

# CMPUT 566

## Coding Assignment 1 Report

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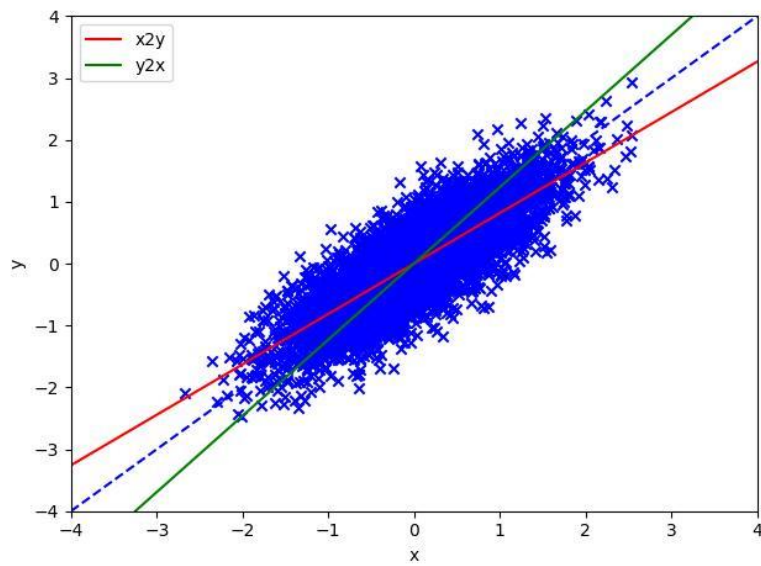
## Problem 1

1)

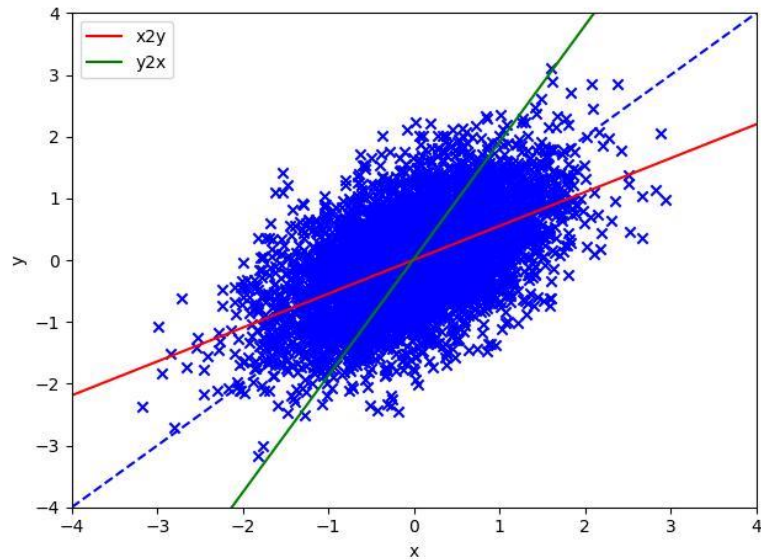
```
Predicting y from x (x2y): weight=0.5485163684654493 bias = 0.006331725736923693  
Predicting x from y (y2x): weight=0.5291743051726622 bias = -0.01238714128208544
```

2)

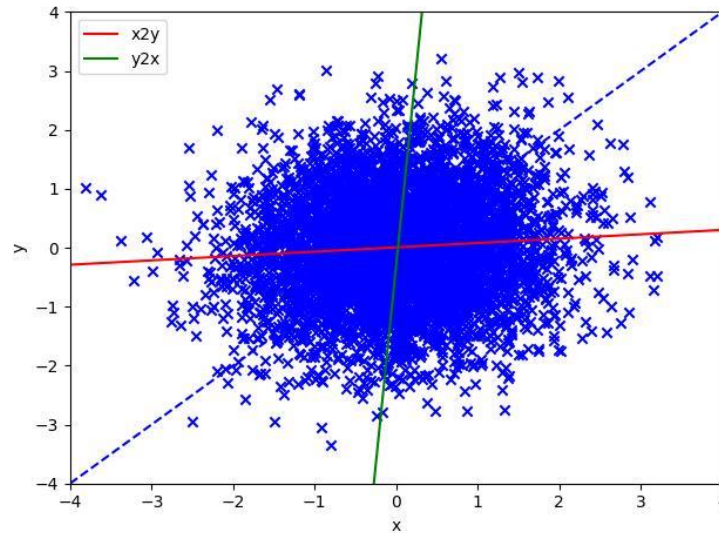
Var2 = 0.1:



Var2 = 0.3



Var2 = 0.8



3)

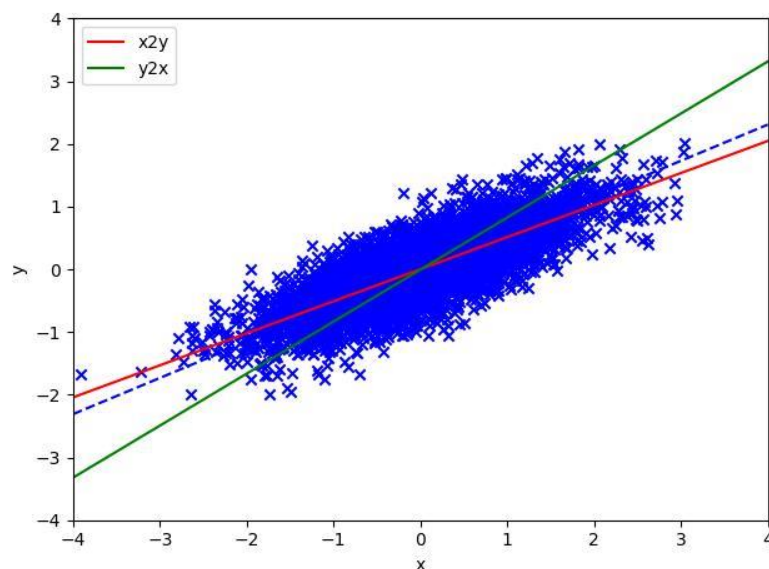
In 1) the two lines are in the opposite side of the true regression line. Therefore, we can know that although the true function is  $y = x$ , it still has different between predicting  $x$  from  $y$  and predicting  $y$  from  $x$ .

In 2) it can be found that the lower variance fit the true regression line better, for both of the predicting lines ( $x_2y$  and  $y_2x$ ).

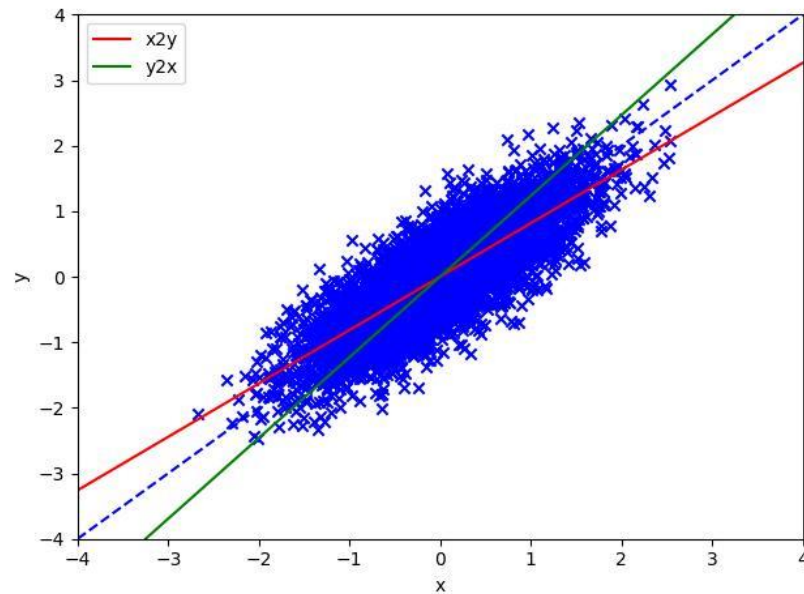
4)

We choose rotation degrees as 30, 45 and 60, and make sure other settings remain intact:  $M = 5000$ ,  $\text{var1} = 1$ ,  $\text{var2} = 0.1$  to get the plot under controlled experimental protocol.

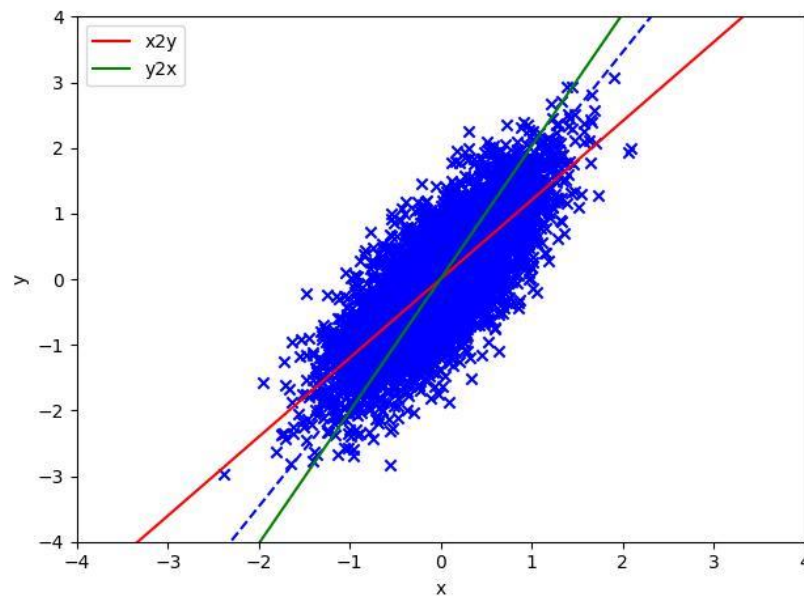
Degree = 30



Degree = 45



Degree = 60



Findings:

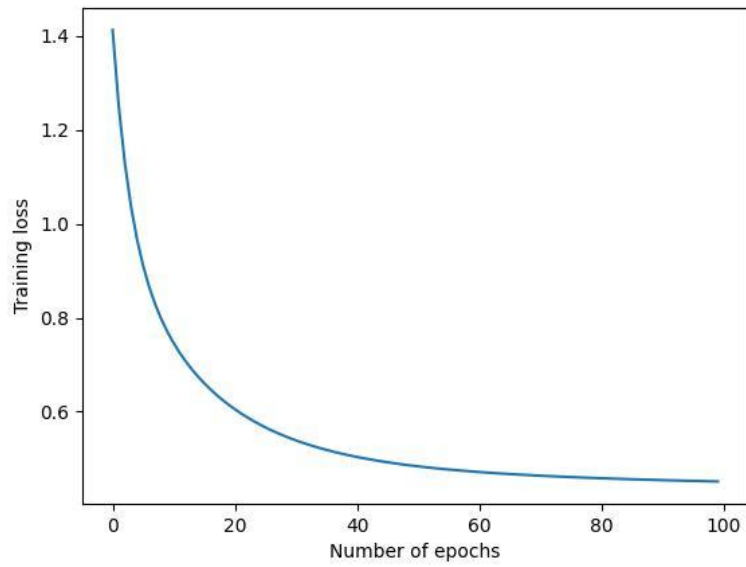
When rotation degree is around 45, two predicting lines both have almost the same fit to true line. With a rotation degree less than 45, the  $x2y$  line fits better to true line. With a degree bigger than 45, the  $y2x$  line is much closer to the true line than  $x2y$  line. It can be inferred that the smaller degree, the closer between  $x2y$  and true lines are. And the bigger degree, the closer between  $y2x$  and true lines are.

## Problem 2

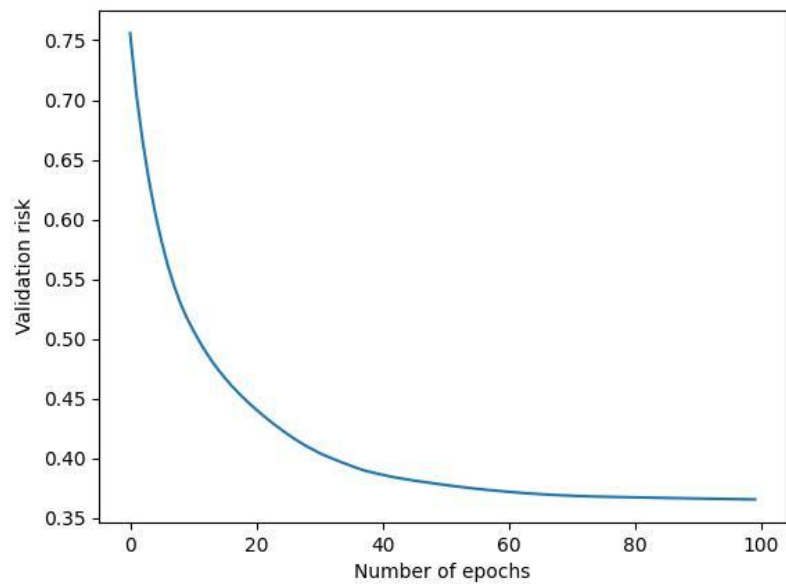
a)

```
Best epoch: 99  
Validation performance: 0.36548514003713645  
Test performance: 0.3523119546733643
```

Training loss / Epoch:



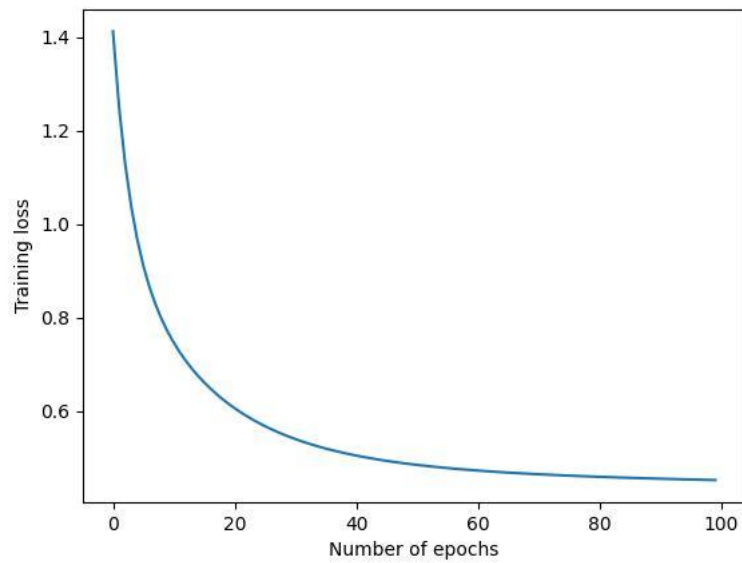
Validation risk / Epoch:



b)

```
Best hyperparameter: 0.01
Best epoch: 99
Validation performance: 0.36582527500460826
Test performance: 0.35162791819297734
```

Training loss / Epoch with hyperparameter tuning:



Validation risk / Epoch with hyperparameter tuning:

