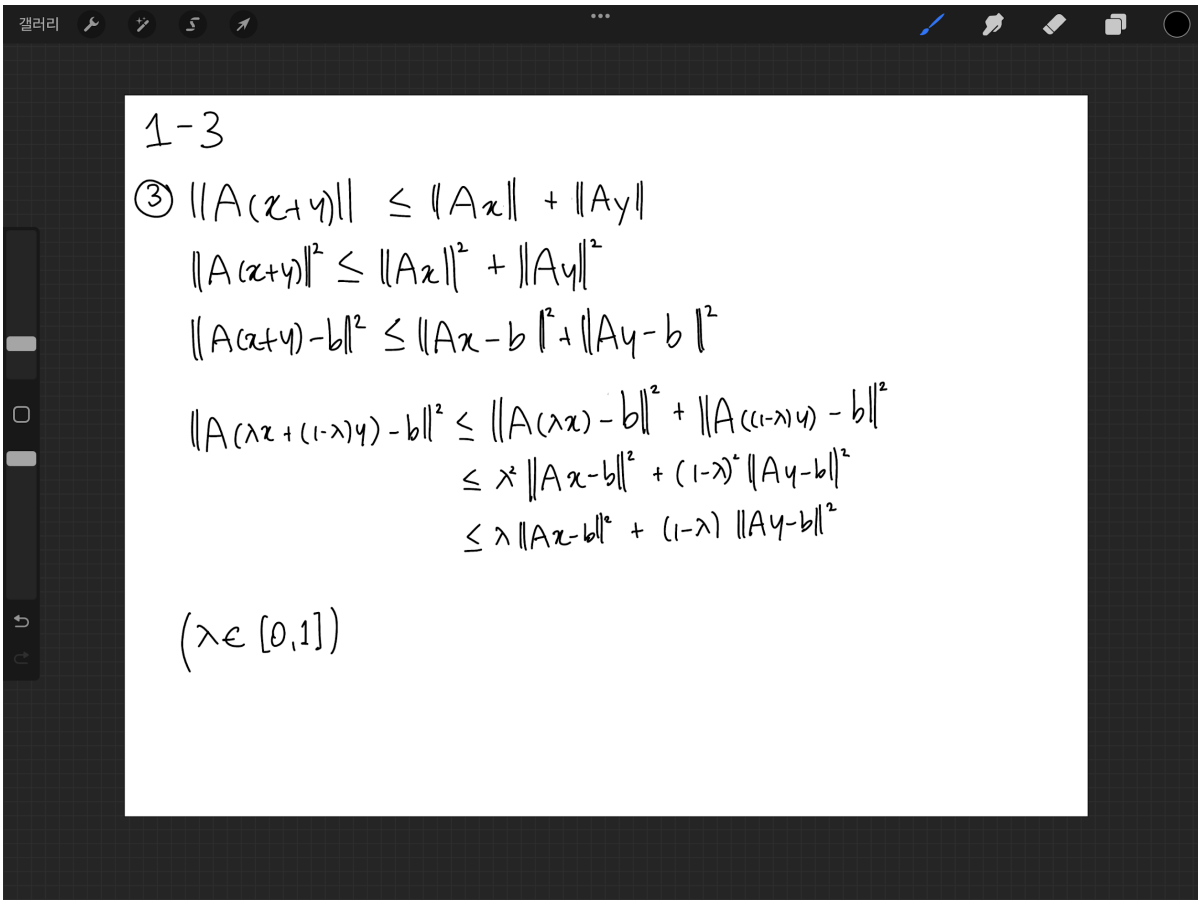

갤러리
1.2
$\min_{W,b} \sum_{i=1}^{N} a_i \|y_i - Wx_i - b\|^2$
① $\|(X^TX)^{-1}X^Ty - B\|$
② 1. Start with a random input value (0 is convention)
2. Calculate the Partial Derivative of the function with respect to the original output value / position
3. Repeat until Convergence

1-3)

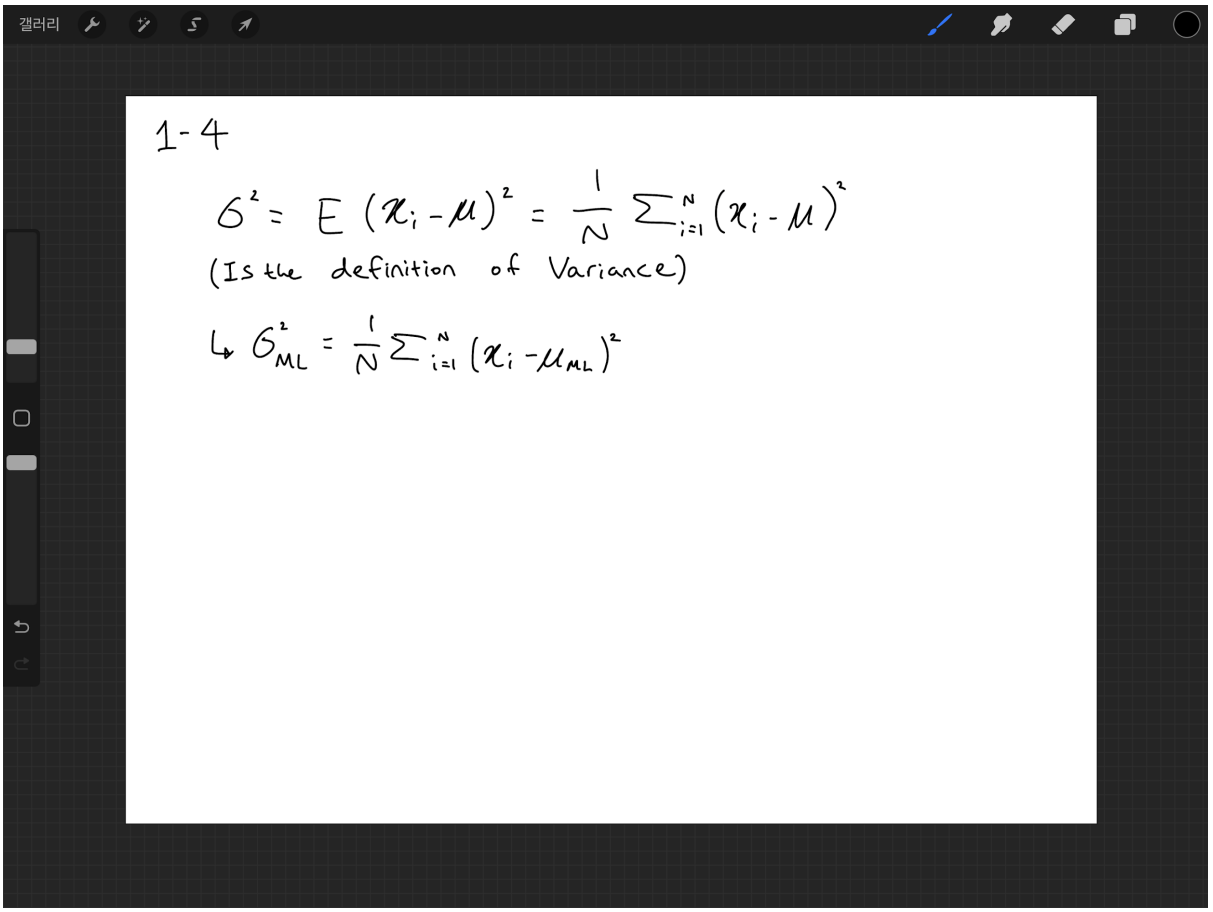

갤러리
1-3
① $(\lambda x+(1-\lambda)y)^4=((\lambda x+(1-\lambda)y)^2)^2 \le (\lambda x^2+(1-\lambda)y^2)^2$
$\le \lambda x^4+(1-\lambda)y^4$
$\lambda^2x^4+2\lambda(1-\lambda)x^2y^2+(1-\lambda)^2y^4-\lambda x^4-(1-\lambda)y^4$
$\hookrightarrow (\lambda-1)x^4+(\lambda-1)y^4-2(\lambda-1)x^2y^2$
$=(\lambda-1)(x^4+y^4-2x^2y^2)$
$=(\lambda-1)(x^2-y^2)^2 \le 0$
$(\lambda \in [0,1])$


갤러리
1-3
② $|\lambda x+(1-\lambda)y| \le \lambda|x|+(1-\lambda)|y|$
$|x+y| \le |x|+|y|$
$\hookrightarrow |\lambda x+(1-\lambda)y| \le |\lambda x|+|(1-\lambda)y|$
$\hookrightarrow |\lambda x+(1-\lambda)y| \le \lambda|x|+(1-\lambda)|y|$
$(\lambda \in [0,1])$

1-3)


갤러리
1-3
③ $\|A(x+y)\| \le \|Ax\| + \|Ay\|$
$\|A(x+y)\|^2 \le \|Ax\|^2 + \|Ay\|^2$
$\|A(x+y)-b\|^2 \le \|Ax-b\|^2 + \|Ay-b\|^2$
$\|A(\lambda x + (1-\lambda)y) - b\|^2 \le \|A(\lambda x) - b\|^2 + \|A((1-\lambda)y) - b\|^2$
$\le \lambda^2 \|Ax-b\|^2 + (1-\lambda)^2 \|Ay-b\|^2$
$\le \lambda \|Ax-b\|^2 + (1-\lambda)\|Ay-b\|^2$
$(\lambda \in [0,1])$

1-4)


갤러리
1-4
$\sigma^2 = E(x_i - \mu)^2 = \frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2$
(Is the definition of Variance)
↳ $\sigma_{ML}^2 = \frac{1}{N}\sum_{i=1}^{N}(x_i - \mu_{ML})^2$

2-1)

```
Trial 1 (Next_Tmax)
 - Training Error RMSE:  0.0291502407
 - Test Error RMSE:  0.1204407047

Trial 2 (Next_Tmax)
 - Training Error RMSE:  0.0306539907
 - Test Error RMSE:  0.1546279789

Trial 3 (Next_Tmax)
 - Training Error RMSE:  0.0459930015
 - Test Error RMSE:  0.0293782999

Trial 4 (Next_Tmax)
 - Training Error RMSE:  0.0205958059
 - Test Error RMSE:  0.0851275653

Trial 5 (Next_Tmax)
 - Training Error RMSE:  0.067856742
 - Test Error RMSE:  0.1470456242

Trial 6 (Next_Tmax)
 - Training Error RMSE:  0.0411286329
 - Test Error RMSE:  0.0487073477

Trial 7 (Next_Tmax)
 - Training Error RMSE:  0.0723820473
 - Test Error RMSE:  0.1272343491

Trial 8 (Next_Tmax)
 - Training Error RMSE:  0.0718629216
 - Test Error RMSE:  0.0705387448

Trial 9 (Next_Tmax)
 - Training Error RMSE:  0.0426002037
 - Test Error RMSE:  0.0406797655

Trial 10 (Next_Tmax)
 - Training Error RMSE:  0.0489320446
 - Test Error RMSE:  0.1698338441
```

```
Trial 1 (Next_Tmin)
 - Training Error RMSE:  0.0092956914
 - Test Error RMSE:  0.0834975961

Trial 2 (Next_Tmin)
 - Training Error RMSE:  0.0292812932
 - Test Error RMSE:  0.0561980276

Trial 3 (Next_Tmin)
 - Training Error RMSE:  0.0353417875
 - Test Error RMSE:  0.0155197476

Trial 4 (Next_Tmin)
 - Training Error RMSE:  0.0338352823
 - Test Error RMSE:  0.0002082216

Trial 5 (Next_Tmin)
 - Training Error RMSE:  0.076820417
 - Test Error RMSE:  0.0240910251

Trial 6 (Next_Tmin)
 - Training Error RMSE:  0.0031703638
 - Test Error RMSE:  0.023440943

Trial 7 (Next_Tmin)
 - Training Error RMSE:  0.0307044456
 - Test Error RMSE:  0.127550735

Trial 8 (Next_Tmin)
 - Training Error RMSE:  0.0129012211
 - Test Error RMSE:  0.0075642227

Trial 9 (Next_Tmin)
 - Training Error RMSE:  0.0322146765
 - Test Error RMSE:  0.0895942114

Trial 10 (Next_Tmin)
 - Training Error RMSE:  0.0356269333
 - Test Error RMSE:  0.1180644071
```

2-2)

```
Iteration  10
Sento      Versi      Virgi      Prediction           Guess
0.0%       27.53%     96.1%      Iris-virginica       True - Iris-virginica
0.01%      36.64%     99.45%     Iris-virginica       True - Iris-virginica
99.97%     8.12%      0.0%       Iris-setosa          True - Iris-setosa
0.0%       37.17%     99.86%     Iris-virginica       True - Iris-virginica
0.0%       38.46%     99.91%     Iris-virginica       True - Iris-virginica
0.47%      62.56%     0.08%      Iris-versicolor      True - Iris-versicolor
99.8%      11.5%      0.0%       Iris-setosa          True - Iris-setosa
0.04%      16.98%     36.67%     Iris-virginica       False - Iris-versicolor
99.27%     30.18%     0.0%       Iris-setosa          True - Iris-setosa
99.73%     17.72%     0.0%       Iris-setosa          True - Iris-setosa
0.4%       90.1%      0.54%      Iris-versicolor      True - Iris-versicolor
99.24%     14.0%      0.0%       Iris-setosa          True - Iris-setosa
0.1%       64.11%     0.54%      Iris-versicolor      True - Iris-versicolor
0.01%      43.98%     93.5%      Iris-virginica       True - Iris-virginica
0.17%      54.96%     0.32%      Iris-versicolor      True - Iris-versicolor
0.09%      72.85%     4.6%       Iris-versicolor      True - Iris-versicolor
0.15%      27.76%     1.04%      Iris-versicolor      True - Iris-versicolor
0.54%      55.22%     0.02%      Iris-versicolor      True - Iris-versicolor
0.0%       90.19%     100.0%     Iris-virginica       True - Iris-virginica
0.0%       56.81%     98.14%     Iris-virginica       True - Iris-virginica
0.11%      53.37%     10.35%     Iris-versicolor      True - Iris-versicolor
0.04%      82.86%     48.71%     Iris-versicolor      True - Iris-versicolor
99.05%     21.43%     0.0%       Iris-setosa          True - Iris-setosa
0.36%      28.56%     4.4%       Iris-versicolor      True - Iris-versicolor
6.84%      36.99%     0.01%      Iris-versicolor      True - Iris-versicolor
99.55%     15.77%     0.0%       Iris-setosa          True - Iris-setosa
0.21%      72.61%     0.27%      Iris-versicolor      True - Iris-versicolor
0.0%       85.65%     99.01%     Iris-virginica       True - Iris-virginica
0.3%       37.2%      0.17%      Iris-versicolor      True - Iris-versicolor
*Accuracy:  96.55172413793103 %
```