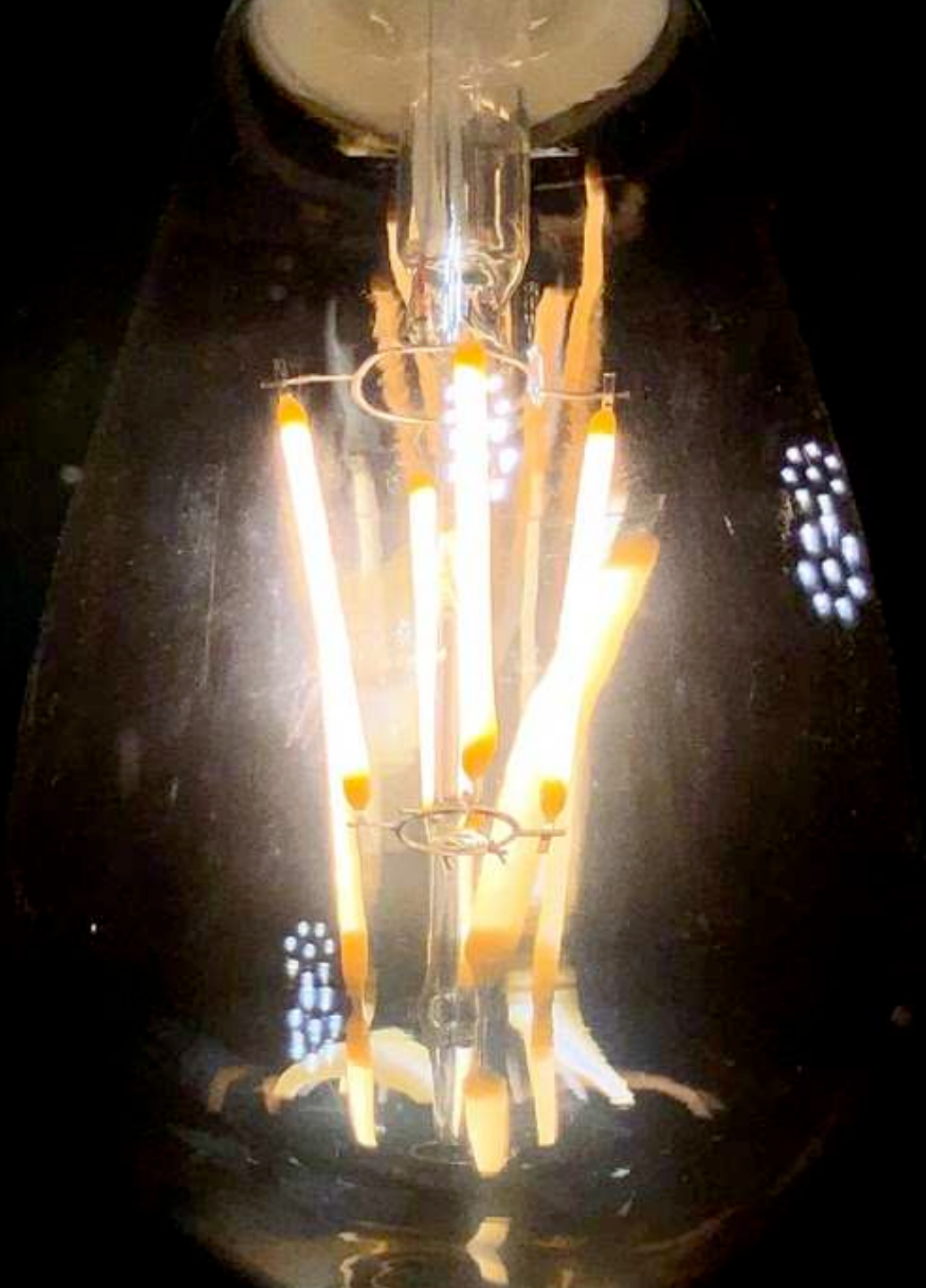


Data Science for Marketers 101

Christopher S. Penn
Cofounder and Chief Data Scientist
TrustInsights.ai



WhereCanIGetTheSlides.com

```
o <- as.h2o(blendeddt)
```

===== | 100%

```
t_h2o <-  
o.splitFrame(dfh2o, c(0.5999999999, 0.2, 0.2), seed = 1234)
```

```
n_conv_h2o <- h2o.assign(split_h2o[[1]], "train") # 60%  
d_conv_h2o <- h2o.assign(split_h2o[[2]], "valid") # 20%  
_conv_h2o <- h2o.assign(split_h2o[[3]], "test") # 20%
```

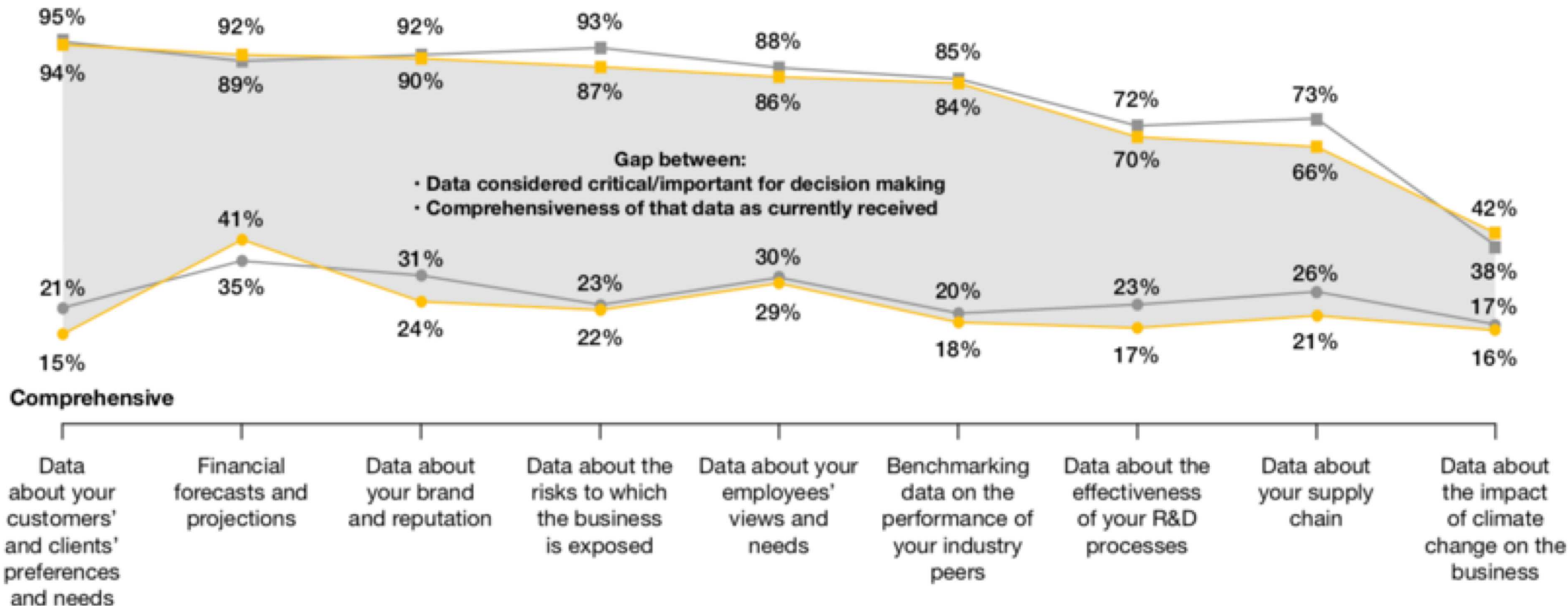
Marketing's Three Biggest Problems

```
alidate model fir1st
```

```
ml_h2o_models <- h2o.automl(  
= predictors,  
= target,  
aining_frame = train_conv_h2o,  
aderboard_frame = valid_conv_h2o
```

===== | 44%

Critical/important

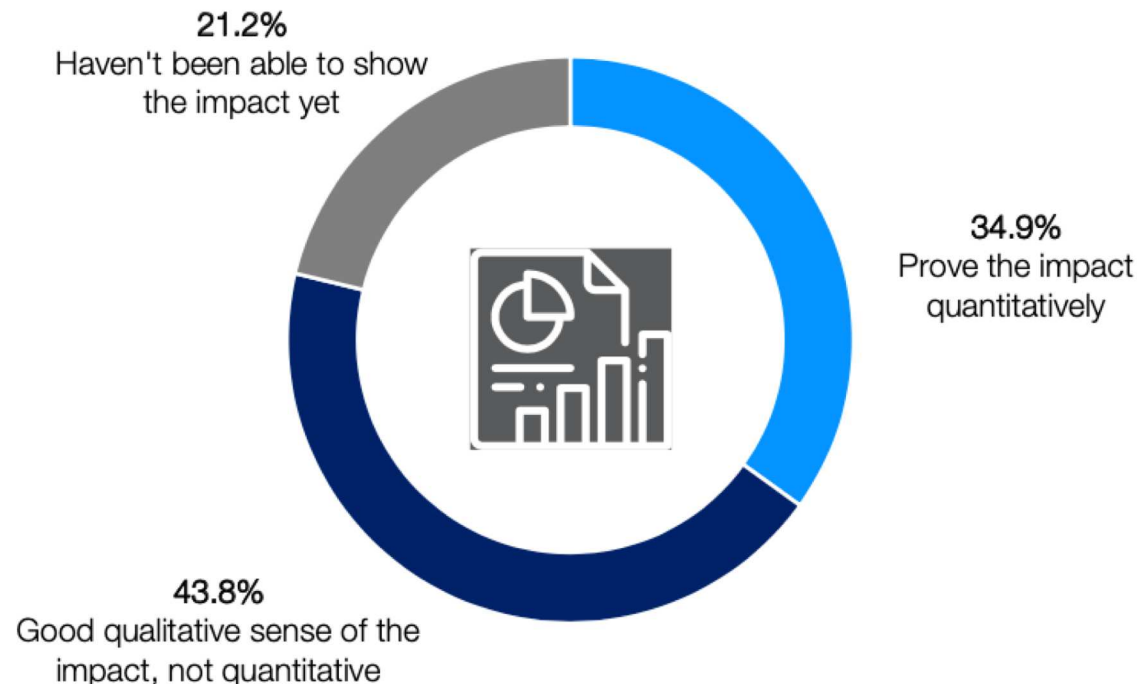


■ 2019 Critical/important
 ● 2019 Comprehensive
 ■ 2009 Critical/important
 ● 2009 Comprehensive

Source: PwC, 22nd Annual Global CEO Survey
 Base: All respondents (2019=1,378; 2009=1,124)

Use of quantitative metrics to demonstrate impact of marketing remains a challenge for marketers

How companies demonstrate the impact of marketing spending over the long run.



Economic Sector % Selected

Prove the impact quantitatively

B2B Product: 23.2%
B2B Services: 32.6%
B2C Product: 52.2%
B2C Services: 52.4%

Good qualitative sense of the impact

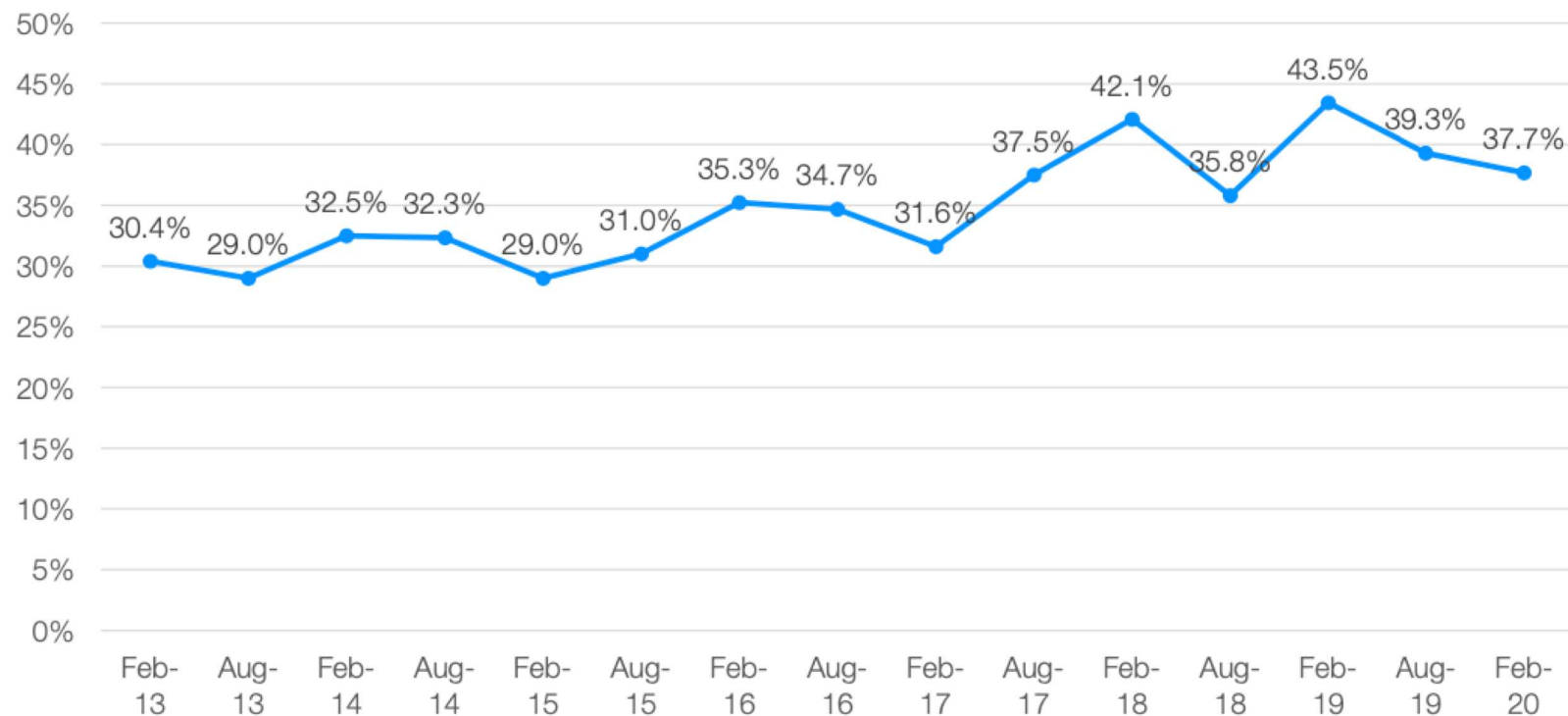
B2B Product: 51.8%
B2B Services: 41.3%
B2C Product: 34.8%
B2C Services: 38.1%

Haven't been able to show the impact

B2B Product: 25.0%
B2B Services: 26.1%
B2C Product: 13.0%
B2C Services: 9.5%

Company use of marketing analytics in decisions continues to slow

Percent of time marketing analytics is used in decision making



Economic Sector

B2B Product: 34.0%
 B2B Services: 27.3%
 B2C Product: 46.4%
 B2C Services: 58.6%



Insights

As companies increase in revenue and level of Internet sales, they increasingly rely on marketing analytics in decision making.

```
o <- as.h2o(blendeddt)
```

===== | 100%

```
t_h2o <-  
o.splitFrame(dfh2o, c(0.5999999999, 0.2, 0.2), seed = 1234)
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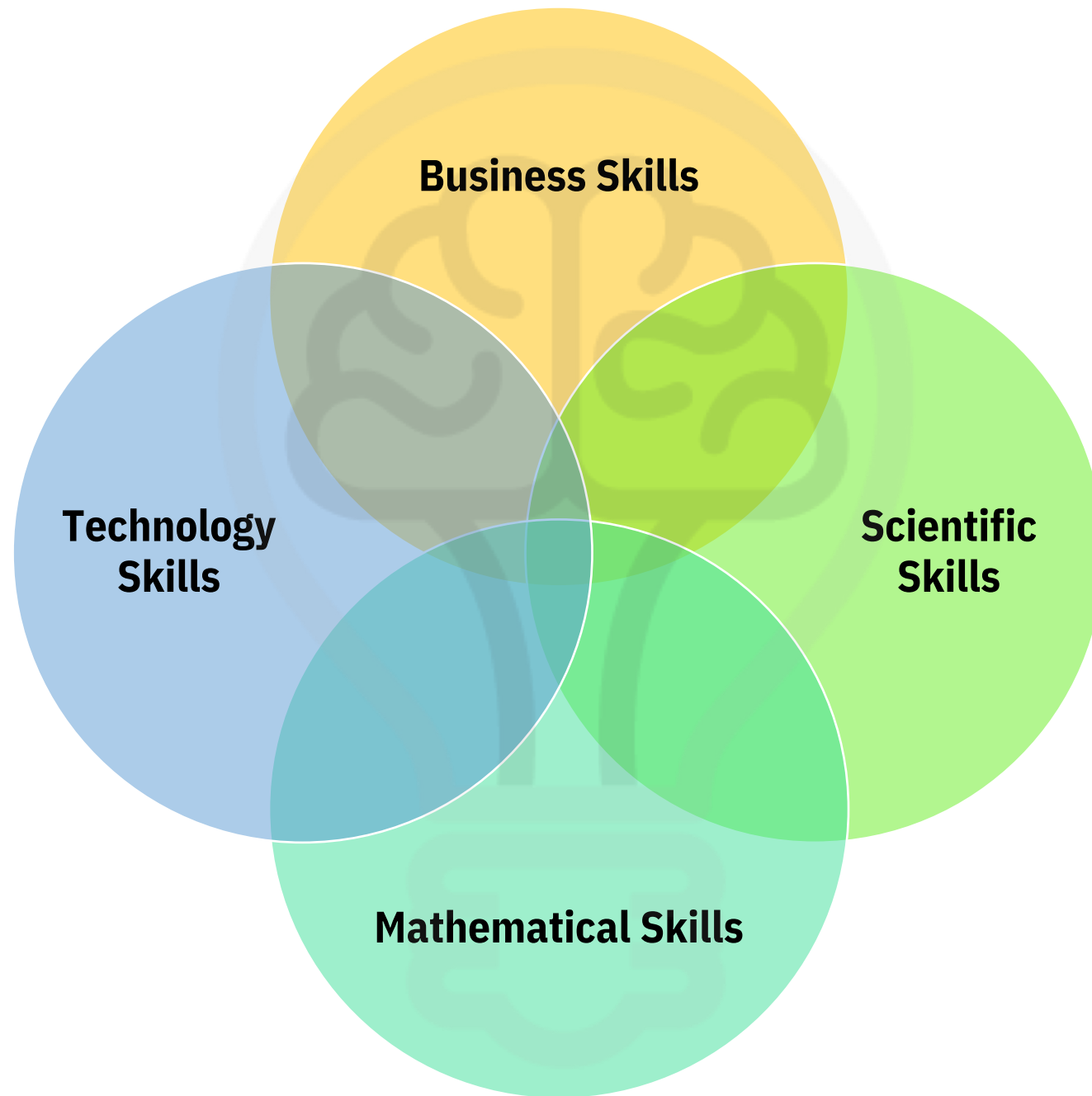
What is Data Science?

```
validate model first
```

```
ml_h2o_models <- h2o.automl(  
  = predictors,  
  = target,  
  aining_frame = train_conv_h2o,  
  aderboard_frame = valid_conv_h2o
```

===== | 44%

**Meaningful insights
from data using the
scientific method**



```
o <- as.h2o(blendeddt)
```

===== | 100%

```
t_h2o <-  
o.splitFrame(dfh2o, c(0.5999999999, 0.2, 0.2), seed = 1234)
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_conv_h2o <- h2o.assign(split_h2o[[3]], "test") # 20%
```

What is NOT Data Science?

```
validate model first
```

```
ml_h2o_models <- h2o.automl(  
  = predictors,  
  = target,  
  aining_frame = train_conv_h2o,  
  aderboard_frame = valid_conv_h2o
```

===== | 44%

Data Science Is NOT



Analytics



Reporting



Engineering



Statistics



AI

Data Science Is NOT



Analytics



Reporting



Engineering



Statistics



AI

Data Science Is NOT



Analytics



Reporting



Engineering



Statistics



AI

Data Science Is NOT



Analytics



Reporting



Engineering



Statistics



AI

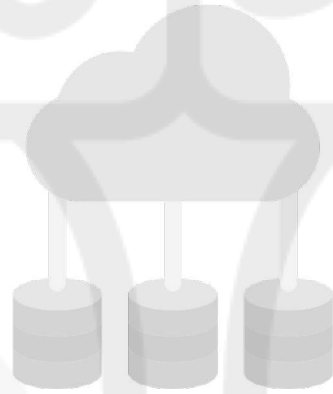
Data Science Is NOT



Analytics



Reporting



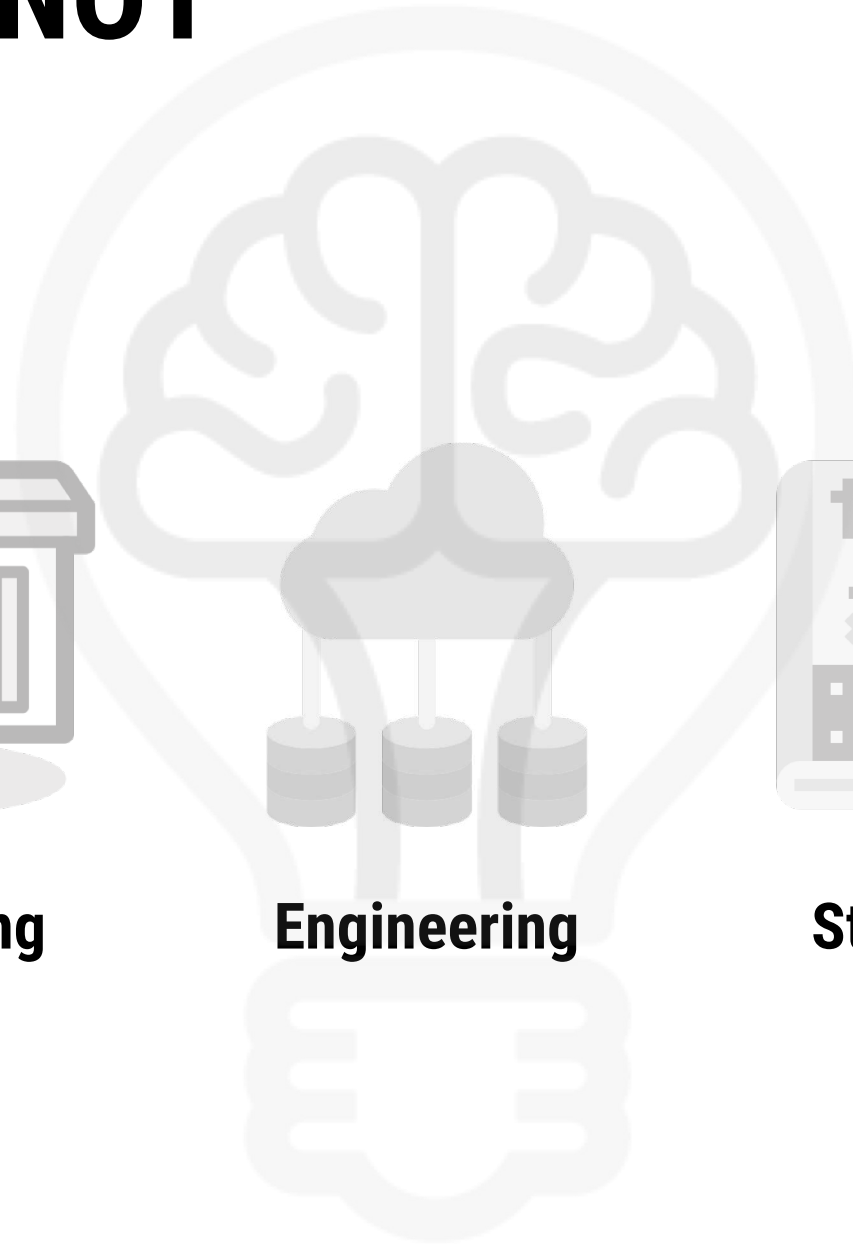
Engineering



Statistics



AI



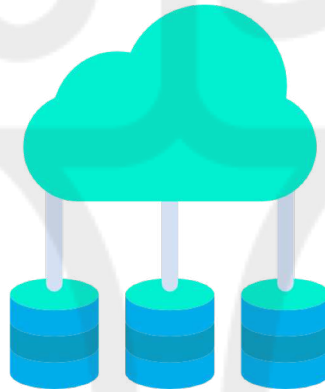
Data Science Is NOT



Analytics



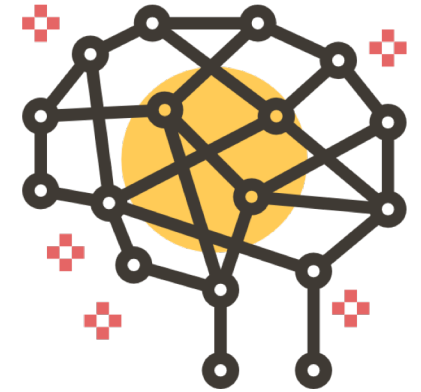
Reporting



Engineering



Statistics



AI

```
o <- as.h2o(blendeddt)
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===== | 100%

```
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d_conv_h2o <- h2o.assign(split_h2o[[2]], "valid") # 20%  
_conv_h2o <- h2o.assign(split_h2o[[3]], "test") # 20%
```

Why Should Marketers Care?

```
validate model first
```

```
ml_h2o_models <- h2o.automl(  
  = predictors,  
  = target,  
  aining_frame = train_conv_h2o,  
  aderboard_frame = valid_conv_h2o
```

===== | 44%

Why Should Marketers Care About Data Science?



Why Should Marketers Care About Data Science?



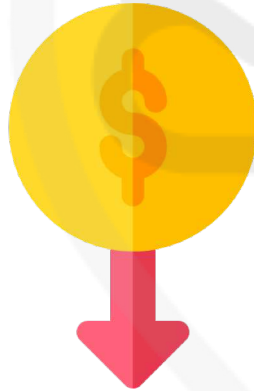
**Accelerate
Decisions**



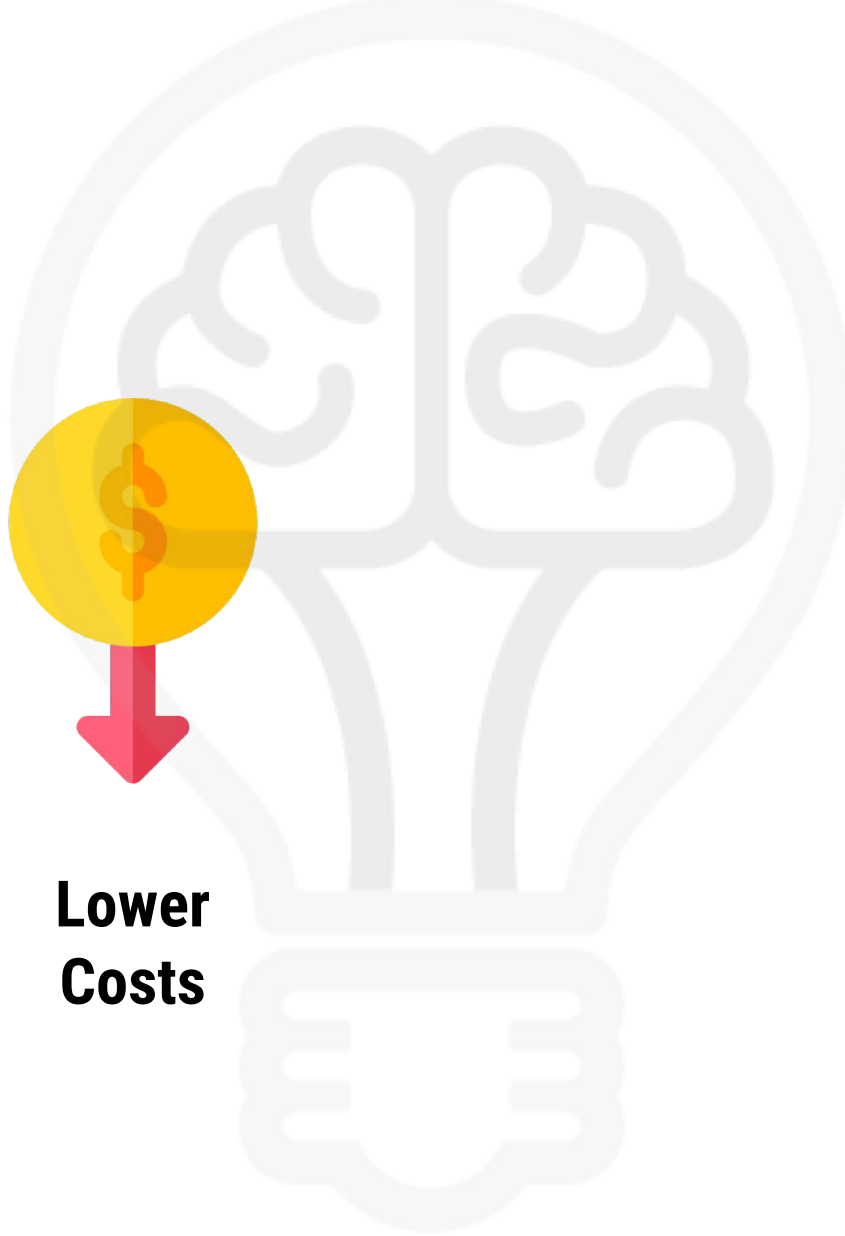
Why Should Marketers Care About Data Science?



**Accelerate
Decisions**



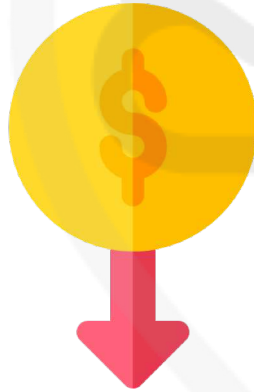
**Lower
Costs**



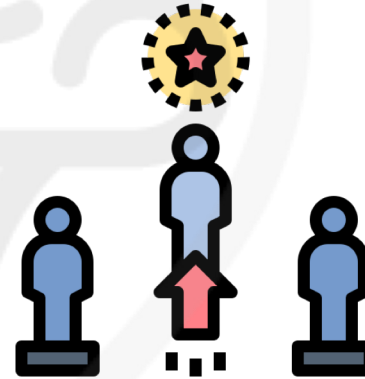
Why Should Marketers Care About Data Science?



**Accelerate
Decisions**



**Lower
Costs**

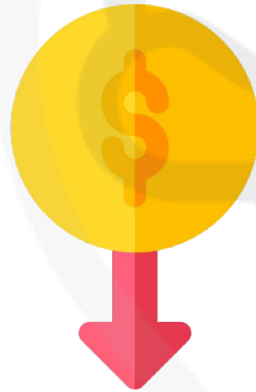


**Beat
Competitors**

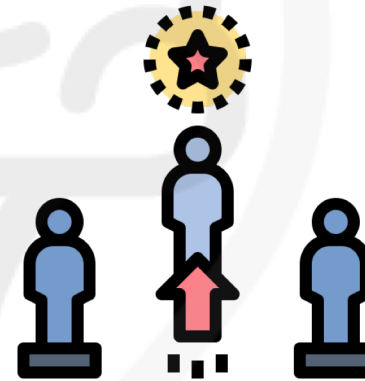
Why Should Marketers Care About Data Science?



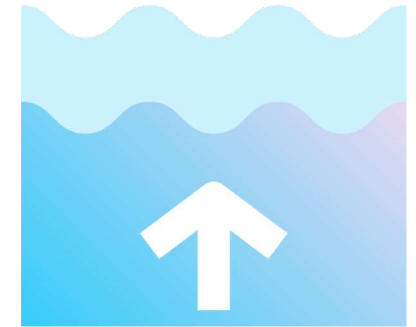
**Accelerate
Decisions**



**Lower
Costs**



**Beat
Competitors**



**New
Opportunities**

```
o <- as.h2o(blendeddt)
```

===== | 100%

```
t_h2o <-  
o.splitFrame(dfh2o, c(0.5999999999, 0.2, 0.2), seed = 1234)
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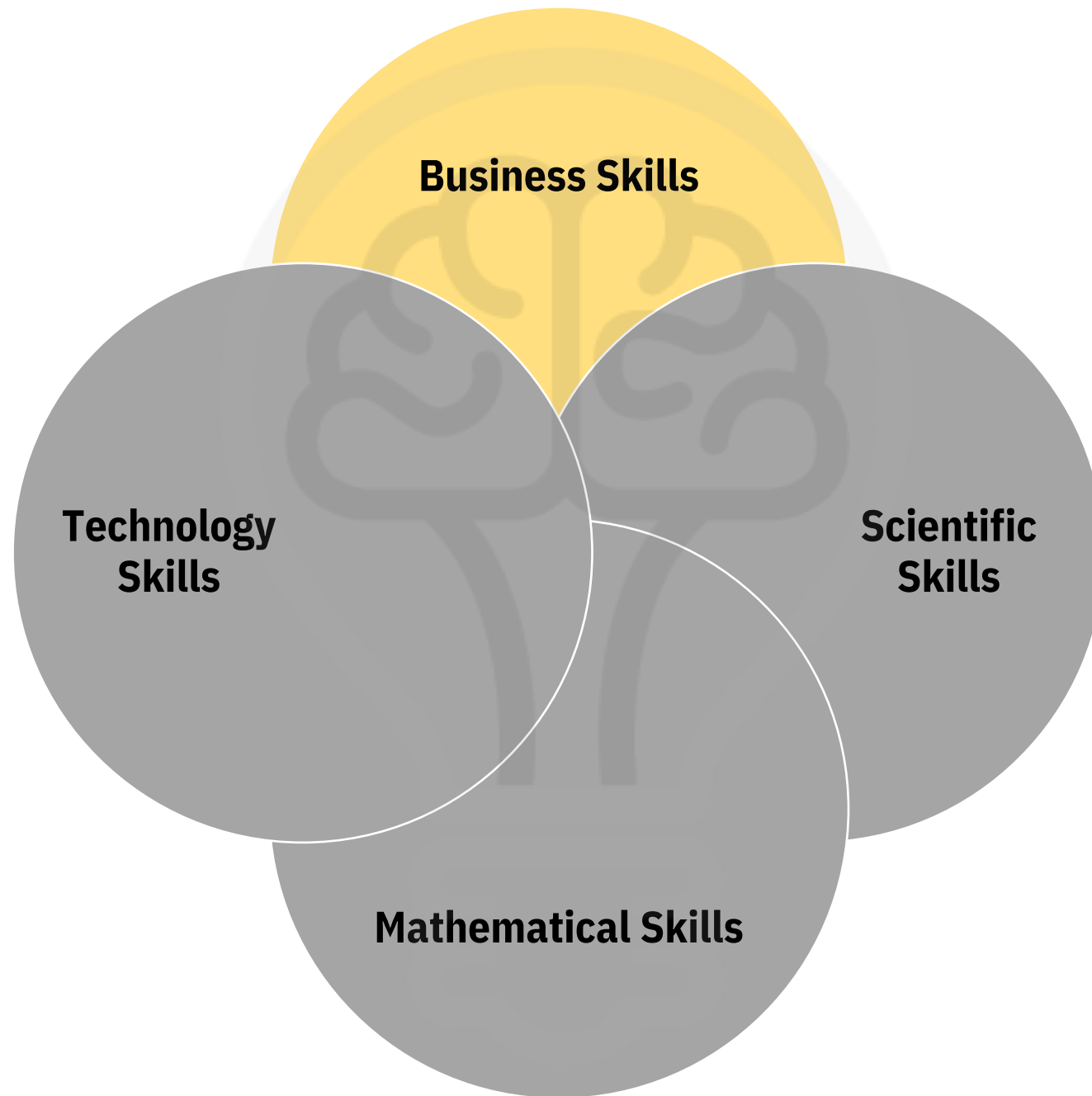
```
n_conv_h2o <- h2o.assign(split_h2o[[1]], "train") # 60%  
d_conv_h2o <- h2o.assign(split_h2o[[2]], "valid") # 20%  
_conv_h2o <- h2o.assign(split_h2o[[3]], "test") # 20%
```

Data Science 101: Business Skills

```
validate model first
```

```
ml_h2o_models <- h2o.automl(  
  = predictors,  
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```

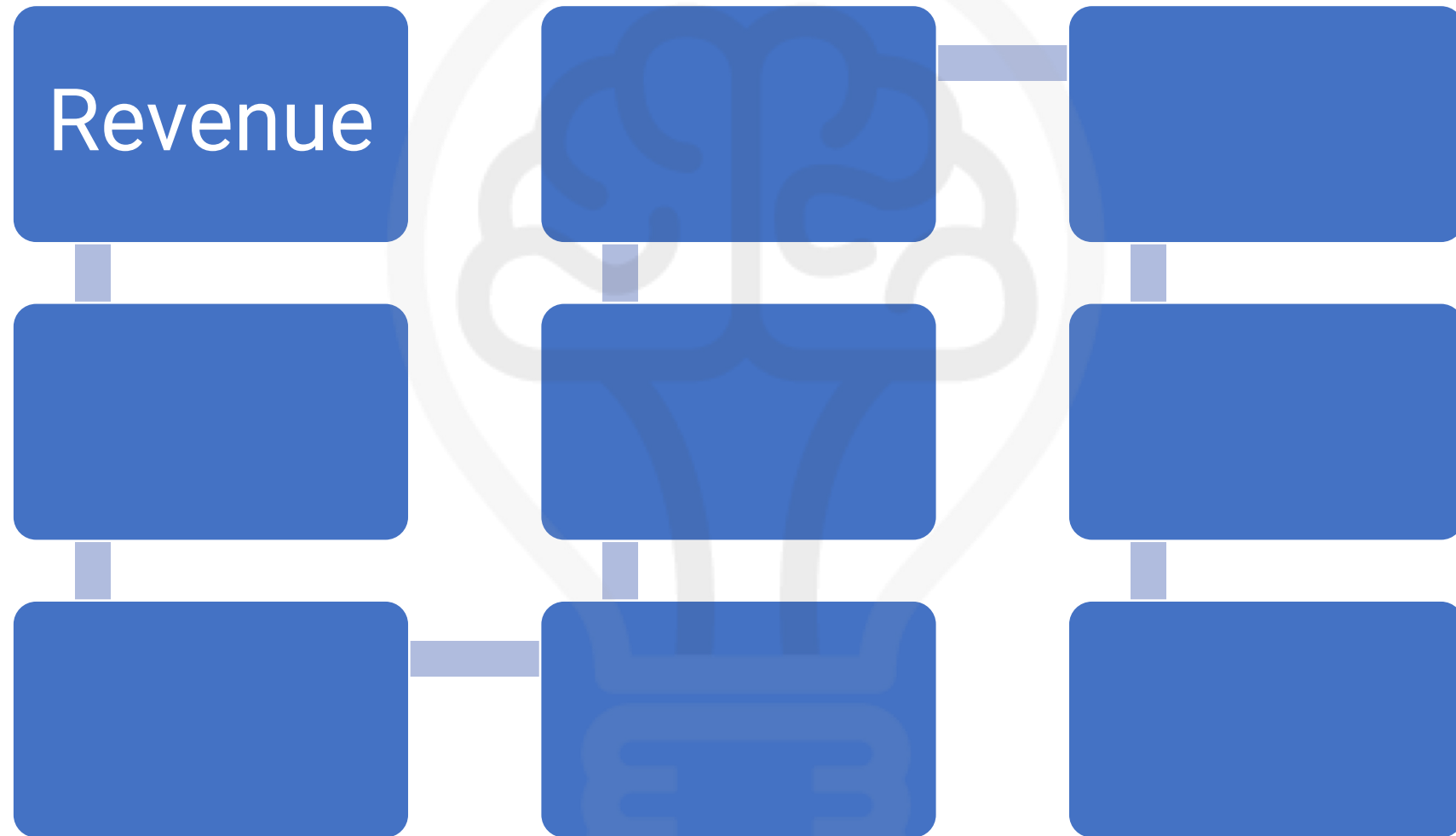
===== | 44%

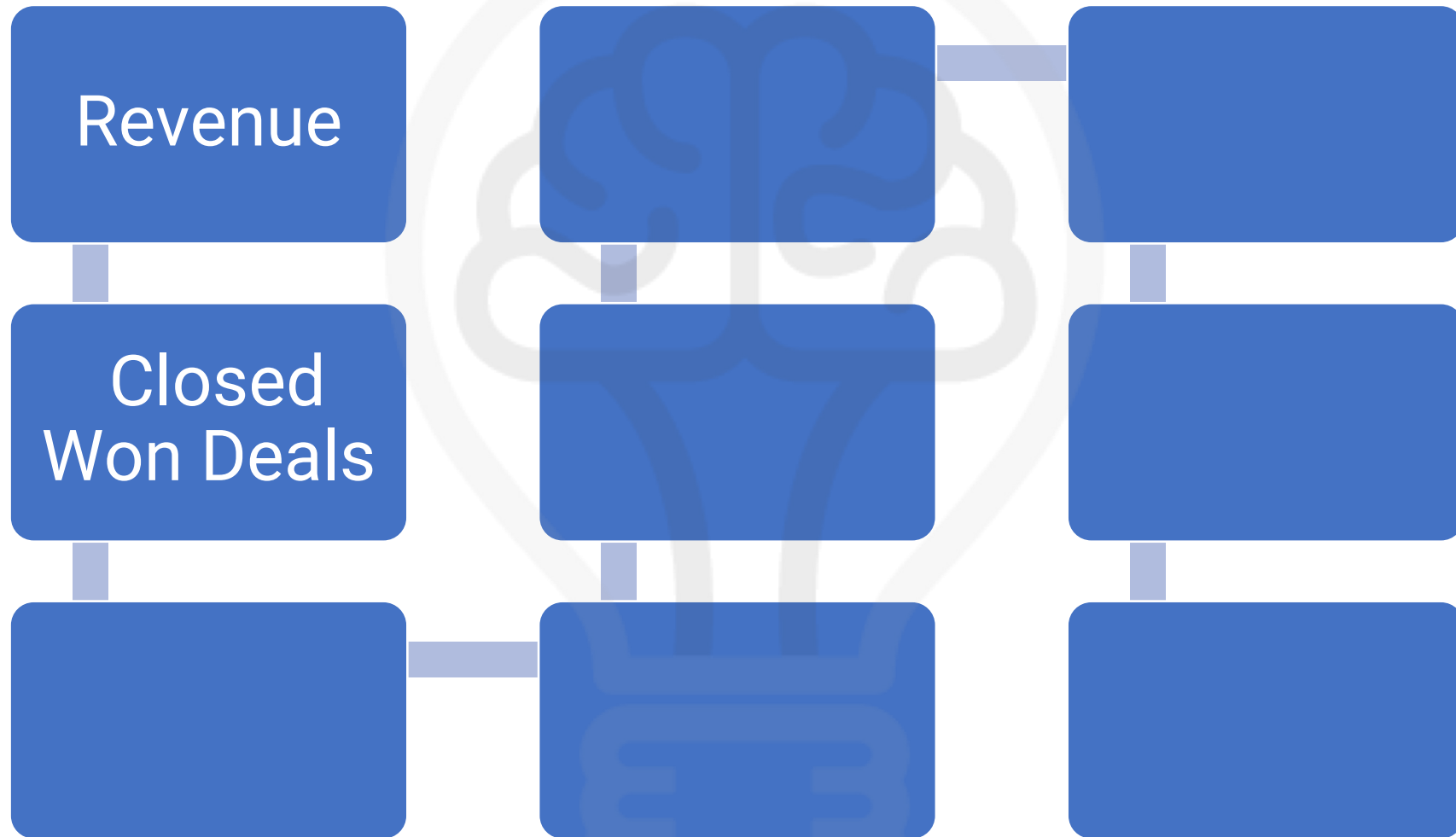


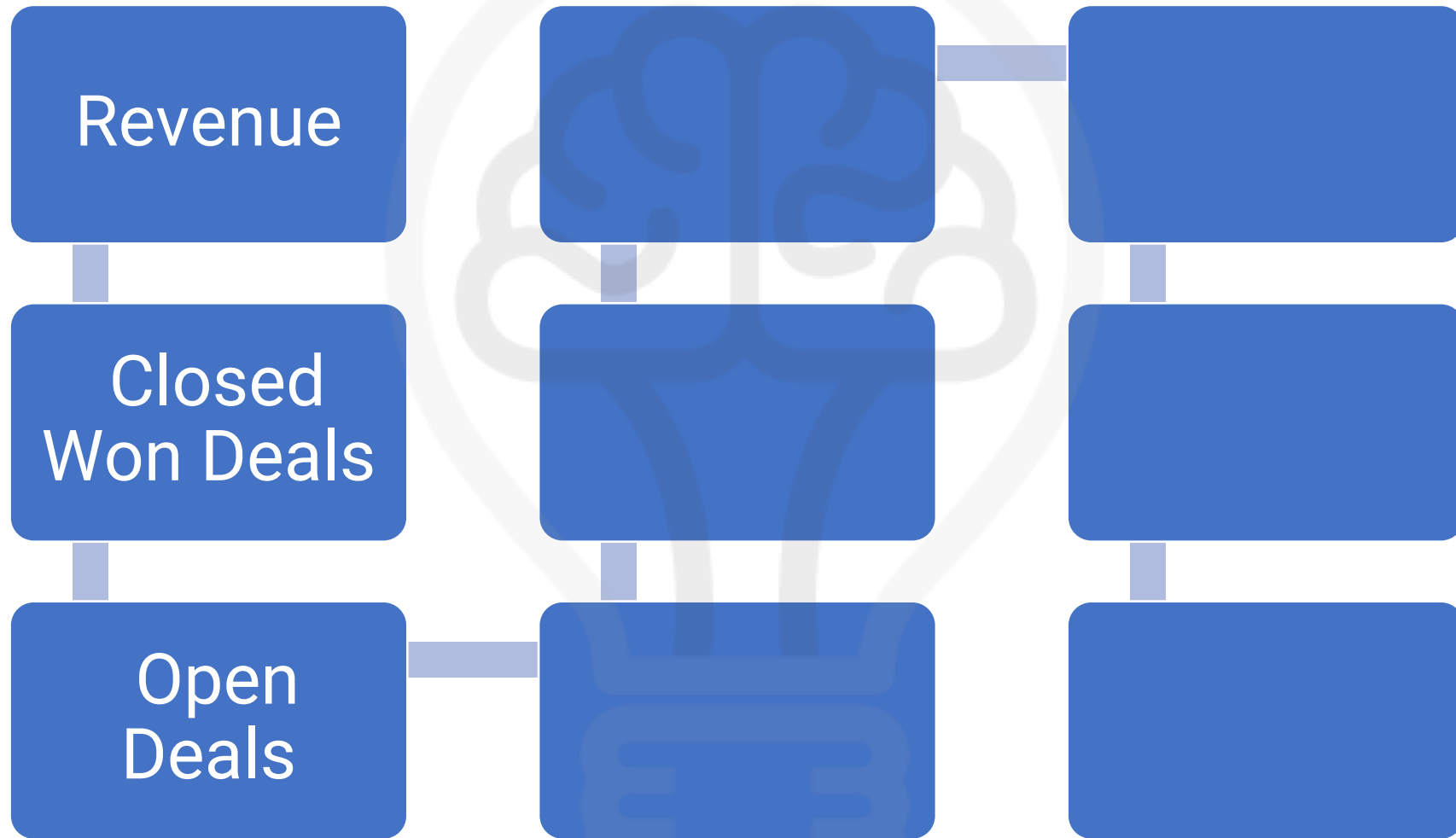
Key Question:
What decision will be made from this?

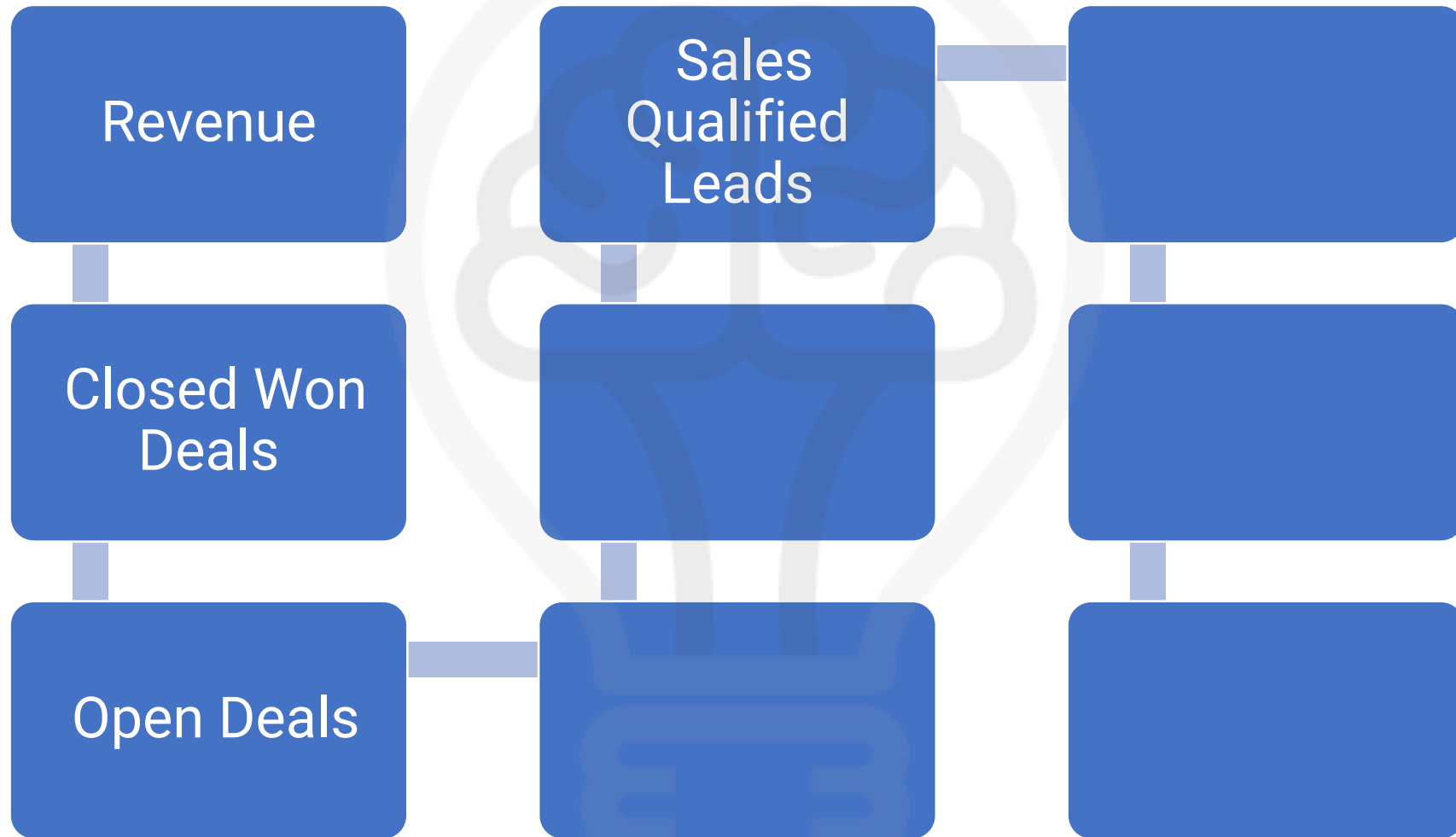
Data, without decisions, is distraction.

Example: KPI Mapping





















```
o <- as.h2o(blendeddt)
```

===== | 100%

```
t_h2o <-  
o.splitFrame(dfh2o, c(0.5999999999, 0.2, 0.2), seed = 1234)
```

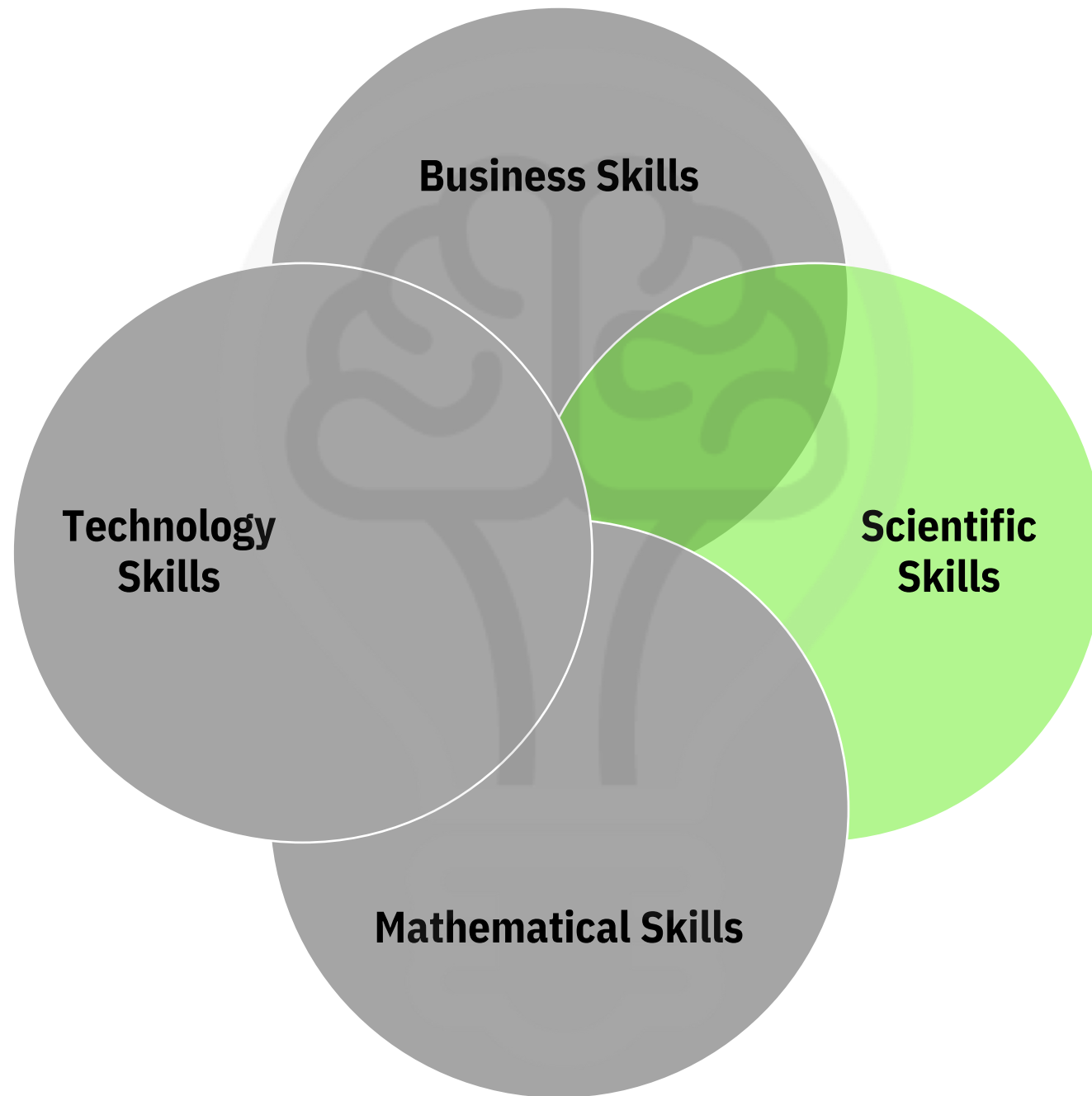
```
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d_conv_h2o <- h2o.assign(split_h2o[[2]], "valid") # 20%  
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```

Data Science 101: Scientific Skills

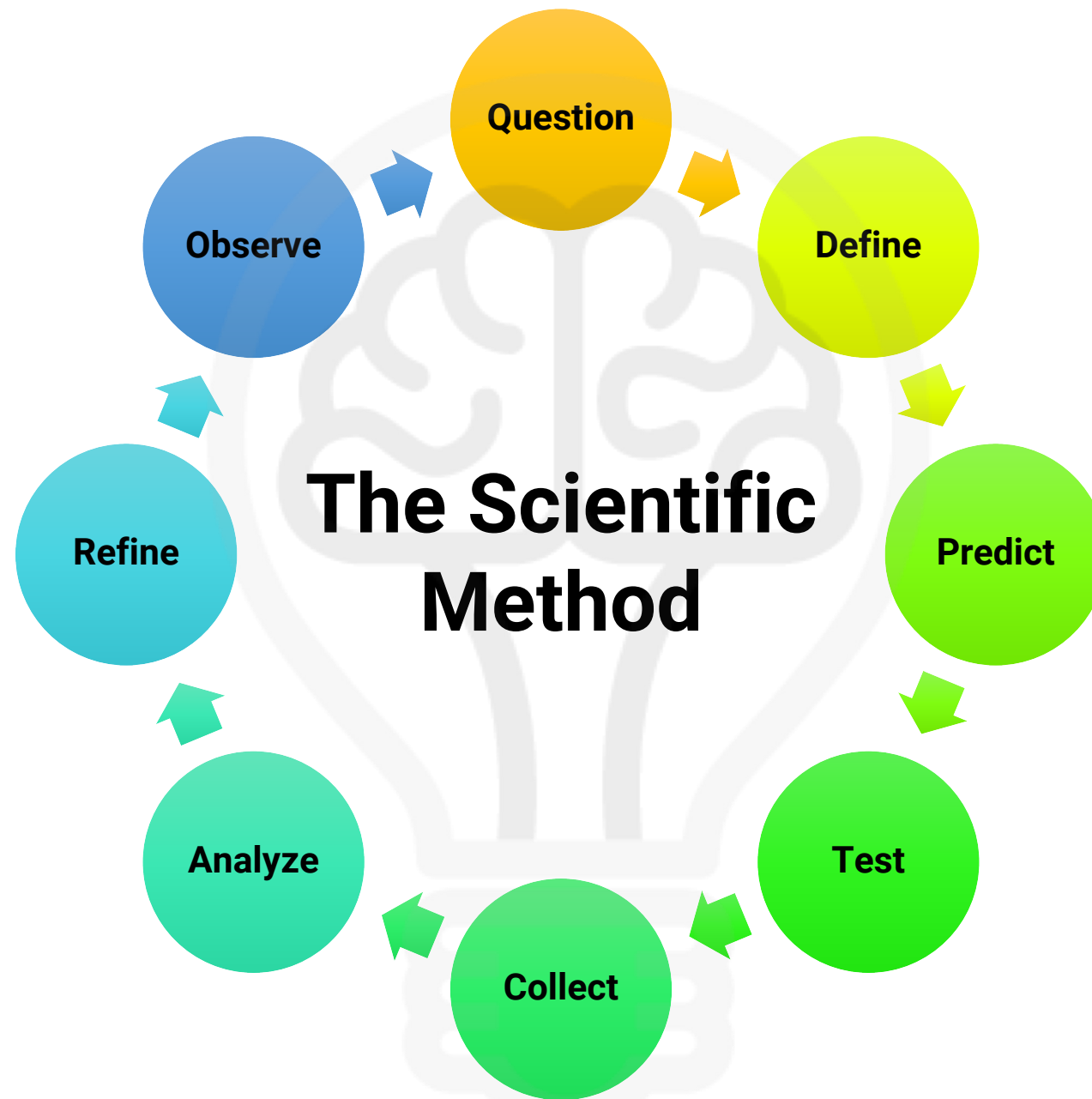
```
alidate model fir1st
```

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===== | 44%

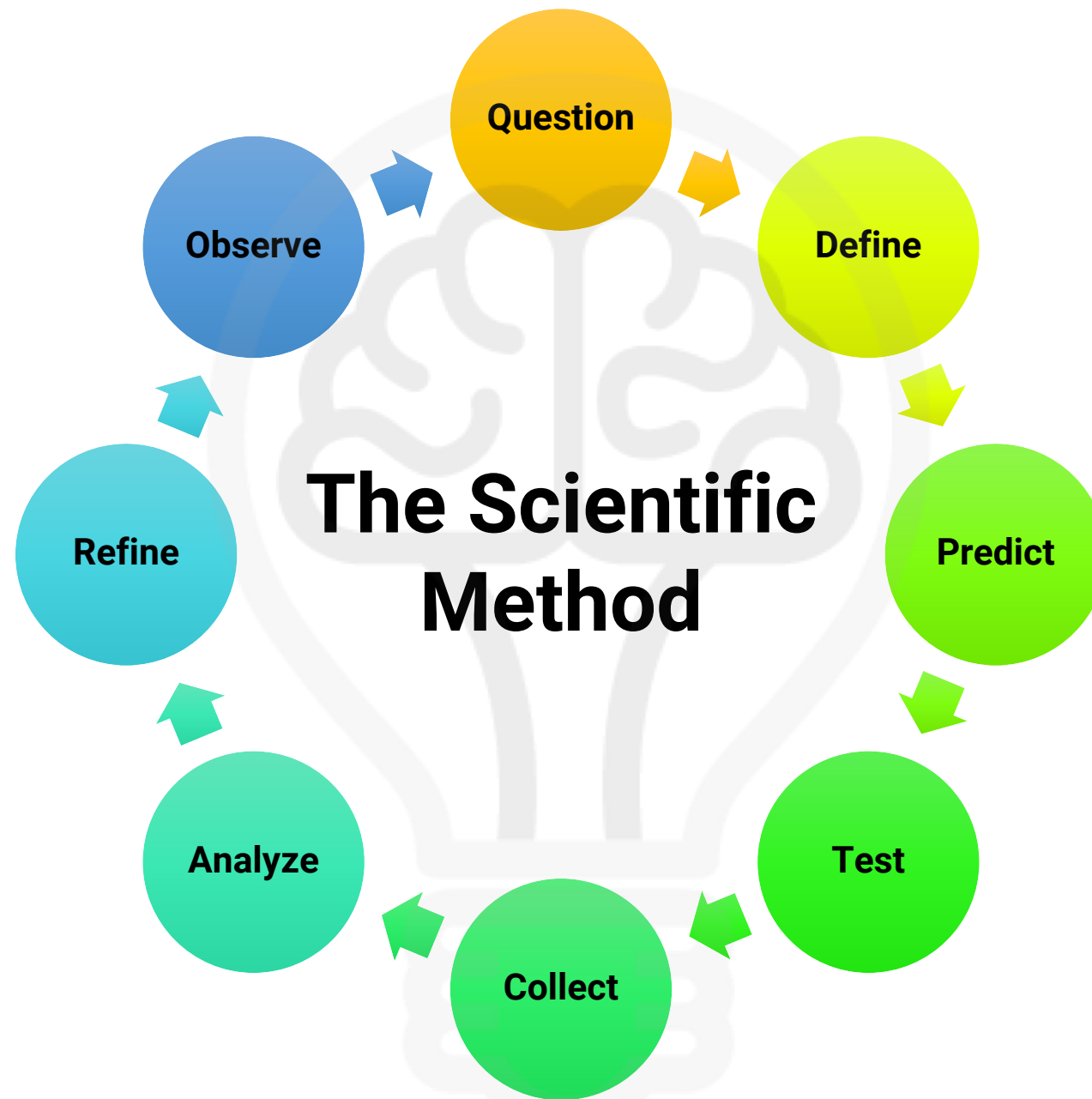


**Key Question:
Is this reproducible?**



The A/B Test

**Provably true or false
single condition**



No leader found

Not enough data was received to find a leader. [Learn more.](#)

Started manually: Wed, Jun 28, 2017, 6:00 AM EDT

Ended: Tue, Sep 26, 2017, 8:54 AM EDT

Based on Google Analytics data as of Tue, Sep 26, 2017, 8:54 AM EDT. ⓘ

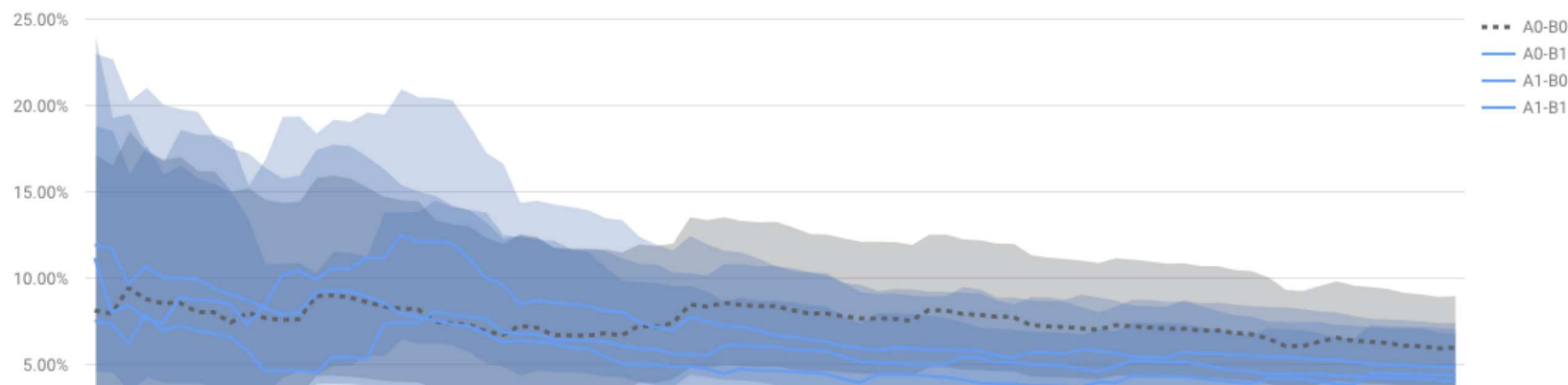
[View in Analytics](#)

Newsletter Subscription (Goal 1 Completions) ▾

		OBSERVED DATA			OPTIMIZE ANALYSIS			
✓	Combination ↑	Experiment Sessions	Experiment Conversions	Calculated Conversion Rate	Probability to be Best	Probability to beat Original	Modeled Conversion Rate	Modeled Improvement
✓	A0-B0	312	18	5.77%	61%	Baseline	3.7% — 9.0%	Baseline
✓	A0-B1	334	17	5.09%	20%	26%	3.0% — 7.4%	-57% to 54%
✓	A1-B0	274	10	3.65%	8%	14%	2.1% — 6.8%	-68% to 36%
✓	A1-B1	291	12	4.12%	11%	18%	2.4% — 7.1%	-64% to 44%

Modeled Conversion Rate

All Last 7 days Last 30 days



```
o <- as.h2o(blendeddt)
```

===== | 100%

```
t_h2o <-  
o.splitFrame(dfh2o, c(0.5999999999, 0.2, 0.2), seed = 1234)
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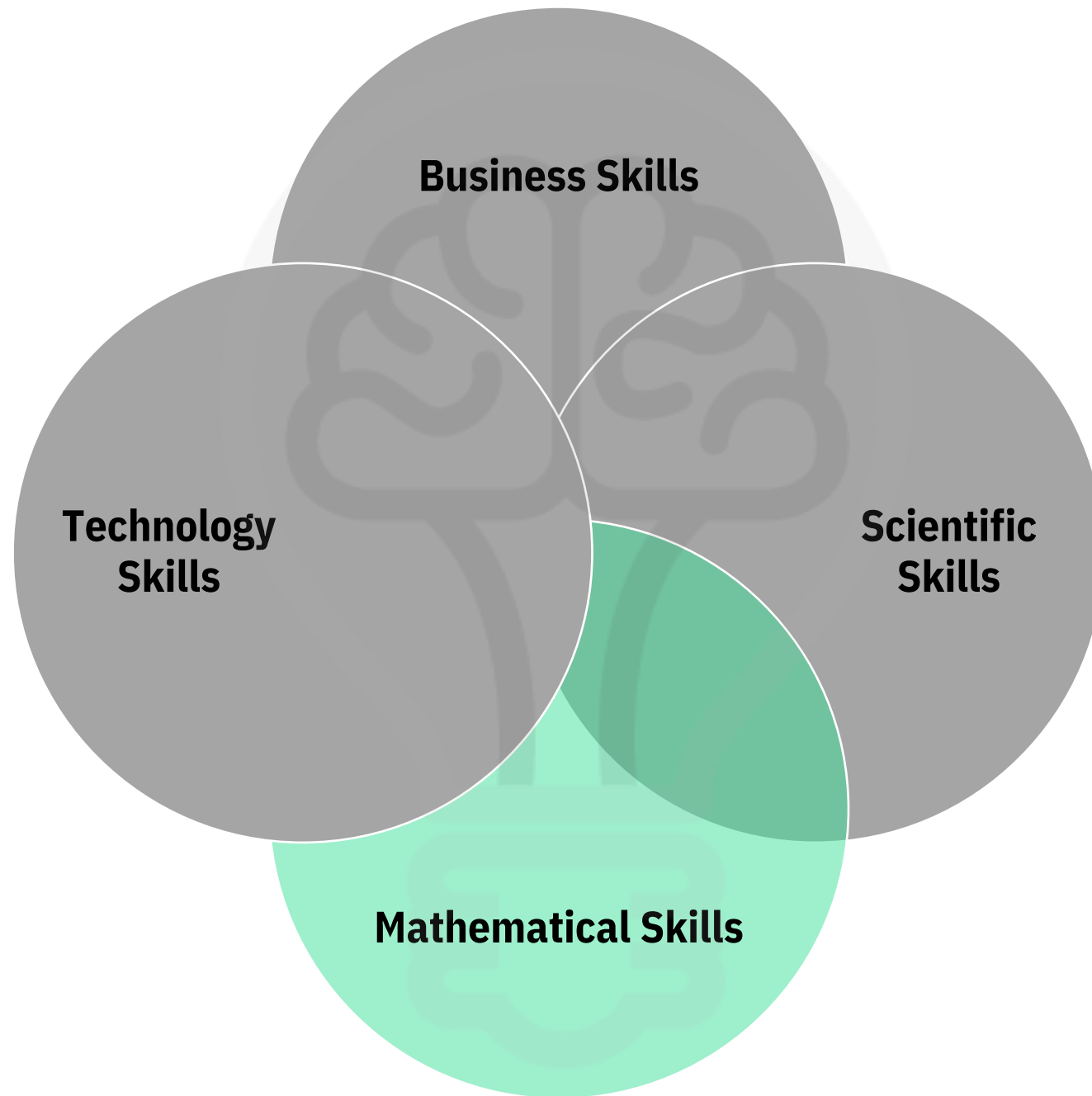
```
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_conv_h2o <- h2o.assign(split_h2o[[3]], "test") # 20%
```

Data Science 101: Mathematical Skills

```
validate model first
```

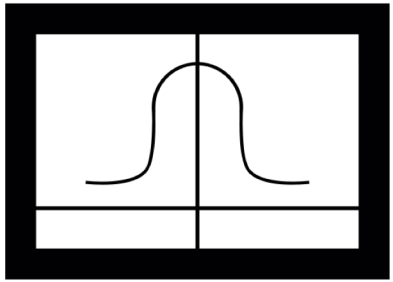
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  aining_frame = train_conv_h2o,  
  aderboard_frame = valid_conv_h2o
```

===== | 44%



Key Question:
Is this mathematically sound and valid?

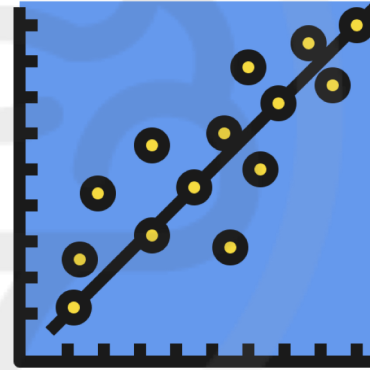
4 Key Techniques



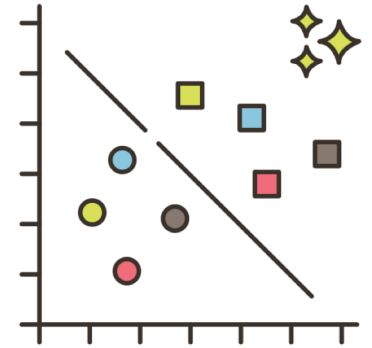
Centrality



Distribution



Regression



Clustering

COMPARE CONTRAST

Audience Overview

 SAVE  EXPORT  SHARE  INSIGHTS

 All Users
100.00% Users

 + Add Segment

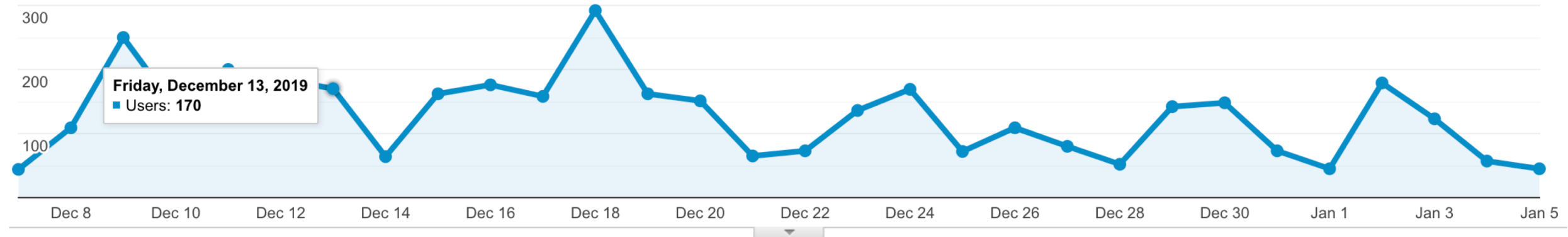
Dec 7, 2019 - Jan 5, 2020 ▼

Overview

Users ▼ VS. [Select a metric](#)

Hourly Day Week Month

● Users



Users

3,343

New Users

3,167

Sessions

4,333

Number of Sessions per User

1.30

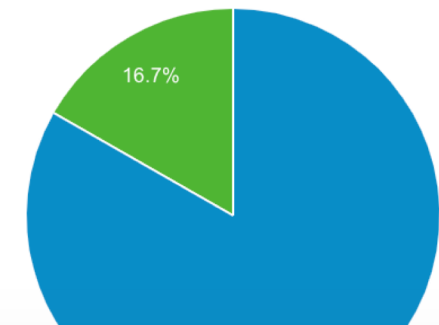
Pageviews

12,466

Pages / Session

2.88

■ New Visitor ■ Returning Visitor



  All Users
+0.00% Users

 + Add Segment

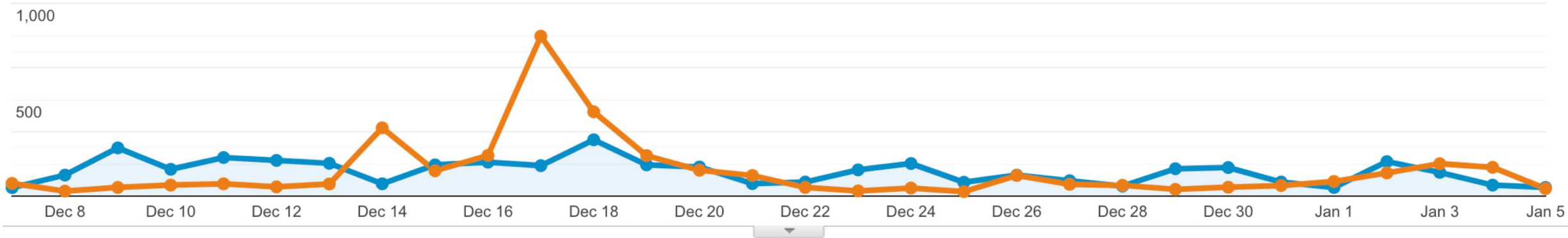
Dec 7, 2019 - Jan 5, 2020
Compare to: Dec 7, 2018 - Jan 5, 2019

Overview

Users VS. [Select a metric](#)

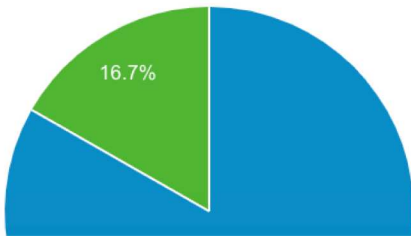
Hourly Day Week Month

Dec 7, 2019 - Jan 5, 2020:  Users
Dec 7, 2018 - Jan 5, 2019:  Users



 New Visitor  Returning Visitor

Dec 7, 2019 - Jan 5, 2020

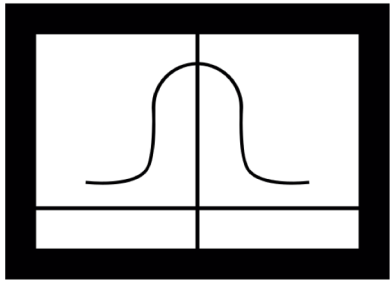


Number of Sessions per User

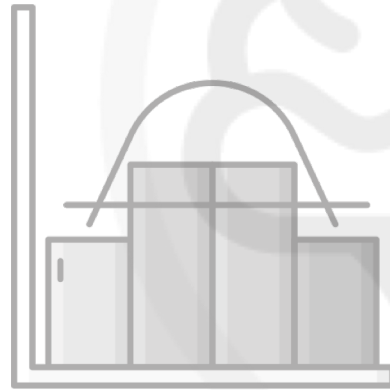
Pageviews

Pages / Session

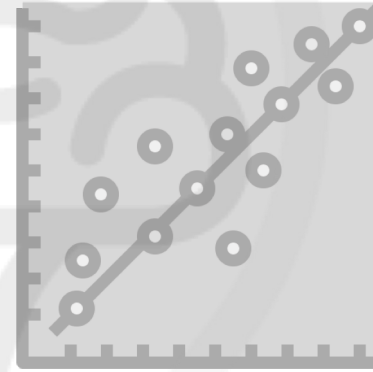
4 Key Techniques



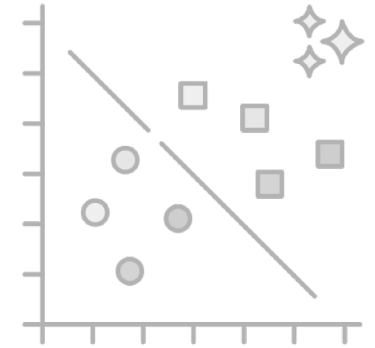
Centrality



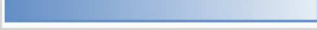
Distribution



Regression



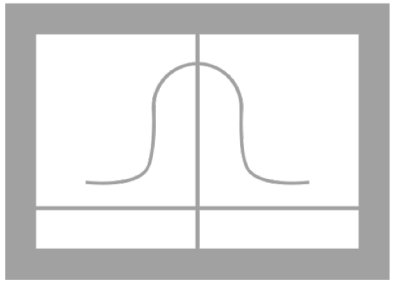
Clustering

Day Index	Pageviews	
12/7/19		137
12/8/19		274
12/9/19		632
12/10/19		408
12/11/19		637
12/12/19		582
12/13/19		643
12/14/19		212
12/15/19		401
12/16/19		610
12/17/19		546
12/18/19		1091
12/19/19		538
12/20/19		555
12/21/19		192
12/22/19		250
12/23/19		382
12/24/19		535
12/25/19		257
12/26/19		362
12/27/19		320
12/28/19		245
12/29/19		428
12/30/19		465
12/31/19		237
1/1/20		154
1/2/20		640
1/3/20		401
1/4/20		200
1/5/20		132

Day Index	Pageviews
12/18/19	1091
12/13/19	643
1/2/20	640
12/11/19	637
12/9/19	632
12/16/19	610
12/12/19	582
12/20/19	555
12/17/19	546
12/19/19	538
12/24/19	535
12/30/19	465
12/29/19	428
12/10/19	408
12/15/19	401
1/3/20	401
12/23/19	382
12/26/19	362
12/27/19	320
12/8/19	274
12/25/19	257
12/22/19	250
12/28/19	245
12/31/19	237
12/14/19	212
1/4/20	200
12/21/19	192
1/1/20	154
12/7/19	137
1/5/20	132

Day Index	Pageviews			
12/18/19	1091		Mean	415.533333
12/13/19	643			
1/2/20	640		Median	401
12/11/19	637			
12/9/19	632		Mode	401
12/16/19	610			
12/12/19	582			
12/20/19	555			
12/17/19	546			
12/19/19	538			
12/24/19	535			
12/30/19	465			
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1/3/20	401			
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12/28/19	245			
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1/4/20	200			
12/21/19	192			
1/1/20	154			
12/7/19	137			
1/5/20	132			

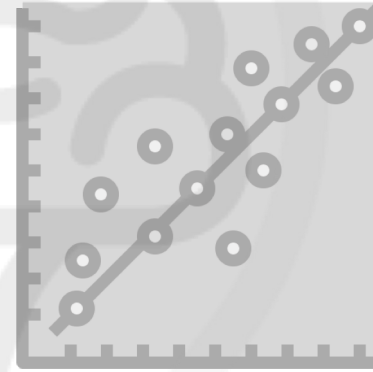
4 Key Techniques



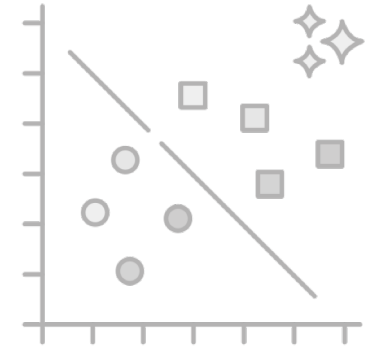
Centrality



Distribution

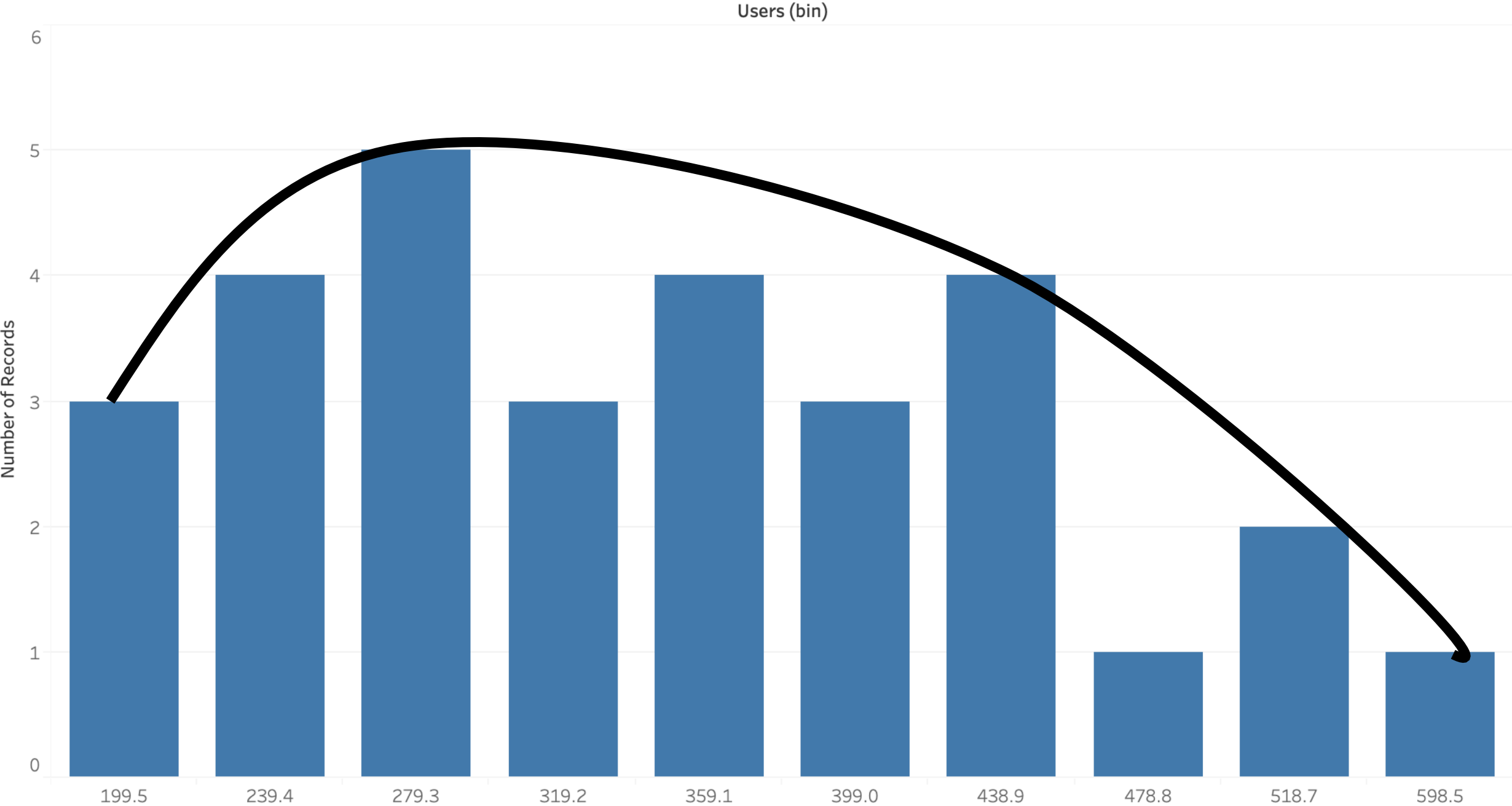


Regression

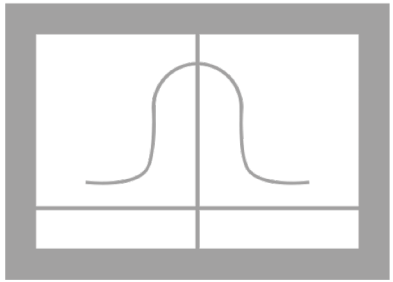


Clustering

Google Analytics Bins



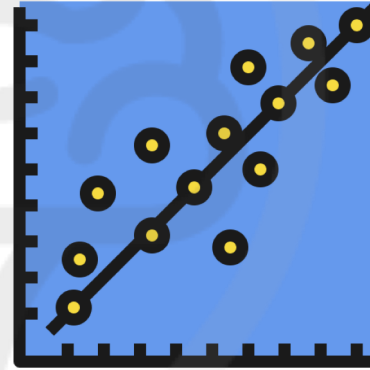
4 Key Techniques



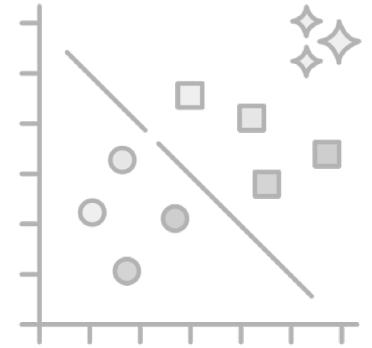
Centrality



Distribution

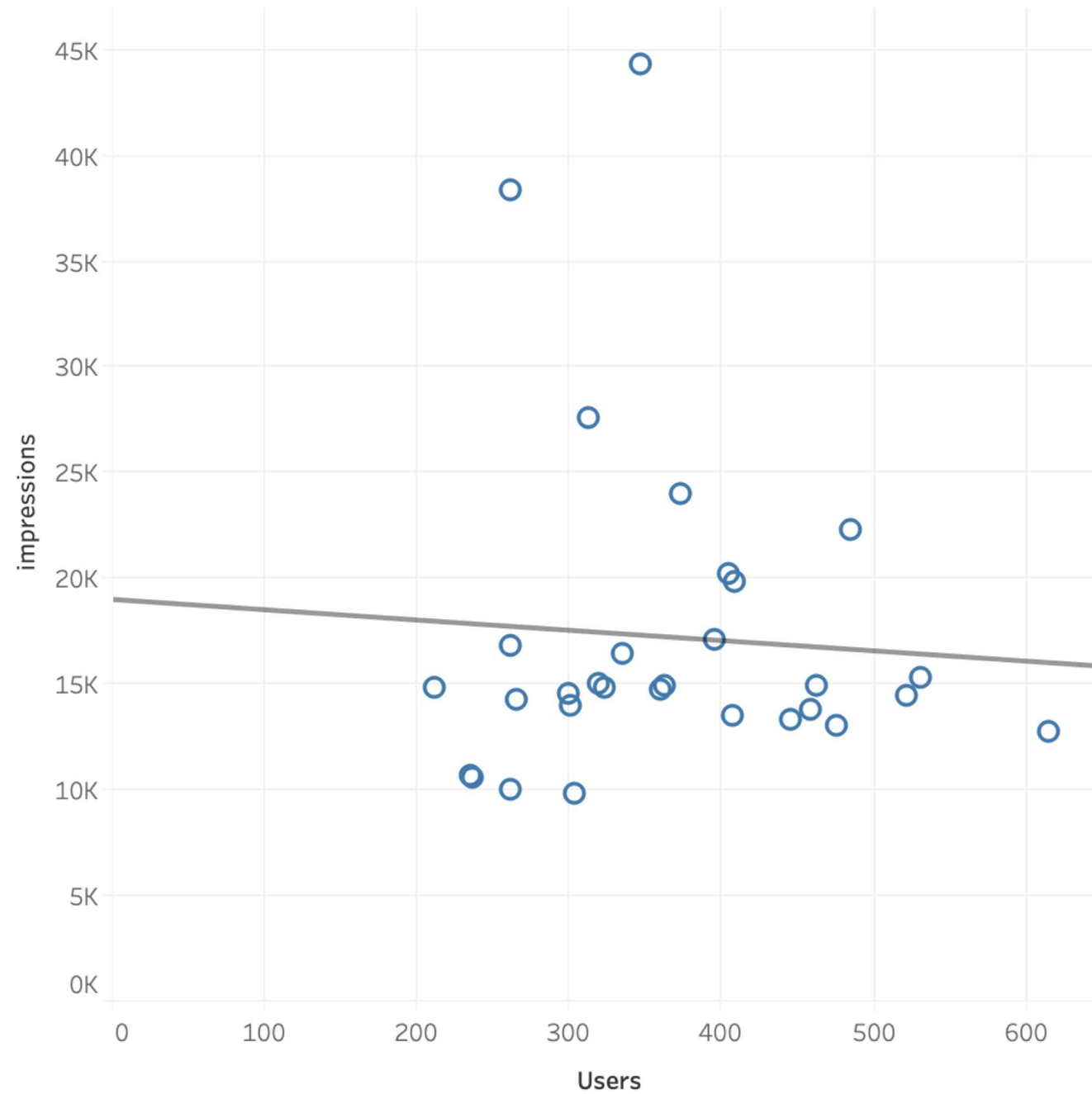


Regression

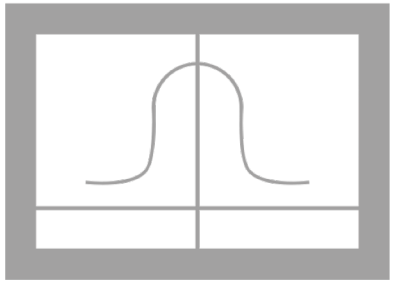


Clustering

Twitter Impressions vs. Google Analytics traffic



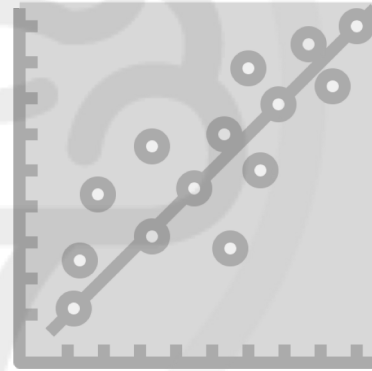
4 Key Techniques



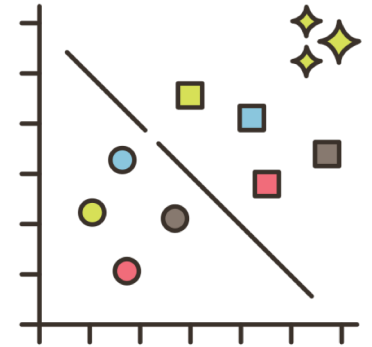
Centrality



Distribution

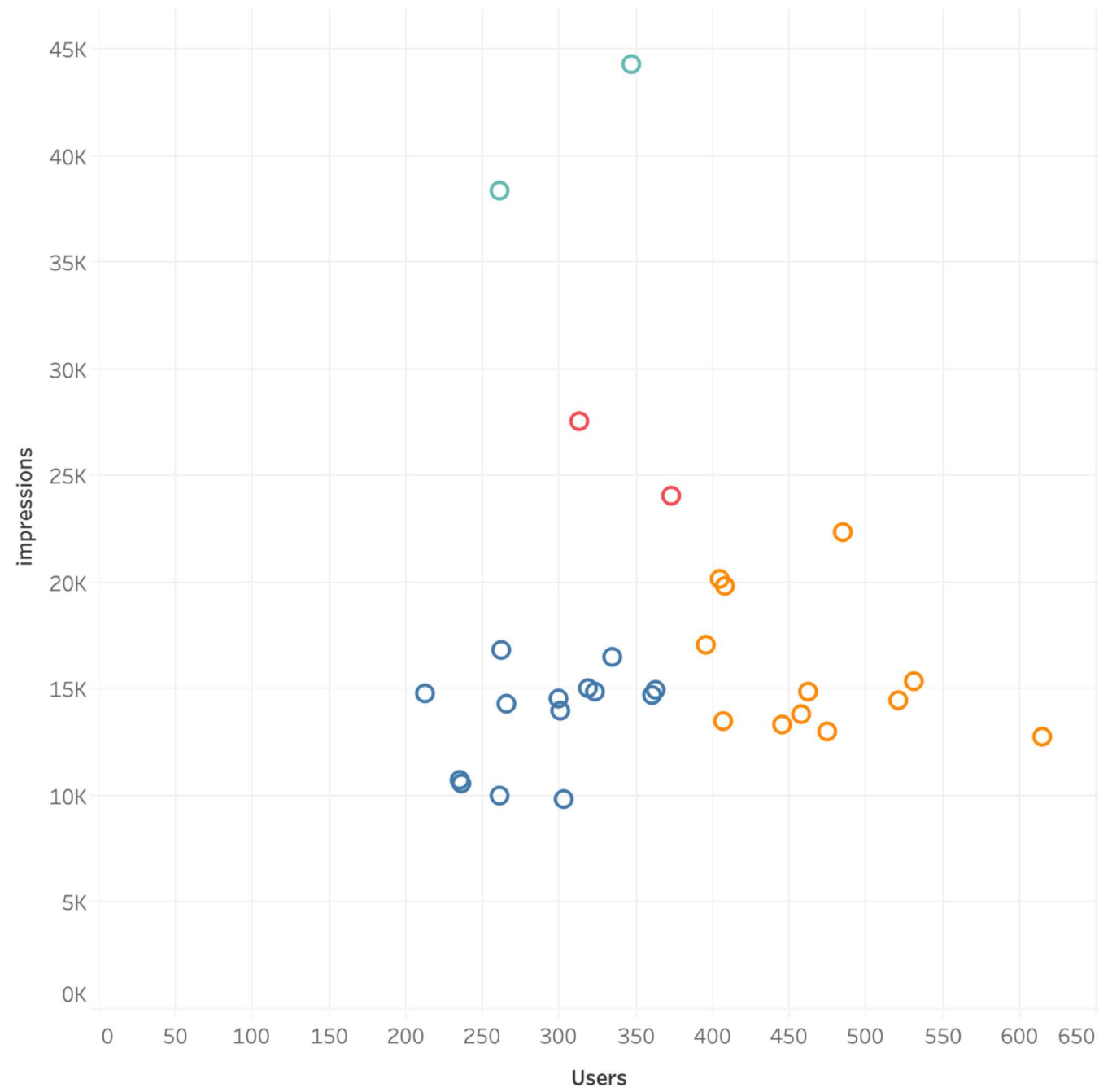


Regression



Clustering

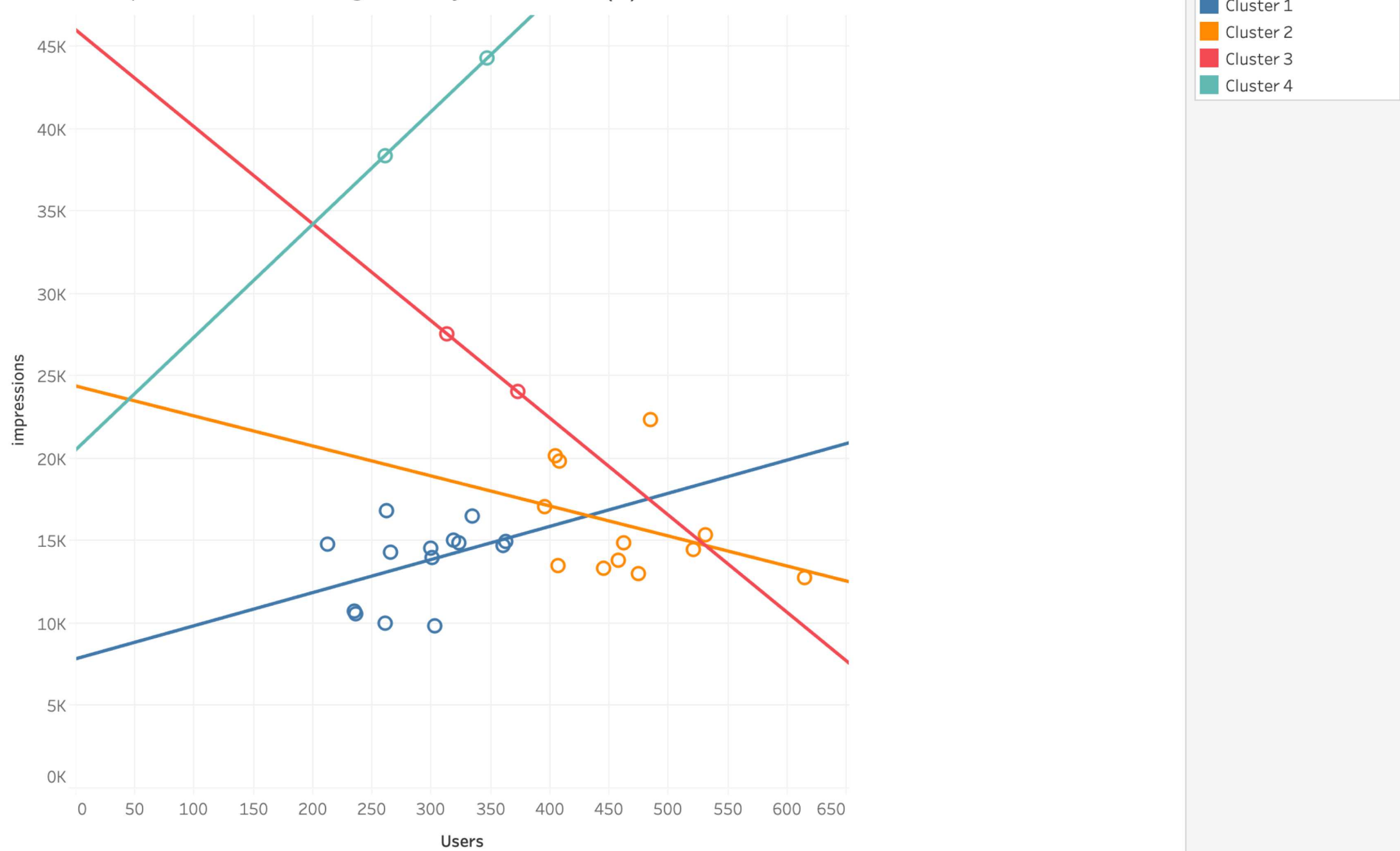
Twitter Impressions vs. Google Analytics traffic (2)

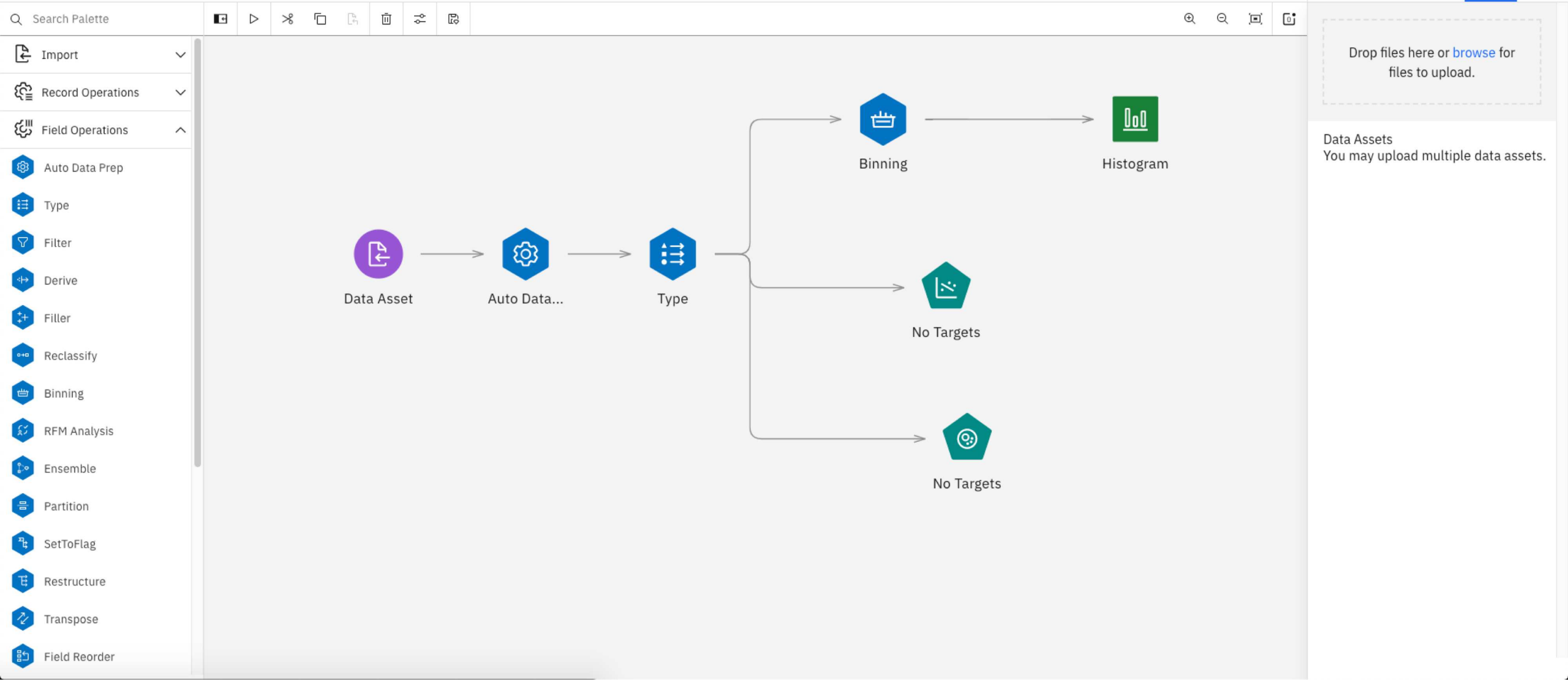


Clusters

- Cluster 1
- Cluster 2
- Cluster 3
- Cluster 4

Twitter Impressions vs. Google Analytics traffic (2)





```
o <- as.h2o(blendeddt)
```

===== | 100%

```
t_h2o <-  
o.splitFrame(dfh2o, c(0.5999999999, 0.2, 0.2), seed = 1234)
```

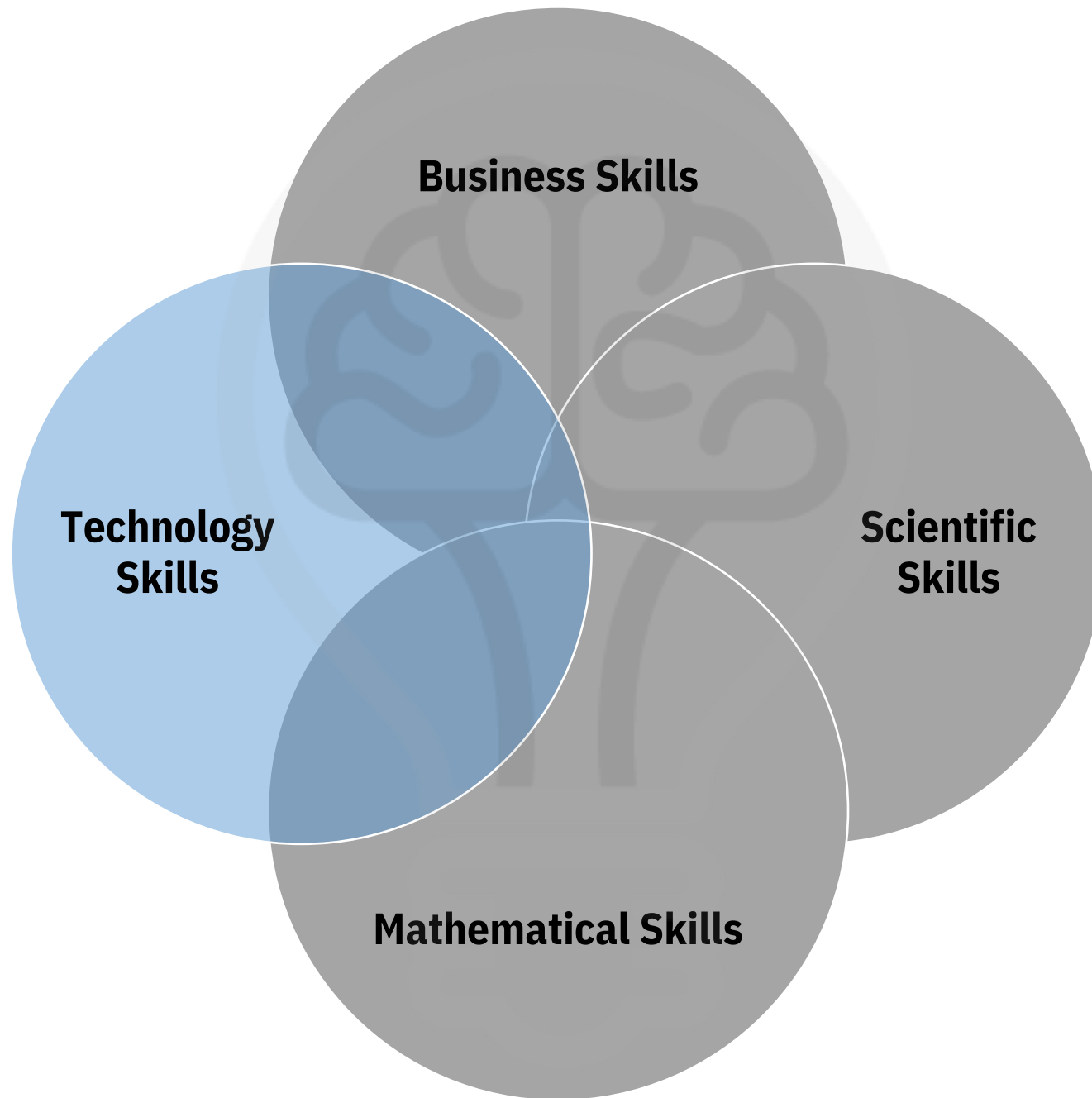
```
n_conv_h2o <- h2o.assign(split_h2o[[1]], "train") # 60%  
d_conv_h2o <- h2o.assign(split_h2o[[2]], "valid") # 20%  
_conv_h2o <- h2o.assign(split_h2o[[3]], "test") # 20%
```

Data Science 101: Technology Skills

```
validate model first
```

```
ml_h2o_models <- h2o.automl(  
  = predictors,  
  = target,  
  aining_frame = train_conv_h2o,  
  aderboard_frame = valid_conv_h2o
```

===== | 44%



Key Question:
Is this scalable/automated?



Repeatable

Scalable

Home Insert Page Layout Formulas Data Review View Tell me what you want to do

Paste Cut Copy Format

Calibri (Body) 12 A A

B I U

= = =

Wrap Text

General

\$ %

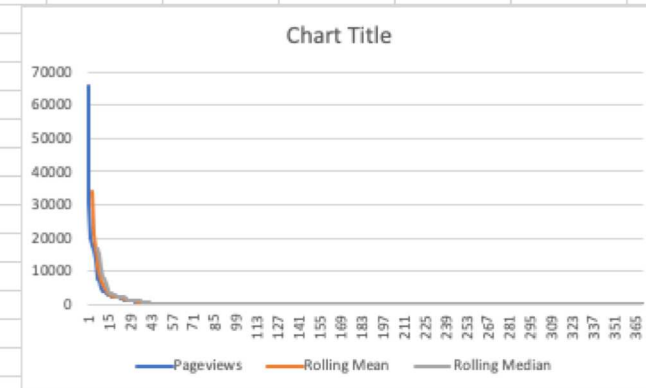
Conditional Formatting Format as Table Cell Styles

Insert Delete Format

A1 Page

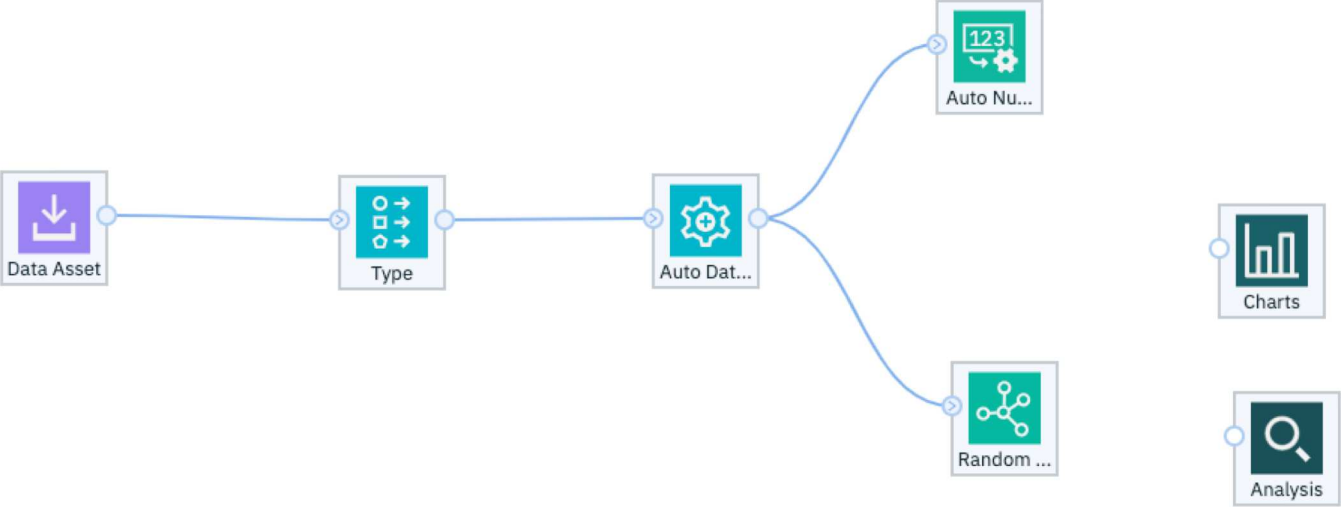
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	P	Pageviews	Unique Page	Avg. Time or	Entrances	Bounce Rate	% Exit	Page Value	Rolling Mean	Rolling Median									
2	m	66000	54577	121.93	6183	78.94%	34.42%	1.30											
3	m	30926	25153	52.77	18157	76.67%	54.93%	0.62											
4	m	20275	17684	87.54	7540	95.28%	51.11%	1.28											
5	m	17844	14948	85.44	6612	92.48%	49.01%	1.34	33761.25										
6	m	16217	13414	65.46	6576	92.41%	49.44%	0.73	21315.5										
7	ol	13635	11048	122.39	1232	79.63%	34.23%	1.19	16992.75										
8	hi	8322	6918	122.20	751	80.83%	35.94%	1.38	14004.5										
9	ol	7574	5475	75.96	3140	67.08%	44.98%	0.74	11437	17030.5									
10	ol	7262	5748	124.61	587	75.21%	31.88%	2.01	9198.25	14926									
11	ol	4787	3372	61.75	269	68.15%	19.74%	1.49	6986.25	10978.5									
12	ka	3955	3272	127.66	368	77.45%	35.90%	1.90	5894.5	7948									
13	ka	3671	3098	74.02	2595	76.69%	66.00%	0.27	4918.75	7418									
14	ol	3412	2254	58.92	188	68.09%	17.23%	3.24	3956.25	6024.5									
15	m	2888	2721	72.76	1955	98.62%	74.55%	0.23	3481.5	4371									
16	ol	2820	2330	88.18	134	70.15%	27.23%	1.42	3197.75	3813									
17	ka	2585	2077	48.63	1625	69.29%	56.44%	1.33	2926.25	3541.5									
18	ka	2481	1947	74.26	1370	70.73%	54.57%	1.06	2693.5	3150									
19	ol	2267	1633	95.80	179	72.63%	26.11%	4.61	2538.25	2854									
20	ol	2209	1732	45.69	143	44.06%	16.07%	1.55	2385.5	2702.5									
21	ni	2178	1750	120.53	170	78.70%	33.33%	2.35	2283.75	2533									
22	m	2153	1958	70.14	957	96.87%	57.08%	0.44	2201.75	2374									
23	m	2092	2020	43.09	1637	99.14%	80.59%	0.12	2158	2238									
24	ka	1871	1209	63.32	1132	40.72%	40.89%	1.30	2073.5	2193.5									
25	hi	1499	1240	102.26	101	71.29%	28.55%	2.75	1903.75	2165.5									
26	ol	1410	1154	96.50	51	66.67%	23.97%	3.79	1718	2122.5									
27	hi	1338	1055	45.31	95	35.79%	16.44%	3.31	1529.5	1981.5									
28	m	1314	946	26.70	33	66.67%	14.69%	0.65	1390.25	1685									
29	hi	1295	1019	85.37	86	61.63%	23.32%	3.10	1339.25	1454.5									
30	sc	1163	962	119.41	95	75.79%	33.71%	2.02	1277.5	1374									
31	ol	1052	816	48.31	77	38.96%	14.64%	3.69	1206	1326									
32	sc	984	735	60.97	56	83.93%	17.78%	2.82	1123.5	1304.5									
33	hi	959	736	61.08	61	68.85%	21.27%	0.67	1039.5	1229									
34	ni	908	611	93.97	76	73.68%	26.21%	1.59	975.75	1107.5									
35	sc	726	502	88.33	47	63.83%	25.21%	3.17	894.25	1018									
36	ni	675	513	57.52	39	69.23%	18.52%	0.71	817	971.5									

Summary Dataset1 Dataset2 +



Search Palette

- Import
- Record Operations
- Field Operations
- Graphs
- Modeling
- Outputs
- Table
- Matrix
- Analysis
- Data Audit
- Transform
- Statistics
- Means
- Report
- Set Globals
- Sim Fit
- Export



```
scannerstatuscheck.R x fasttextnewsexplorer.R x
Source on Save Run Source
128 "iot",
129 "public relations"
130 )
131
132 megatermdf <-
133 data.frame(term = character(),
134            relevance = double(),
135            sourceterm = character())
136
137 megautputfile <- paste(category, ".csv", sep = "")
138
139 for (term in targetterms) {
140   nndf <- as.data.frame(get_nn(model, term, 50))
141
142   nndf <- setDT(nndf, keep.rownames = TRUE)[,]
143   colnames(nndf)[1] <- "term"
144   colnames(nndf)[2] <- "relevance"
145
146   nndf$sourceterm <- term
147
148   outputfile <- paste(category, "-", term, ".csv", sep = "")
149
150   megatermdf <- rbind(megatermdf, nndf[, 1:3, drop = FALSE])
151
144:35 # (Untitled) R Script
```

```
Console Jobs
~/code/contentexporter/
>
> postdf <- dbxSelect(dbxcon, postquery) %>%
+   clean_names() %>%
+   distinct()
>
> #####
> # fastrtext
> #####
>
> cleantraintext <-
+   clean.text(stri_trans_general(postdf$contentraw, "Latin-ASCII"))
```

Environment History Connections

Import Dataset

Global Environment

get_handles	function (x)
get_tags	function (x)
get.all.sentiment	function (textdf)
get.collocation	function (tokensin, targetword)
get.tokens	function (corpus, dictfile, stopfile)
LinearizeNestedList	function (NList, LinearizeDataFrames = FALSE, NameS...
make.idf	function (tokens, dictfile, stopfile)
make.tf	function (tokens, dictfile, stopfile)
nextweekday	function (date, wday)
quotemeta	function (string)
removeWords	function (str, stopwords)
topicmodels2LDAvis	function (x, ...)

Files Plots Packages Help Viewer

New Folder Delete Rename More

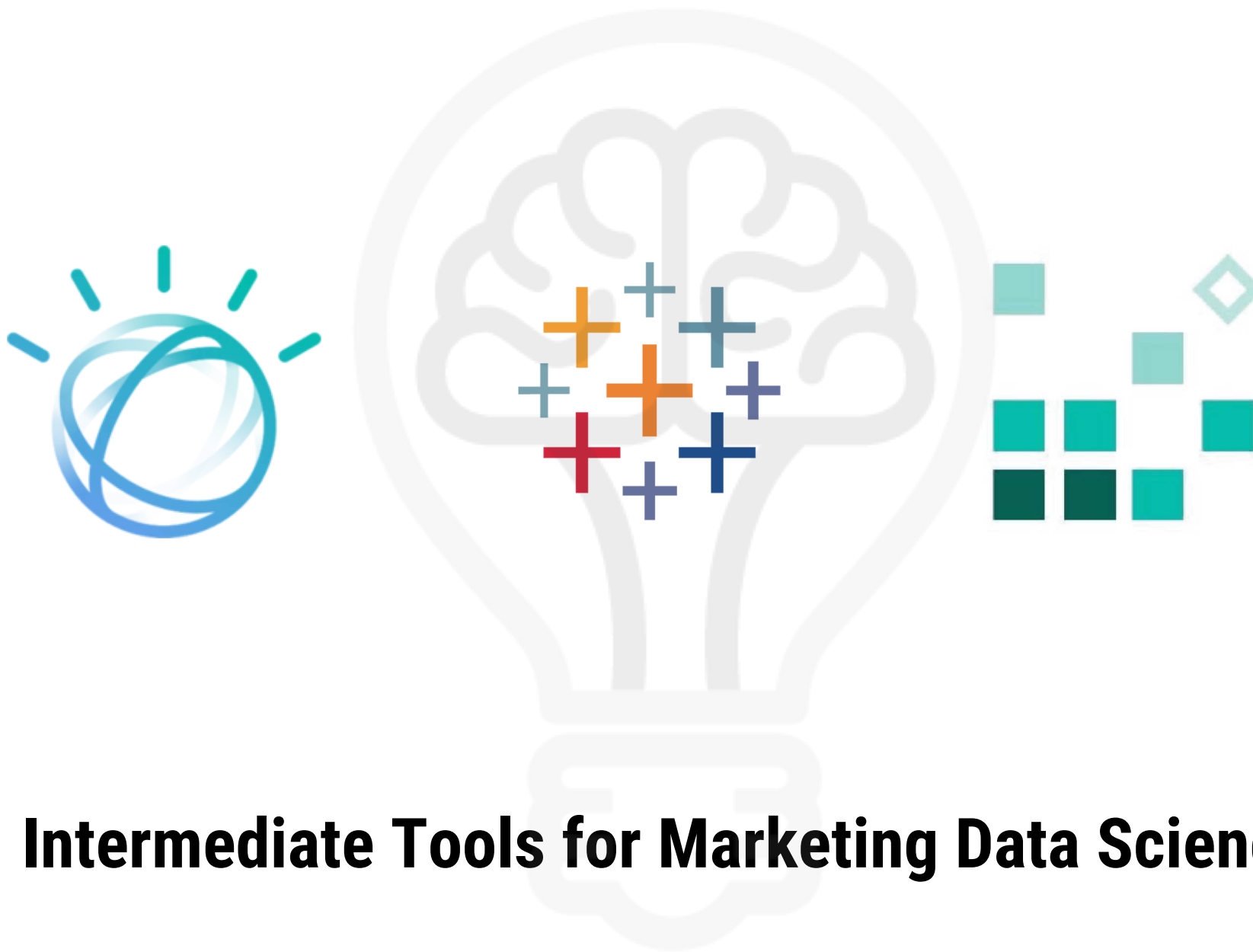
Home > code > contentexporter

	Name	Size	Modified
	cspadarray.csv	7 KB	Oct 21, 2019, 10:55 AM
	cptopics.php	14.2 KB	Oct 14, 2019, 10:19 AM
	.php_cs.cache	875 B	Oct 14, 2019, 10:16 AM
	fasttextnewsexplorer.R	3.2 KB	Oct 1, 2019, 2:44 PM
	majortextfunctions.r	11.6 KB	Sep 7, 2019, 9:15 PM
	marchnewsexporter.R	3.5 KB	Jul 25, 2019, 11:02 AM
	tinewsexport-ownedonly.R	3.4 KB	Jul 24, 2019, 10:08 AM
	tinewsletterexporter.R	1.9 KB	Jul 17, 2019, 10:55 AM
	contentexport.R	4.4 KB	May 31, 2019, 11:54 AM
	r36.R	1.4 KB	May 10, 2019, 12:16 PM
	btiadarray.txt	3.8 KB	May 2, 2019, 1:26 PM
	sentimentscanner.r	1.4 KB	Jun 6, 2018, 1:38 PM
	linearize.r	5.8 KB	Jun 6, 2018, 12:28 PM
	.Rproj.user		
	exports		





Beginner Tools for Marketing Data Science



Intermediate Tools for Marketing Data Science



pythonTM



Advanced Tools for Marketing Data Science

```
o <- as.h2o(blendeddt)
```

=====| 100%

```
t_h2o <-  
o.splitFrame(dfh2o, c(0.5999999999, 0.2, 0.2), seed = 1234)
```

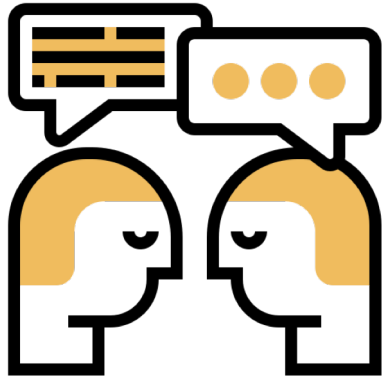
```
n_conv_h2o <- h2o.assign(split_h2o[[1]], "train") # 60%  
d_conv_h2o <- h2o.assign(split_h2o[[2]], "valid") # 20%  
_conv_h2o <- h2o.assign(split_h2o[[3]], "test") # 20%
```

Vital Soft Skills for Data Science

```
validate model first
```

```
ml_h2o_models <- h2o.automl(  
  = predictors,  
  = target,  
  aining_frame = train_conv_h2o,  
  aderboard_frame = valid_conv_h2o
```

=====| 44%



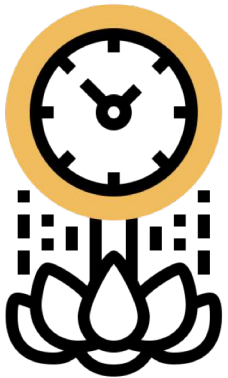
Open



Resilient



Curious



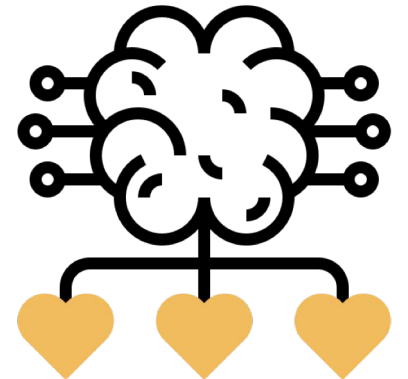
Patient



Persistent



Humble



Passionate



```
o <- as.h2o(blendeddt)
```

===== | 100%

```
t_h2o <-  
o.splitFrame(dfh2o, c(0.5999999999, 0.2, 0.2), seed = 1234)
```

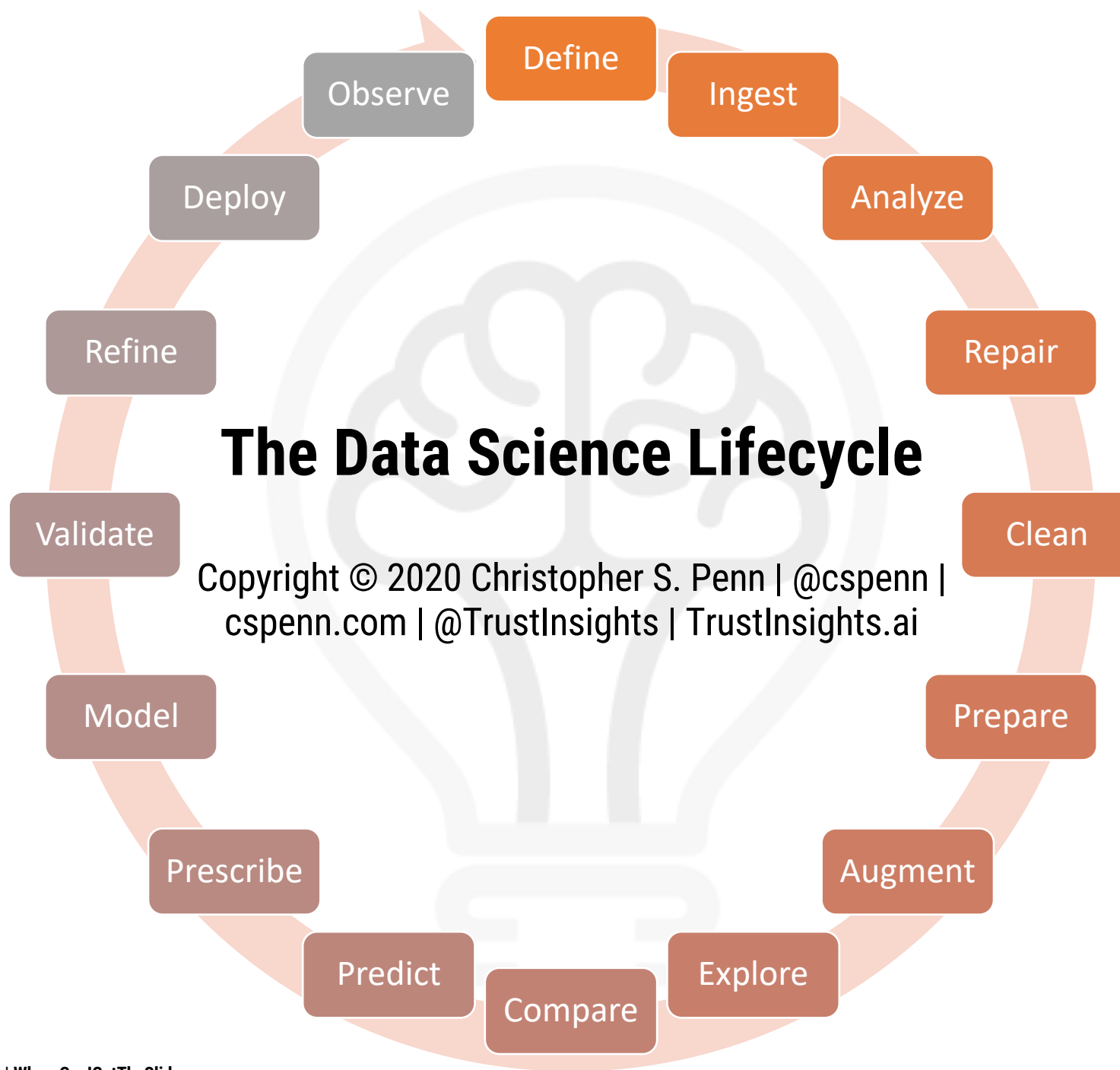
```
n_conv_h2o <- h2o.assign(split_h2o[[1]], "train") # 60%  
d_conv_h2o <- h2o.assign(split_h2o[[2]], "valid") # 20%  
_conv_h2o <- h2o.assign(split_h2o[[3]], "test") # 20%
```

The Data Science Lifecycle

```
validate model first
```

```
ml_h2o_models <- h2o.automl(  
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  aderboard_frame = valid_conv_h2o
```

===== | 44%



```
o <- as.h2o(blendeddt)
```

===== | 100%

```
t_h2o <-  
o.splitFrame(dfh2o, c(0.5999999999, 0.2, 0.2), seed = 1234)
```

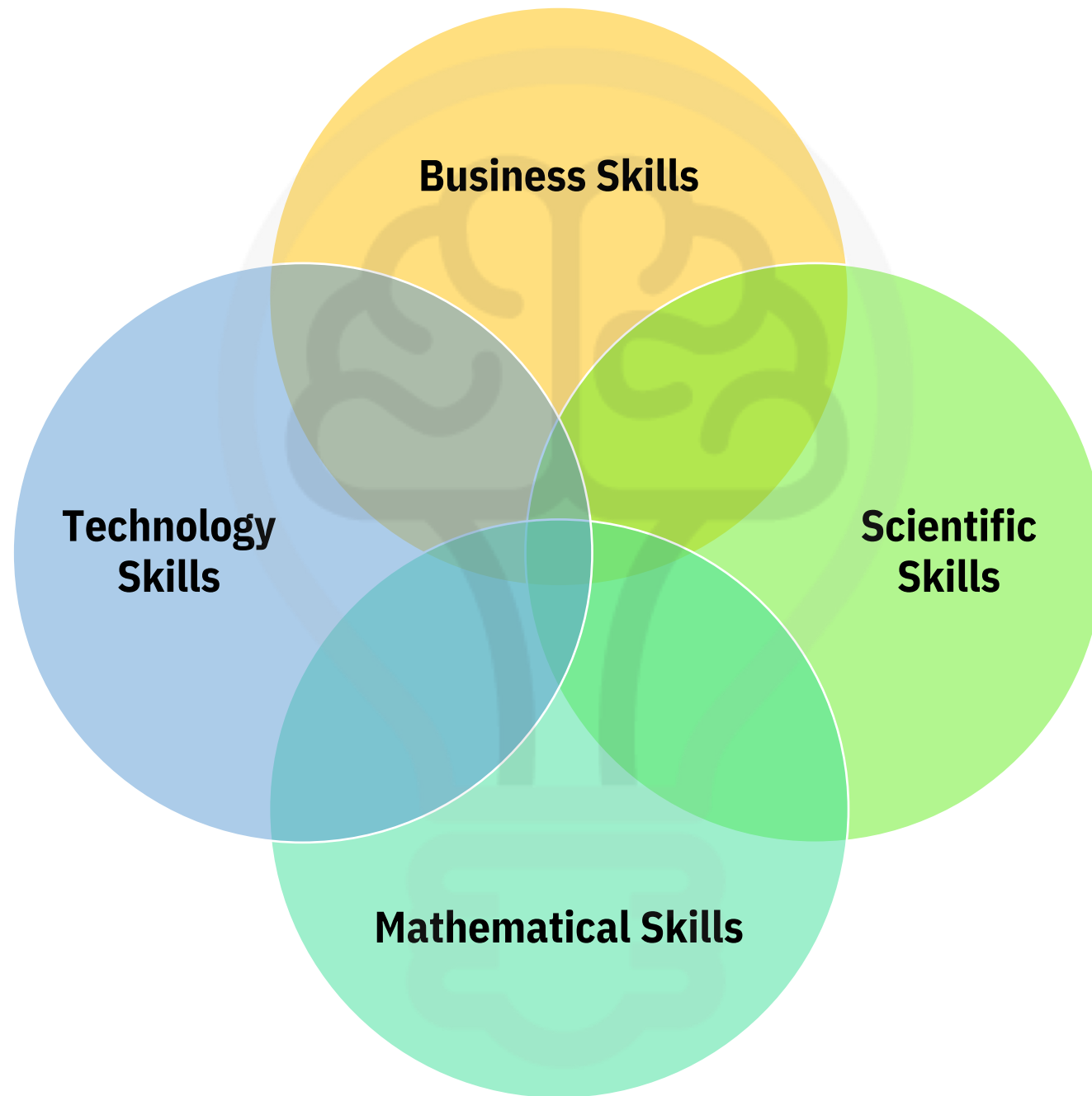
```
n_conv_h2o <- h2o.assign(split_h2o[[1]], "train") # 60%  
d_conv_h2o <- h2o.assign(split_h2o[[2]], "valid") # 20%  
_conv_h2o <- h2o.assign(split_h2o[[3]], "test") # 20%
```

How To Get Started

```
validate model first
```

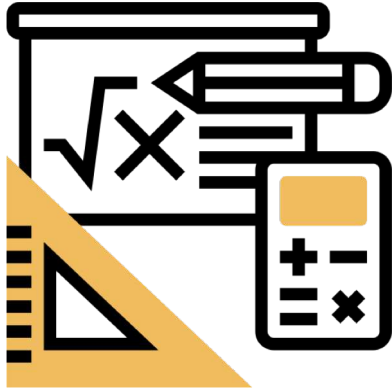
```
ml_h2o_models <- h2o.automl(  
  = predictors,  
  = target,  
  aining_frame = train_conv_h2o,  
  aderboard_frame = valid_conv_h2o
```

===== | 44%





Data Science Team



Stats & Math Expert



Data Engineer



Coder



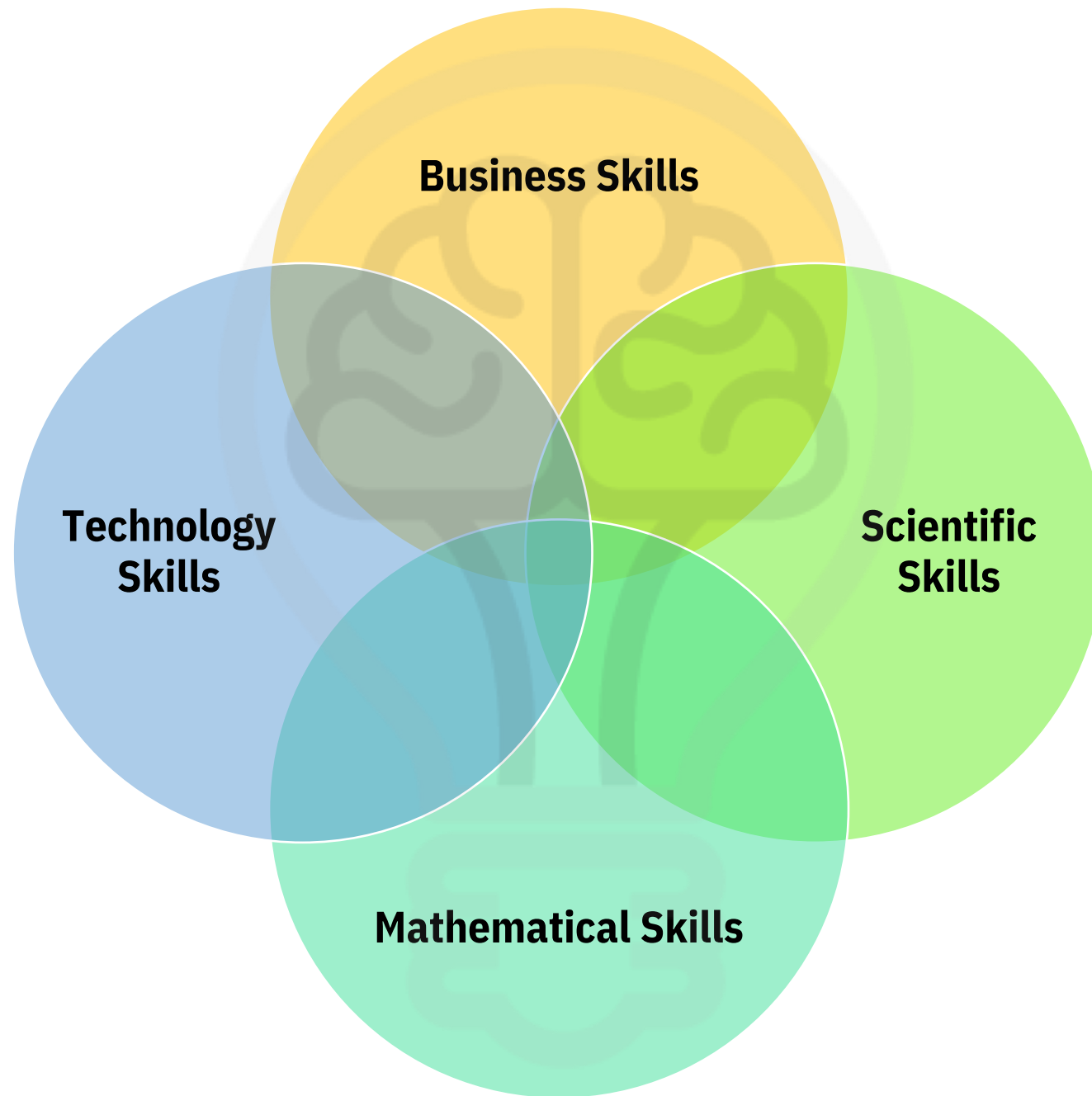
Scientist



Domain Expert



Business Expert



**Meaningful insights
from data using the
scientific method**

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AlforMarketersBook.com**

This is my card. Take a picture, save a tree.

cspenn@TrustInsights.ai
www.TrustInsights.ai