Data in Julia

Some (but not all!) popular packages for data representation, manipulation, and visualization

DataFrames.jl

Similar to pandas in Python, DataFrames is a library for data representation and manipulation

In [1]:

```
using DataFrames
```

In [2]:

```
names = DataFrame(ID = [20, 40], Name = ["John Doe", "Jane Doe"])
```

Out[2]:

2 rows × 2 columns

	ID	Name
	Int64	String
1	20	John Doe
2	40	Jane Doe

In [3]:

```
jobs = DataFrame(ID = [20, 40], Job = ["Lawyer", "Doctor"])
```

Out[3]:

2 rows × 2 columns

	ID	Job
	Int64	String
1	20	Lawyer
2	40	Doctor

A DataFrame isn't a matrix, it operates more like a database. For example, you can do joins with DataFrames

In [4]:

```
join(names, jobs, on = :ID)
```

Out[4]:

2 rows × 3 columns

	ID	Name	Job
	Int64	String	String
1	20	John Doe	Lawyer
2	40	Jane Doe	Doctor

Database Interaction

C wrappers and full Julia implementations for many databases, such as

- SQLite.jl (https://github.com/JuliaDatabases/SQLite.jl)
- MySQL.jl (https://github.com/JuliaDatabases/MySQL.jl)
- LibPQ.jl (https://github.com/invenia/LibPQ.jl)

In [5]:

```julia
using SQLite
```

In [6]:

```julia
db = SQLite.DB("Chinook_Sqlite.sqlite")
```

Out[6]:

```
SQLite.DB("Chinook_Sqlite.sqlite")
```

In [7]:

```julia
SQLite.Query(db, "SELECT * FROM Album WHERE Title LIKE @word"; values=Dict(:word
=> "%time%")) |> DataFrame
```

Out[7]:

3 rows × 3 columns

	AlbumId	Title	ArtistId
	Int64⍰	String⍰	Int64⍰
1	76	King For A Day Fool For A Lifetime	82
2	111	Somewhere in Time	90
3	187	Out Of Time	122

RDatasets.jl

Many sample datasets that are included in R and others that are popular in R

```
In [8]: using RDatasets
```

In [9]:

```
iris = dataset("datasets", "iris")
first(iris, 4)
```

Out[9]:

4 rows × 5 columns

	SepalLength	SepalWidth	PetalLength	PetalWidth	Species
	Float64	Float64	Float64	Float64	Categorical...
1	5.1	3.5	1.4	0.2	setosa
2	4.9	3.0	1.4	0.2	setosa
3	4.7	3.2	1.3	0.2	setosa
4	4.6	3.1	1.5	0.2	setosa

In [10]:

```
sort!(iris, :PetalLength)
ismall = first(iris, 6)
```

Out[10]:

6 rows × 5 columns

	SepalLength	SepalWidth	PetalLength	PetalWidth	Species
	Float64	Float64	Float64	Float64	Categorical...
1	4.6	3.6	1.0	0.2	setosa
2	4.3	3.0	1.1	0.1	setosa
3	5.8	4.0	1.2	0.2	setosa
4	5.0	3.2	1.2	0.2	setosa
5	4.7	3.2	1.3	0.2	setosa
6	5.4	3.9	1.3	0.4	setosa

Query.jl

Allows for querying many data structures, including DataFrames, to create new DataFrames or matrices

```
In [11]: using Query
```

```
In [12]: queried = @from i in ismall begin
             @where i.SepalWidth < 4.2 && i.SepalLength > 5.4
             @select {i.SepalWidth, i.SepalLength, i.Species}
             @collect DataFrame
         end
```

Out[12]:

1 rows × 3 columns

	SepalWidth	SepalLength	Species
	Float64	Float64	Categorical...
1	4.0	5.8	setosa

We can also do this with logical indexing, using the different columns as Arrays

In [13]:
```
x = ismall[!, :SepalWidth] .< 4.2
```

Out[13]:
```
6-element BitArray{1}:
 1
 1
 1
 1
 1
 1
```

In [14]:
```
y = ismall[!, :SepalLength] .> 5.4
```

Out[14]:
```
6-element BitArray{1}:
 0
 0
 1
 0
 0
 0
```

In [15]:
```
indices = x .& y
```

Out[15]:
```
6-element BitArray{1}:
 0
 0
 1
 0
 0
 0
```

In [16]:

```
queried
```

Out[16]:

1 rows × 3 columns

	SepalWidth	SepalLength	Species
	Float64	Float64	Categorical...
1	4.0	5.8	setosa

In [17]:

```
ismall[indices, :]
```

Out[17]:

1 rows × 5 columns

	SepalLength	SepalWidth	PetalLength	PetalWidth	Species
	Float64	Float64	Float64	Float64	Categorical...
1	5.8	4.0	1.2	0.2	setosa

Gadfly.jl

A popular pure-Julia data visualization package. Other options include PyPlot.jl (https://github.com/JuliaPy/PyPlot.jl) (wrapper of matplotlib), GR.jl (https://github.com/jheinen/GR.jl) (wrapper of GR), and Plots.jl (https://github.com/JuliaPlots/Plots.jl) (meta-wrapper)

In [18]:

```
using Gadfly
```

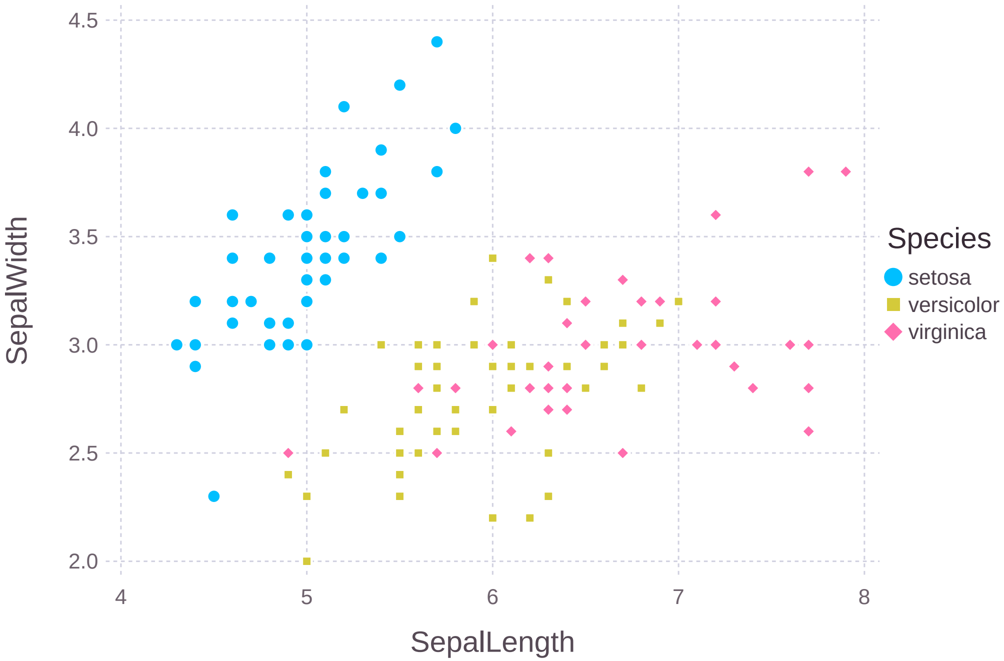
```
┌ Info: Loading DataFrames support into Gadfly.jl
└ @ Gadfly /home/d9w/.julia/packages/Gadfly/09PWZ/src/mapping.jl:228
```

In [19]:

```
plot(iris, x="SepalLength", y="SepalWidth", color="Species", shape="Species", Ge
om.point)
```

```
┌ Warning: `getindex(df::DataFrame, col_ind::ColumnIndex)` is deprecated, use
`df[!, col_ind]` instead.
│   caller = evalmapping at dataframes.jl:96 [inlined]
└ @ Core /home/d9w/.julia/packages/Gadfly/O9PWZ/src/dataframes.jl:96
```

Out[19]:



In [20]:

```
using Distributions
```

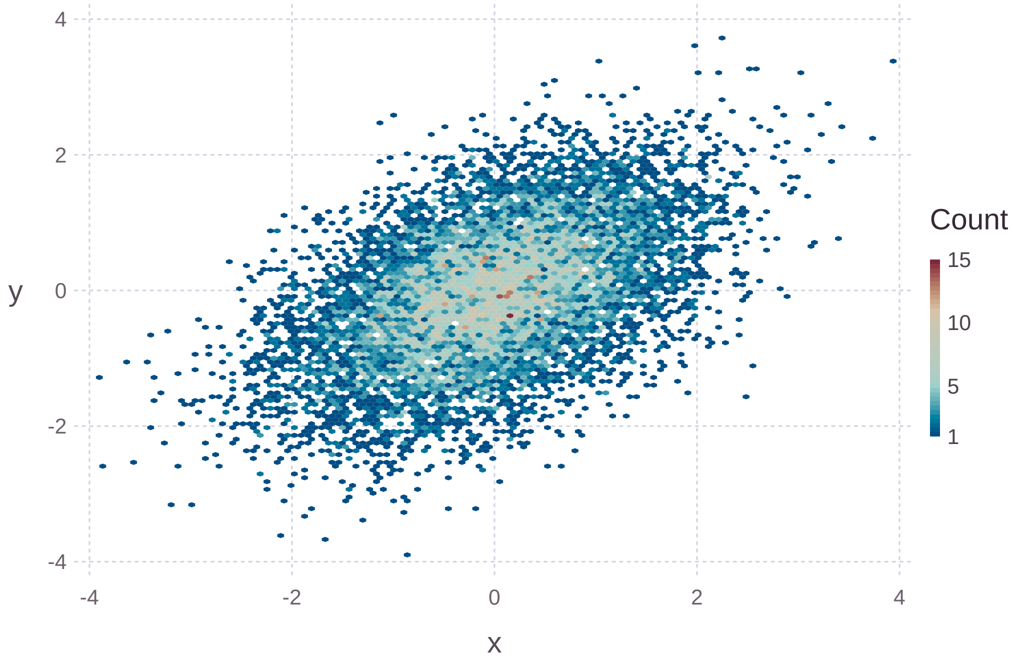
In [21]:

```
X = rand(MultivariateNormal([0.0, 0.0], [1.0 0.5; 0.5 1.0]), 10000);
println(X[1:10])
```

```
[1.1058063270138778, 0.48263147399183204, -1.361454808508512, -0.1999595308225
0173, -1.6522068278970796, -0.5467814476758401, -0.2345114494492488, 1.4931372
487075465, -0.9841703863258605, -1.3899466454803642]
```

```
In [22]: plot(x=X[1,:], y=X[2,:], Geom.hexbin)
```

Out[22]:



```
In [ ]:
```