

## Challenging Experiment - 2

*Submitted by*

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Course Title: IOT Domain Analyst

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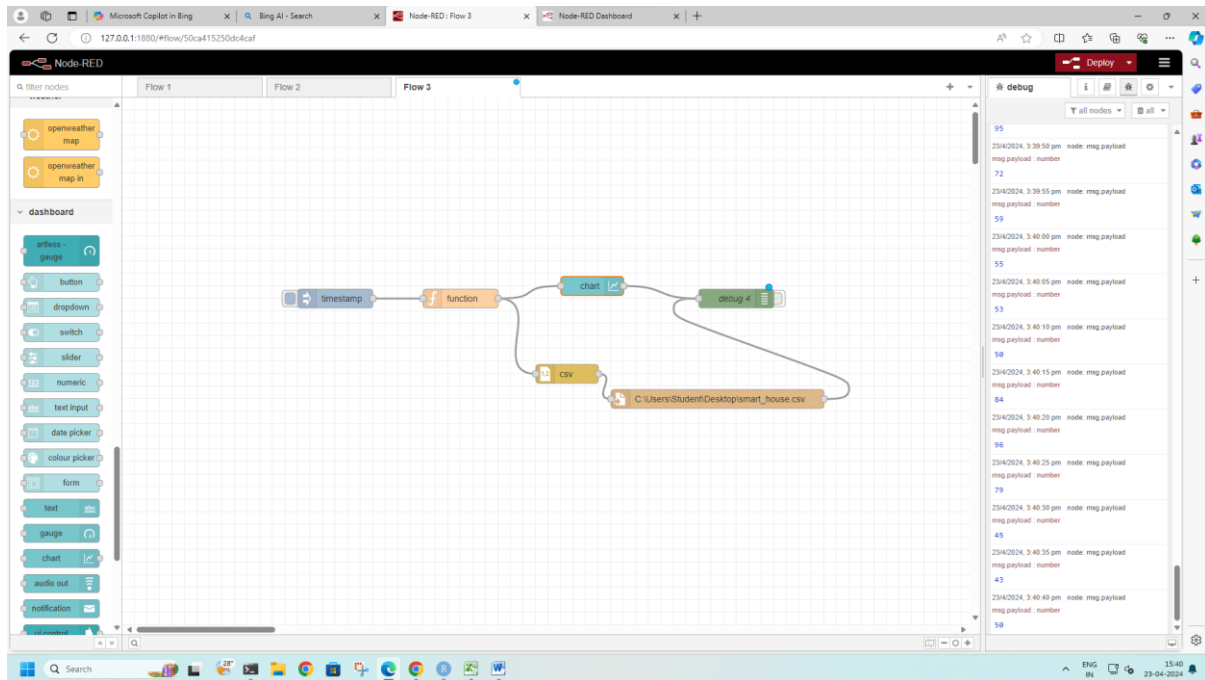
*Submitted on*

*24-04-2024*

## Challenging Experiment – 2

A smart home system uses a collection of sensors to monitor the power utilization of each device in the home. Develop this smart home system in node-red, generate the dataset with a minimum of 500 records in node-red save it as a .csv file.

**Node – red:**



**Function node:**

```
const numRecords = 500;
const devices = [
  { type: 1000, count: 5 },
  { type: 1001, count: 3 },
  { type: 1002, count: 8 },
  { type: 1003, count: 1 },
  { type: 1004, count: 2 }
];

const getRandomDate = () => {
  const startDate = new Date('2024-01-01');
  const endDate = new Date('2024-12-31');
  return new Date(startDate.getTime() + Math.random() * (endDate.getTime() -
startDate.getTime()));
};
```

```
const getRandomTime = () => {
  const hours = Math.floor(Math.random() * 24);
  const minutes = Math.floor(Math.random() * 60);
  return `${hours.toString().padStart(2,
'0')}:${minutes.toString().padStart(2, '0')}`;
};

const getRandomVoltage = () => {

  return Math.floor(Math.random() * 1900) + 100;
};

const getRandomUtilizationHrs = () => {

  return Math.floor(Math.random() * 10) + 1;
};

const data = [];
for (let i = 0; i < numRecords; i++) {
  const device = devices[i % devices.length];
  const deviceType = 1000 + i + 1;
  data.push({
    DeviceType: deviceType,
    NoOfDevices: device.count,
    PowerUtilization: getRandomVoltage(),
    Date: getRandomDate(),
    Time: getRandomTime(),
    UtilizationHrs: getRandomUtilizationHrs()
  });
}

msg.payload = data;
return msg;
```

a) Summarize the data.

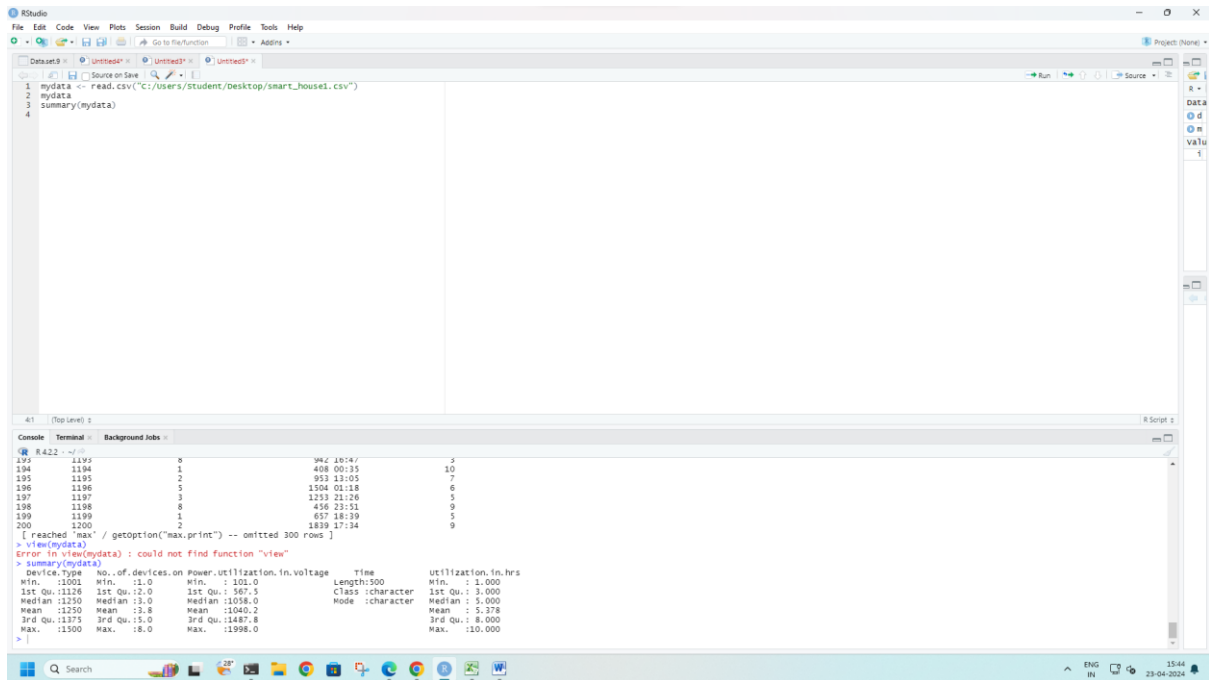
**Code:**

```
mydata <- read.csv("C:/Users/deepm/Downloads/smart_house1.csv")

view(mydata)

mydata
```

**Output:**



```

1 mydata <- read.csv("C:/Users/student/Desktop/smart_house1.csv")
2 mydata
3 summary(mydata)
4

```

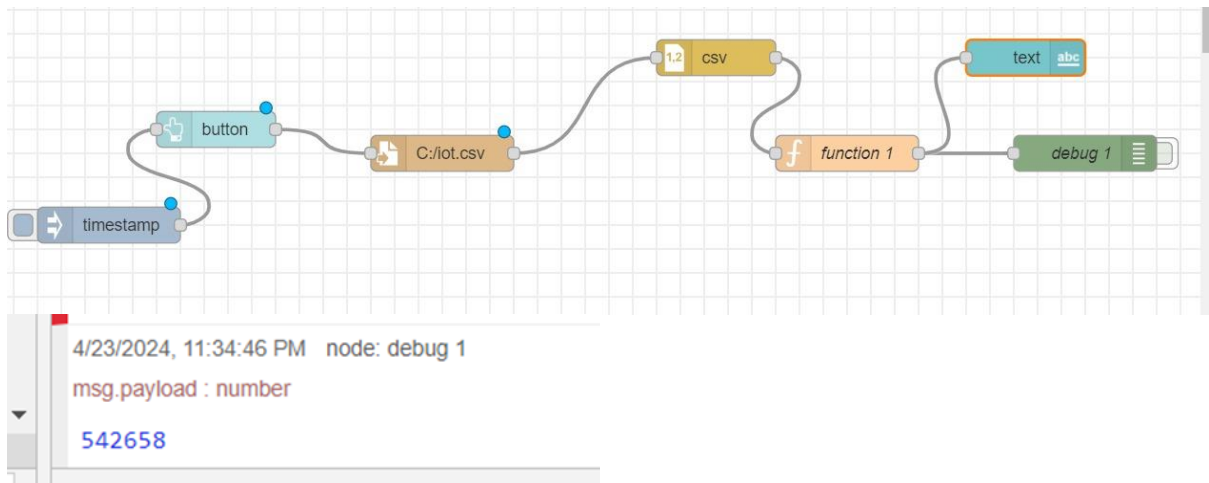
```

R 4.2.2 > summary(mydata)
Error in view(mydata) : could not find function "view"
> summary(mydata)
      device.type      no..of.devices.on      power.utilization.in.voltage      time      utilization.in.hrs
Min.   :1001   Min.   :1.0   Min.   :101.0   Length:500   Min.   :1.000
1st Qu.:1126   1st Qu.:12.0   1st Qu.:567.5   Class:character 1st Qu.:3.000
Median :1250   Median :3.0   Median :11058.0   Mode :character  Median :5.000
Mean   :1250   Mean   :13.8   Mean   :10460.2                Mean   :5.378
3rd Qu.:1175   3rd Qu.:15.0   3rd Qu.:11487.8                3rd Qu.:8.000
Max.   :1500   Max.   :18.0   Max.   :11998.0                Max.   :10.000

```

b) Display the total power consumption for a period of time in node-red dashboard.

**Screenshot:**



c) Predict whether the total power consumption will exceed the user's target or not.

**Code:**

```
devices<-mydata$No..of.devices.on
```

```
pow<-mydata$Power.Utilization.in.Voltage
```

```
uti<-mydata$Utilization.in.hrs
```

```
combined_data <- data.frame(pow = pow, devices = devices, uti = uti)
```

```
model <- lm(pow ~ devices + uti, data = combined_data)
```

```
summary(model)
```

```
test_data<-data.frame(devices=8,uti=5)
```

```
result<-predict(model,newdata = test_data)
```

```
result
```

**Output:**

```

RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Addins
Untitled1* x Untitled2* x
Source on Save Run Source
1 mydata <- read.csv("C:/Users/deepm/Downloads/smart_house1.csv")
2 view(mydata)
3 mydata
4
5 devices<-mydata$No..of.devices.on
6 pow<-mydata$Power.Utilization.in.Voltage
7 uti<-mydata$Utilization.in.hrs
8
9 combined_data <- data.frame(pow = pow, devices = devices, uti = uti)
10
11 model <- lm(pow ~ devices + uti, data = combined_data)
11:55 (Top Level) R Script
Console Terminal x Jobs x
R 4.1.2 ~ /
192      1192      3      436 14:40      3
193      1193      8      942 16:47      3
194      1194      1      408 00:35     10
195      1195      2      953 13:05      7
196      1196      5     1504 01:18      6
197      1197      3     1253 21:26      5
198      1198      8      456 23:51      9
199      1199      1      657 18:39      5
200      1200      2     1839 17:34      9
[ reached 'max' / getoption("max.print") -- omitted 300 rows ]
> devices<-mydata$No..of.devices.on
> pow<-mydata$Power.Utilization.in.Voltage
> uti<-mydata$Utilization.in.hrs
> combined_data <- data.frame(pow = pow, devices = devices, uti = uti)
> model <- lm(pow ~ devices + uti, data = combined_data)
> summary(model)

Call:
lm(formula = pow ~ devices + uti, data = combined_data)

Residuals:
    Min       1Q   Median       3Q      Max
-981.2 -459.3  18.2  441.6  995.3

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 1106.155    65.054   17.004  <2e-16 ***
devices      -2.259     9.783   -0.231   0.817
uti          -10.672     8.450   -1.263   0.207
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 542 on 497 degrees of freedom
Multiple R-squared:  0.003248, Adjusted R-squared:  -0.0007629
F-statistic: 0.8098 on 2 and 497 DF, p-value: 0.4455

> test_data<-data.frame(devices=8,uti=5)
> result<-predict(model,newdata = test_data)
> result
      1
1034.724
> |

```

d) What is the accuracy of the model for the test data?

### Code:

```
ypred <- 1032.599 + ( -12.053 * mydata$No..of.devices.on) + (2.679*mydata$Utilization.in.hrs)
```

```
mydata$power_pred <- ypred
```

```
yx <- mydata$Power.Utilization.in.Voltage - mydata$power_pred
```

```
mydata$yx <- (yx*yx)
```

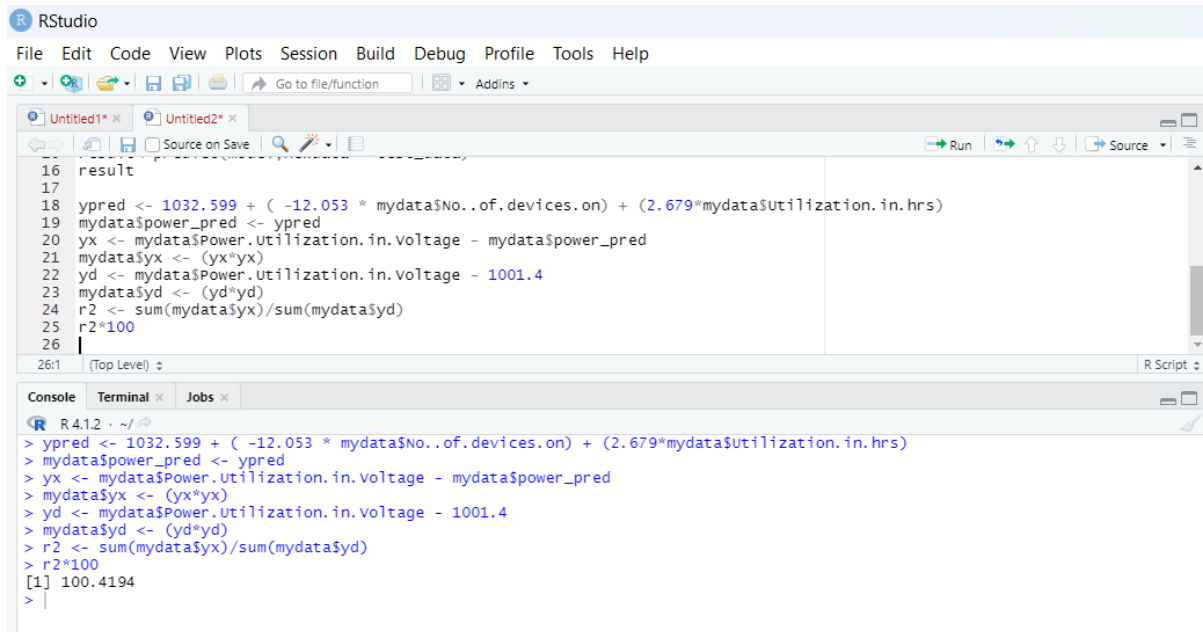
```
yd <- mydata$Power.Utilization.in.Voltage - 1001.4
```

```
mydata$yd <- (yd*yd)
```

```
r2 <- sum(mydata$yx)/sum(mydata$yd)
```

```
r2*100
```

**Output:**



```

16 result
17
18 ypred <- 1032.599 + (-12.053 * mydata$No..of.devices.on) + (2.679*mydata$utilization.in.hrs)
19 mydata$power_pred <- ypred
20 yx <- mydata$Power.Utilization.in.voltage - mydata$power_pred
21 mydata$yx <- (yx*yx)
22 yd <- mydata$Power.Utilization.in.voltage - 1001.4
23 mydata$yd <- (yd*yd)
24 r2 <- sum(mydata$yx)/sum(mydata$yd)
25 r2*100
26
26:1 (Top Level)
R Script

```

```

> ypred <- 1032.599 + (-12.053 * mydata$No..of.devices.on) + (2.679*mydata$utilization.in.hrs)
> mydata$power_pred <- ypred
> yx <- mydata$Power.Utilization.in.voltage - mydata$power_pred
> mydata$yx <- (yx*yx)
> yd <- mydata$Power.Utilization.in.voltage - 1001.4
> mydata$yd <- (yd*yd)
> r2 <- sum(mydata$yx)/sum(mydata$yd)
> r2*100
[1] 100.4194
>

```

- e) If the total power consumption exceeds the user's target, then display an alert in node-red dashboard.

