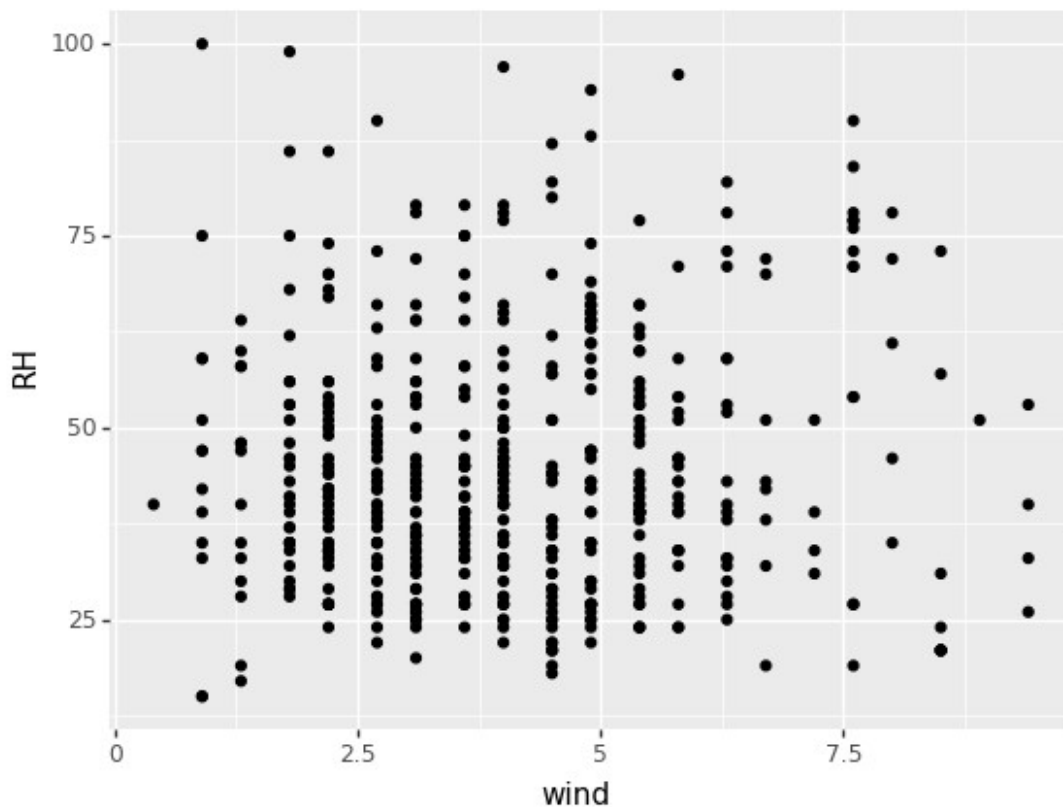


```
import matplotlib.pyplot as plt
import pandas as pd
from plotnine import *
forest = pd.read_csv("forestfires.csv")
forest.head()
```

	X	Y	month	day	FFMC	DMC	DC	ISI	temp	RH	wind	rain	area
0	7	5	mar	fri	86.2	26.2	94.3	5.1	8.2	51	6.7	0.0	0.0
1	7	4	oct	tue	90.6	35.4	669.1	6.7	18.0	33	0.9	0.0	0.0
2	7	4	oct	sat	90.6	43.7	686.9	6.7	14.6	33	1.3	0.0	0.0
3	8	6	mar	fri	91.7	33.3	77.5	9.0	8.3	97	4.0	0.2	0.0
4	8	6	mar	sun	89.3	51.3	102.2	9.6	11.4	99	1.8	0.0	0.0

```
(ggplot(forest, aes(x = "wind", y = "RH")) +
  geom_point())
```



```
<ggplot: (8745267746877)>
```

```
cov_mat = forest.cov()
cov_mat
```

	X	Y	FFMC	DMC	DC	\
X	5.353568	1.535401	-0.268720	-7.170019	-49.313282	
Y	1.535401	1.512655	-0.314391	0.612960	-30.869004	
FFMC	-0.268720	-0.314391	30.471624	135.272459	452.587277	
DMC	-7.170019	0.612960	135.272459	4101.951889	10838.501342	

DC	-49.313282	-30.869004	452.587277	10838.501342	61536.835467
ISI	0.065512	-0.137321	13.384902	89.102965	259.185313
temp	-0.688667	-0.172134	13.831997	174.639099	714.751694
RH	3.217602	1.248699	-27.111933	77.121359	-158.640438
wind	0.077926	-0.044822	-0.281718	-12.087923	-90.430008
rain	0.044776	0.012097	0.092635	1.417655	2.632813
area	9.335731	3.513139	14.098358	297.592727	779.803423

	ISI	temp	RH	wind	rain
area					
X	0.065512	-0.688667	3.217602	0.077926	0.044776
9.335731					
Y	-0.137321	-0.172134	1.248699	-0.044822	0.012097
3.513139					
FFMC	13.384902	13.831997	-27.111933	-0.281718	0.092635
14.098358					
DMC	89.102965	174.639099	77.121359	-12.087923	1.417655
297.592727					
DC	259.185313	714.751694	-158.640438	-90.430008	2.632813
779.803423					
ISI	20.788832	10.438820	-9.859163	0.872661	0.091313
2.396689					
temp	10.438820	33.716898	-49.969934	-2.362793	0.119421
36.165676					
RH	-9.859163	-49.969934	266.259802	2.029220	0.481729
78.441272					-
wind	0.872661	-2.362793	2.029220	3.210019	0.032409
1.404775					
rain	0.091313	0.119421	0.481729	0.032409	0.087592
0.138767					-
area	2.396689	36.165676	-78.441272	1.404775	-0.138767
4052.063225					

2.0292197082152543

```
def cov_alt(x, y):
    n = len(x)
    return ((x * y).sum() / (n - 1)) - ((n / (n - 1)) * x.mean() *
y.mean())
```

```
cov_mat.loc["wind", "RH"]
```

```
cov_alt(forest["wind"], forest["RH"])
```

2.029219708215237