Lab 3 - Wind Turbine

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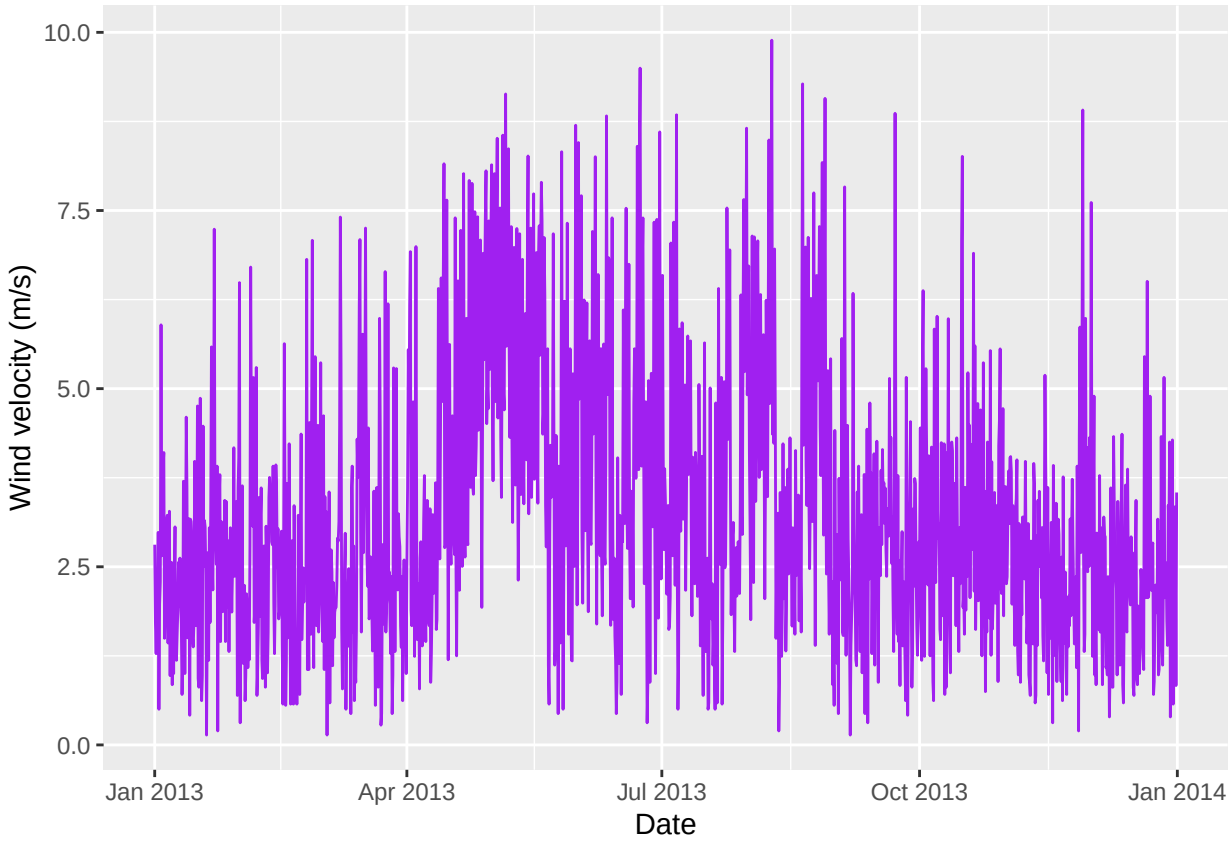
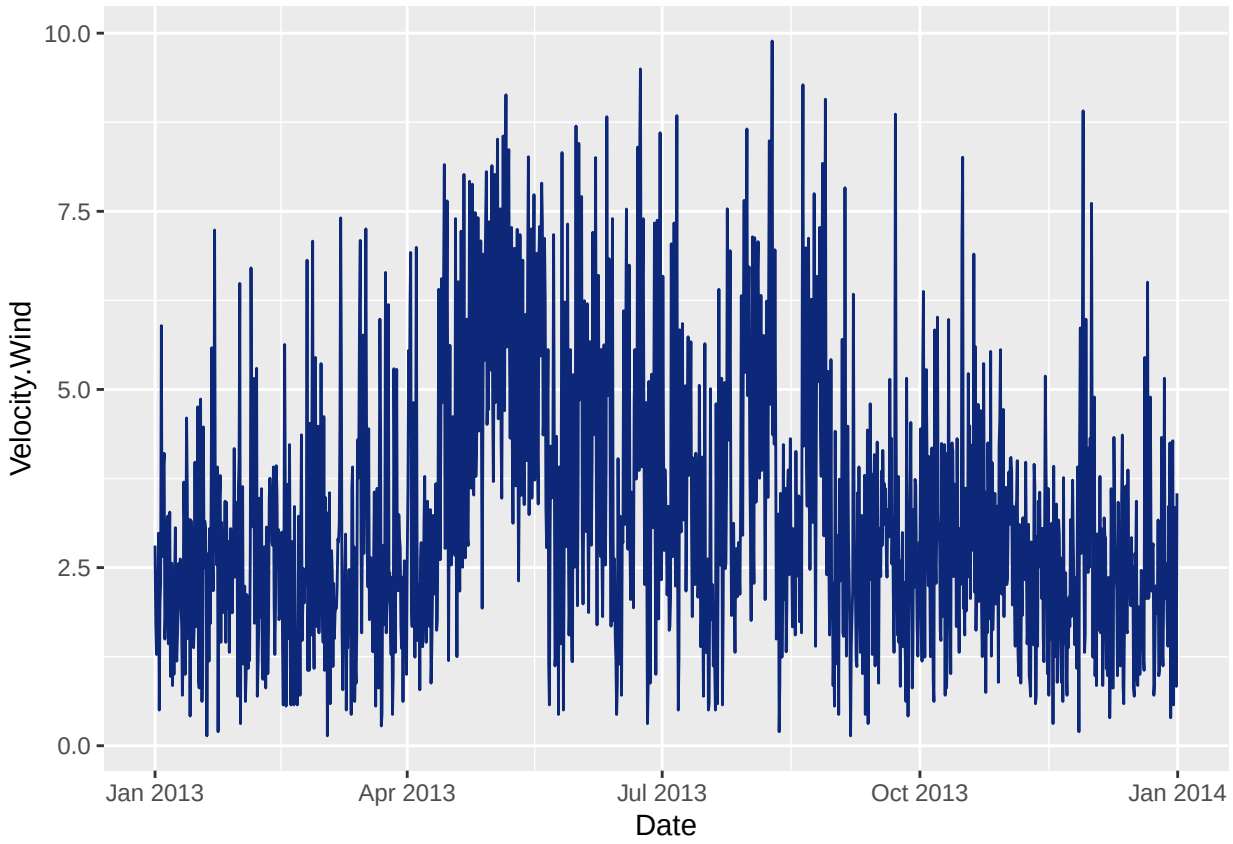
```
load("Gisenyi Wind Data.RData")
source ("weplot function.R")
```

```
## -- weplot loaded (version 1.11) --
```

```
weplot(x = Date, y = Velocity.Wind, type= "line",
       ylab= "Wind velocity (m/s)", color = "purple")
```

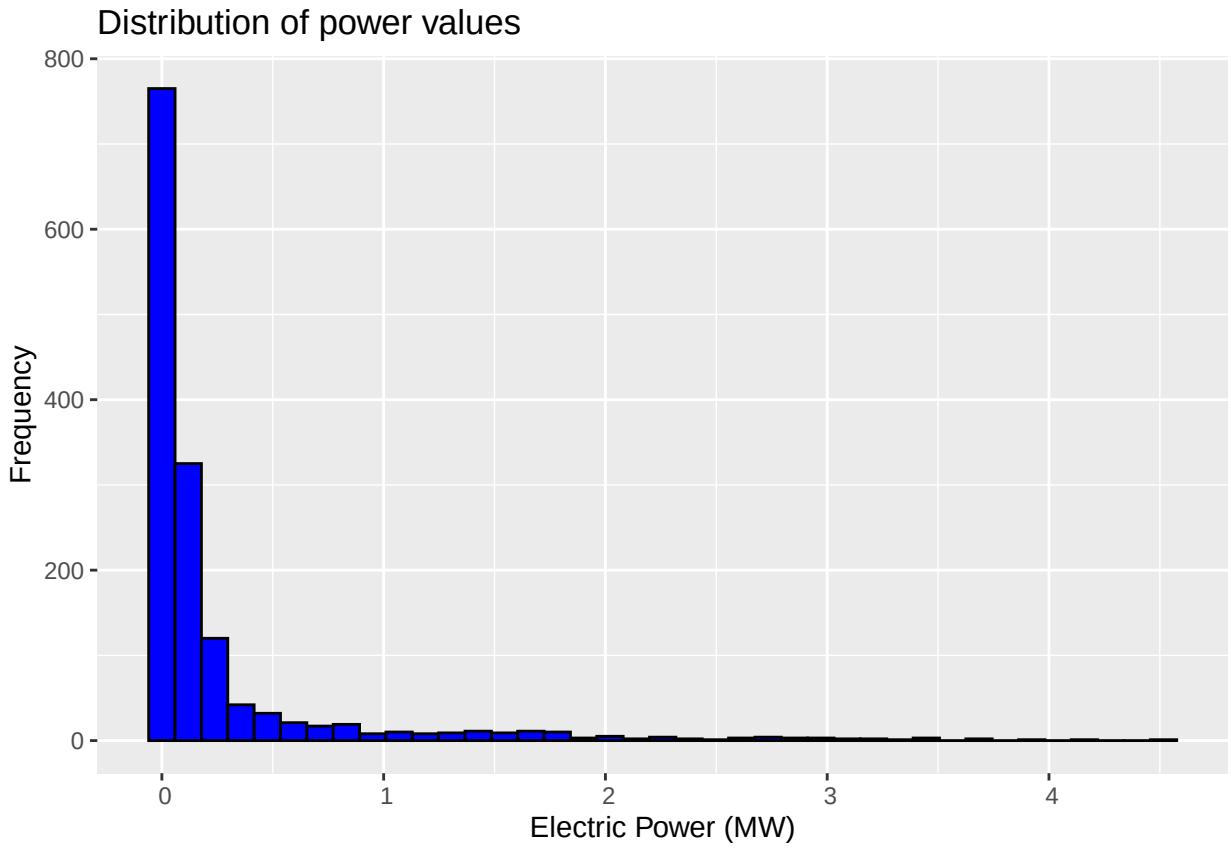



```
#define inputs
cut.in <- 3
cut.out <- 25
a <- -6.8409
b <- 0.8043
Max.Power <- 6e+06

weplot(x = Date, y = Velocity.Wind, type = "line")
```

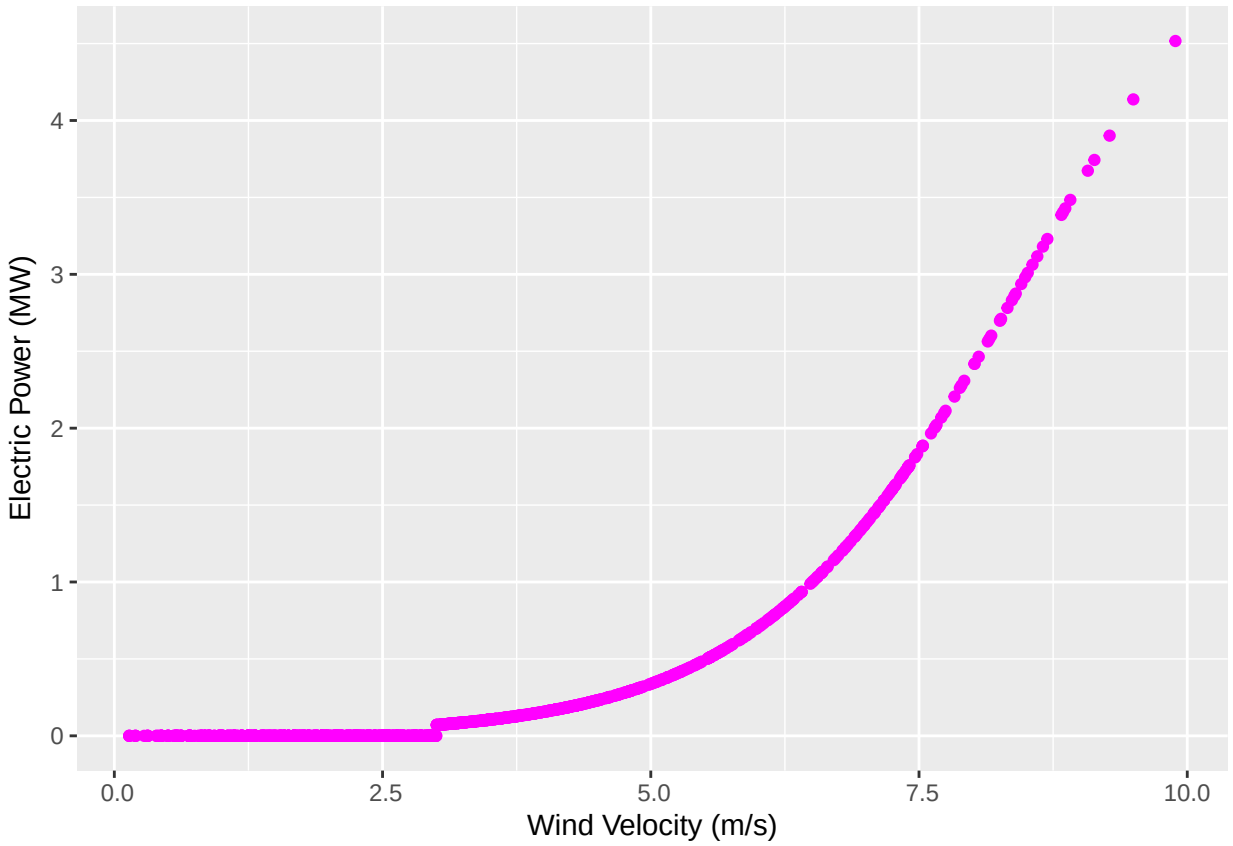



```
Time <- length(Date) #length of dataset (used to run the loop)

#define outputs
Electric.Power <- numeric()

#loop
for (t in 1:Time){

  Electric.Power [t] <- (Max.Power) * (exp(a+b*Velocity.Wind [t])/(1+exp(a+b*Velocity.Wind[t])))

  if (Velocity.Wind [t] < cut.in){
    Electric.Power [t] <- 0
  }

  if (Velocity.Wind [t] > cut.out){
    Electric.Power [t] <- 0
  }
}

Electric.Power <- Electric.Power / 1e6 #watts to megawatts

#Calculate average power & total energy
Average.Power <- mean(Electric.Power)
Total.Energy <- Average.Power * 8760

weplot(x = Electric.Power, type= "hist",
       color = "blue",
```

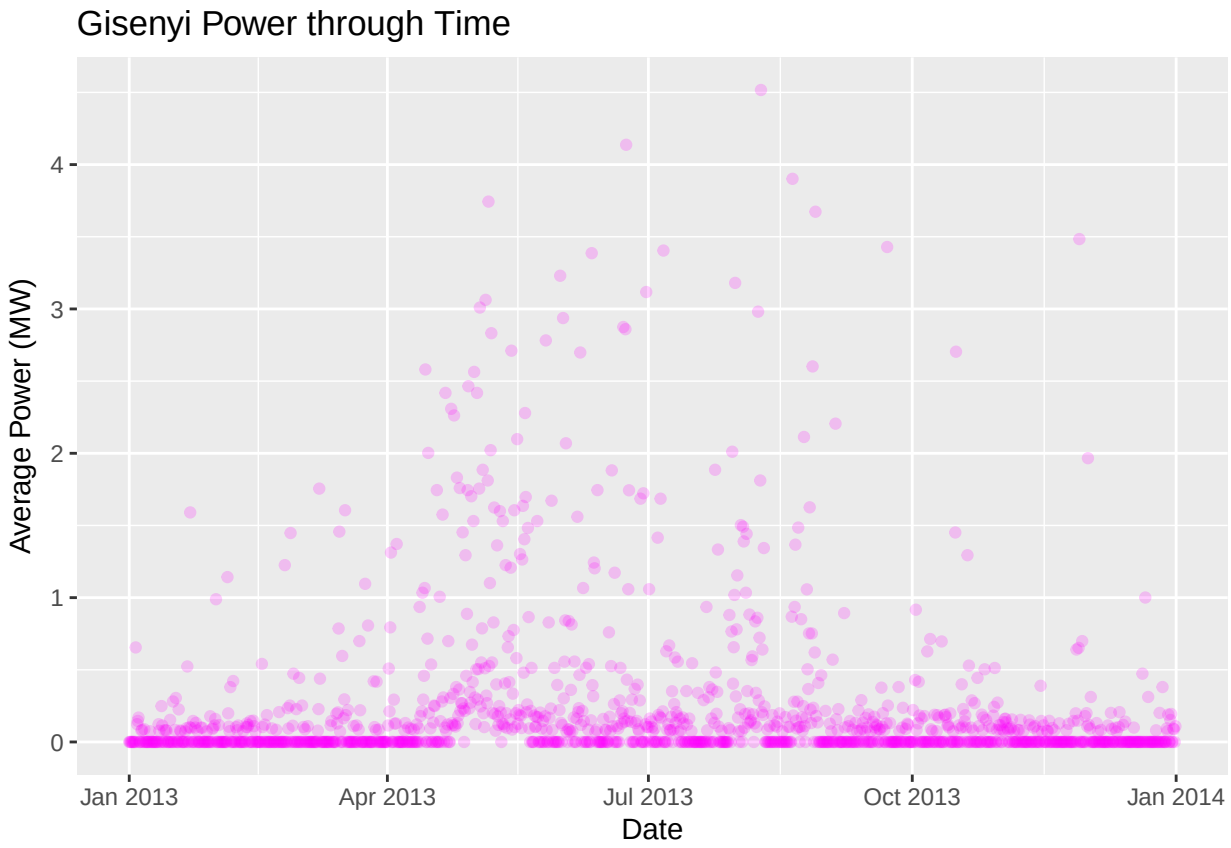
```
       ylab= "Frequency", xlab= "Electric Power (MW)",
       title = "Distribution of power values"
)
```



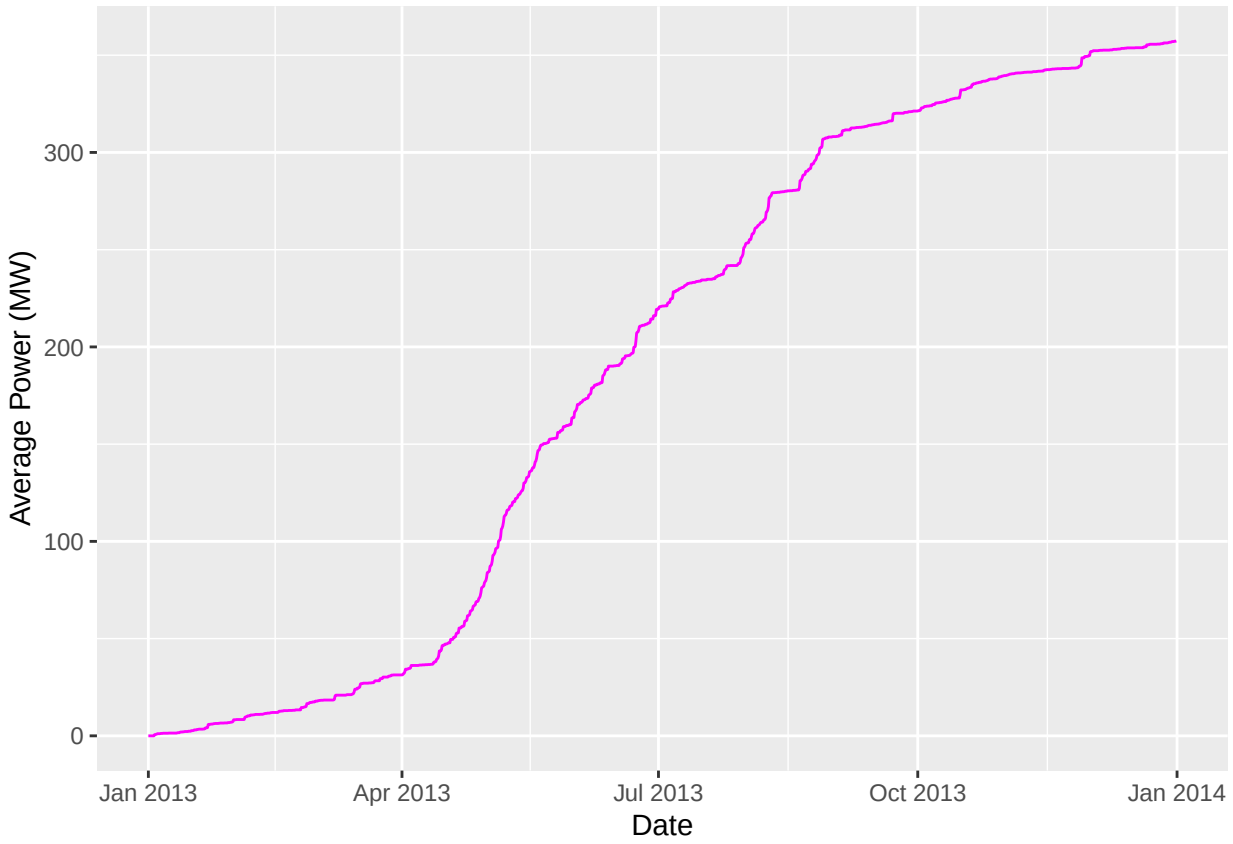

```
weplot(x=Velocity.Wind, y=Electric.Power, type="point",
       ylab= "Electric Power (MW)", color = "magenta", xlab= "Wind Velocity (m/s)")
```




```
weplot(x=Date, y=(Electric.Power), type="point",
       ylab= "Average Power (MW)", color = "magenta", xlab= "Date",
       transparency = 0.8, title= "Gisenyi Power through Time")
```




```
weplot(x=Date, y=cumsum(Electric.Power), type="line",
       ylab= "Average Power (MW)", color = "magenta", xlab= "Date")
```




```
mean(Electric.Power == 0)*100
```

```
## [1] 52.39726
```

```
mean(Electric.Power > 5.9)*100
```

```
## [1] 0
```

```
mean(Electric.Power < 1)*100
```

```
## [1] 92.26027
```