Analysis of bicycle rentals in Washington D.C. and Seoul

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Climate

To begin to understand bike rental numbers in the two cities, it is important to understand each city's climate.

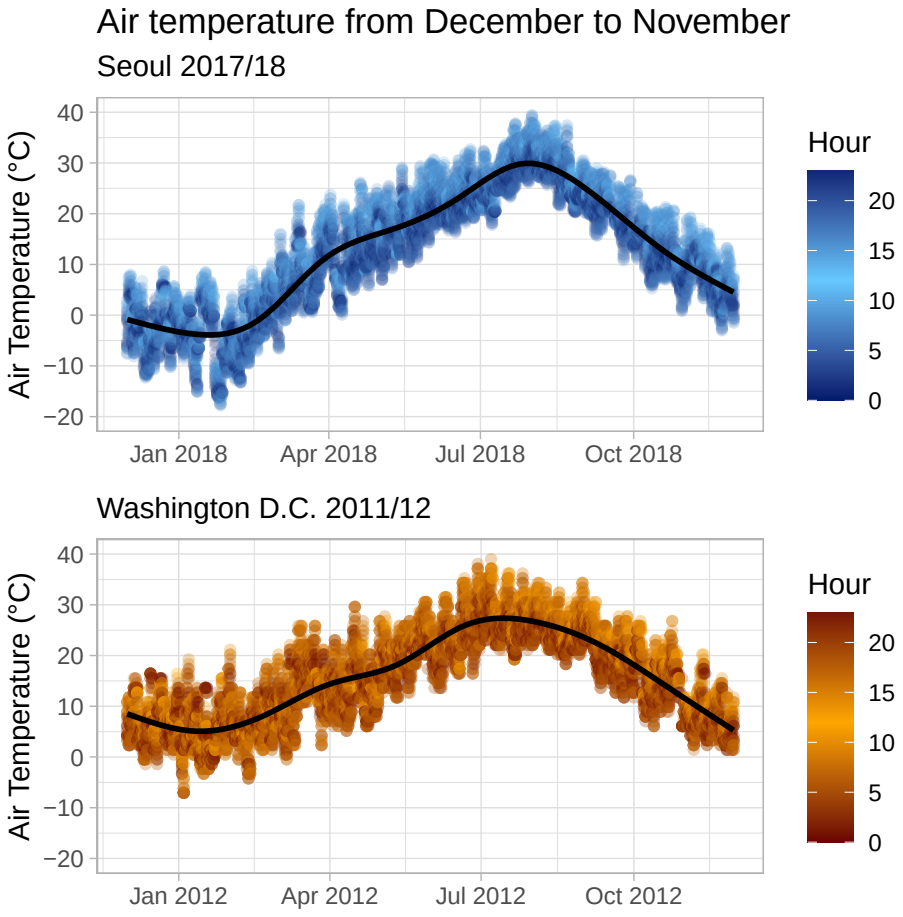

Figure 1: Air Temperature in Seoul and Washington D.C.

Figure 1 shows the air temperature (°C) throughout a year in Washington D.C. and Seoul. Visibly the climate Seoul is more extreme in the chosen year, with a hotter summer and colder winter.

```
## `geom_smooth()` using method = 'gam' and formula = 'y ~ s(x, bs = "cs")'
```

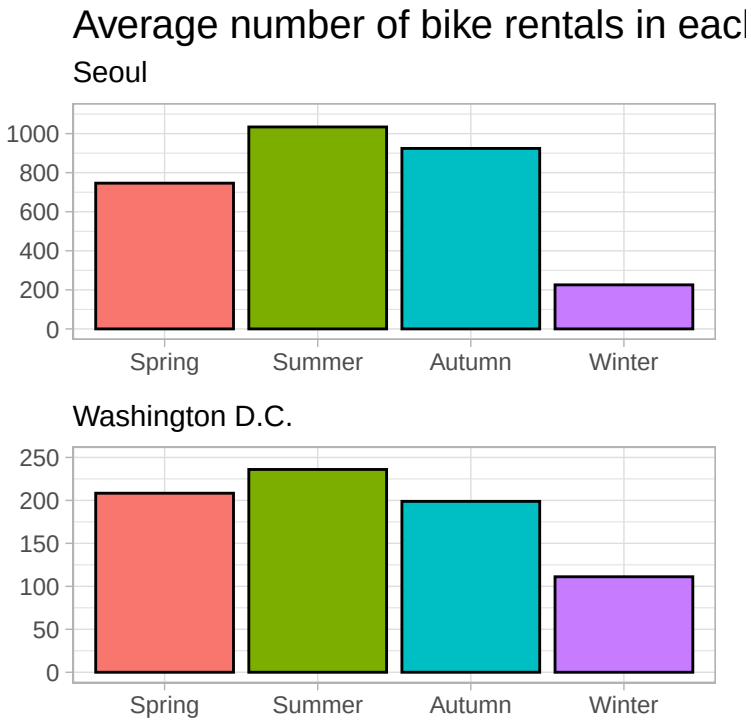

Figure 2: Bike rentals in Seoul and Washington D.C.

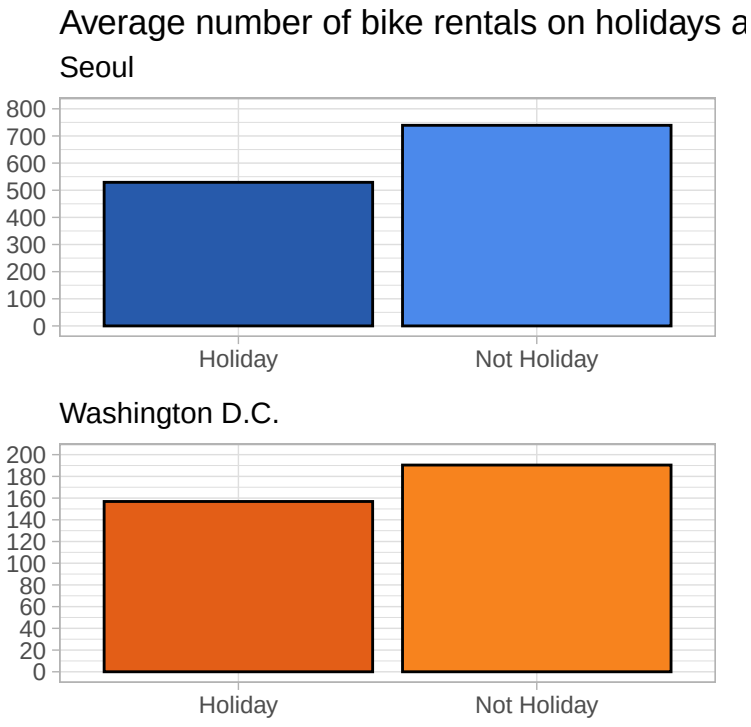

Figure 3: Bike rentals in Seoul and Washington D.C.

```
## `geom_smooth()` using method = 'gam' and formula = 'y ~ s(x, bs = "cs")'
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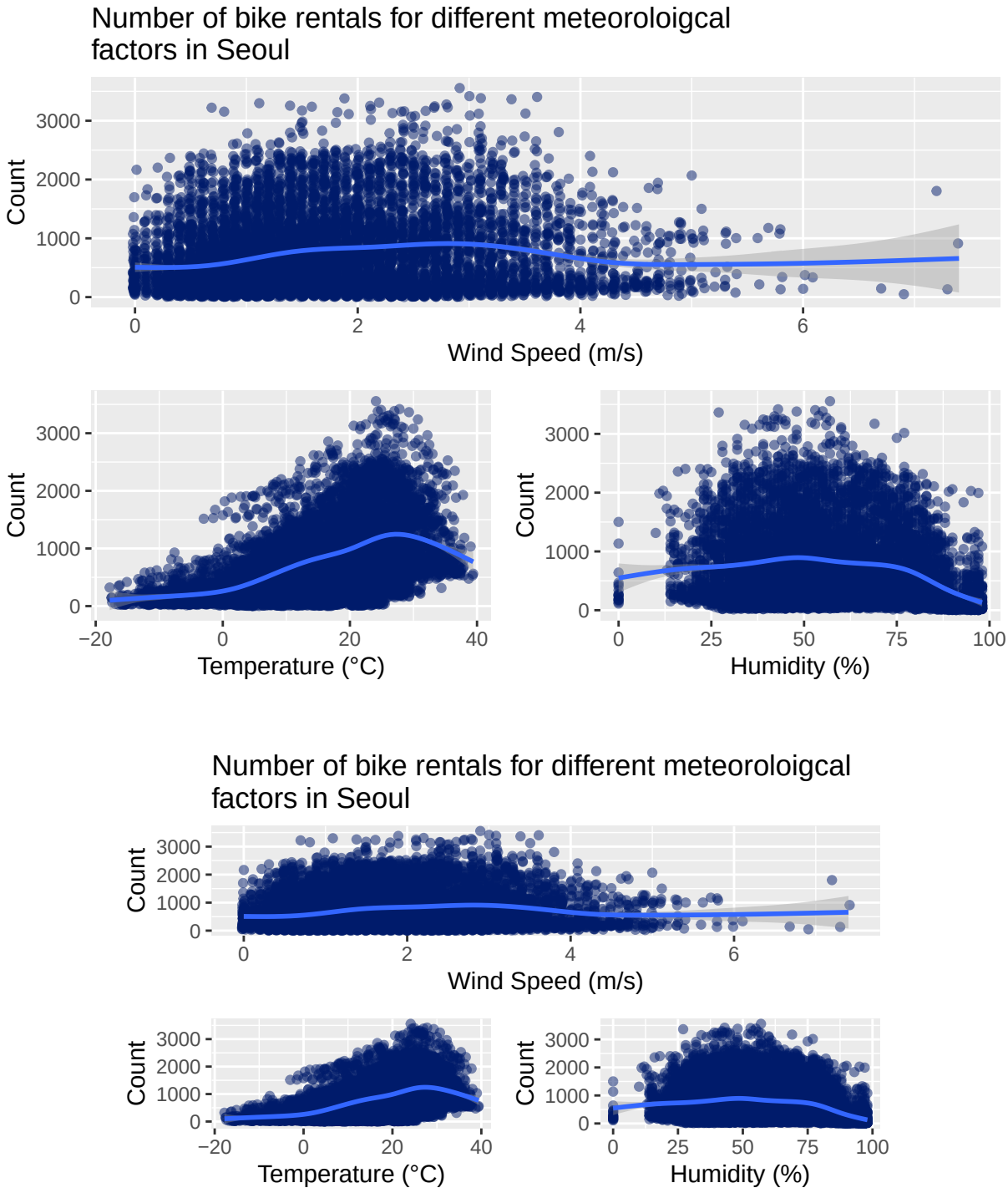

Figure 4: Seoul bike rentals

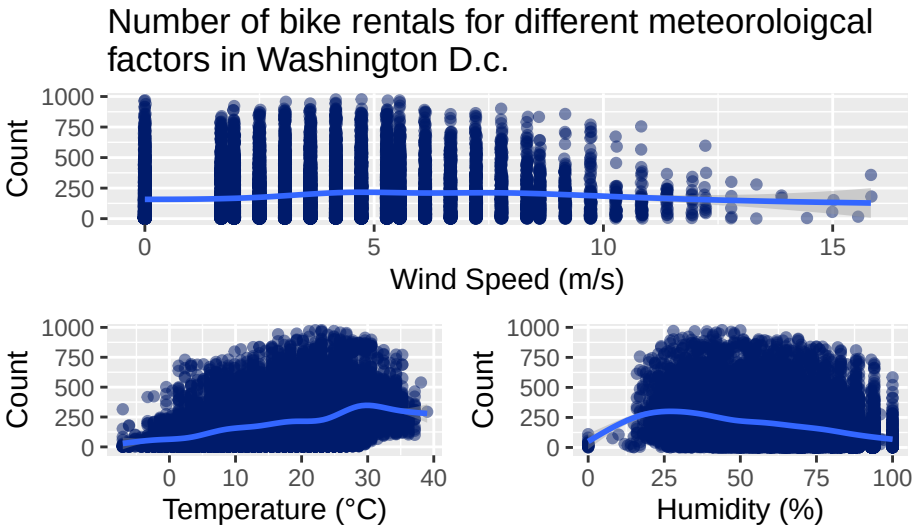

Figure 5: Washington D.C. bike rentals

Modelling

$$log(Count) \sim Season + Temperature + Humidity + WindSpeed$$

```
##
## Call:
## lm(formula = log(Count) ~ Season + Temperature + Humidity + WindSpeed,
##     data = seoul3)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -5.1073 -0.4281  0.0812  0.5493  2.4352
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)   6.7336965  0.0467062 144.171  < 2e-16 ***
## SeasonSummer  0.0036038  0.0327843   0.110  0.91247
## SeasonAutumn  0.3733211  0.0261578  14.272  < 2e-16 ***
## SeasonWinter -0.3830362  0.0349918 -10.946  < 2e-16 ***
## Temperature   0.0492700  0.0015053  32.732  < 2e-16 ***
## Humidity     -0.0224974  0.0004844 -46.441  < 2e-16 ***
## WindSpeed     0.0253809  0.0093544   2.713  0.00668 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.8276 on 8458 degrees of freedom
## Multiple R-squared:  0.4941, Adjusted R-squared:  0.4937
## F-statistic:  1377 on 6 and 8458 DF,  p-value: < 2.2e-16

##
## Call:
## lm(formula = log(Count) ~ Season + Temperature + Humidity + WindSpeed,
```

```
##     data = washington3)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -5.4834 -0.6069  0.2458  0.8440  3.5203
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)   4.6264010  0.0576892  80.195  < 2e-16 ***
## SeasonSummer -0.3651680  0.0300276 -12.161  < 2e-16 ***
## SeasonAutumn  0.5361839  0.0289332  18.532  < 2e-16 ***
## SeasonWinter  0.1046103  0.0341346   3.065  0.00218 **
## Temperature   0.0797914  0.0017401  45.856  < 2e-16 ***
## Humidity     -0.0233425  0.0005317 -43.901  < 2e-16 ***
## WindSpeed     0.0245022  0.0044358   5.524 3.37e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.263 on 17372 degrees of freedom
## Multiple R-squared:  0.278,  Adjusted R-squared:  0.2777
## F-statistic:  1115 on 6 and 17372 DF,  p-value: < 2.2e-16
```

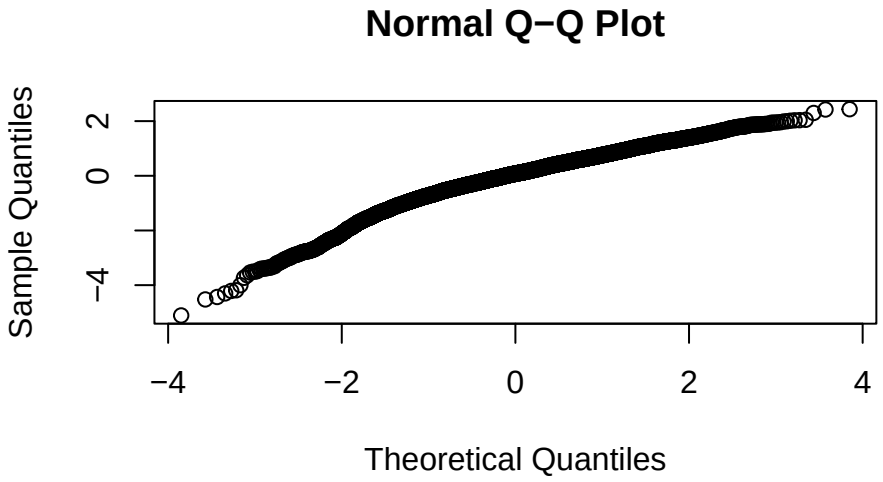

Figure 6: Seoul normal Q-Q plot

Table 1: Seoul model parameters 97% CI

	1.5 %	98.5 %
Intercept	6.6323227	6.8350703
Summer	-0.0675531	0.0747607
Autumn	0.3165466	0.4300955
Winter	-0.4589844	-0.3070880
Temperature	0.0460029	0.0525372
Humidity	-0.0235488	-0.0214459

	1.5 %	98.5 %
Wind Speed	0.0050777	0.0456842

Table 2: Wasjington D.C. model parameters 97% CI

	1.5 %	98.5 %
Intercept	4.5012000	4.7516020
Summer	-0.4303359	-0.3000002
Autumn	0.4733911	0.5989767
Winter	0.0305290	0.1786916
Temperature	0.0760151	0.0835678
Humidity	-0.0244964	-0.0221885
Wind Speed	0.0148754	0.0341290

Prediction

Table 3: Seoul prediction

Prediction	5%	95%
5.913404	5.865934	5.960874

Table 4: Washington D.C. prediction

Prediction	5%	95%
4.276413	4.215417	4.33741

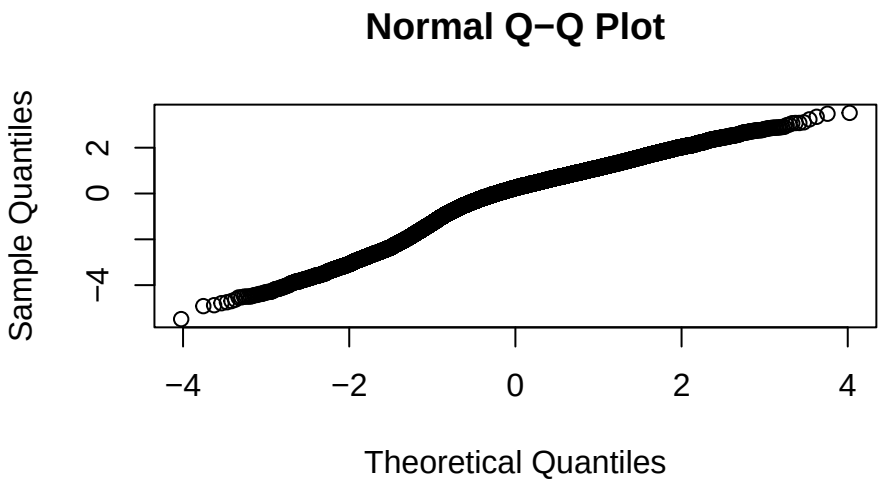

Figure 7: Washington D.C. normal Q-Q plot