TM

Apache Mahout in context

Choosing the right tool for your data analysis task

Isabel Drost-Fromm

Software Engineer at Nokia Maps

Member of the Apache Software Foundation

Co-Founder of Berlin Buzzwords and
Berlin Apache Hadoop GetTogether

Co-founder of Apache Mahout

https://cwiki.apache.org/confluence/display/MAHOUT/Powered+By+Mahout

… provide your own success story online.

… with input from Sebastian Schelter, Steffen Bickel, Zeno Gantner, Stefan Pohl, Shannon Quinn, and others


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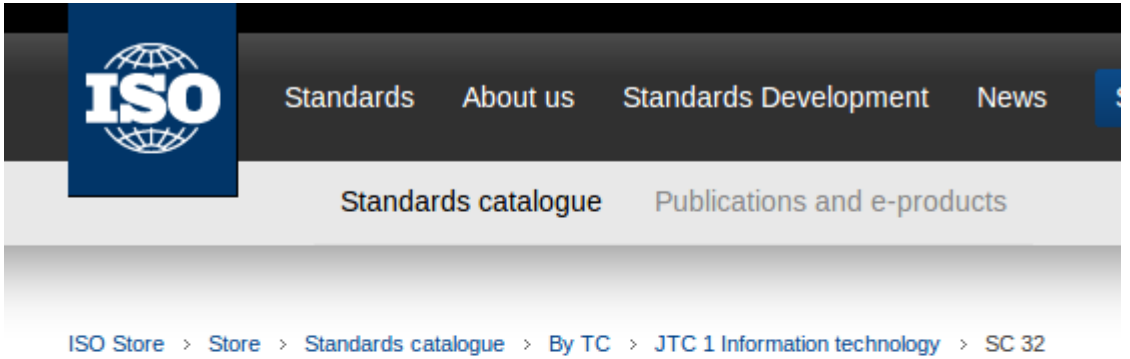
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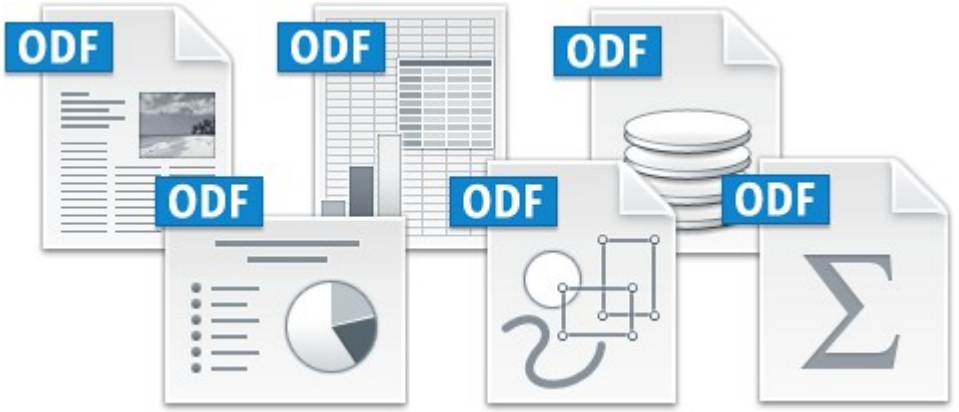

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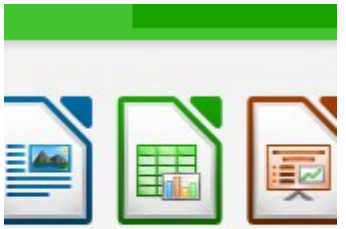

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mahout

Data science is a discipline that incorporates varying elements and **builds on techniques and theories from many fields**, including Math, Statistics, Data Engineering, Pattern Recognition and Learning, Advanced Computing, Visualization, Uncertainty Modeling, Data Warehousing, and high performance computing **with the goal of extracting meaning from data and creating data products**.

Data Science seeks to use all available and relevant data to effectively **tell a story** that can be easily understood by non-practitioners.


Image taken at Berlin Buzzwords by photomic

Trends

Web Search Interest: **servlet, django, node.js**. Worldwide, 2004 - present.

Explore trends

Hot searches

Search terms

- servlet
- django
- node.js

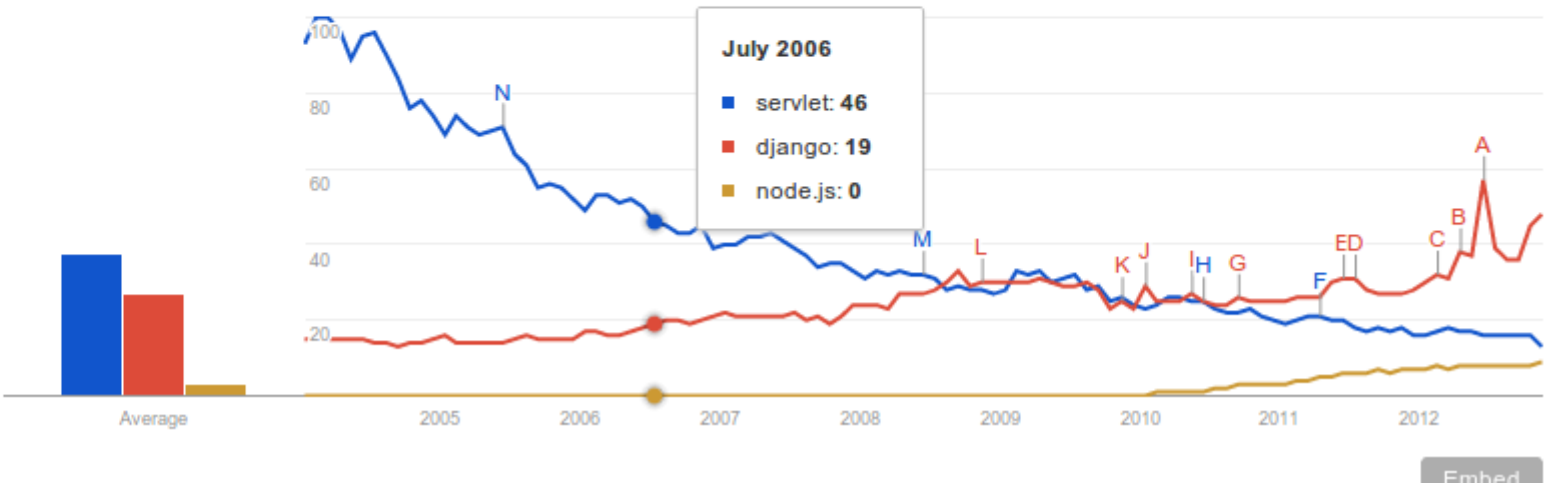
+ Add term

Other comparisons

Interest over time

The number 100 represents the peak search volume

News headlines Forecast



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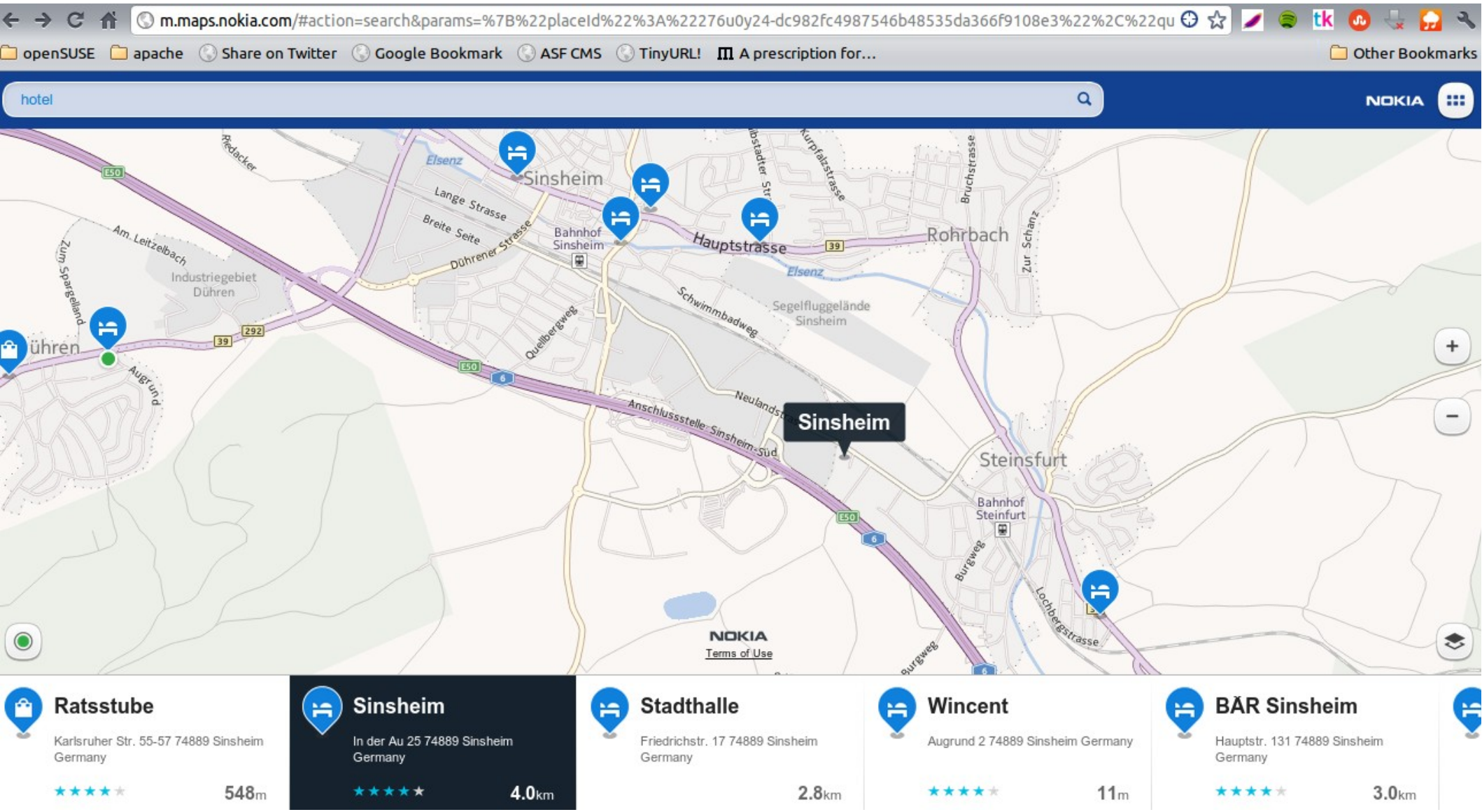
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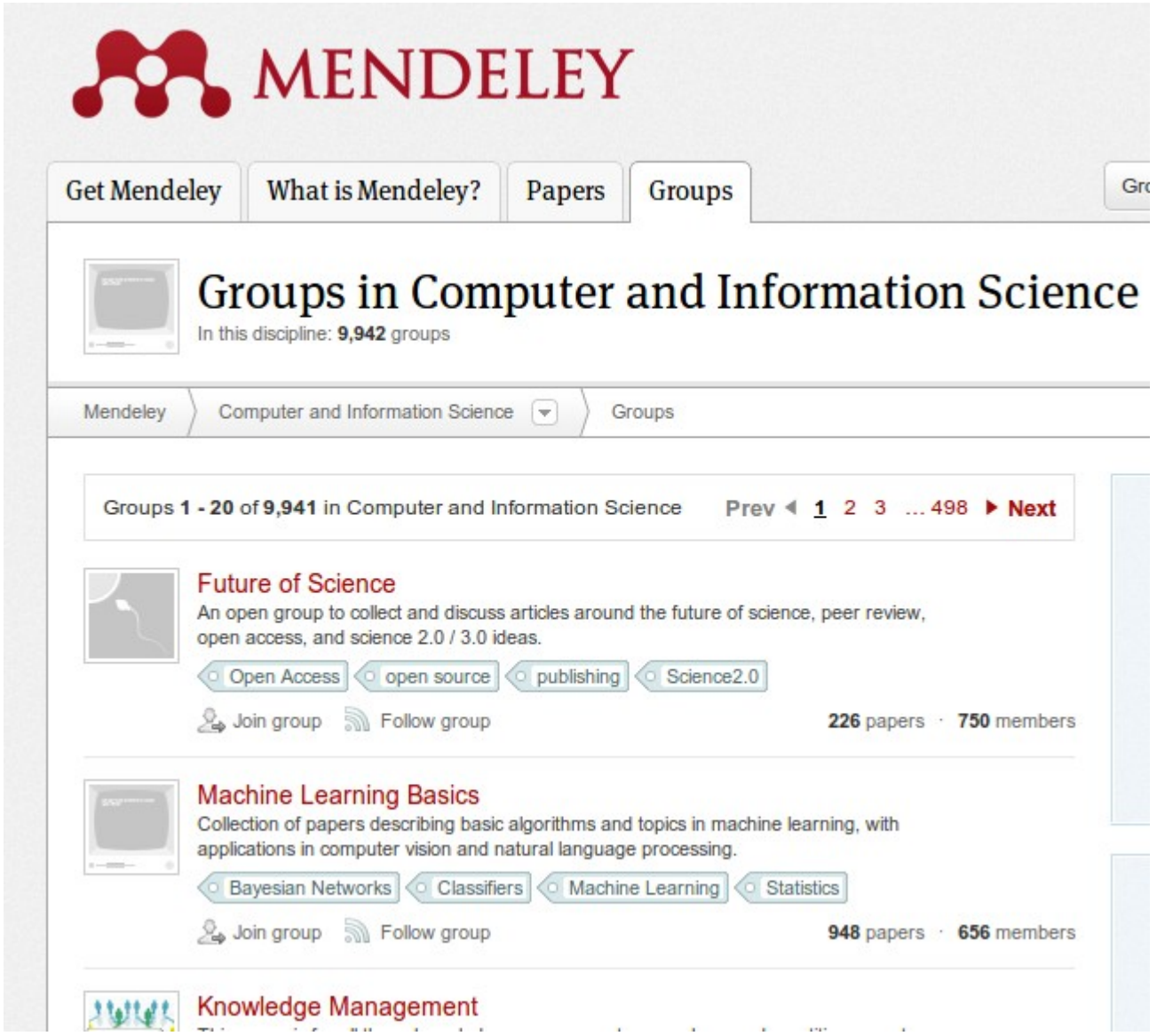
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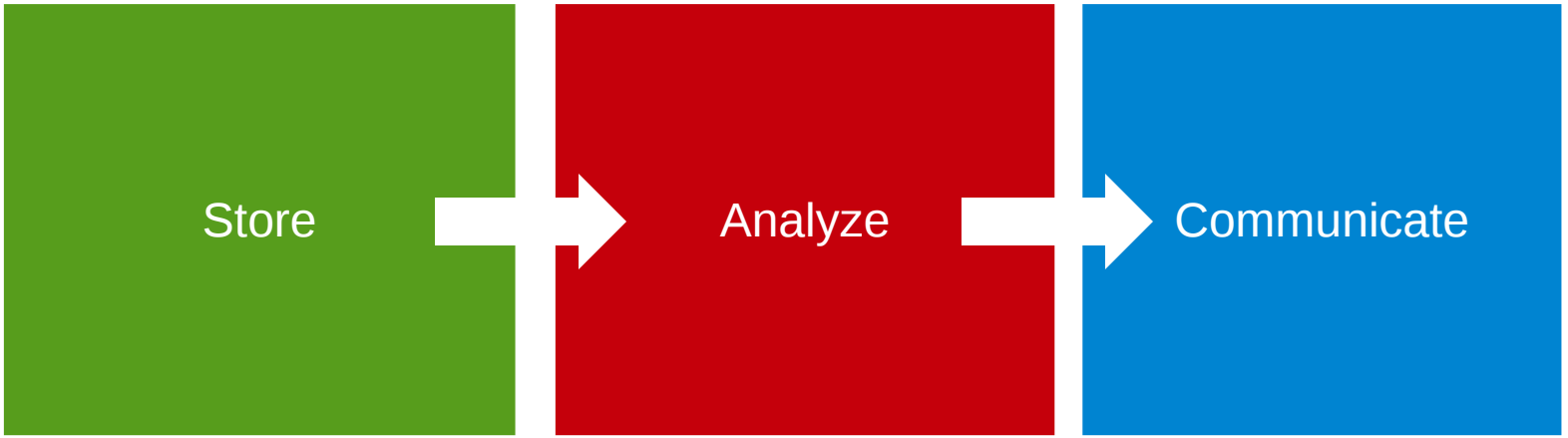
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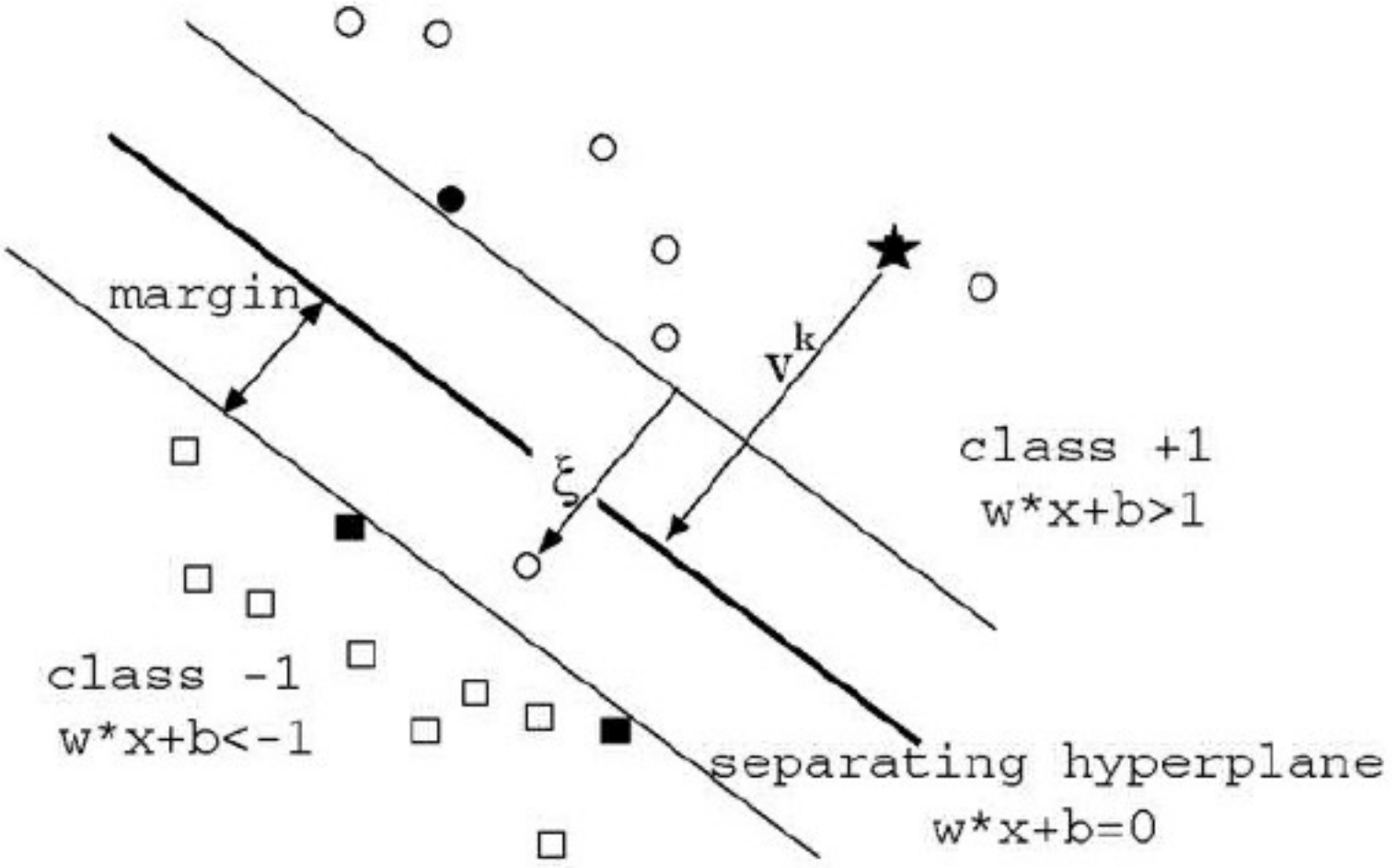
How a linear classifier sees data

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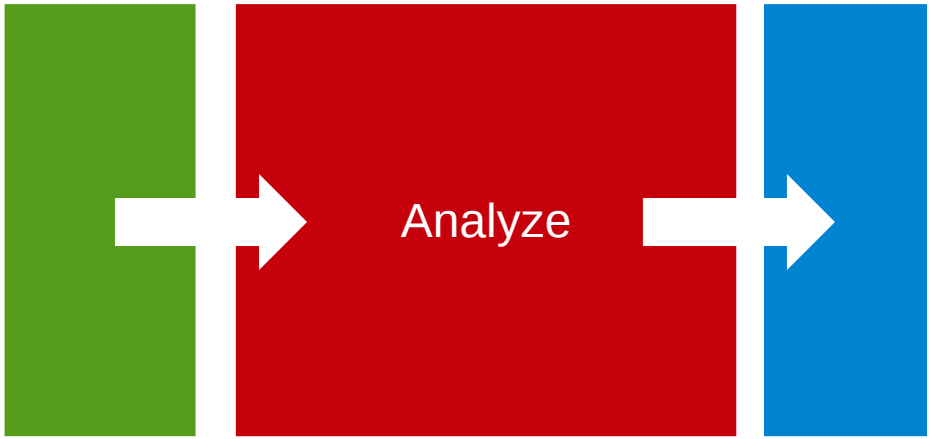
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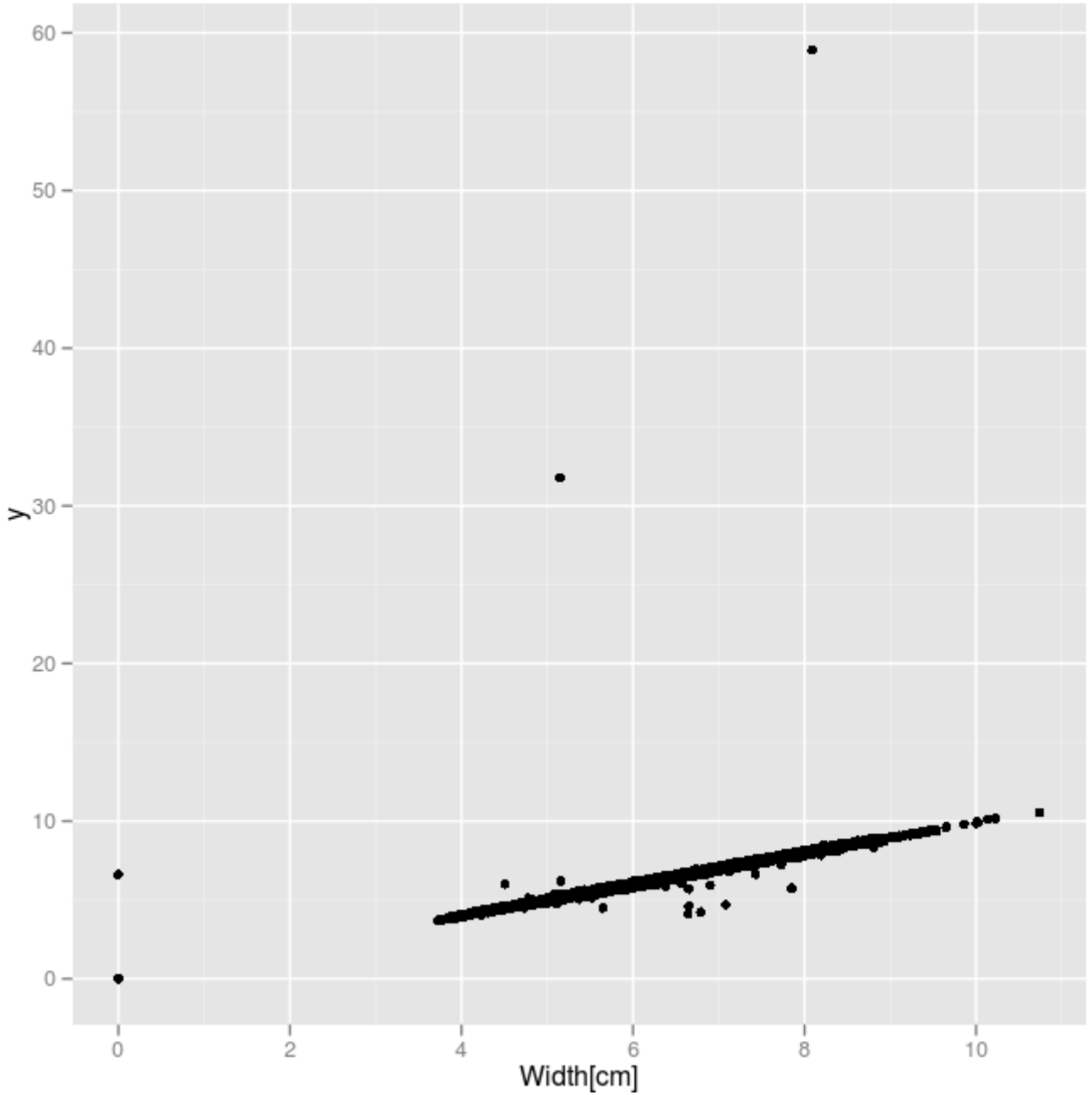
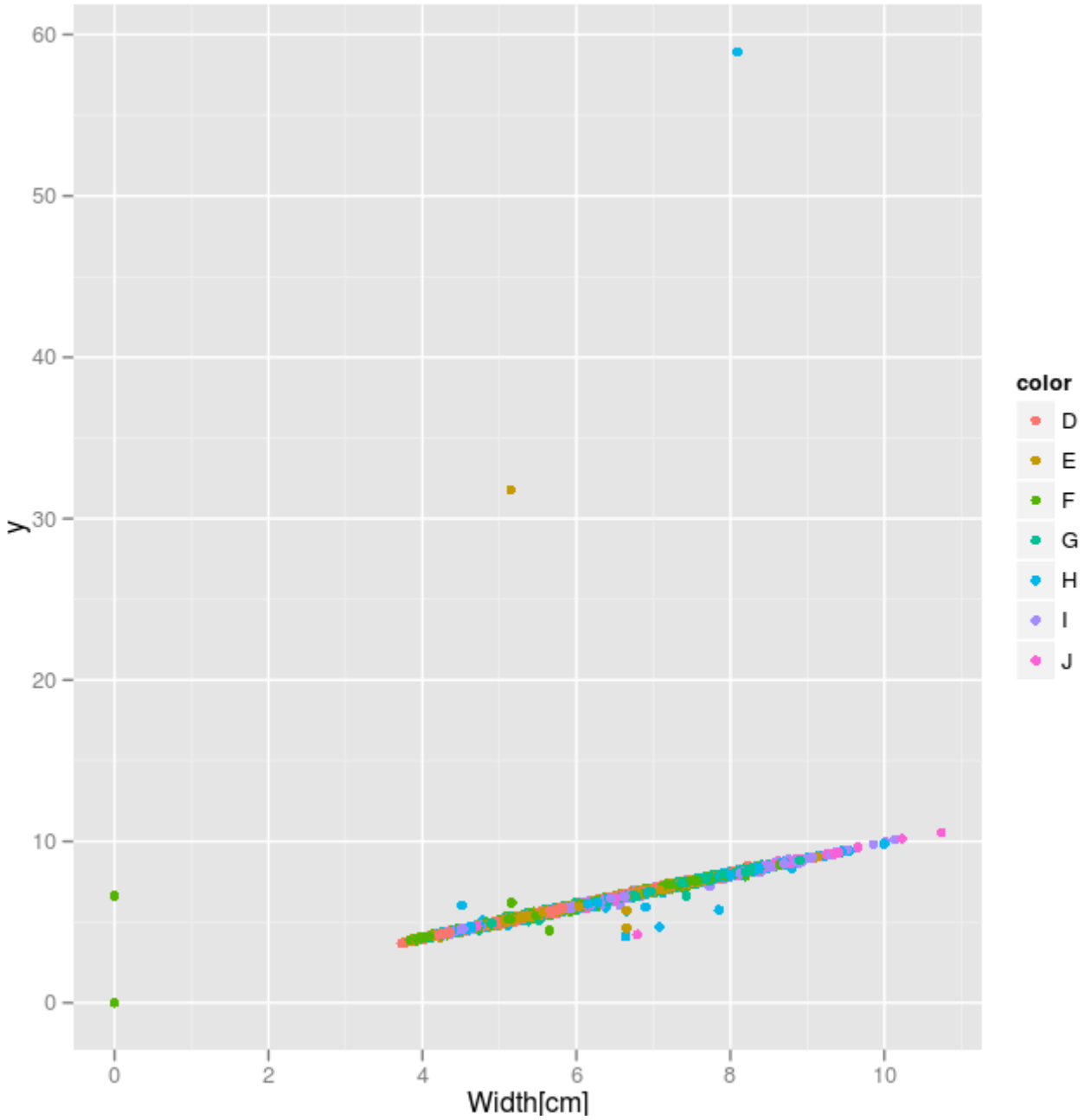
```
> head(diamonds)
  carat       cut color clarity depth table price    x    y    z
1  0.23     Ideal     E     SI2  61.5    55   326 3.95 3.98 2.43
2  0.21   Premium     E     SI1  59.8    61   326 3.89 3.84 2.31
3  0.23      Good     E     VS1  56.9    65   327 4.05 4.07 2.31
4  0.29   Premium     I     VS2  62.4    58   334 4.20 4.23 2.63
5  0.31      Good     J     SI2  63.3    58   335 4.34 4.35 2.75
6  0.24 Very Good     J    VVS2  62.8    57   336 3.94 3.96 2.48
```

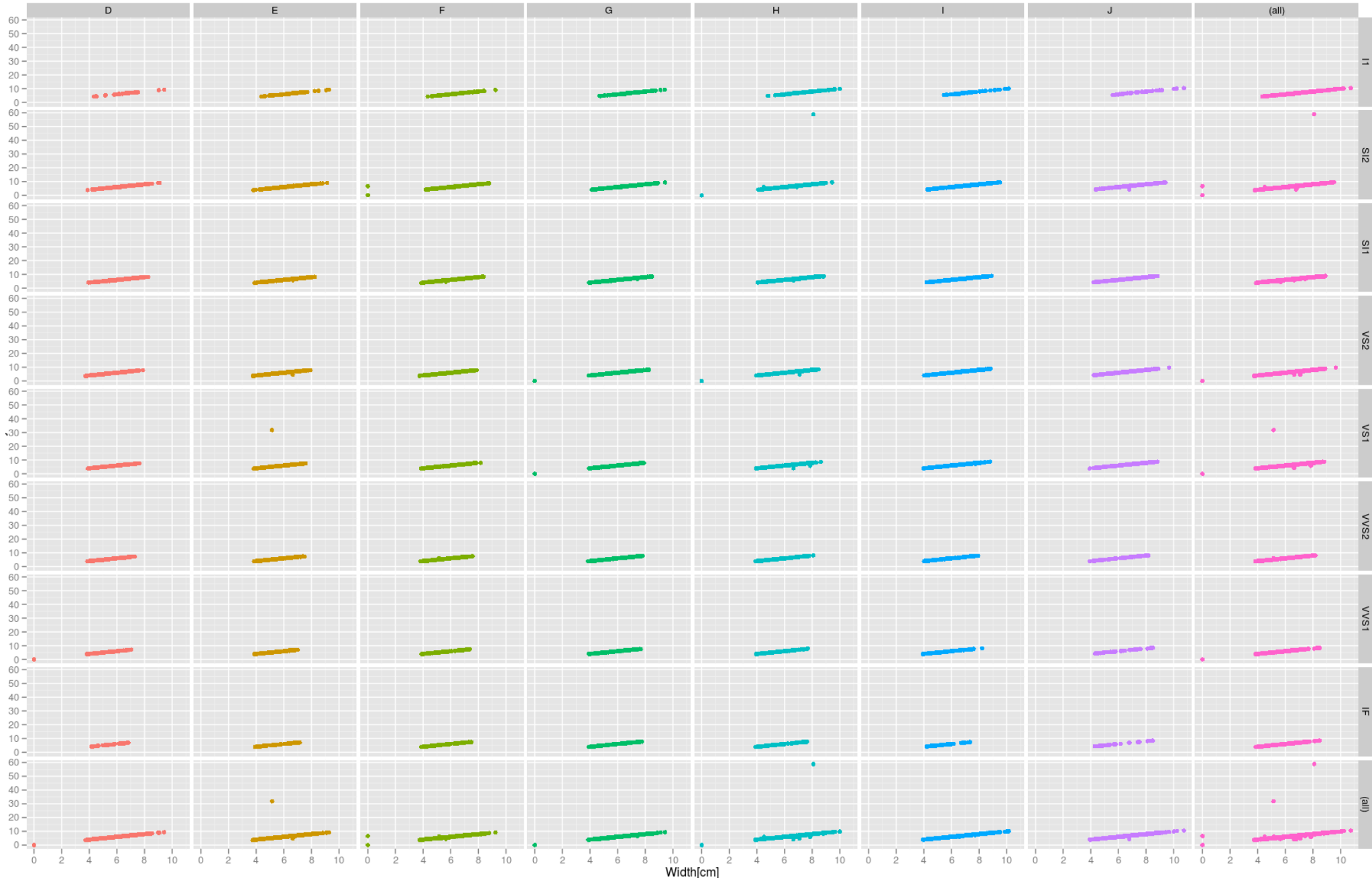
```
> summary(diamonds)
     carat               cut        color        clarity          depth      
 Min.   :0.2000   Fair      : 1610   D: 6775   SI1    :13065   Min.   :43.00  
 1st Qu.:0.4000   Good      : 4906   E: 9797   VS2    :12258   1st Qu.:61.00  
 Median :0.7000   Very Good:12082   F: 9542   SI2    : 9194   Median :61.80  
 Mean   :0.7979   Premium   :13791   G:11292   VS1    : 8171   Mean   :61.75  
 3rd Qu.:1.0400   Ideal     :21551   H: 8304   VVS2   : 5066   3rd Qu.:62.50  
 Max.   :5.0100                     I: 5422   VVS1   : 3655   Max.   :79.00  
                                    J: 2808   (Other): 2531                  
```



Ggplot2 examples courtesy of Stefan Pohl.



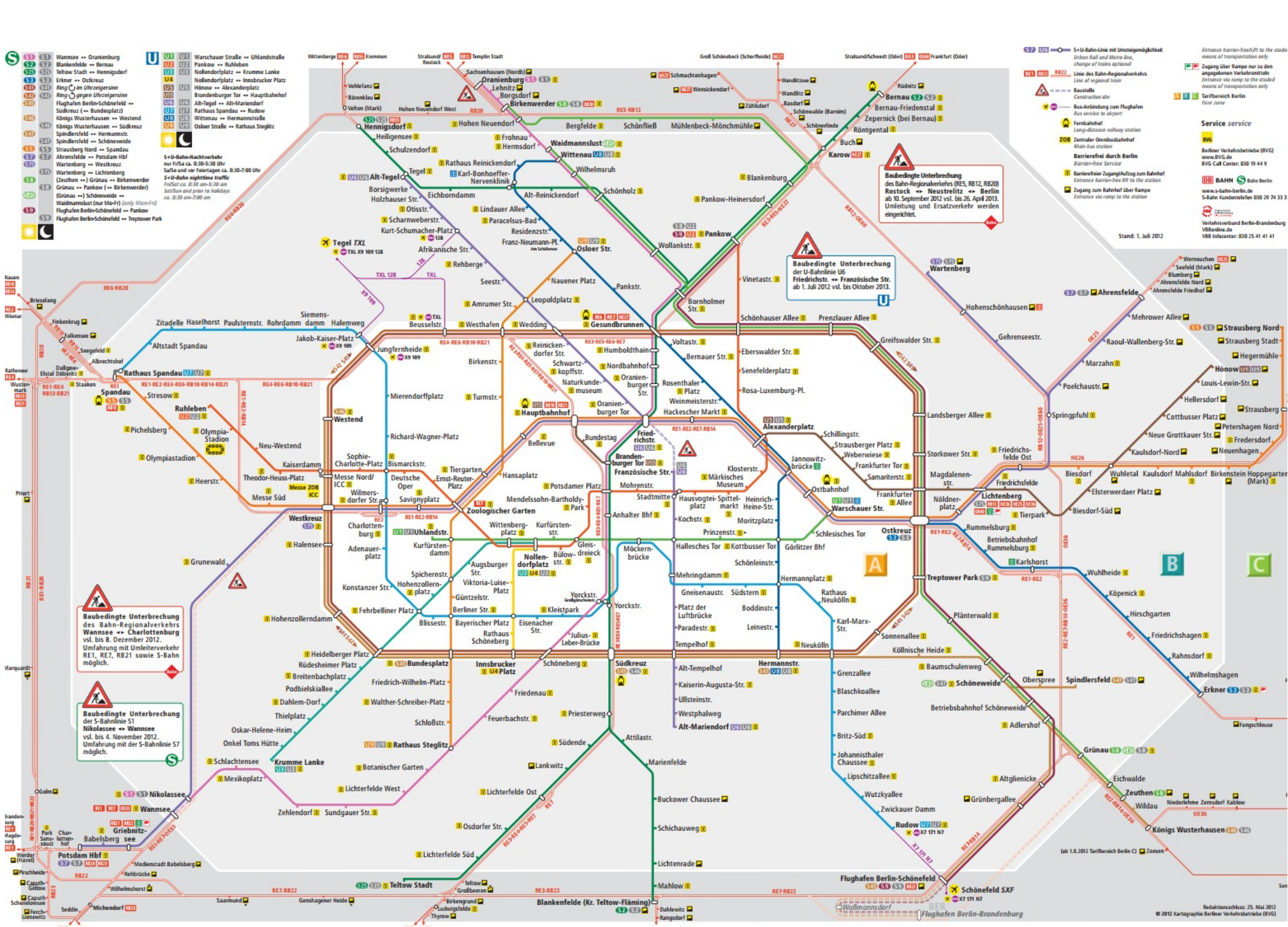
Ggplot2 examples courtesy of Stefan Pohl.



Ggplot2 examples courtesy of Stefan Pohl.

```
> R

> library(ggplot2)

> head(diamonds)

> summary(diamonds)


> ggplot(diamonds, aes(x,y)) + geom_point() + xlab('Width[cm]')


> ggplot(diamonds, aes(x,y, color=color)) + geom_point() +
xlab('Width[cm]')


> ggplot(diamonds, aes(x,y, color=color)) + geom_point() +
xlab('Width[cm]') +facet_grid(clarity ~ color, margins=T)
```

Ggplot2 examples courtesy of Stefan Pohl.



Map of Berlin public transport lines.

Image taken by Thilo Fromm.
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Instance*

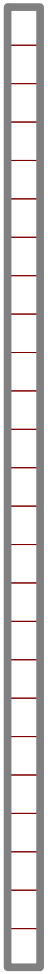
(sometimes also called example, item, or in databases a row)

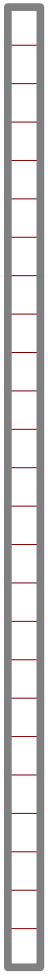
Feature*

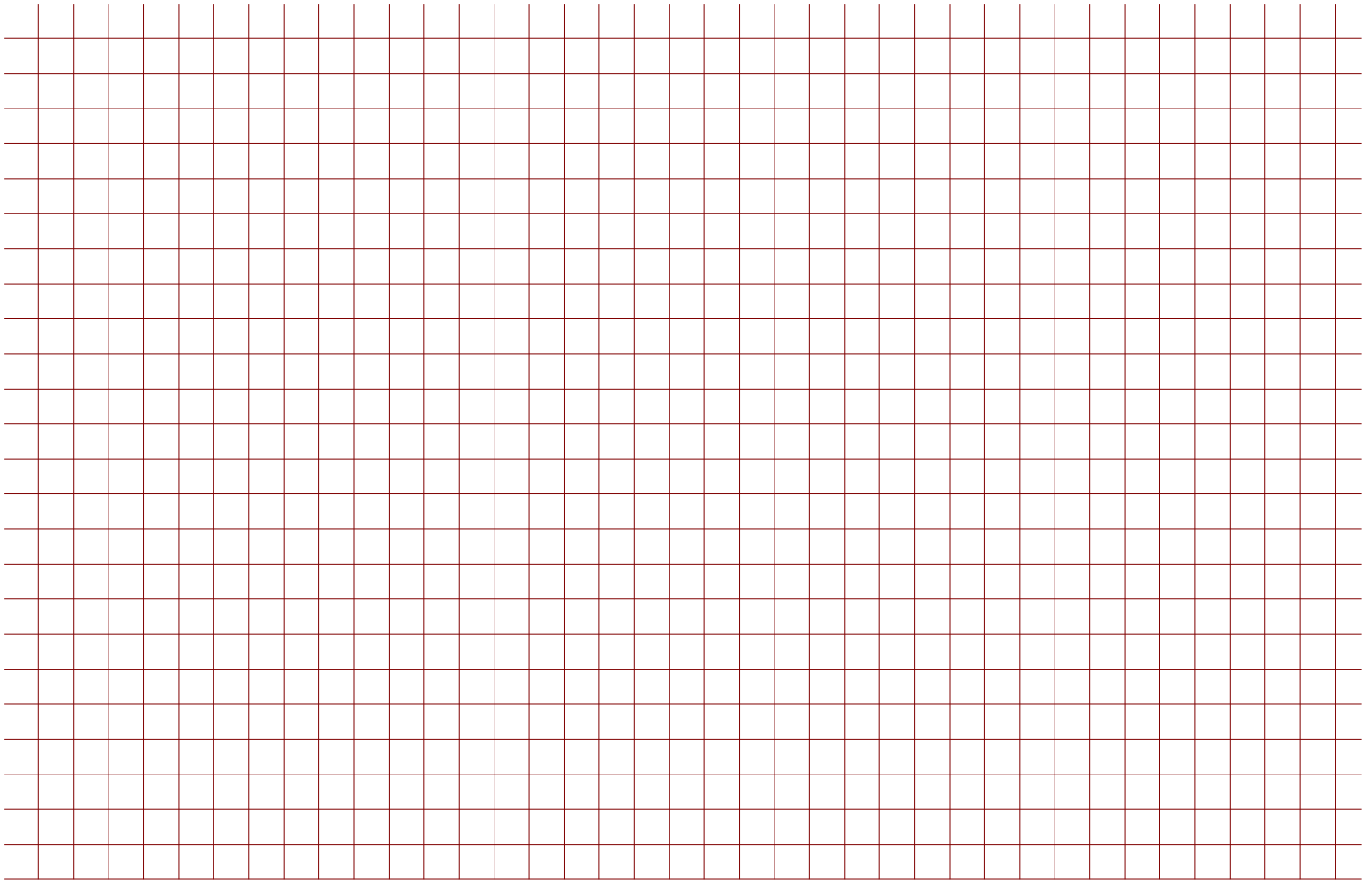
(sometimes also called attribute, signal, predictor, co-variate, or column in databases)

Label*

(sometimes also called class, target variable)





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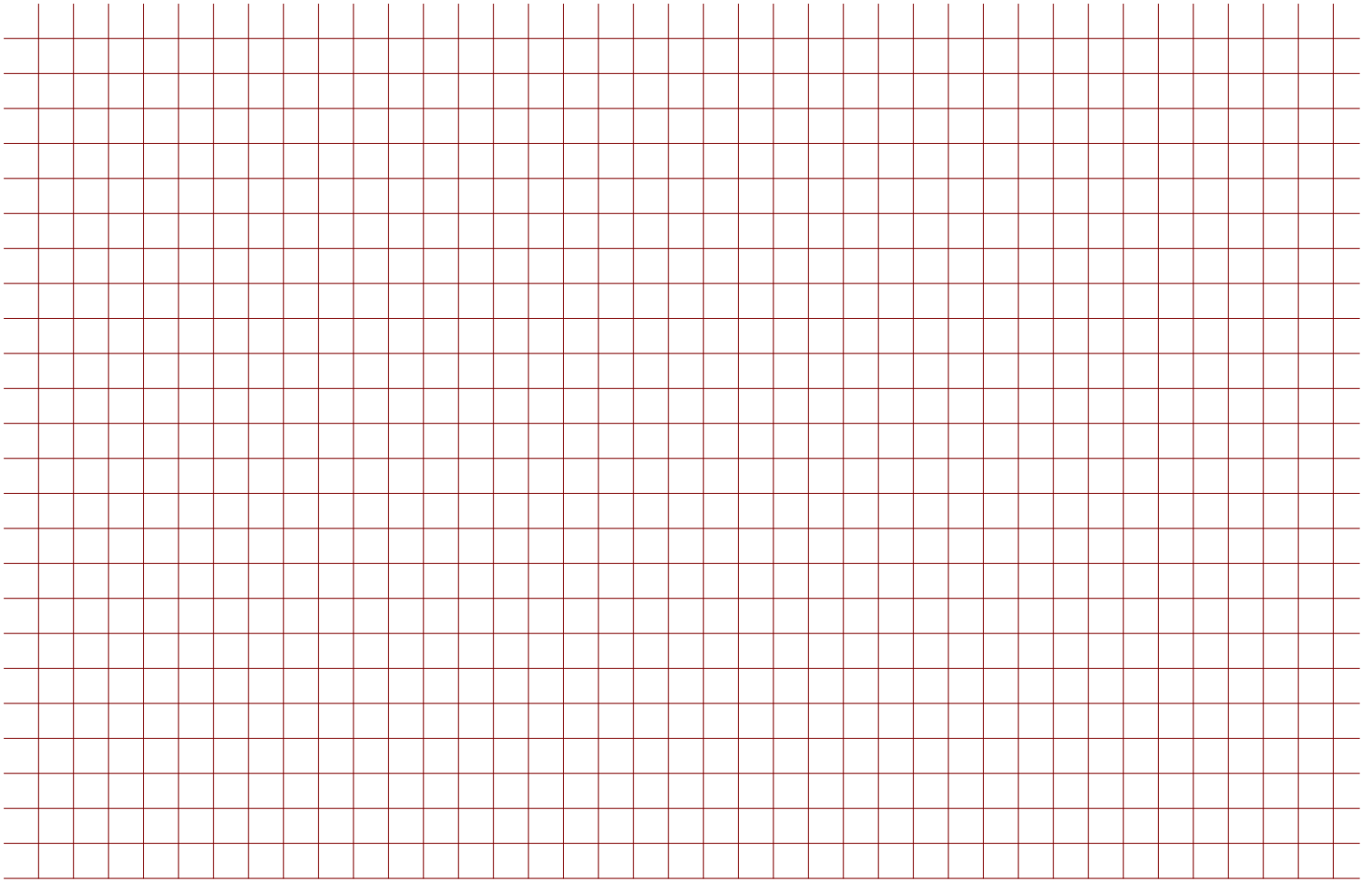

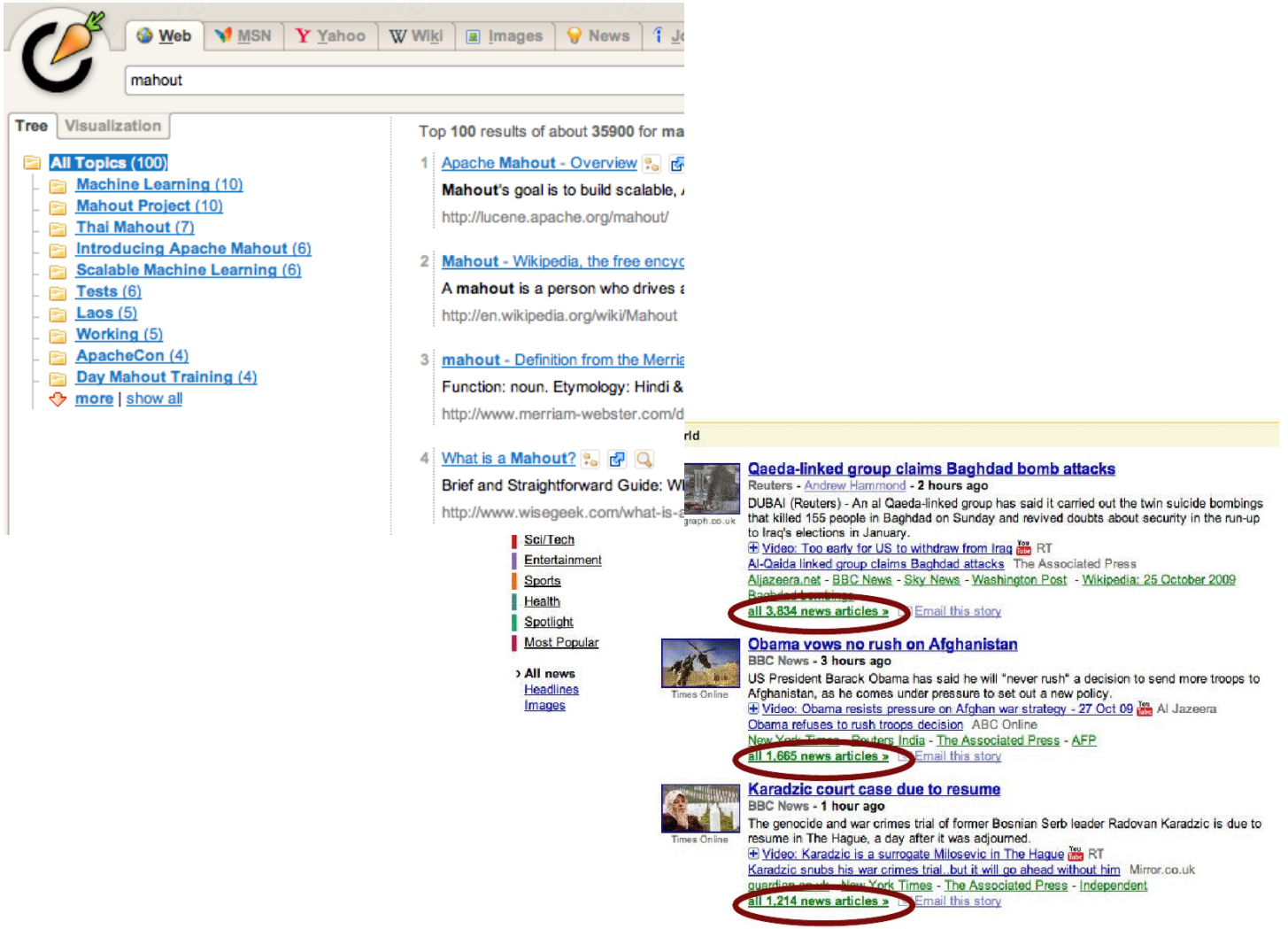
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Mahout's goal is to build scalable,
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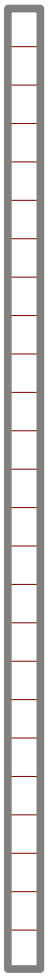

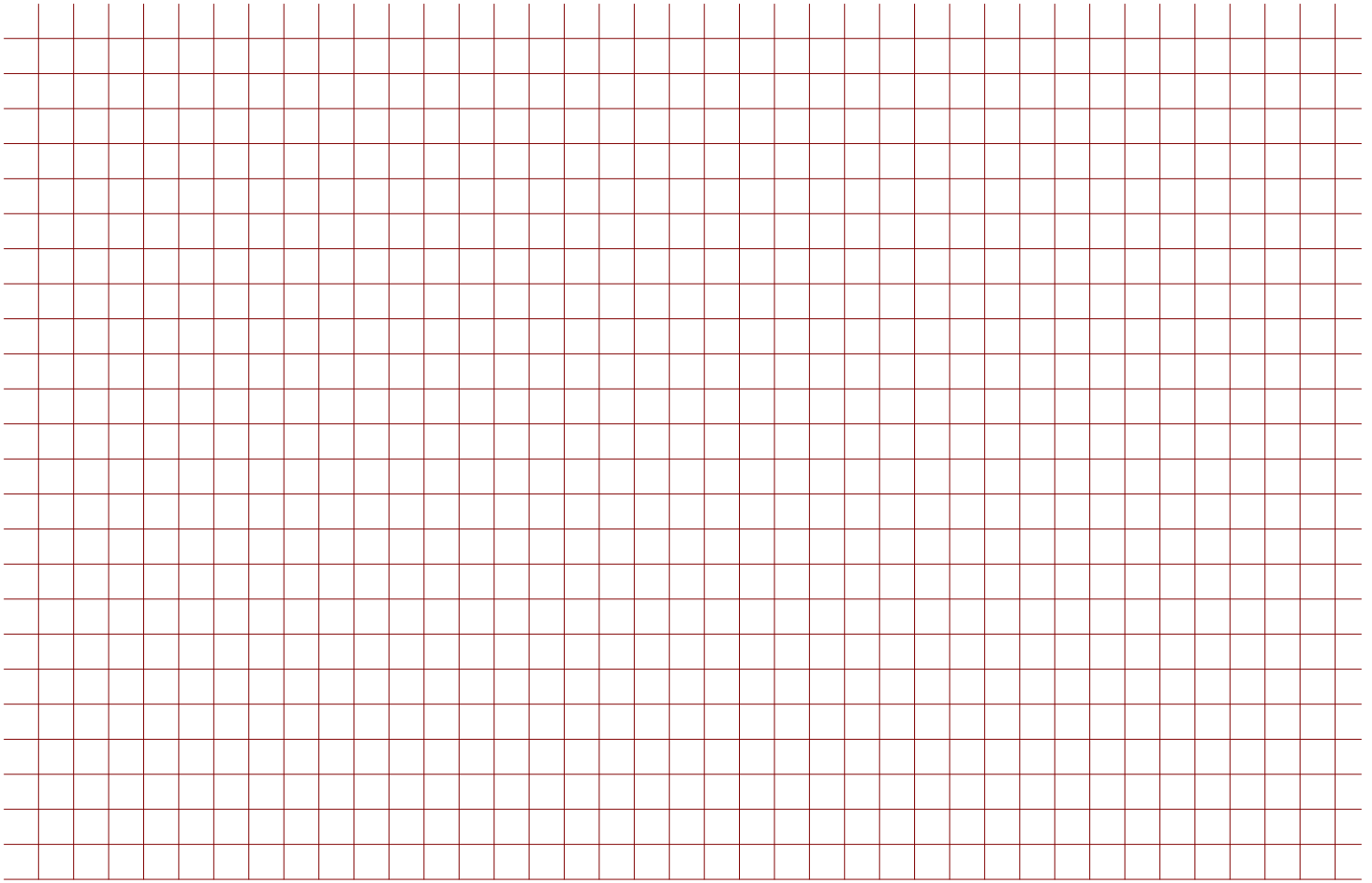

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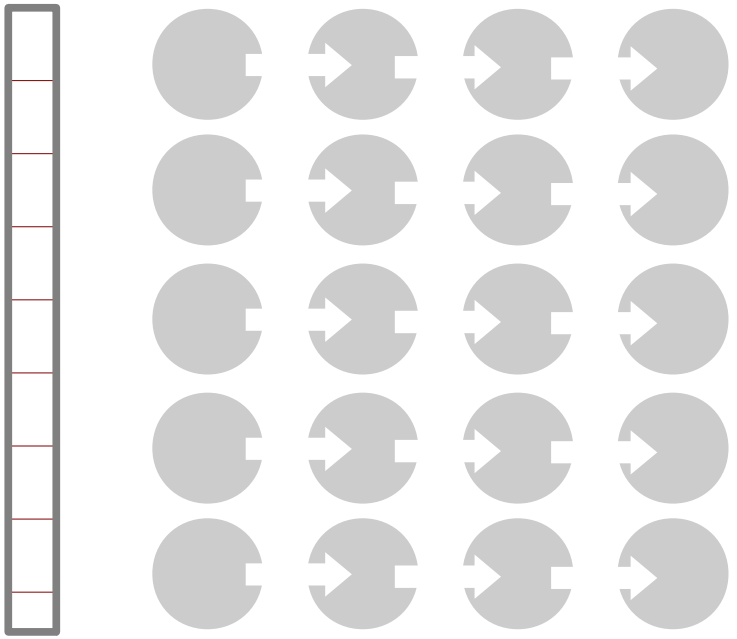

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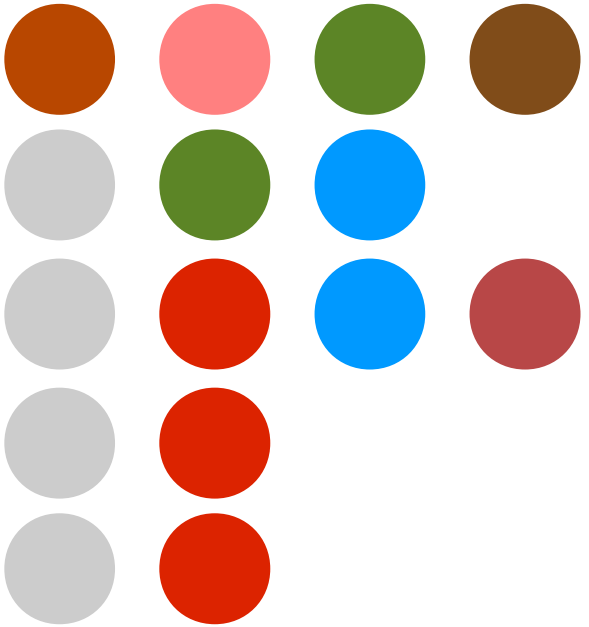

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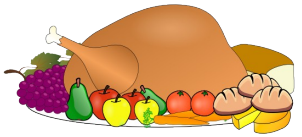


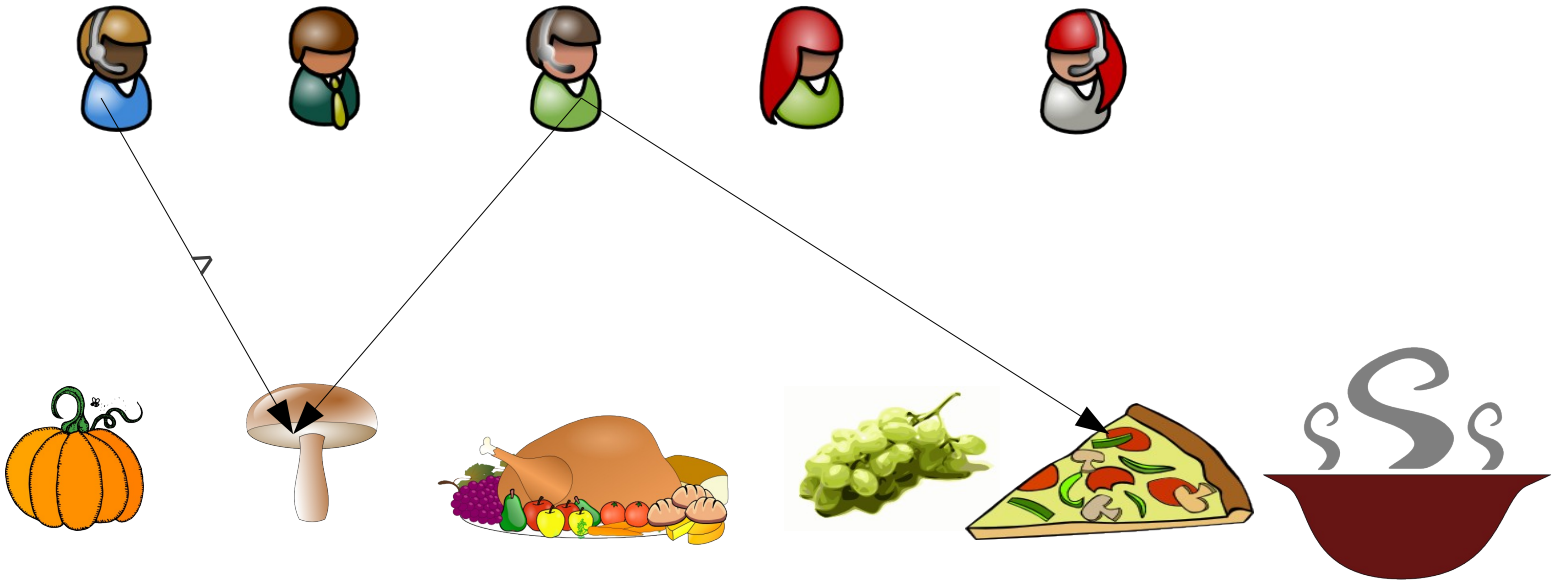

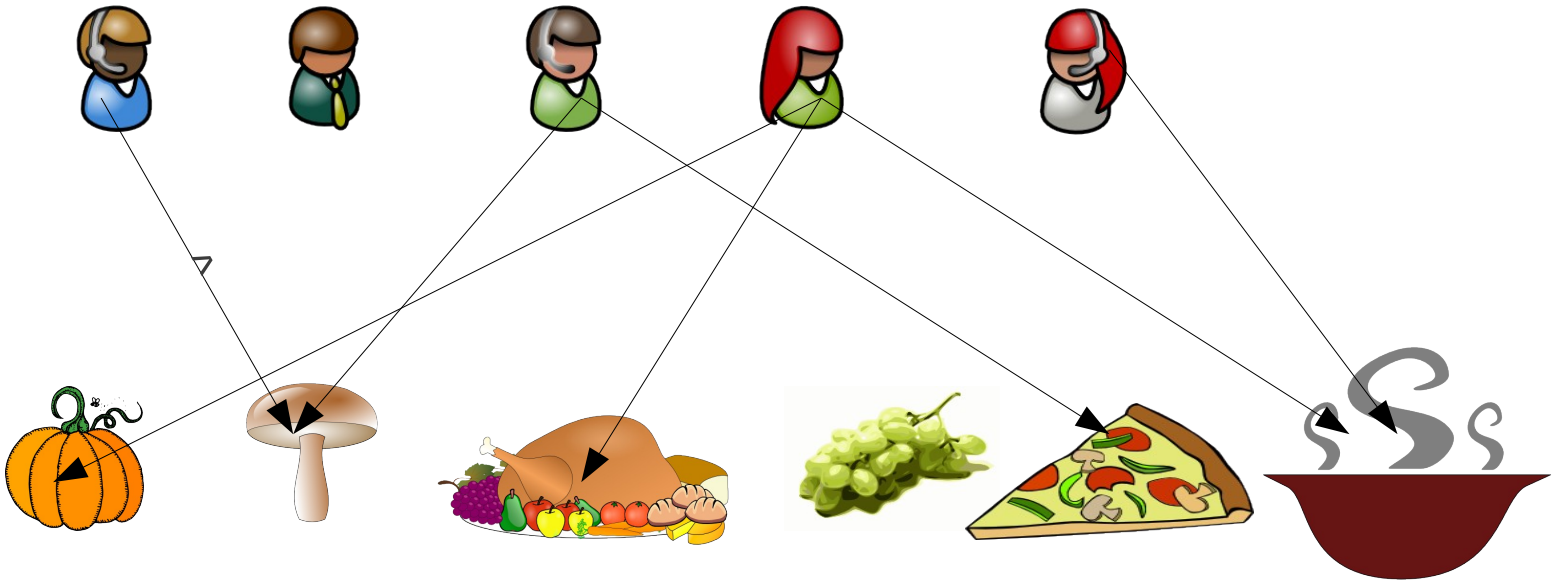

					
					
					
					
					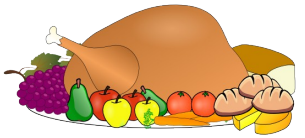
					
					

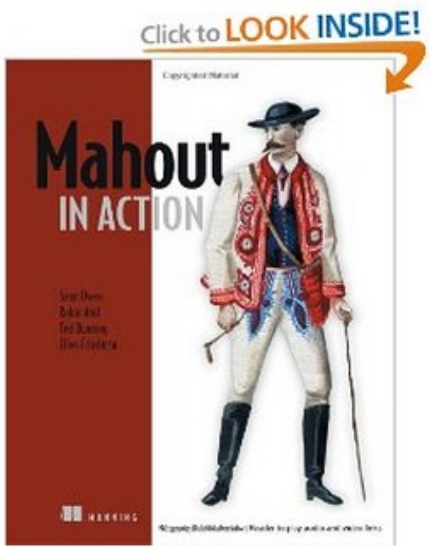

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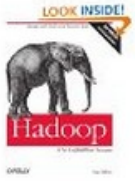

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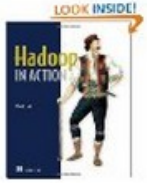

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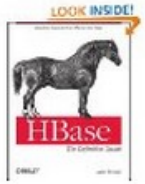

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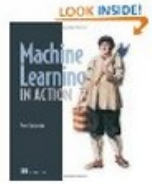

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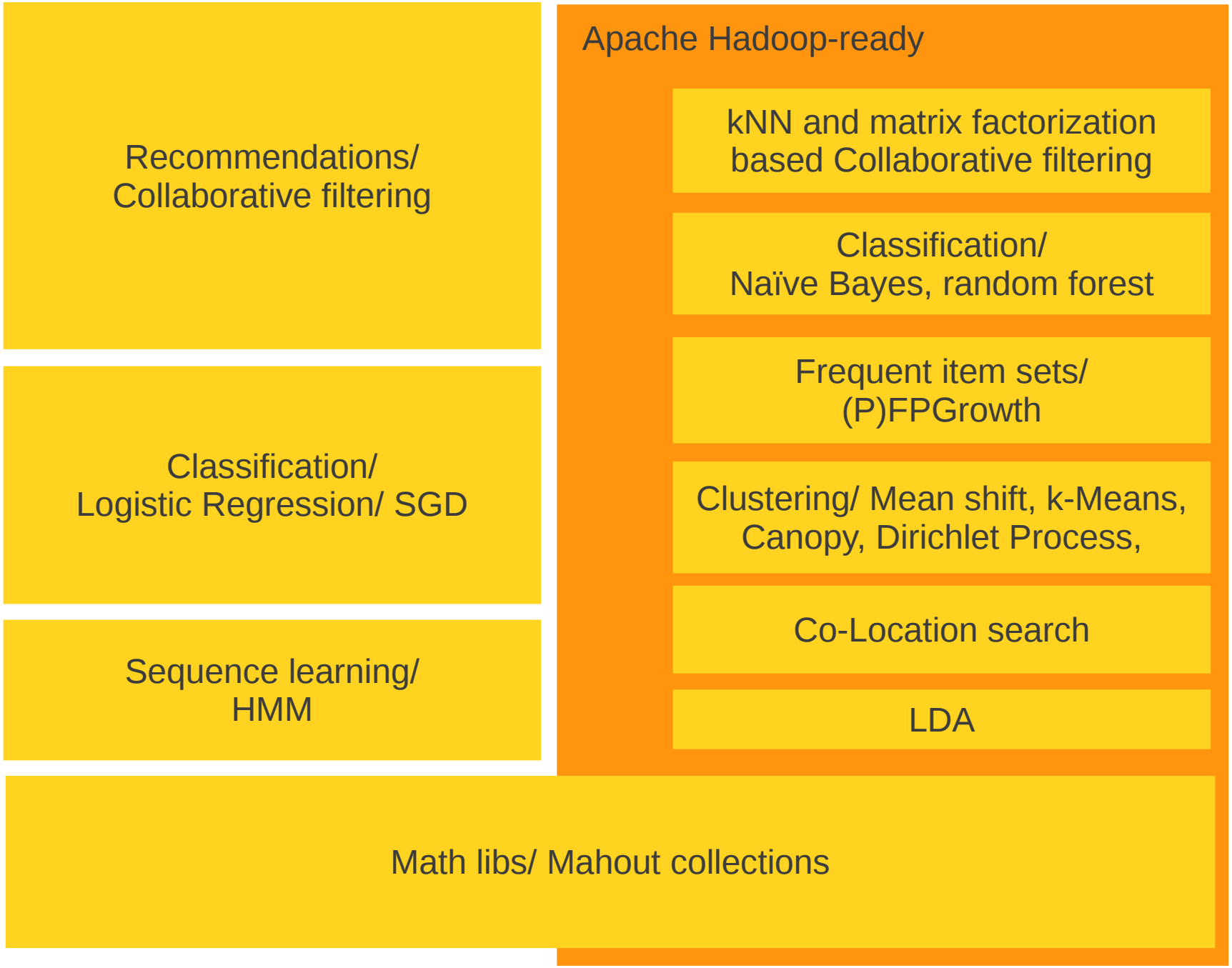
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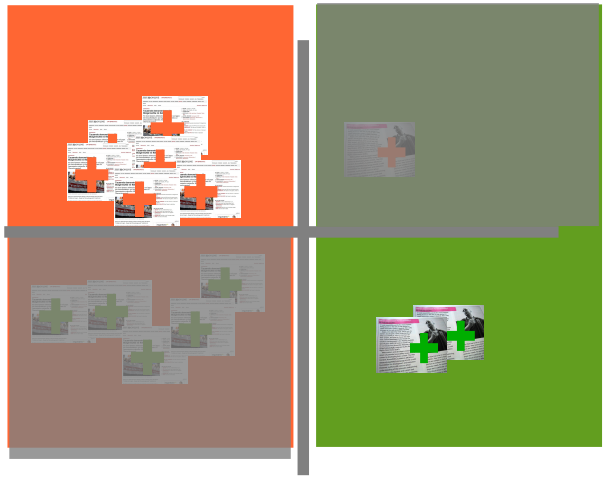
Accuracy

$$ACC = \frac{true\ positive + true\ negative}{true\ positive + false\ positive + false\ negative + true\ negative}$$

- Problems:
  - What if class distribution is skewed?



Precision/ Recall

$$Precision = \frac{true\ positive}{true\ positive + false\ positive}$$

$$Recall = \frac{true\ positive}{true\ positive + false\ negative}$$

- Problem:
  - Depends on decision threshold.

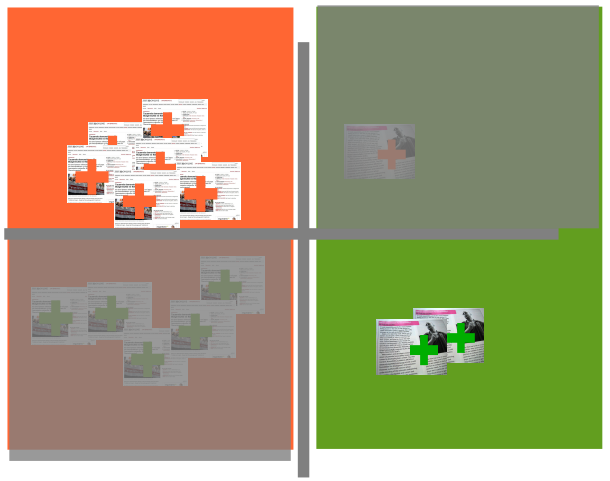
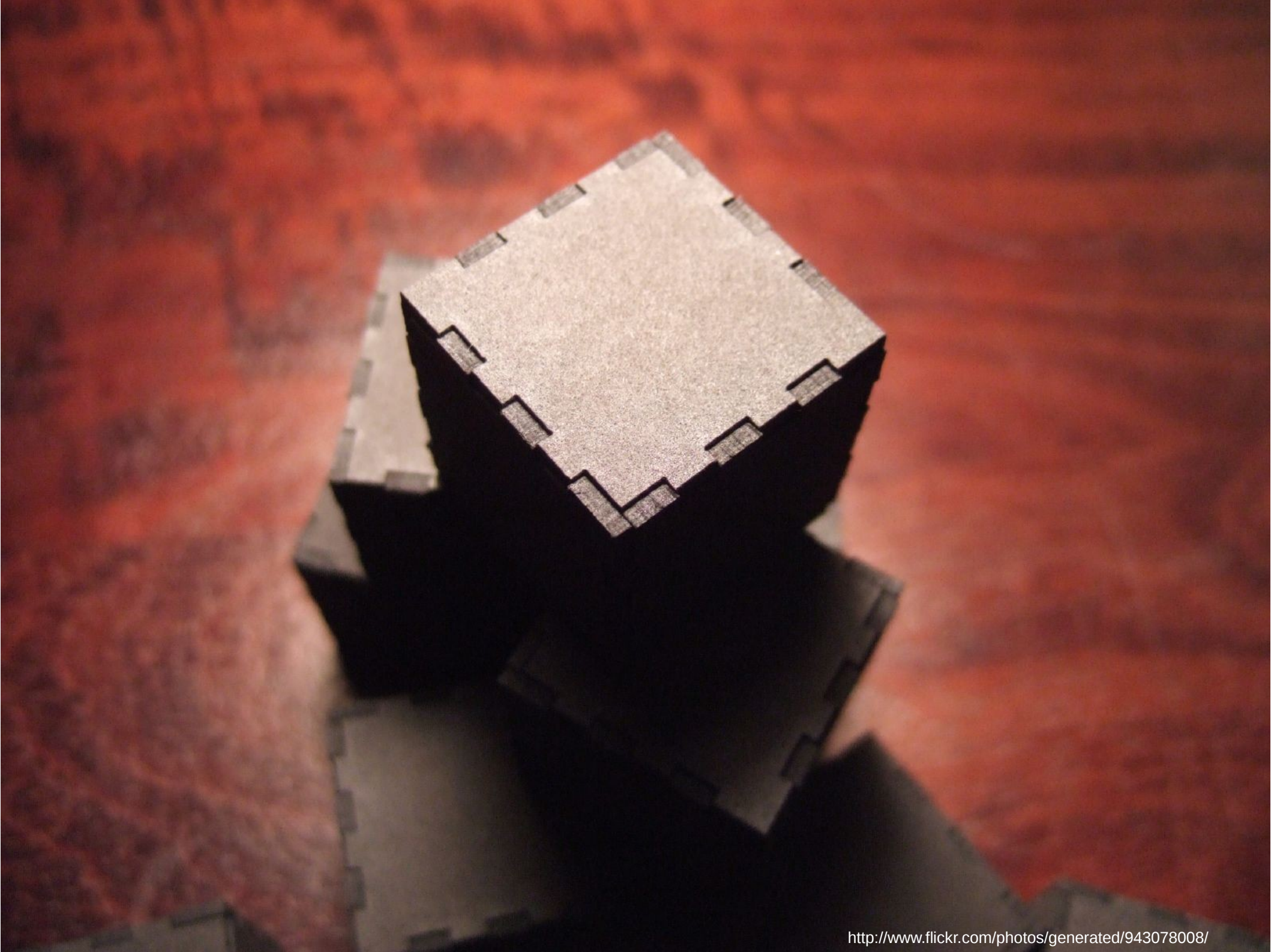


Image taken by wwarby.
http://www.flickr.com/photos/wwarby/3297205226/


ttp://www.flickr.com/photos/eschipul/4160817135/


http://www.flickr.com/photos/generated/943078008/

Libraries to have a look at:

Vowpal Wabbit	Mallet
LibSvm	LibLinear
Libfm	Incanter
GraphLab	Skikits learn

Frameworks worth mentioning:

Apache Mahout	Apache Giraph
Matlab / Otave	R
Shogun	Weka
RapidI	MyMedialight

Where to get more information:

"Mahout in Action" - Manning
"Taming Text" - Manning
"Machine Learning" - Andrew Ng

https://cwiki.apache.org/confluence/display/MAHOUT/Books+Tutorials+and+Talks

https://cwiki.apache.org/confluence/display/MAHOUT/Reference+Reading

Get your hands dirty:

http://kaggle.com

https://cwiki.apache.org/confluence/display/MAHOUT/Collections

Where to meet these people:

RecSys	ICML
NIPS	ECML
KDD	WSDM
PKDD	JMLR

Mahout is general purpose – add your domain knowledge.

Understand your data.

Combine several tools to match your problem.


Get started today with the right tools.
January 8, 2008 by dreizehn28
http://www.flickr.com/photos/1328/2176949559


Discuss ideas and problems online.
November 16, 2005 [phil h]
http://www.flickr.com/photos/hi-phi/64055296

WARNING

http://www.flickr.com/photos/whassupbud55/4581192168



Paritosh Ranjan
Dmitriy Lyubimov
Shannon Quinn
Sebastian Schelter
Jake Mannix
Benson Margulies
Robin Anil
Sean Owen
Grant Ingersoll
Drew Farris
Jeff Eastman
Ted Dunning
Isabel Drost

Become a committer: Of Apache Mahout


Emeritus:

Niranjan Balasubramanian
Otis Gospodnetic
David Hall
Erik Hatcher
Ozgur Yilmazel
Dawid Weiss
Karl Wettin
AbdelHakim Deneche

http://BerlinBuzzwords.de – June 2013 in Berlin/ Germany.

Online – user@mahout.apache.org and dev@mahout.apache.org

Image by: Patrick McEvoy

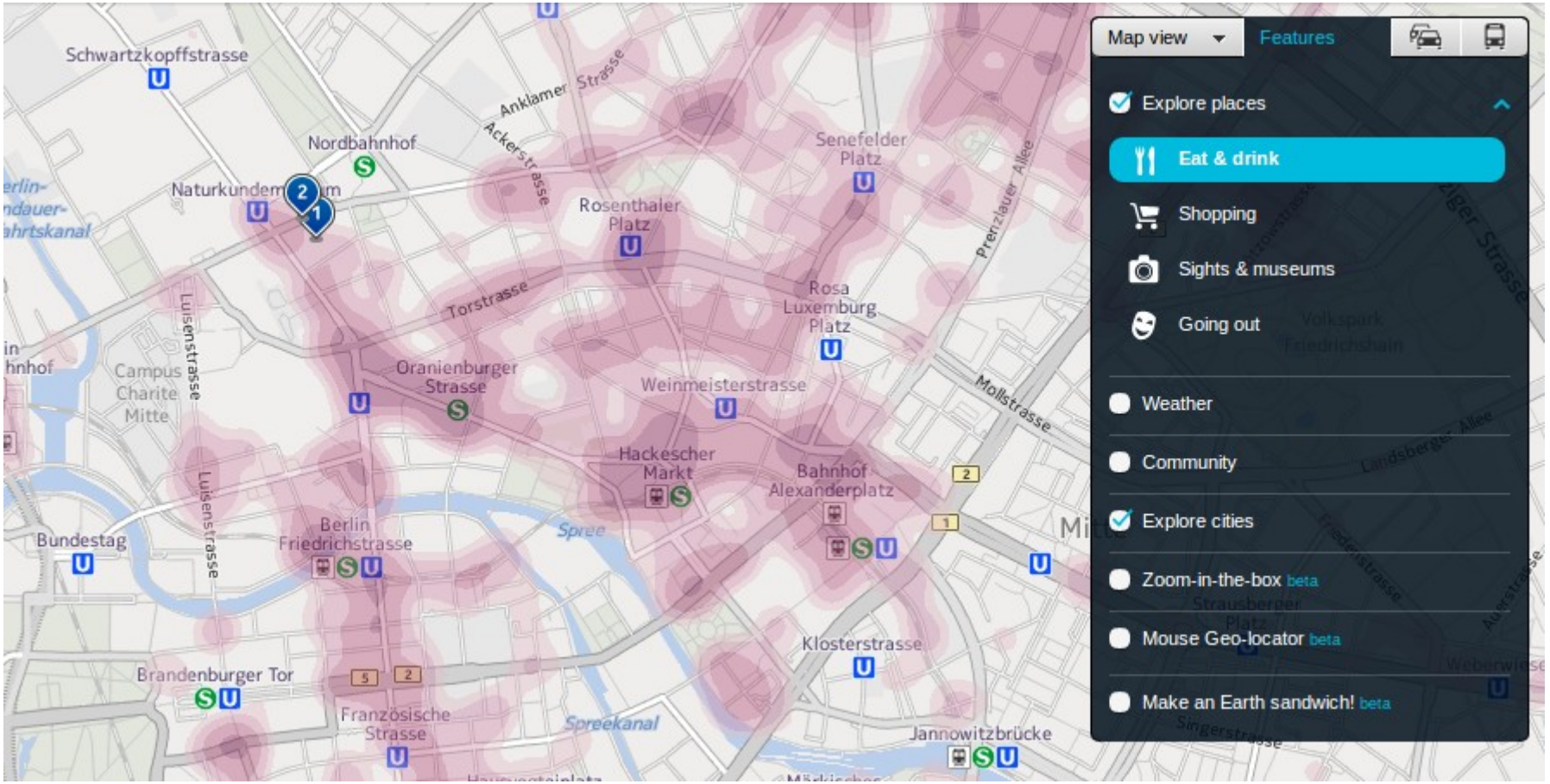
Interest in solving hard problems.

Being part of lively community.

Engineering best practices.

Bug reports, patches, features.

Documentation, code, examples.


Map view
Features
Explore places
Eat & drink
Shopping
Sights & museums
Going out
Weather
Community
Explore cities
Zoom-in-the-box beta
Mouse Geo-locator beta
Make an Earth sandwich! beta
Schwartzkopffstrasse
Nordbahnhof
Anklamer Strasse
Ackerstrasse
Senefelder Platz
Rosenthaler Platz
Prenzlauer Allee
Torstrasse
Rosa Luxemburg Platz
Oranienburger Strasse
Weinmeisterstrasse
Mollstrasse
Hackescher Markt
Bahnhof Alexanderplatz
Campus Charite Mitte
Luisenstrasse
Bundestag
Berlin Friedrichstrasse
Spree
Klosterstrasse
Brandenburger Tor
Französische Strasse
Spreekanal
Jannowitzbrücke





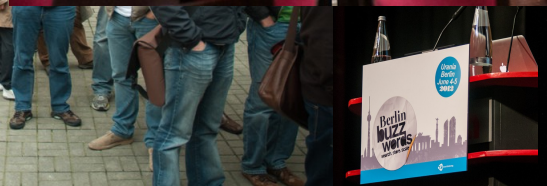
Kasse 1







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