

# TEMPERATURE INFLUENCE ON THE PERFORMANCE OF LI-ON BATTERIES

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# Data needs & sources

## NEEDS

- Type of battery
- Type of usage
- Size
- Location
- Operating conditions
- Charging rates

## SOURCES

- Skoon Energy B.V.
- Collects Battery data from 250+ batteries
- Logs the data per minute interval
- Type period > 2 years

# Minimum Viable Product

- Outlier detection based on operating temperature, which could help identify faulty temperature indicators
- Correlate the temperature to the location to help indicate abnormal behaviour in temperature measurements

# Data sample

 220920\_ProductProductTypesModules\_Anonymous.xlsx 57.4KB

 220920\_ProductTypes\_Anonymous.xlsx 48.5KB

 Battery\_Data.csv 2138.6KB

 Location\_Data.csv 2660.7KB

	A	B	C	D	E	F	G	H	I	J	K
1	Installer	Provider	ID	Year	Dimension	Width	Length	Height	Weight	NominalCa	OutputVolt
2	NULL	0x60D42A	0xB47812A	1981	Custom	1	1	5	1	5	DC
3	0x355D8C	0x60D42A	0xFD65188	2020	Container4	244	1219	29	400	600	DC
4	0x355D8C	0x60D42A	0x92D6F94	2019	Trailer	101	202	48	750	32	AC
5	0xD6404D	0xD7BE765	0x708CD97	2020	Container4	244	1219	29	400	250	DC
6	0xCE2B549	0xBBFEB74	0x1D85DC	2020	Container4	244	1219	29	400	250	DC
7	0x6D7B40	0xD7BE765	0xBF9F188	2020	Container4	244	1219	29	400	250	DC
8	0xE868CA8	0xD7BE765	0xFF6F241	2020	Container4	244	1219	29	400	250	DC

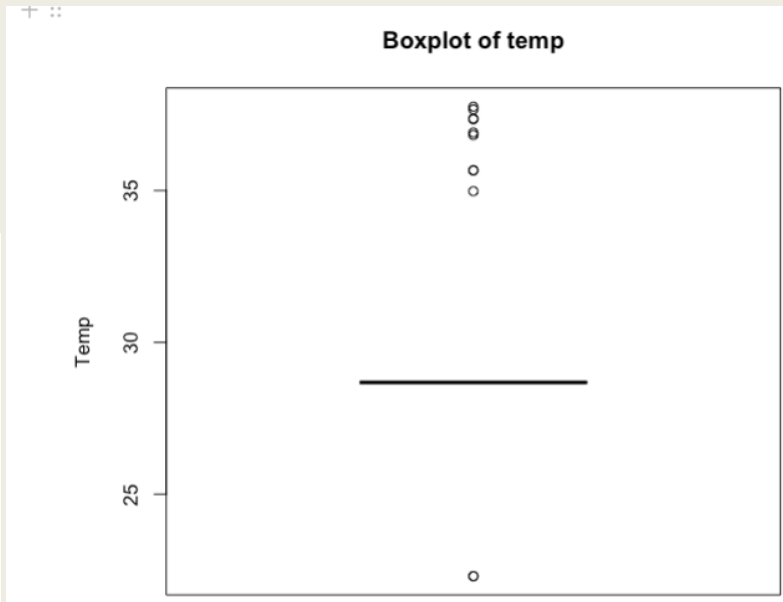
L	M	N	O	P	Q	R	S	T	U	V	W
OutputVolt	MaxContin	MinOperat	MaxOperat	ModuleTyp	BatteryTyp	Depth	EffectiveCa	MaxContin	GeneratorT	FuelTankCapacity	
15	1	0	40	Battery	NCd	80	4	1	NULL	NULL	
400	40	5	35	Battery	LTO	94,12	564,72	40	NULL	NULL	
400	15	0	40	Battery	LFP	90	288	15	NULL	NULL	
400	35	-10	50	Generator	NULL	NULL	NULL	NULL	H2	NULL	
400	35	-10	50	Generator	NULL	NULL	NULL	NULL	H2	123	
400	35	-10	50	Generator	NULL	NULL	NULL	NULL	H2	NULL	
400	35	-10	50	Generator	NULL	NULL	NULL	NULL	H2	NULL	

# A sample of logging data

	A	B	C	D	E	F	G	H	I	J
1	Power	Voltage	Current	StateOfCharge	Temperature	TotalPowerIn	TotalPowerOut	Timestamp	EstimatedTimeRemaining	
2	-83.33			33.33	28.68			08/21/2022 22:00:01 +00:00		
3	-83.34			33.19	28.68			08/21/2022 22:01:01 +00:00		
4	-83.33			33.06	28.68			08/21/2022 22:02:01 +00:00		
5	-83.34			32.92	28.68			08/21/2022 22:03:01 +00:00		
6	-83.34			32.78	28.68			08/21/2022 22:04:01 +00:00		
7	-83.33			32.64	28.68			08/21/2022 22:05:01 +00:00		
8	-83.34			32.50	28.68			08/21/2022 22:06:01 +00:00		
9	-83.33			32.36	28.68			08/21/2022 22:07:01 +00:00		
10	-83.34			32.22	28.68			08/21/2022 22:08:01 +00:00		
11	-83.33			32.08	28.68			08/21/2022 22:09:01 +00:00		
12	-83.34			31.94	28.68			08/21/2022 22:10:01 +00:00		
13	-83.33			31.81	28.68			08/21/2022 22:11:01 +00:00		
14	-83.34			31.67	28.68			08/21/2022 22:12:01 +00:00		

# Outliers

```
library(readr)
Battery_Data_Updated <- read_delim("Battery_Data_Updated.csv",
delim = ";", escape_double = FALSE, trim_ws = TRUE)
summary(Battery_Data_Updated)
sd(Battery_Data_Updated$Temperature)
boxplot(Battery_Data_Updated$Temperature, ylab = "Temp", main = "Boxplot of temp")
boxplot.stats(Battery_Data_Updated$Temperature)$out
out <- boxplot.stats(Battery_Data_Updated$Temperature)$out
out_ind <- which(Battery_Data_Updated$Temperature %in% c(out))
out_ind
Battery_Data_Updated[out_ind, ]
```



Table

## Outliers

Power	StateOfCharge	Temperature	Timestamp
-25083.	58.2	36.9	08/24/2022 08:59:01 +00:00
-10583	82.4	35.7	08/25/2022 11:53:01 +00:00
-10500	82.5	35.7	08/25/2022 11:54:01 +00:00
-45000	25	37.8	09/01/2022 05:00:01 +00:00
-33833	43.6	37.4	09/01/2022 07:14:01 +00:00
-23667	60.6	36.8	09/01/2022 09:16:01 +00:00
0	22.3	22.3	09/06/2022 15:16:47 +00:00
-6583	89.0	35.0	09/06/2022 15:19:00 +00:00
-34500	42.5	37.4	09/13/2022 20:54:11 +00:00
-42333	29.4	37.7	09/13/2022 22:28:01 +00:00
0	22.3	22.3	09/14/2022 12:28:19 +00:00

# Collect, store, process

- Guus will handle the collection of data
- The obtained .csv /.xlsx files will be stored in Notion (shared online workspace)
- Data will be processed with R and scripts will be shared and worked on through Git

Questions?