



Which factors affect  
house energy efficiency? OBYG

DongHyuk\_Kim/ SeungHwan\_Kim/ YuJeong\_Lee/ Hyerin\_Kim





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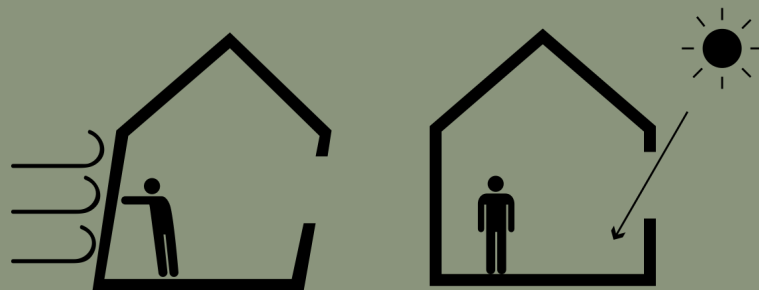
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# 01

## Background of Project

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## Research Question



Which factors affect house energy efficiency?



# Thermal Load

: the amount of energy needed to be added or removed from a space to keep occupants comfortable



# Data Used : house structure dataset

Explanatory Variable	X1	Relative Compactness	12 types of value
	X2	Surface Area	12 types of value
	X3	Wall Area	7 types of value
	X4	Roof Area	4 types of value
	X5	Overall Height	2 types of value
	X6	Orientation	5 types of value
	X7	Glazing area	4 types of value
	X8	Glazing area distribution	6 types of value
Response Variable	Y1	Heating Load	
	Y2	Cooling Load	

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- 1 uniform
  - 2 North
  - 3 East
  - 4 South
  - 5 West



768 observations



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# 02

## Description of Data

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# The feature of dataset

Table 1. descriptive statistics of dataset

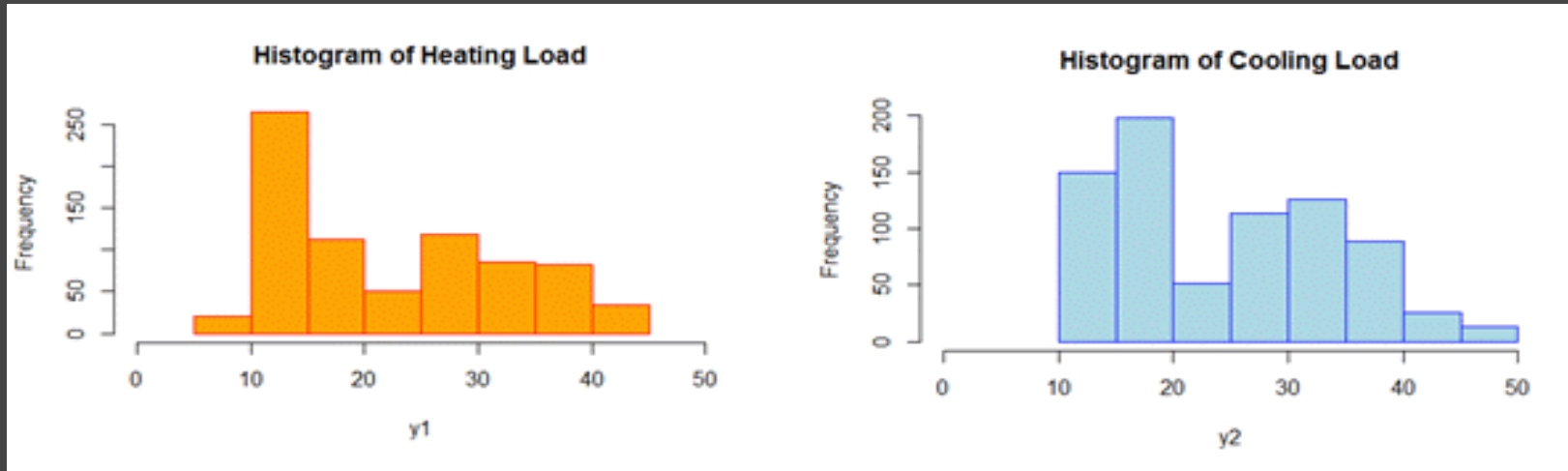
	X1	X2	X3	X4	Y1	Y2
Median	0.75	673.75	318.5	183.75	18.95	22.08
Max	0.98	808.5	416.5	220.5	43.1	48.03
Min	0.62	514.5	245	110.25	6.01	10.9
Mean	0.764167	671.7083	318.5	176.6042	22.3072	24.58776
SD	0.105777	88.08612	43.62648	45.16595	10.0902	9.513306





# Response Variables

Figure 1. The distribution of the core features



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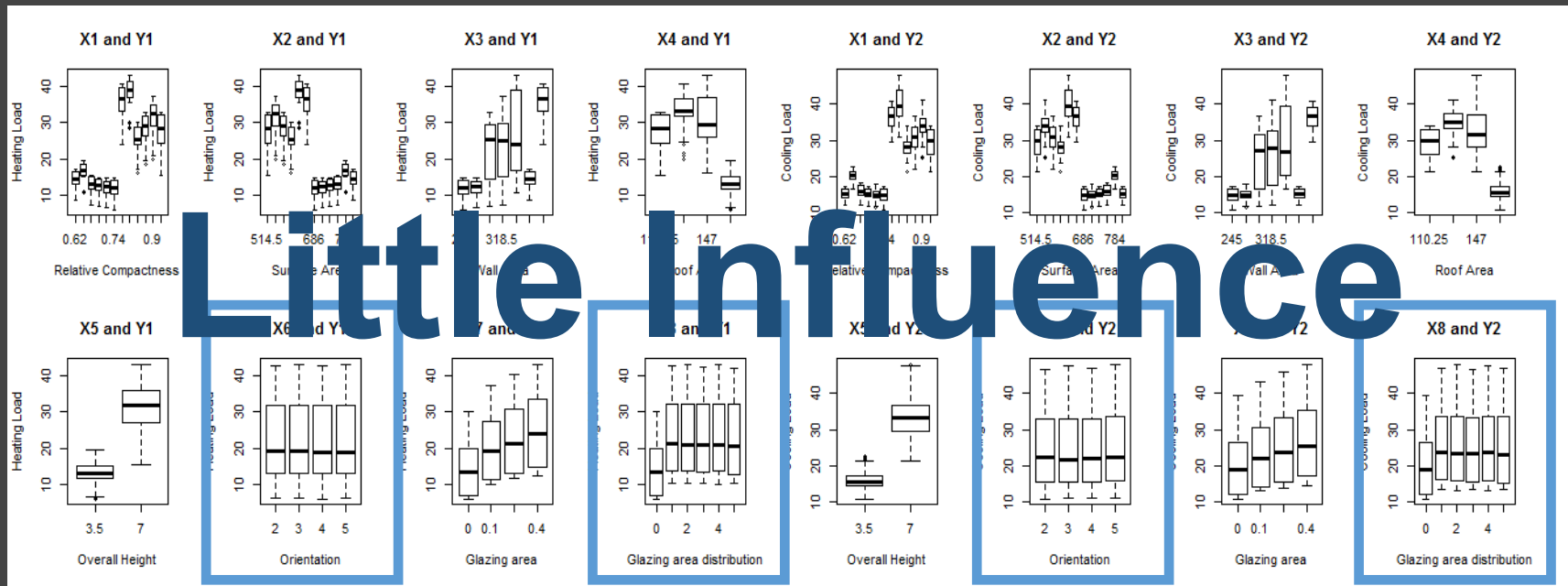
03

# Analysis



# 01 The Boxplot of dataset

Figure 2. Boxplot



# 02 Correlation Coefficient

Table 2. Calculated Correlation Coefficient

	X1	X2	X3	X4	X5	X6	X7	X8
Y1	0.622	-0.658	0.455	-0.861	0.895	-0.002	0.269	0.087
Y2	0.634	-0.672	0.427	-0.862	0.895	0.014	0.207	0.050



# 03 Multiple Regression Analysis

**Model 1.**  $Y_1 = \text{Intercept} + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_5 X_5 + \alpha_7 X_7$

**Model 2.**  $Y_2 = \text{Intercept} + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_5 X_5 + \beta_7 X_7$



# 03 Multiple Regression Analysis

Table 3. Estimation Result of Model 1

	Estimated	Std	t-Value	Pr(> t )	
<b>Intercept</b>	84.38757	19.11175	4.415	1.15E-05	***
<b>X1</b>	-64.774	10.33361	-6.268	6.11E-10	***
<b>X2</b>	-0.08729	0.017149	-5.09	4.51E-07	***
<b>X3</b>	0.060813	0.006676	9.109	< 2e-16	***
<b>X5</b>	4.169939	0.339441	12.285	< 2e-16	***
<b>X7</b>	20.4379	0.798726	25.588	< 2e-16	***
Multiple R-squared : 0.9153, Adjusted R-squared : 0.9147, F-statistic: 1646 on 5 and 762 DF, p-value: < 2.2e-16					



# 03 Multiple Regression Analysis

Table 4. Estimation Result of Model 2

	Estimated	Std	t-Value	Pr(> t )	
<b>Intercept</b>	97.76185	20.75634	4.71	2.94E-06	***
<b>X1</b>	-70.7877	11.22282	-6.307	4.80E-10	***
<b>X2</b>	-0.08825	0.018624	-4.738	2.57E-06	***
<b>X3</b>	0.044682	0.007251	6.162	1.16E-09	***
<b>X5</b>	4.283843	0.36865	11.62	< 2e-16	***
<b>X7</b>	14.81797	0.867458	17.082	< 2e-16	***
Multiple R-squared : 0.8876, Adjusted R-squared : 0.8868, F-statistic : 1203 on 5 and 762 DF, p-value : < 2.2e-16					



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04

# Conclusion







Surface Area(X2)



Wall Area(X3)

Overall Height(X5)

Glazing Area(X7)





**Relative Compactness  
(X1)**

**Glazing Area(X7)**

**Overall Height(X5)**

**Surface Area(X2)**

**Wall Area(X3)**



**Selecting House**



# References

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# Q&A



THANK YOU

