Exercise 1

```
using CSV, DataFrames, Statistics, StatsPlots
```

```
function save_report(file_path::String, content::String)
    open(file_path, "w") do f
        write(f, content)
    end
end
```

```
save_report (generic function with 1 method)
```

```
function read_csv(file_path::String) # Read
    return CSV.read(file_path, DataFrame)
end
```

```
read_csv (generic function with 1 method)
```

```
function ensure_numeric(data::DataFrame) # Ensure data is numeric where it can; har
    println("Tipos iniciales de las columnas:")
    for col in names(data)
        println("$col: $(eltype(data[!, col]))")
    end

    for col in names(data)
        if eltype(data[!, col]) <: Union{Missing, Number} # If the column is alreac
            continue
        elseif eltype(data[!, col]) <: AbstractString
            try
                data[!, col] = parse.(Float64, replace.(data[!, col], missing => "N
                println("Columna $col convertida a Float64.")
            catch e
                println("No se pudo convertir la columna $col a Float64: $e")
            end
        else
            println("Columna $col no es de tipo compatible para conversión.")
        end
    end

    println("Tipos finales de las columnas:")
    for col in names(data)
        println("$col: $(eltype(data[!, col]))")
    end

    return data
end
```

```
ensure_numeric (generic function with 1 method)
```

```
function missing_percentage(data::DataFrame) # Calculate missing ones
    total_rows = nrow(data)
    return Dict(col => count(ismissing, data[!, col]) / total_rows * 100 for col
end

# Eliminate columns with missing data above threshold
function deleteColumns(data::DataFrame, threshold::Float64)
    missing_perc = missing_percentage(data)
    keep_cols = [col for col in names(data) if missing_perc[col] <= threshold]
    deleted_cols = setdiff(names(data), keep_cols)  # Capture eliminated columns
    return data[:, keep_cols], deleted_cols
end
```

```
deleteColumns (generic function with 1 method)
```

```
function cal_correlation(data::DataFrame) # Correlation matrix
    numeric_cols = names(data)[map(c -> eltype(data[!, c]) <: Number, names(data)
    numeric_data = data[:, numeric_cols]
    return cor(Matrix(numeric_data))
end
```

```
cal_correlation (generic function with 1 method)
```

```
function display_correlation(data::DataFrame, img_path::String) # Show correlatio
    corr_matrix = cal_correlation(data)
    heatmap(corr_matrix, title="Matriz de correlación", xlabel="Columnas", ylabel
    savefig(img_path)  # Save image in file
    display(heatmap(corr_matrix))  # Show heatmap
end
```

```
display_correlation (generic function with 1 method)
```

```
function remove_outliers_IQR(data::DataFrame) # Eliminate outliers with interquar
    numeric_cols = names(data)[map(c -> eltype(data[!, c]) <: Number, names(data)
    original_rows = nrow(data)  # Num of rows before removing outliers
    for col in numeric_cols
        q1, q3 = quantile(data[!, col], [0.25, 0.75])
        iqr = q3 - q1
        lower_bound, upper_bound = q1 - 1.5 * iqr, q3 + 1.5 * iqr
        data = filter(row -> (row[col] ≥ lower_bound) && (row[col] ≤ upper_bound)
    end
    deleted_rows = original_rows - nrow(data)  # Num of rows deleted
    println("Se eliminaraon $deleted_rows filas por outliers con el IQR.")
    return data, deleted_rows
end
```

```
remove_outliers_IQR (generic function with 1 method)
```

```
function describe_data(data::DataFrame)
    return DataFrames.describe(data)
end
```

```
describe_data (generic function with 1 method)
```

```
function process_csv(file_path::String, missing_threshold::Float64) # Principal p
    data = read_csv(file_path)
    println("Archivo leído con ", nrow(data), " filas y ", ncol(data), " columnas

    data = ensure_numeric(data)
    println("Tipos de datos después de asegurar numéricos: ", eltype.(eachcol(dat

    println("Porcentaje de datos faltantes por columna:")
    missing_percentages = missing_percentage(data)
    println(missing_percentages)

    data, deleted_cols = deleteColumns(data, missing_threshold)  # Eliminate data
    println("Columnas eliminadas: ", deleted_cols)

    return data, missing_percentages, deleted_cols
end
```

```
process_csv (generic function with 1 method)
```

```
file_path = "/Users/michelletorres/Desktop/Homeworks AI/archive/bottle.csv"
missing_threshold = 10.0  # Max percentage
```

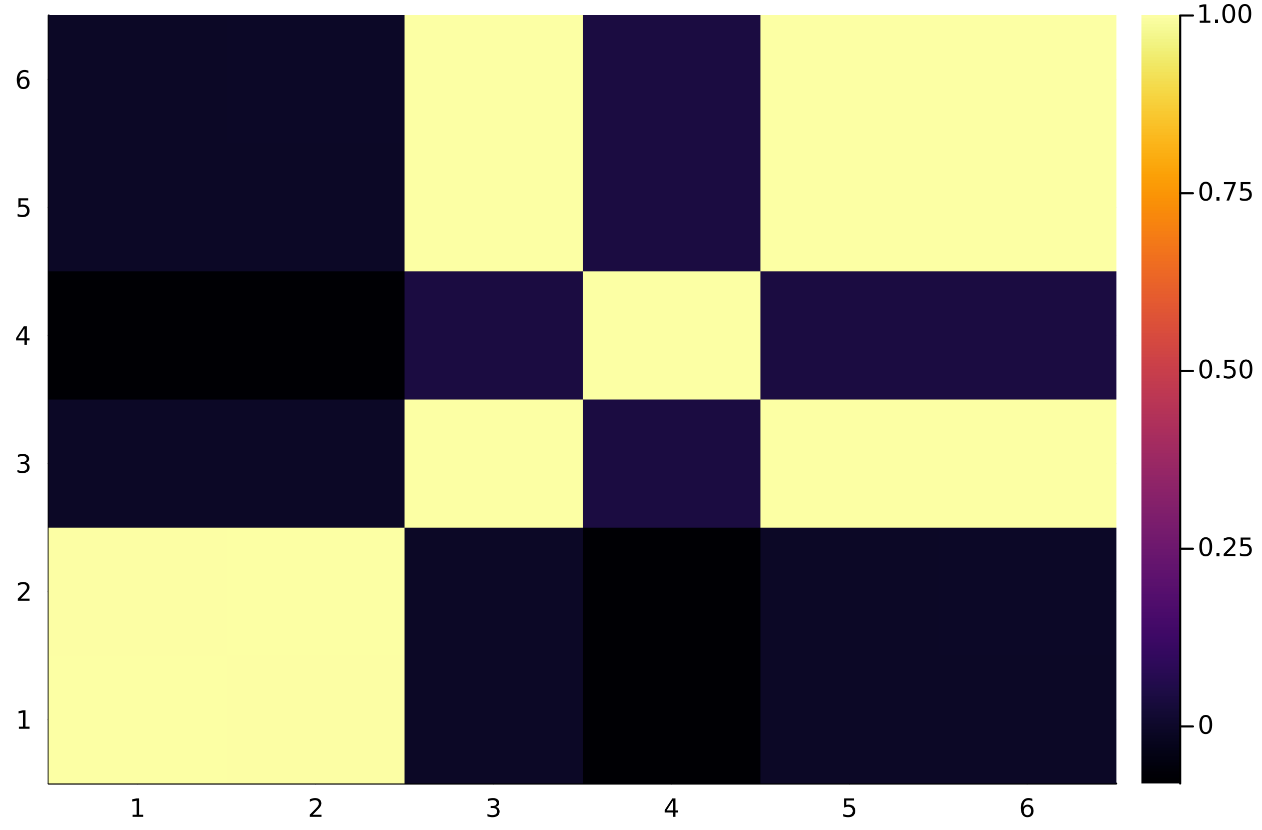
```
10.0
```

```
processed_data, missing_percentages, deleted_cols = process_csv(file_path, missin
description = describe_data(processed_data) # Data set description
processed_data, deleted_rows = remove_outliers_IQR(processed_data) # Eliminate ou
```

```
Archivo leído con 864863 filas y 74 columnas.
Tipos iniciales de las columnas:
Cst_Cnt: Int64
Btl_Cnt: Int64
Sta_ID: String15
Depth_ID: String
Depthm: Int64
T_degC: Union{Missing, Float64}
Salnty: Union{Missing, Float64}
O2ml_L: Union{Missing, Float64}
STheta: Union{Missing, Float64}
O2Sat: Union{Missing, Float64}
Oxy_µmol/Kg: Union{Missing, Float64}
BtlNum: Union{Missing, Int64}
RecInd: Int64
T_prec: Union{Missing, Int64}
T_qual: Union{Missing, Int64}
S_prec: Union{Missing, Int64}
S_qual: Union{Missing, Int64}
P_qual: Union{Missing, Int64}
O_qual: Union{Missing, Int64}
SThtaq: Union{Missing, Int64}
O2Satq: Union{Missing, Int64}
ChlorA: Union{Missing, Float64}
Chlqua: Union{Missing, Int64}
Phaeop: Union{Missing, Float64}
Phaqua: Union{Missing, Int64}
PO4uM: Union{Missing, Float64}
PO4q: Union{Missing, Int64}
SiO3uM: Union{Missing, Float64}
SiO3qu: Union{Missing, Int64}
NO2uM: Union{Missing, Float64}
NO2q: Union{Missing, Int64}
NO3uM: Union{Missing, Float64}
NO3q: Union{Missing, Int64}
NH3uM: Union{Missing, Float64}
NH3q: Union{Missing, Int64}
C14As1: Union{Missing, Float64}
C14A1p: Union{Missing, Int64}
```

```
C14A1q: Union{Missing, Int64}
C14As2: Union{Missing, Float64}
C14A2p: Union{Missing, Int64}
C14A2q: Union{Missing, Int64}
DarkAs: Union{Missing, Float64}
DarkAp: Union{Missing, Int64}
DarkAq: Union{Missing, Int64}
MeanAs: Union{Missing, Float64}
MeanAp: Union{Missing, Int64}
MeanAq: Union{Missing, Int64}
IncTim: Union{Missing, String31}
LightP: Union{Missing, Float64}
R_Depth: Float64
R_TEMP: Union{Missing, Float64}
R_POTEMP: Union{Missing, Float64}
R_SALINITY: Union{Missing, Float64}
R_SIGMA: Union{Missing, Float64}
R_SVA: Union{Missing, Float64}
R_DYNHT: Union{Missing, Float64}
R_O2: Union{Missing, Float64}
```

```
heatmap_img_path = "/Users/michelletorres/Desktop/heatmap.png" # Save img heatmap
display_correlation(processed_data, heatmap_img_path)
```



```
# Report/text
report_content = """
Informe de Análisis Exploratorio de Datos (EDA)

1. Información general:
El archivo contiene $(nrow(processed_data)) filas y $(ncol(processed_data)) colum

2. Porcentaje de datos faltantes por columna:
   $(missing_percentages)

3. Columnas eliminadas debido a datos faltantes:
   $(deleted_cols)

4. Descripción de los datos:
   $(description)

5. Outliers eliminados con el IQR:
$deleted_rows

6. Matriz de correlación:
$heatmap_img_path

7. Conclusión:
Se completó el análisis de manera satisfactoria, limpiando los datos faltantes, e

"""
```

```
"Informe de Análisis Exploratorio de Datos (EDA)\n\n1. Información
general:\nEl archivo contiene 790980 filas y 24 columnas.\n   \n2. Porcentaje
de datos faltantes por columna:\n   Dict(\"pH2\" => 99.99884374750683,
\"SiO3uM\" => 59.058139844114045, \"LightP\" => 97.84347347498968, " ⋯ 6730
bytes ⋯ "ados con el IQR:\n73883\n\n6. Matriz de
correlación:\n/Users/michelletorres/Desktop/heatmap.png\n   \n7.
Conclusión:\nSe completó el análisis de manera satisfactoria, limpiando los
datos faltantes, eliminando outliers y mostrando la matriz de correlación
entre las variables.\n\n"
```

```
report_path = "/Users/michelletorres/Desktop/EDA_report.txt" # Save
save_report(report_path, report_content)
```

```
7277
```