Set 8, Task 2

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We want to find regression line of temperature with respect to latitude and longitude. I will use this short names:

Y - temperature
X_1 - latitude
X_2 - longitude

Our regression line has this form:

$Y = b_1 * X_1 + b_2 * X_2 + a$

We just need to compute all three coefficients. From note 8 we have:

$$\underset{X}{\begin{bmatrix} 1 & x_{11} & x_{12} \\ 1 & x_{21} & x_{22} \\ \vdots & \vdots & \vdots \\ 1 & x_{n1} & x_{n2} \end{bmatrix}} \underset{\beta}{\begin{bmatrix} \beta_0 \\ \beta_1 \\ \beta_2 \end{bmatrix}} \approx \underset{Y}{\begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix}}$$

And the Beta vector is exactly what we want. From notes we know that:

$$\beta = \left(X^T X\right)^{-1} X^T Y$$

Now we can just compute everything in excel.

X		
One	X1	X2
1,00	51,11	17,02
1,00	50,66	17,93
1,00	50,26	19,02
1,00	50,06	19,94
1,00	50,03	22,00
1,00	50,87	20,63
1,00	51,78	19,45
1,00	52,41	16,93
1,00	51,94	15,51
1,00	53,44	14,54
1,00	54,35	18,65
1,00	53,13	18,00
1,00	52,23	21,01
1,00	53,14	23,15
1,00	51,25	22,57
1,00	53,77	20,48

Y
9,70
8,40
7,90
8,70
7,50
7,80
8,60
8,40
8,80
8,00
6,70
8,40
8,20
6,80
8,40
7,20

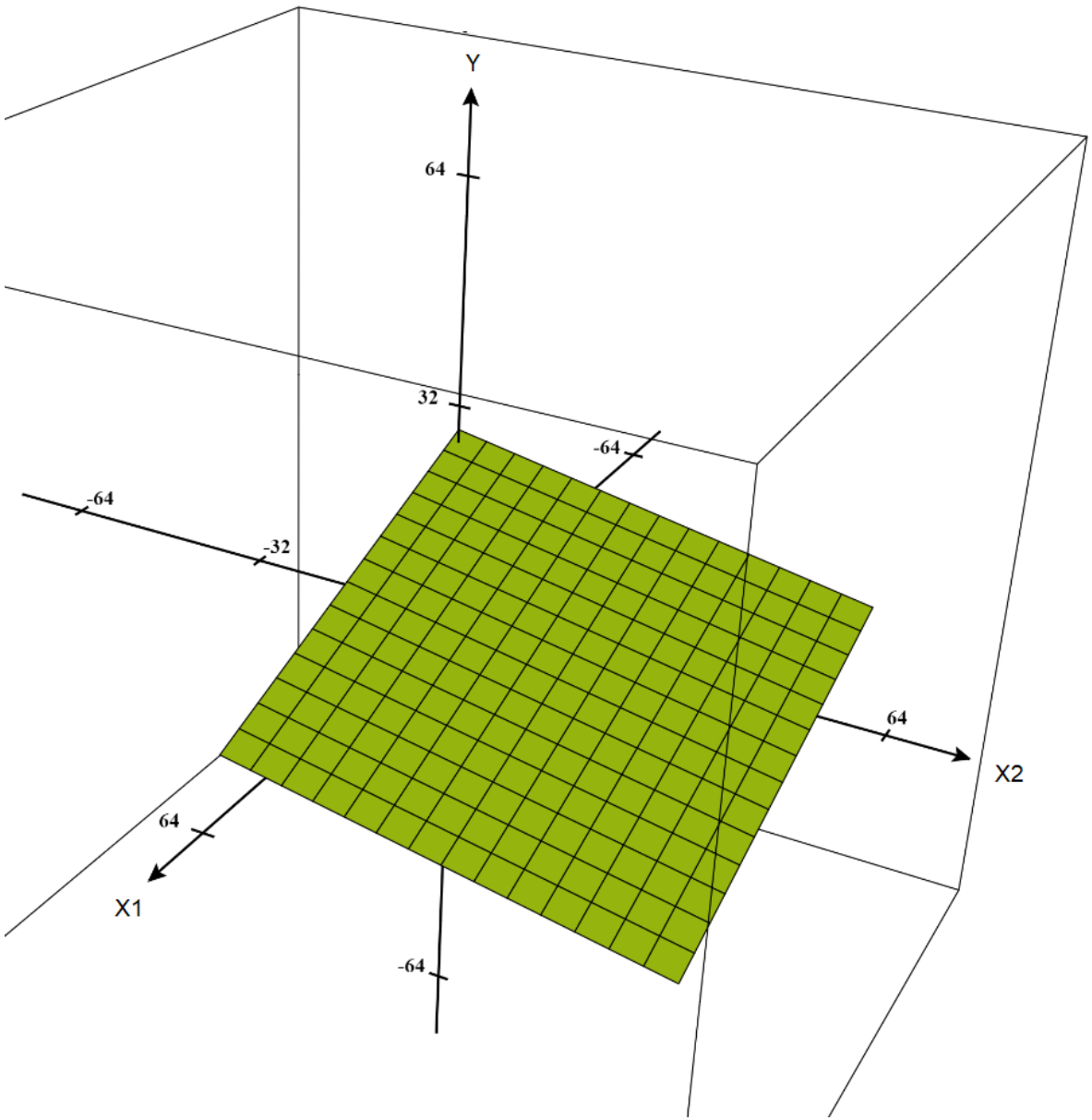
Beta
28,53
-0,33
-0,18

XTY
129,50
6 713,78
2 470,58

(XTX)-1		
111,01	-1,98	-0,43
-1,98	0,04	0,00
-0,43	0,00	0,01

XTX		
16,00	830,43	306,83
830,43	43 129,52	15 915,06
306,83	15 915,06	5 975,08

XT															
1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
51,11	50,66	50,26	50,06	50,03	50,87	51,78	52,41	51,94	53,44	54,35	53,13	52,23	53,14	51,25	53,77
17,02	17,93	19,02	19,94	22,00	20,63	19,45	16,93	15,51	14,54	18,65	18,00	21,01	23,15	22,57	20,48


Y
64
32
-64
-64
-32
64
X2
64
X1
-64