

The future Outlook and the path to be a Data Scientist

21st April 2018, ACAT, Penang



Poo Kuan Hoong, Ph.D
Principal Data Scientist,
Coqnitics Sdn Bhd

Agenda

- What is a data scientist?
 - Why the global need?
- What kinds of companies that employ data scientists?
- What are the key functions of data scientist?
 - What type of work does a data scientist do?
- General Aptitude to be a data scientist
 - What skillsets needed to be a data scientist?
- What is the average salary for a data scientist?
- What is data science?
- Where do I begin?
- Take away

Self Introduction



Poo Kuan Hoong, <http://www.linkedin.com/in/kuanhoong>



- Principal Data Scientist



- Senior Data Scientist



- Senior Manager Data Science



- Senior Lecturer
- Chairperson Data Science Institute



- Founder R User Group & TensorFlow User Group
- Speaker/Trainer

Coqnitics Sdn Bhd

www.coqnitics.com



SERVICES

Cognitics offers Machine Learning / AI solutions
includes integration or customization of solutions to fit customers' need and unique operating environment.



CAR PARK SURVEILLANCE

Effective monitoring tool for parking lots

UNDER DEVELOPMENT



FASHION ANALYTICS

Intelligent Personal Fashion Stylist

UNDER DEVELOPMENT



Apart from Machine Learning solutions, we provide



TRAINING

Data Analytics such as Python/R programming, Machine Learning and Deep Learning



CONSULTANCY

Anything relating to Machine Learning or Analytics or Applications in these areas.



ANALYTICS-AS-A-SERVICE

To help you with your Analytics journey,
without you forming an in-house Data
Science / Analytics team.

Malaysia R User Group - (myRUG)

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Kuala Lumpur,
Malaysia

Founded Jun 5, 2016

[About us...](#)

Welcome to Malaysia R User Group (myRUG)

+ Schedule a new Meetup

[Upcoming](#) Past Calendar

There are no upcoming
Meetups

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What's new



<https://www.meetup.com/MY-RUserGroup/>



R User Group Malaysia

@rusergroupmalaysia

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224 likes

0 this week
Andy Low and 18 other friends

226 follows

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309 post reach this week

The R User Group Malaysia is a diverse group that come together to discuss anything related to the R programming language.



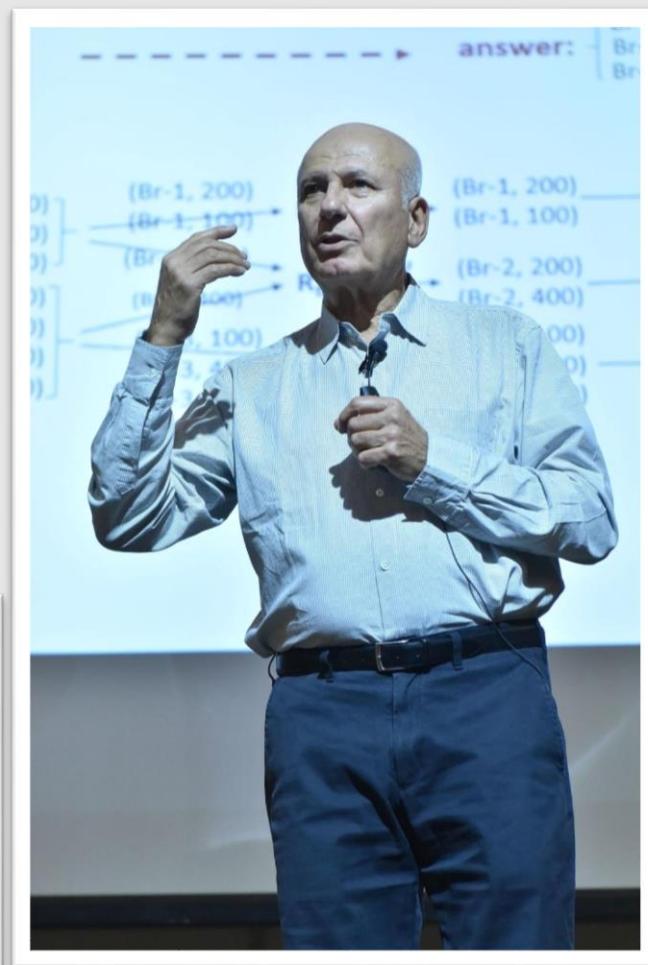
224 Likes

Andy Low and 18 other friends like this

<https://www.facebook.com/rusergroupmalaysia/>

3rd Meet-up & Malaysia Digital Economy Corp (MDEC)

- 24th Nov 2016, 230 participants, 5 speakers



TensorFlow & Deep Learning Malaysia

Public group

Discussion

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The logo features a large, stylized TensorFlow icon composed of orange and yellow 3D blocks. To the right of the icon is a portion of the Malaysian flag with its characteristic red, white, and blue colors and yellow crescent and star.

TENSORFLOW & DEEP LEARNING MALAYSIA

Joined Notifications Share ...

Write Post Add Photo/Video Live Video More



Write something...



Photo/Video



Feeling/Activity

...

ADD MEMBERS

+ Enter name or email address...



MEMBERS

256 members (77 new)











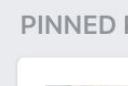
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SUGGESTED MEMBERS



Kurt Orion G

Add Member



Kuan Hoong created a poll.

<https://www.facebook.com/groups/TensorFlowMY/>

What is a Data Scientist?

Myth #1

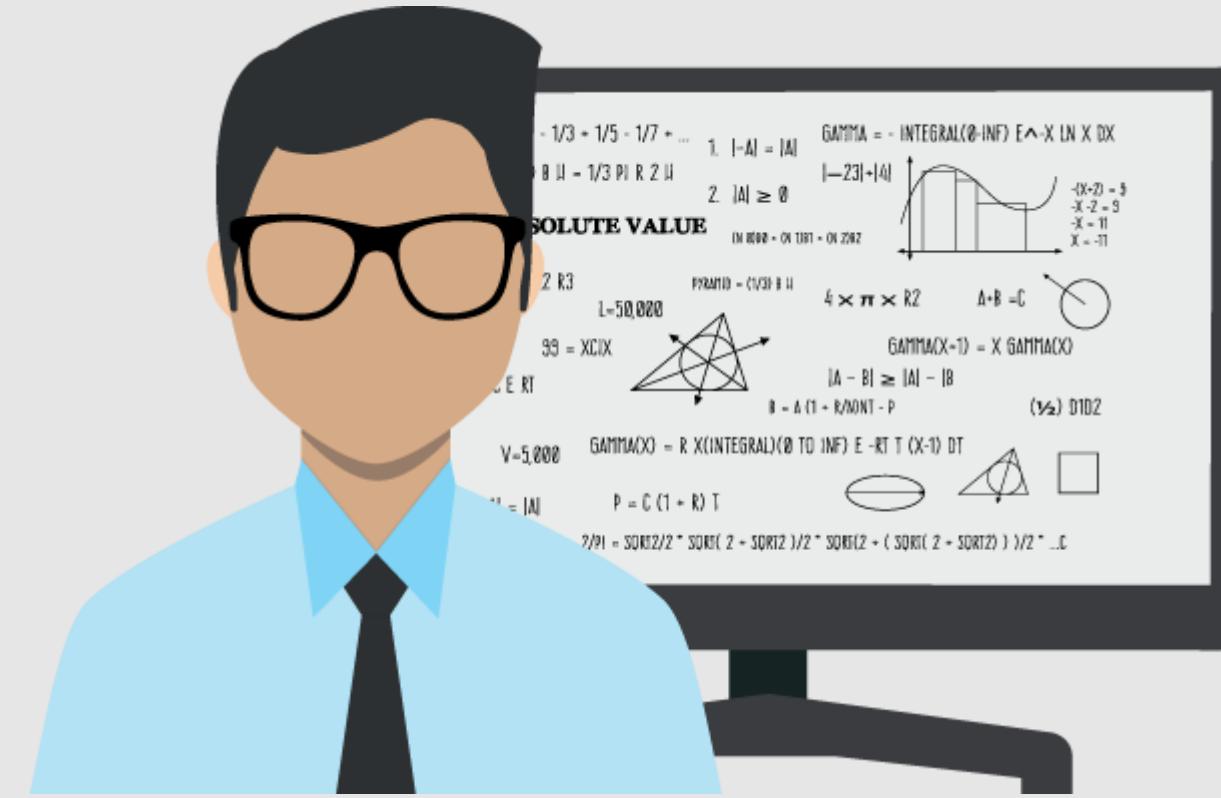


Data scientists are mythical
beings, like the unicorns.

Data Scientist

The term "**data scientist**" has been around for years, and the various advanced analytics specialties that fall under it are even older.

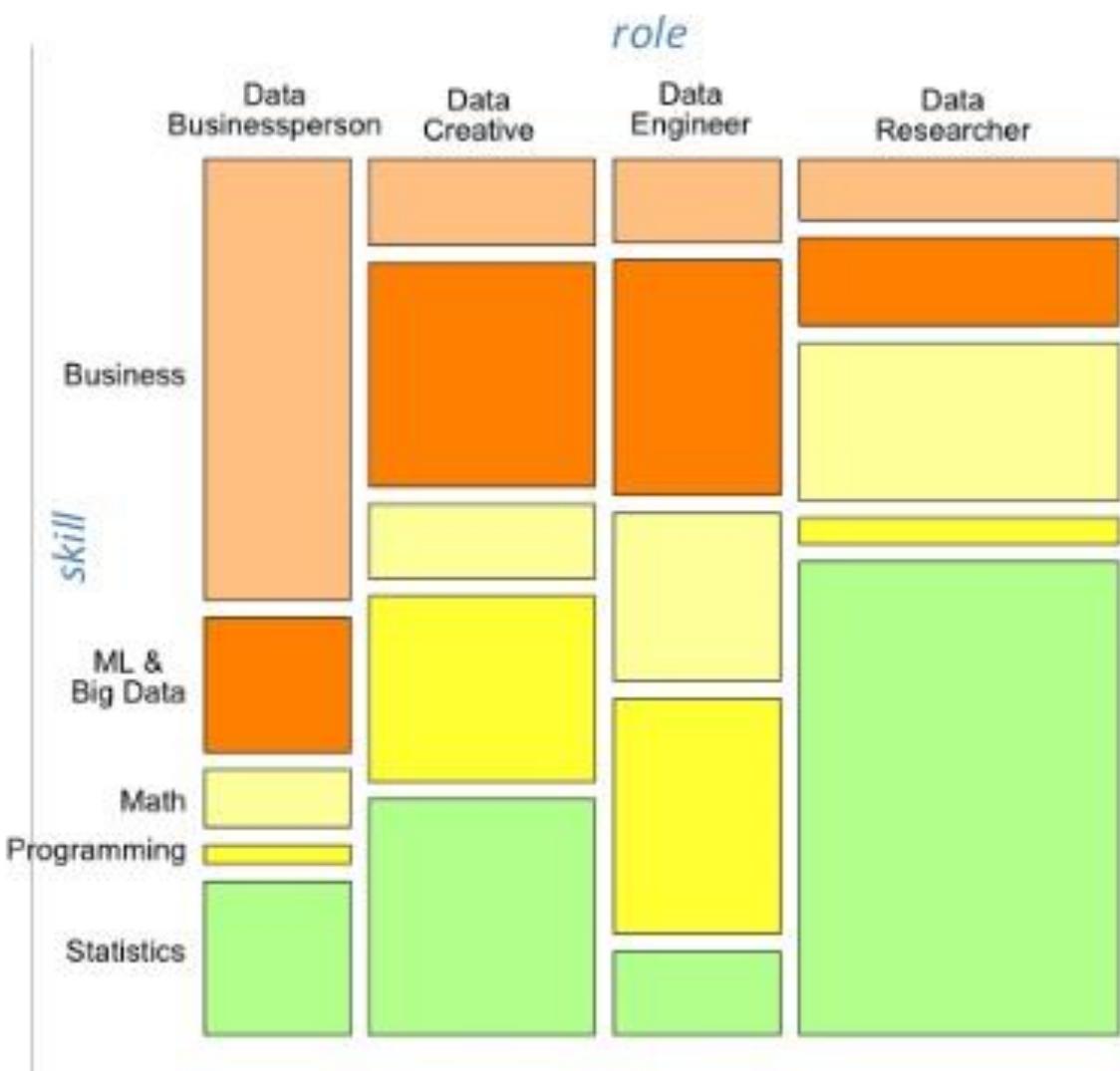
However, due to recent explosion of data, the term has been used in the convergence of disciplines and that leads to the soaring popularity.



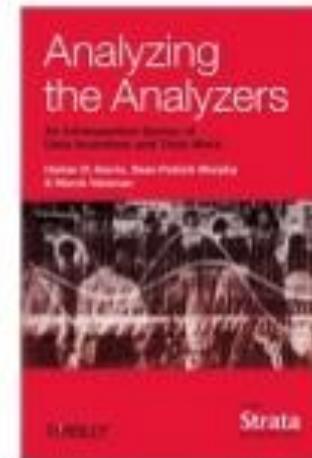
What are the job title?

- Data Scientist
 - Data Engineer
 - Big Data Engineer
 - Machine Learning Scientist
 - Business Analytics Specialist
 - Data Visualization Developer
 - BI Solutions Architect/ BI Specialist
 - Operations Research Analyst
 - Analytics Manager
 - Machine Learning Engineer
 - Statistician
 - Business Intelligence (BI) Engineer
- 

Many Flavors of Data Scientist



2012-3 Survey



... from research
to development
to business-focused

Why the Global Need?



Abundance of
Data



Availability of
affordable
compute
resources



Internet of
Things (IoT)
sensors data





“Data is the new oil”

Where data analytics is employed

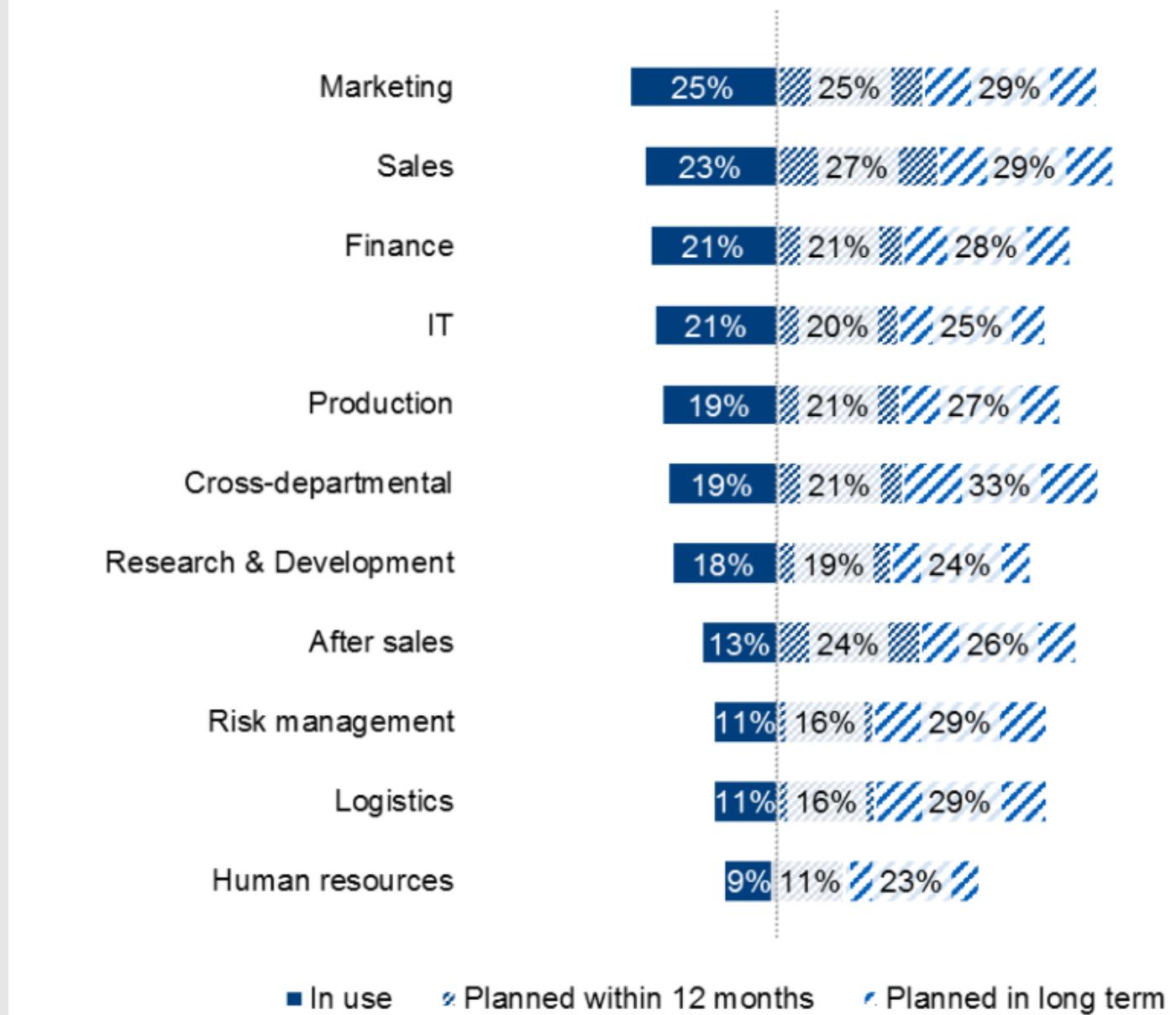


Figure 1: In which areas does your company use, or plan to use, Big Data analysis? Source: BARC survey "Big Data Use Cases. Getting real on data monetization"

Data scientists are high in demand

IBM Predicts Demand For Data Scientists Will Soar 28% By 2020



Louis Columbus, CONTRIBUTOR

I cover CRM, Cloud Computing, ERP and Enterprise Software

FULL BIO ▾

Opinions expressed by Forbes Contributors are their own.

- Jobs requiring machine learning skills are paying an average of \$114,000. Advertised data scientist jobs pay an average of \$105,000 and advertised data engineering jobs pay an average of \$117,000.
- 59% of all Data Science and Analytics (DSA) job demand is in Finance and Insurance, Professional Services, and IT.
- Annual demand for the fast-growing new roles of data scientist, data developers, and data engineers will reach nearly 700,000 openings by 2020.
- By 2020, the number of jobs for all US data professionals will increase by 364,000 openings to 2,720,000 according to IBM.
- Data Science and Analytics (DSA) jobs remain open an average of 45 days, five days longer than the market average.

CROSSWORDS & GAMES

Sexiest Job of the 21st Century

Wordplay

By DEB AMLEN FEB. 9, 2017



CXO

Top 10 hottest IT jobs for 2017

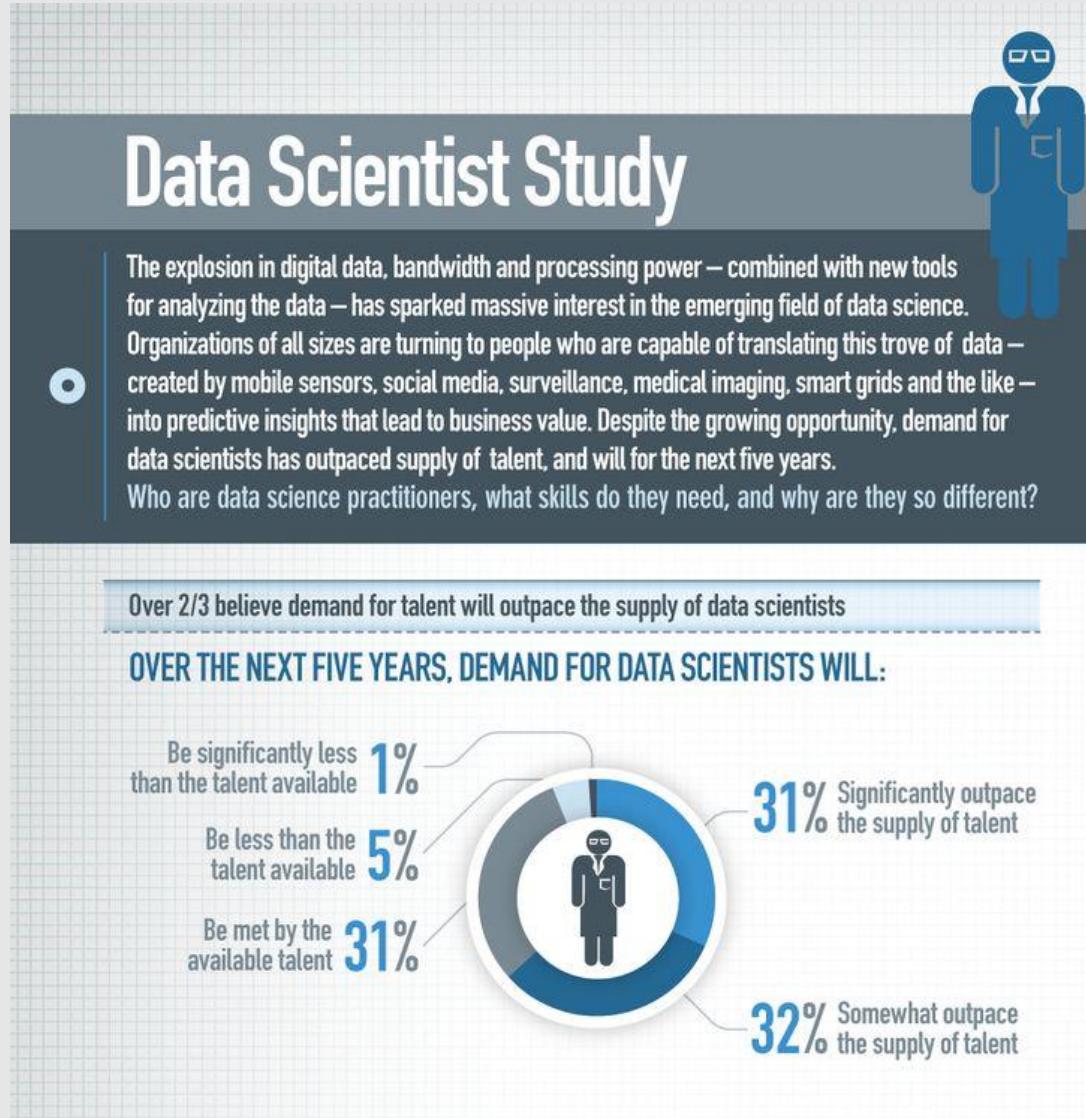
Data scientist, engineer, and UX designer are among the tech jobs that will be in demand in the new year, experts say.

By Alison DeNisco | January 3, 2017, 4:00 AM PST



EDITOR'S PICKS

Demand will outpace the supply



MDEC SUPPORTS PUBLIC AND PRIVATE UNIVERSITIES TO BRIDGE TALENT GAP IN DATA ANALYTICS INDUSTRY

21 Apr 2015

The Star, Friday, 24 April 2015 “Malaysia needs 1,500 data scientists by 2020”

Specialised data science programmes aim to address talent gap and rising demand for data professionals in Malaysia.

Pacific University (APU), Malaysia Multimedia University (MMU), International Islamic University Malaysia (IIUM), Sunway University, Monash University, University Institute Technology Mara (UiTM) and University Teknologi Petronas (UTP). **80 in April 2015** **1,500 by 2020**

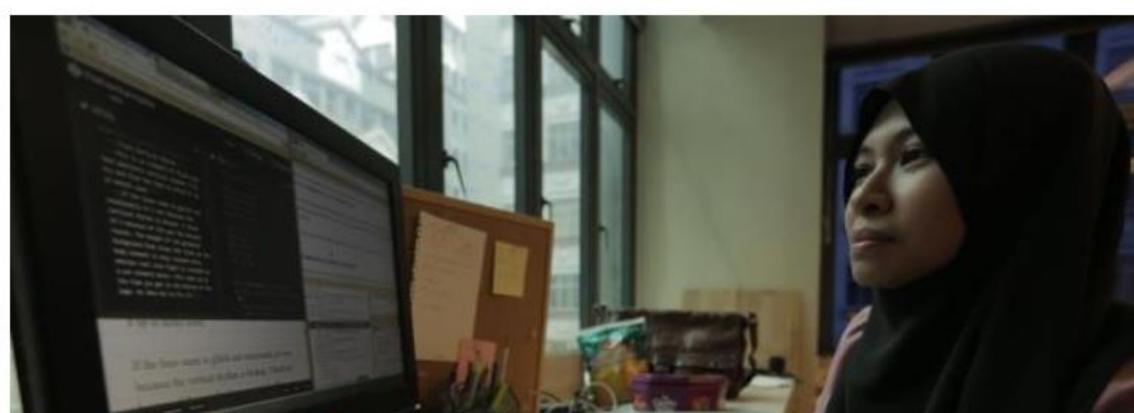
“There are currently 80 data scientists in our local data analytics industry. To meet our target of 1,500 data scientists by 2020, we need more support from IHLs in Malaysia to offer courses that will encourage young people in the country to explore a highly demanded career as this. We need to ensure consistent

MDEC aims to have 20,000 data professionals by 2020

TECHNOLOGY

Thursday, 14 Sep 2017

10:05 PM MYT



“There are currently 80 data scientists in our local data analytics industry. To meet our target of 1,500 data scientists by 2020, we need more support from IHLs in Malaysia to offer courses that will encourage young people in the country to explore a highly demanded career as this. We need to ensure consistent and sustainable supply of skilled workforce to drive the adoption of data science in the local economy,” said Dr Dato’ Sri Mohd Noor bin Mohamed, MDEC’s Executive Director of Technology.

What kinds of companies that employ data scientists?

F



Data Scientist
OSRAM Opto Semiconductors
(Malaysia) Sdn Bhd

\$ Login to view salary

Min 7 years (Senior Executive)

MNC

Senior Data Scientist / Data S

JobStreet.com

FUSIONEX

Others

Sign in to view salary



Analyst, Customer Analytics

Apply with Profile

Maybank

Kuala Lumpur, Malaysia

Posted 15 days ago

747 views

BANKS



Tan Chong Group

Manager, Data Analyst
TAN CHONG GROUP

Data Scientist Quick Apply



Axiata

Kuala Lumpur, Malaysia

Posted 11 days ago

754 views



3 connections work here



Data Scientist

Apply with Profile

HRDF - Human Resources Development Fund Malaysia

Kuala Lumpur, Malaysia

Posted 18 days ago

1134 views



2 alumni work here

Apply

Save

Government

Job description

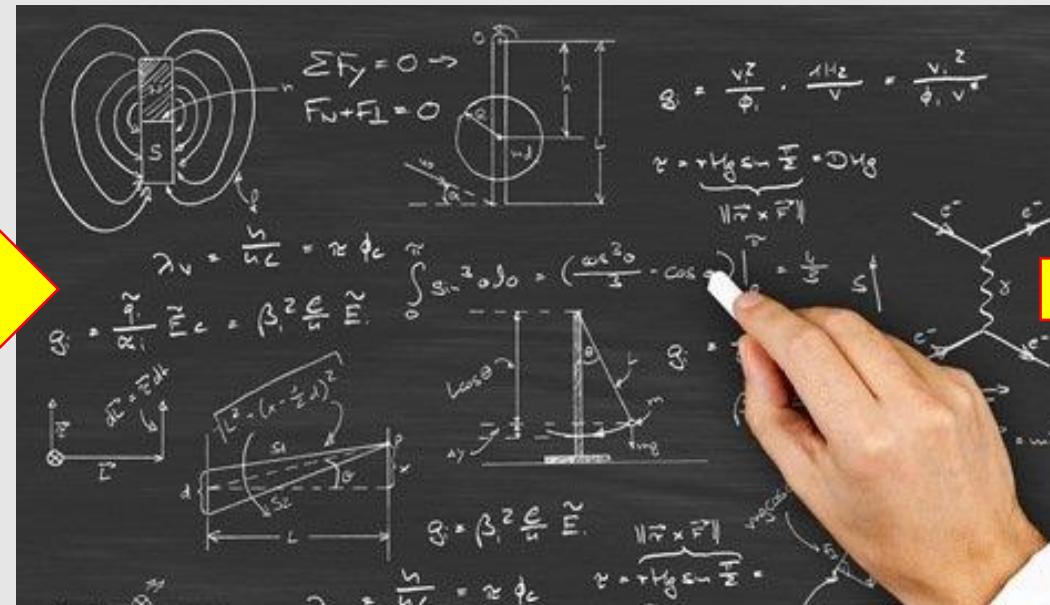
WANT TO BE A PART OF NATIONAL HUMAN CAPITAL DEVELOPMENT ? APPLY NOW BEFORE IT'S TOO LATE !

What are the key functions of
data scientist?

What do people think Data Scientist can do?



Lots of data

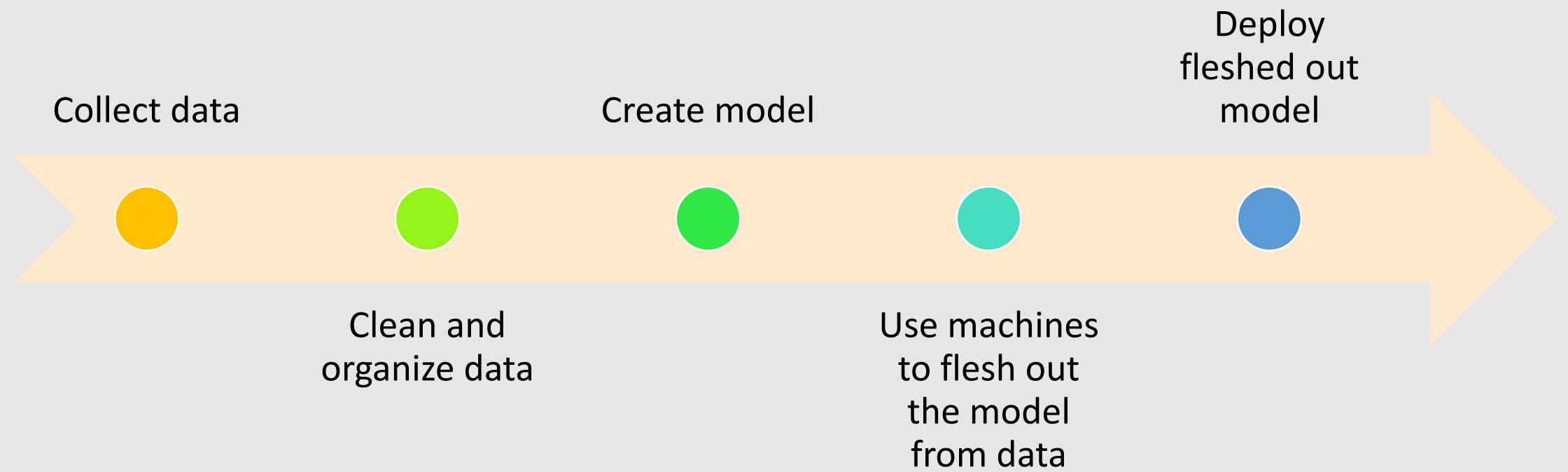


Complex mathematics in
multidimensional spaces

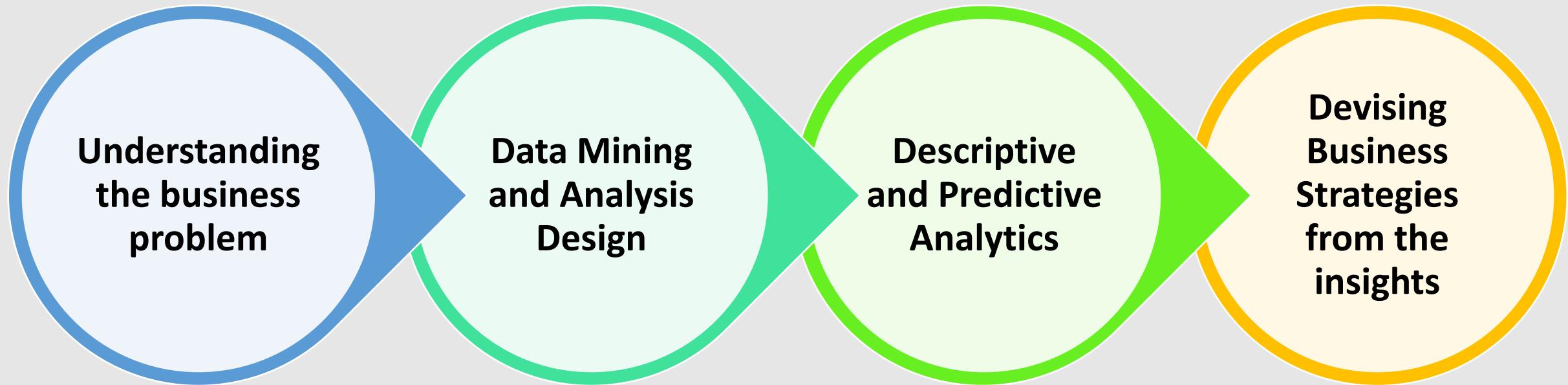


Magical results

In reality...



Key functions of data scientist



Scenario 1: Customer Churn Analytics

Churn analytics

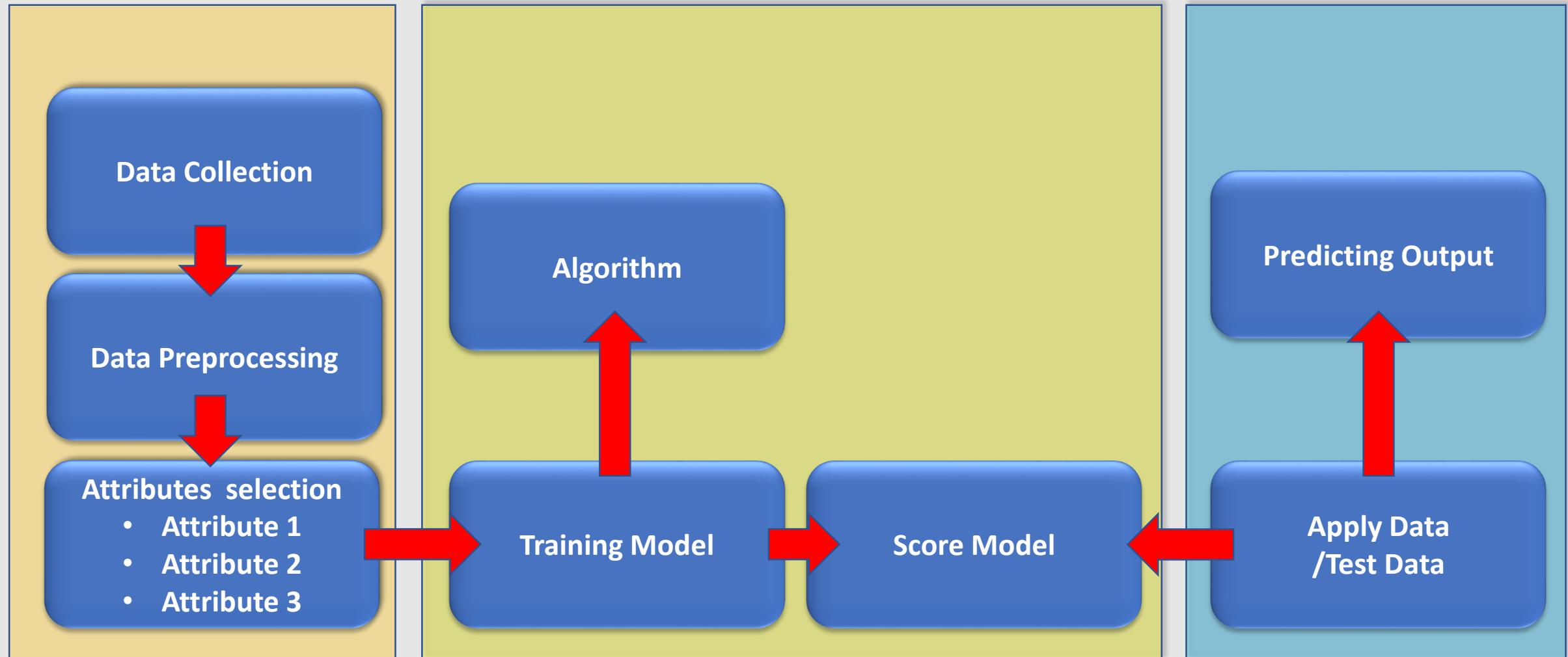
- Predicting who will switch mobile operator

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	customerID	gender	SeniorCitizen	Partner	Dependents	tenure	PhoneService	MultipleLines	InternetService	OnlineSecurity	OnlineBackup	DeviceProtection	TechSupport	StreamingTV	StreamingMovies	Contract	PaperlessBilling	PaymentMethod	MonthlyCharges	TotalCharges	Churn
2	7590-VHV	Female	0	Yes	No	1	No	No phone	DSL	No	Yes	No	No	No	No	Month-to-month	Yes	Electronic	29.85	29.85	No
3	5575-GNV	Male	0	No	No	34	Yes	No	DSL	Yes	No	Yes	No	No	No	One year	No	Mailed ch	56.95	1889.5	No
4	3668-QPY	Male	0	No	No	2	Yes	No	DSL	Yes	Yes	No	No	No	No	Month-to-month	Yes	Mailed ch	53.85	108.15	Yes
5	7795-CFO	Male	0	No	No	45	No	No phone	DSL	Yes	No	Yes	Yes	No	No	One year	No	Bank trans.	42.3	1840.75	No
6	9237-HQI	Female	0	No	No	2	Yes	No	Fiber optic	No	No	No	No	No	No	Month-to-month	Yes	Electronic	70.7	151.65	Yes
7	9305-CDSI	Female	0	No	No	8	Yes	Yes	Fiber optic	No	No	Yes	No	Yes	Yes	Month-to-month	Yes	Electronic	99.65	820.5	Yes
8	1452-KIOV	Male	0	No	Yes	22	Yes	Yes	Fiber optic	No	Yes	No	No	Yes	No	Month-to-month	Yes	Credit card	89.1	1949.4	No
9	6713-OKC	Female	0	No	No	10	No	No phone	DSL	Yes	No	No	No	No	No	Month-to-month	No	Mailed ch	29.75	301.9	No
10	7892-POC	Female	0	Yes	No	28	Yes	Yes	Fiber optic	No	No	Yes	Yes	Yes	Yes	Month-to-month	Yes	Electronic	104.8	3046.05	Yes
11	6388-TABO	Male	0	No	Yes	62	Yes	No	DSL	Yes	Yes	No	No	No	No	One year	No	Bank trans.	56.15	3487.95	No
12	9763-GRSI	Male	0	Yes	Yes	13	Yes	No	DSL	Yes	No	No	No	No	No	Month-to-month	Yes	Mailed ch	49.95	587.45	No
13	7469-LKBO	Male	0	No	No	16	Yes	No	No	No internet	No internet	No internet	No internet	No internet	No internet	Two year	No	Credit card	18.95	326.8	No
14	8091-TTV	Male	0	Yes	No	58	Yes	Yes	Fiber optic	No	No	Yes	No	Yes	Yes	One year	No	Credit card	100.35	5681.1	No
15	0280-XJGE	Male	0	No	No	49	Yes	Yes	Fiber optic	No	Yes	Yes	No	Yes	Yes	Month-to-month	Yes	Bank trans.	103.7	5036.3	Yes
16	5129-JLPI	Male	0	No	No	25	Yes	No	Fiber optic	Yes	No	Yes	Yes	Yes	Yes	Month-to-month	Yes	Electronic	105.5	2686.05	No
17	3655-SNQ	Female	0	Yes	Yes	69	Yes	Yes	Fiber optic	Yes	Yes	Yes	Yes	Yes	Yes	Two year	No	Credit card	113.25	7895.15	No
18	8191-XWS	Female	0	No	No	52	Yes	No	No	No internet	No internet	No internet	No internet	No internet	No internet	One year	No	Mailed ch	20.65	1022.95	No
19	9959-WOI	Male	0	No	Yes	71	Yes	Yes	Fiber optic	Yes	No	Yes	No	Yes	Yes	Two year	No	Bank trans.	106.7	7382.25	No
20	4190-MFL	Female	0	Yes	Yes	10	Yes	No	DSL	No	No	Yes	Yes	No	No	Month-to-month	No	Credit card	55.2	528.35	Yes

Customer churn - who do customers change operators?

- The top 3 reasons why subscribers change providers:
 - They want a new handset
 - They believe they pay too much for calls/data
 - Providers do not offer additional loyalty benefits





Initialization Step

Learn Step

Apply Step

Machine Learning Framework

So what is next?

- Further improve the models by doing feature selection or feature engineering
- Try other machine learning algorithms
- Algorithm tuning
- Ensemble methods
- Add more data
- Cross validation

Scenario 2: Market Basket Analysis

Market Basket Analysis



Where should detergents be placed in the store to maximize sales?

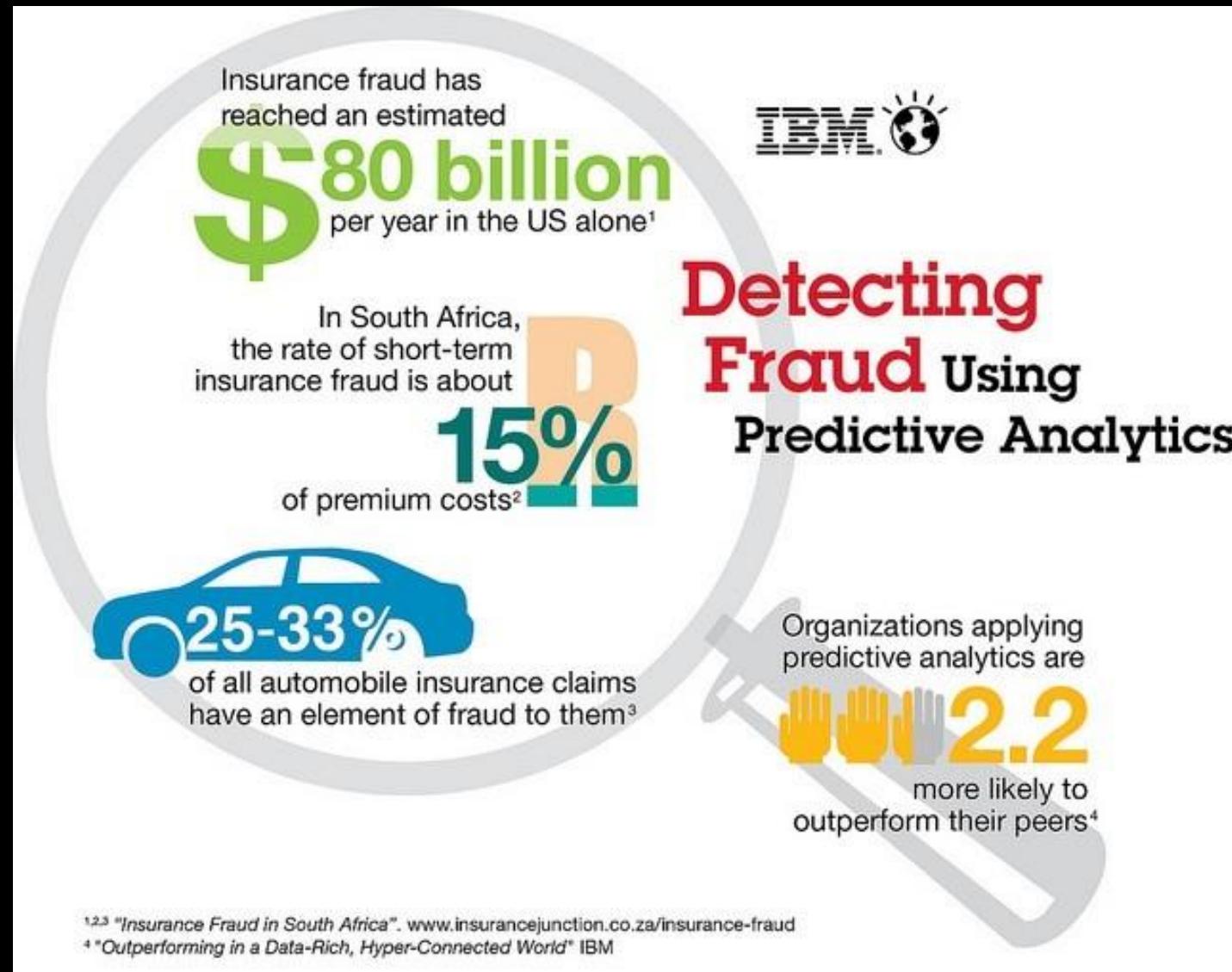
Are bleach products purchased when detergents and orange juice are bought together?

Is cola typically purchased with bananas?
Does the brand of cola make a difference?

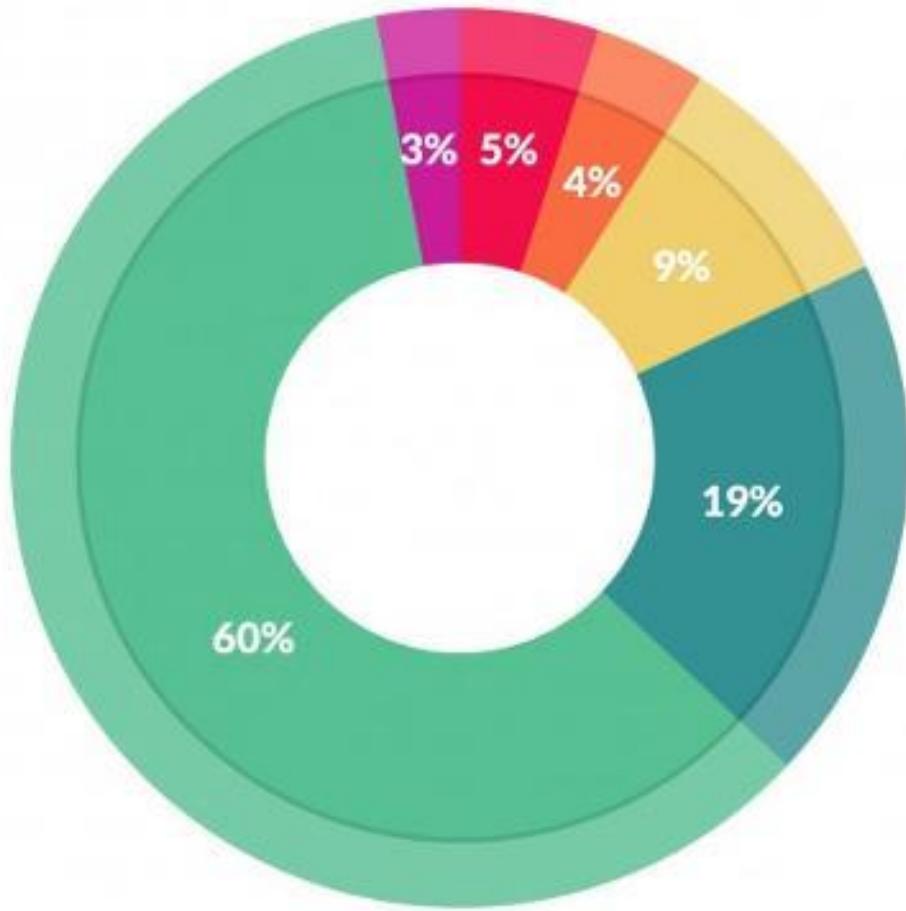
How are the demographics of the neighbourhood affecting what customers are buying?

Scenario 3: Fraud Detection

- Financial services client that can detect fraud without disrupting service to valuable customers.
- With massive amounts of structured and unstructured data from a hybrid of sources, models and algorithms are used to find patterns of fraud and anomalies in the data to predict customer behavior



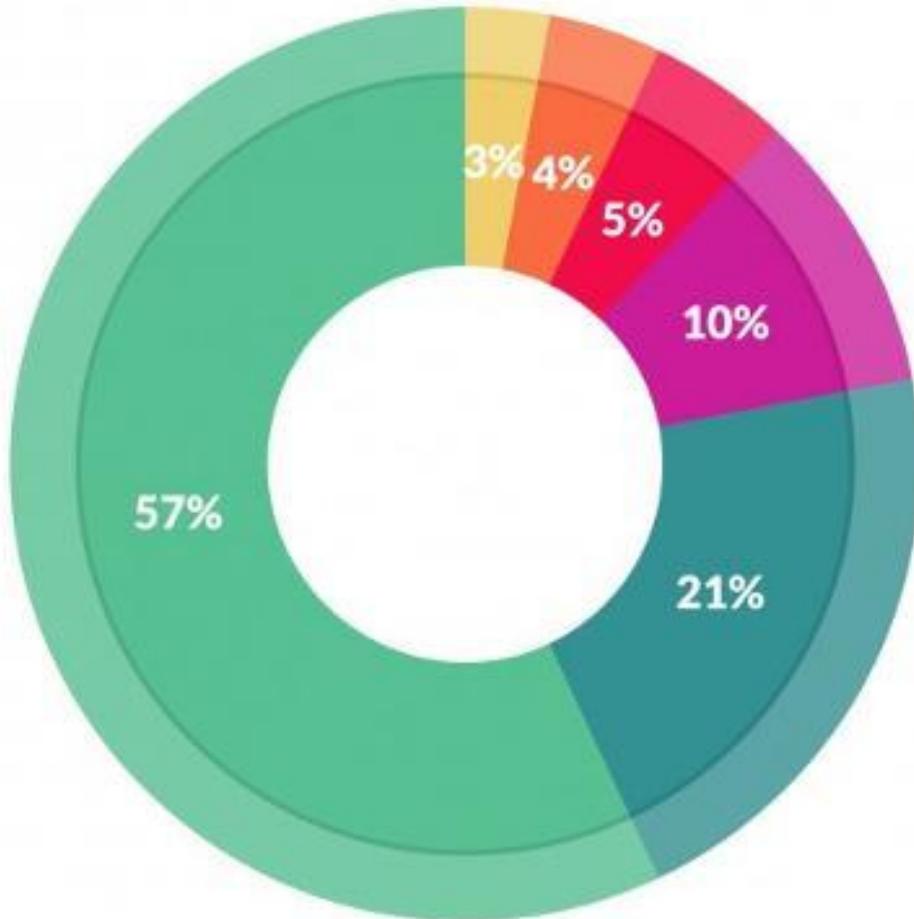
What type of work does a data scientist do?



What data scientists spend the most time doing

- *Building training sets: 3%*
- *Cleaning and organizing data: 60%*
- *Collecting data sets: 19%*
- *Mining data for patterns: 9%*
- *Refining algorithms: 4%*
- *Other: 5%*

<http://www.forbes.com/sites/gilpress/2016/03/23/data-preparation-most-time-consuming-least-enjoyable-data-science-task-survey-says/#f37c7f758459>



What's the least enjoyable part of data science?

- Building training sets: 10%
- Cleaning and organizing data: 57% (highlighted)
- Collecting data sets: 21%
- Mining data for patterns: 3%
- Refining algorithms: 4%
- Other: 5%

<http://www.forbes.com/sites/gilpress/2016/03/23/data-preparation-most-time-consuming-least-enjoyable-data-science-task-survey-says/#f37c7f758459>

DATA SCIENTIST



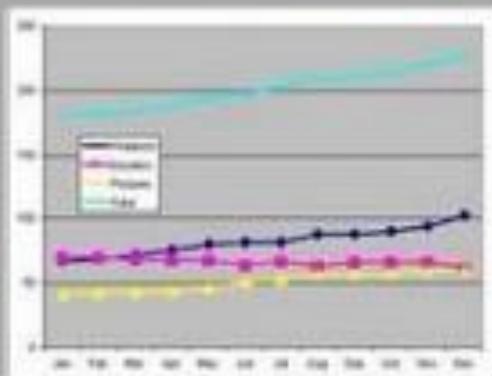
What my friends think I do



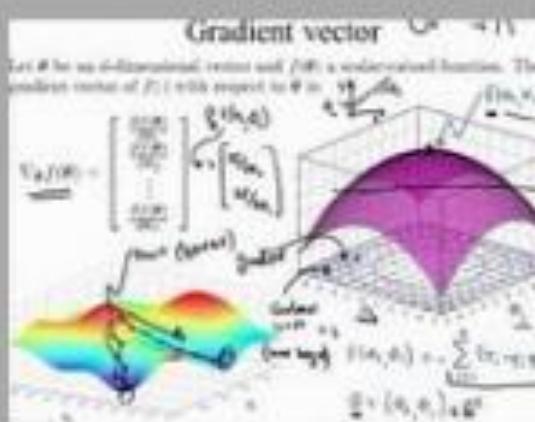
What my mom thinks I do



What society thinks I do



What my boss thinks I do



What I think I do



What I actually do



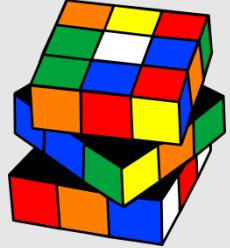
- Common sense
- Curious mind
- Clear and simplify thought



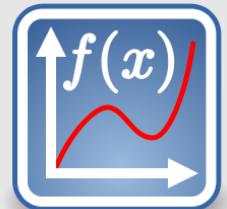
- Good listening, writing and communication skills
(visualizations)



- Love to solve puzzles



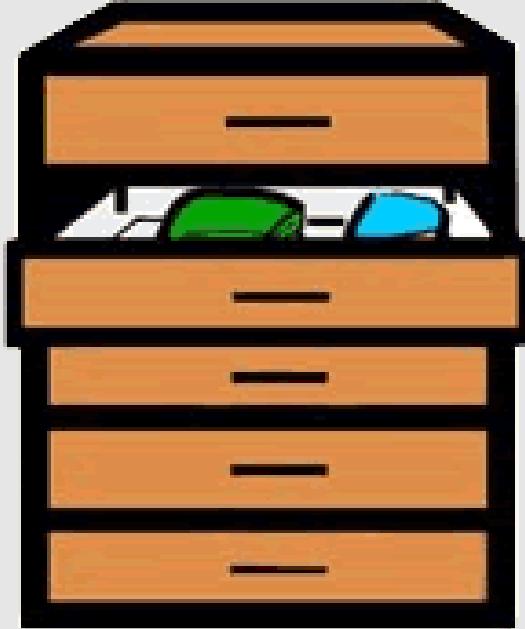
- Maths & Stats



- Business sense



Data Scientist



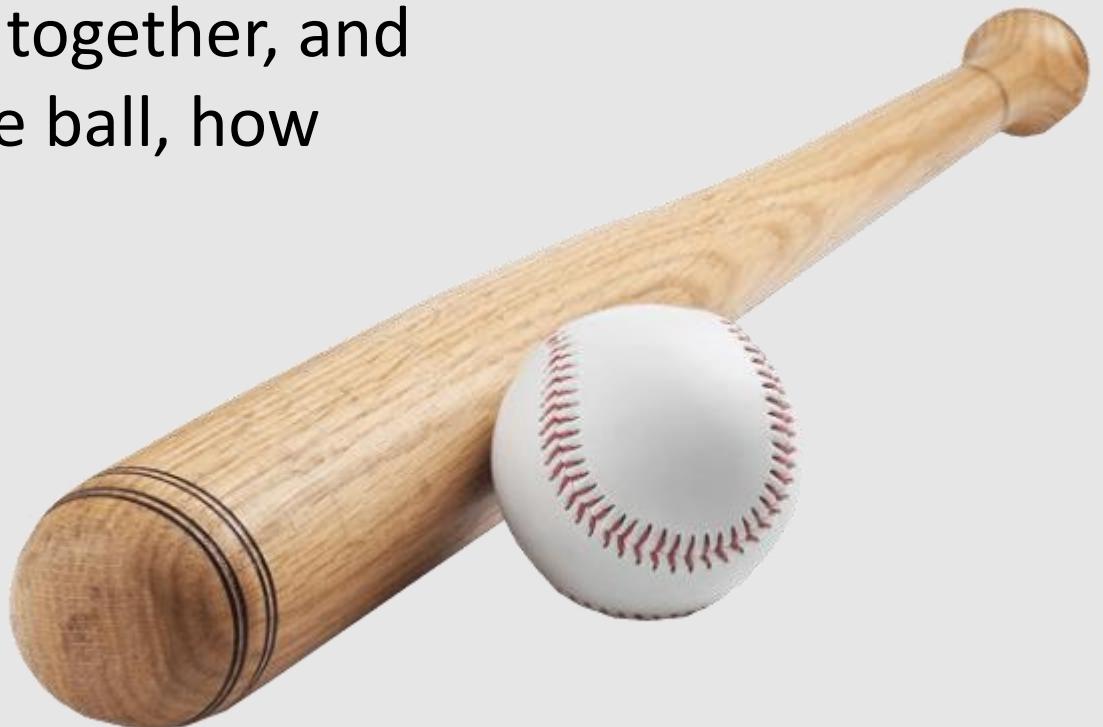
I have **4 red**, **18 black** and **8 brown** socks in my sock drawer. If it is completely dark and I cannot see the colour of the socks that I am picking, how many socks do I need to take from the drawer to be sure that I have at least one pair of socks that are the same colour?

4

If a baseball and a bat cost RM 10.10 together, and the bat costs RM 10.00 more than the ball, how much does the ball cost?

$$x + (10.00 + x) = 10.10, \text{ so}$$

$$x = 0.05$$



What is the hidden number under the car?



What skillsets needed to be a data scientist?

Data scientist skillsets

- Data Mining
- Machine Learning
- R/Python
- Data Analysis
- Statistics
- SQL
- Java
- Algorithms
- Data Visualization

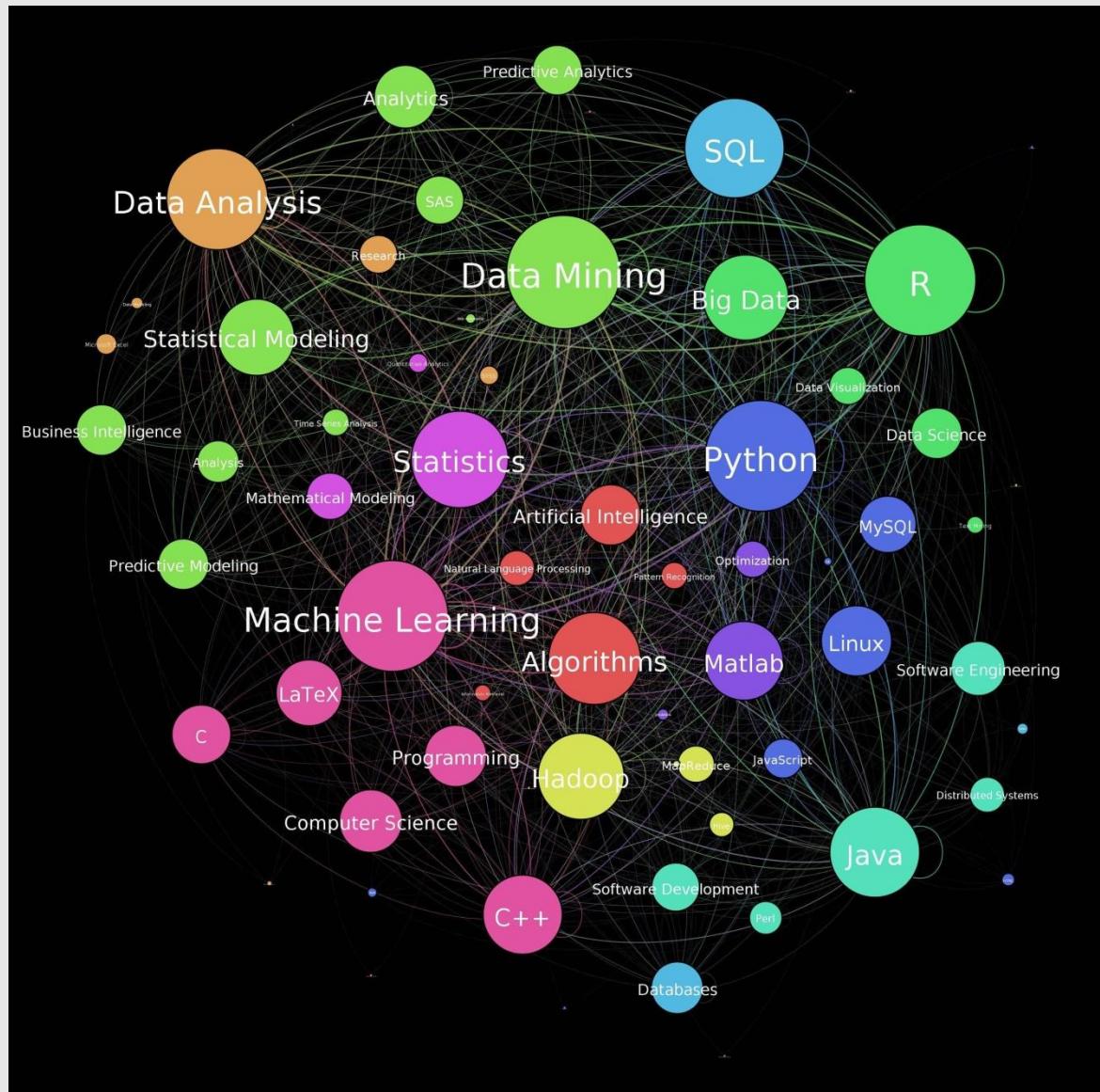


Image Source: <http://imgur.com/hoyFT4t>

Mathematics & Statistics

Mathematics



Linear Algebra



Calculus



Graph Theory



Probability/Combinatorics

Statistics



Distributions
(Binomial, Poisson, etc)



Summary Statistics

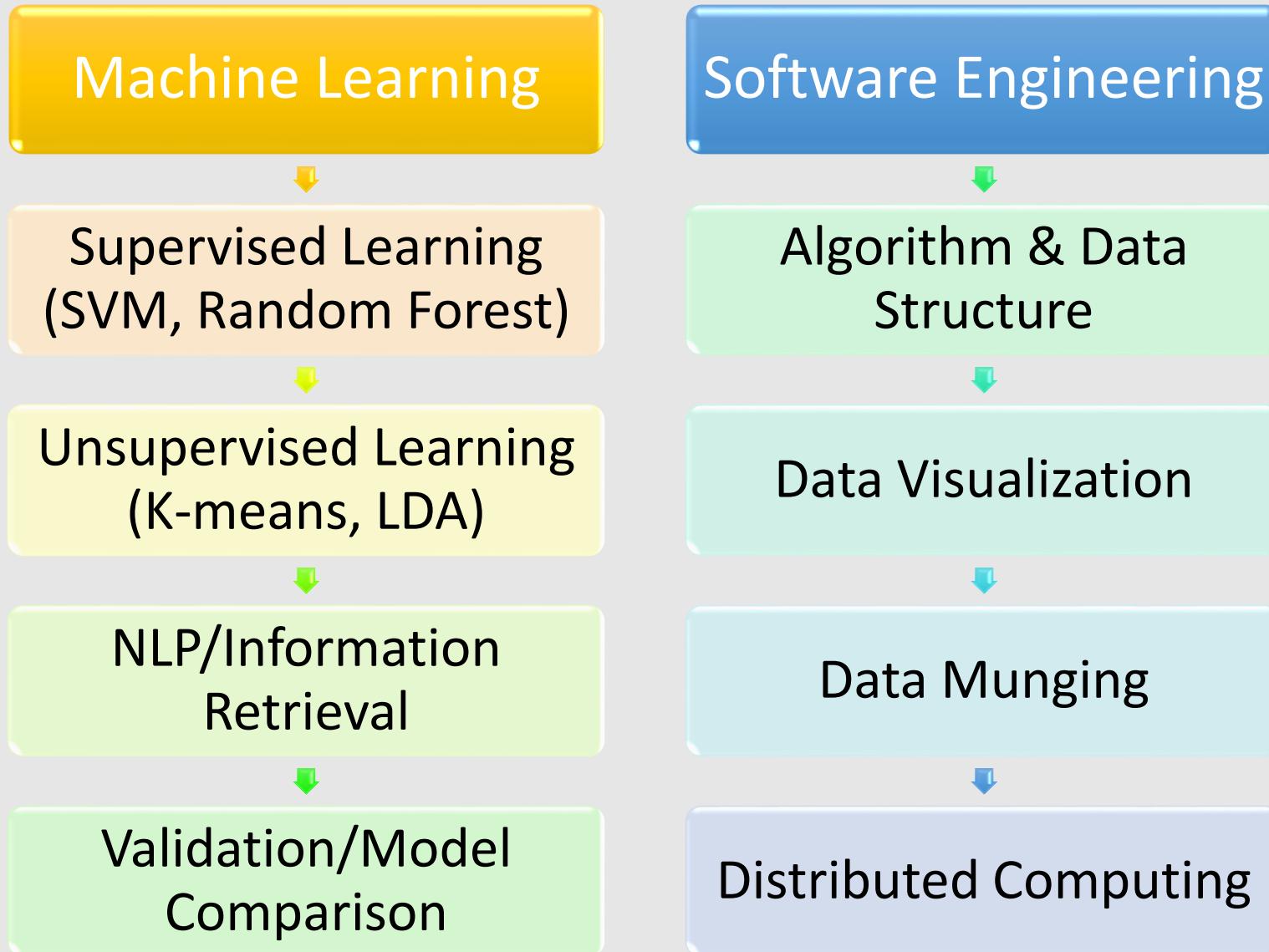


Hypothesis testing

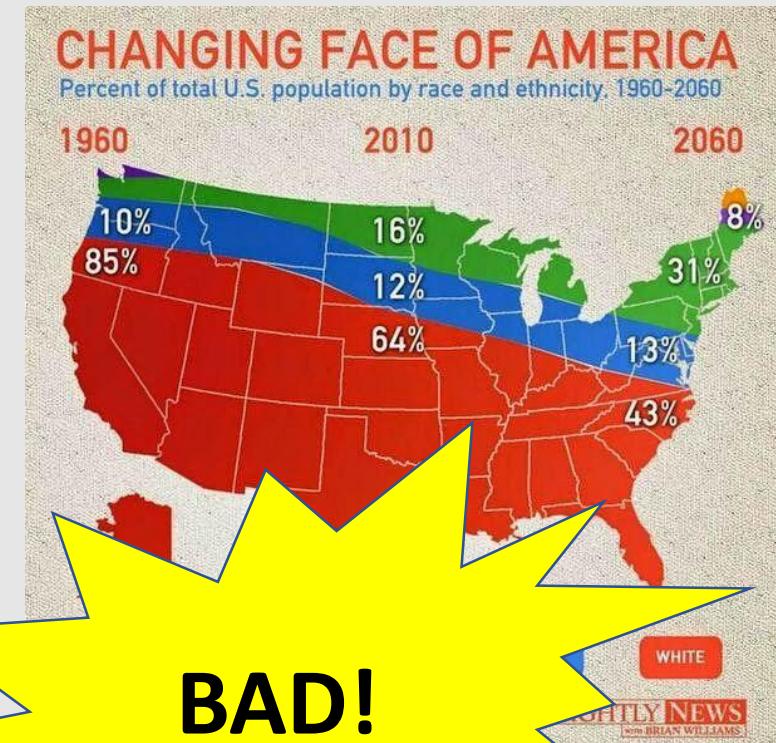
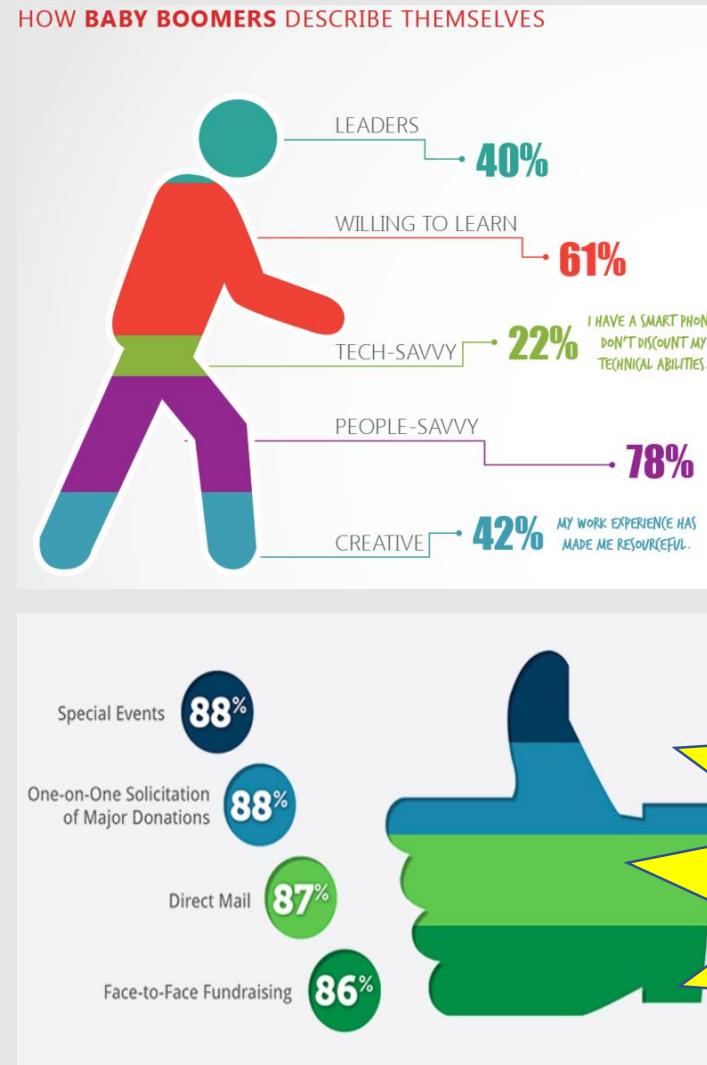
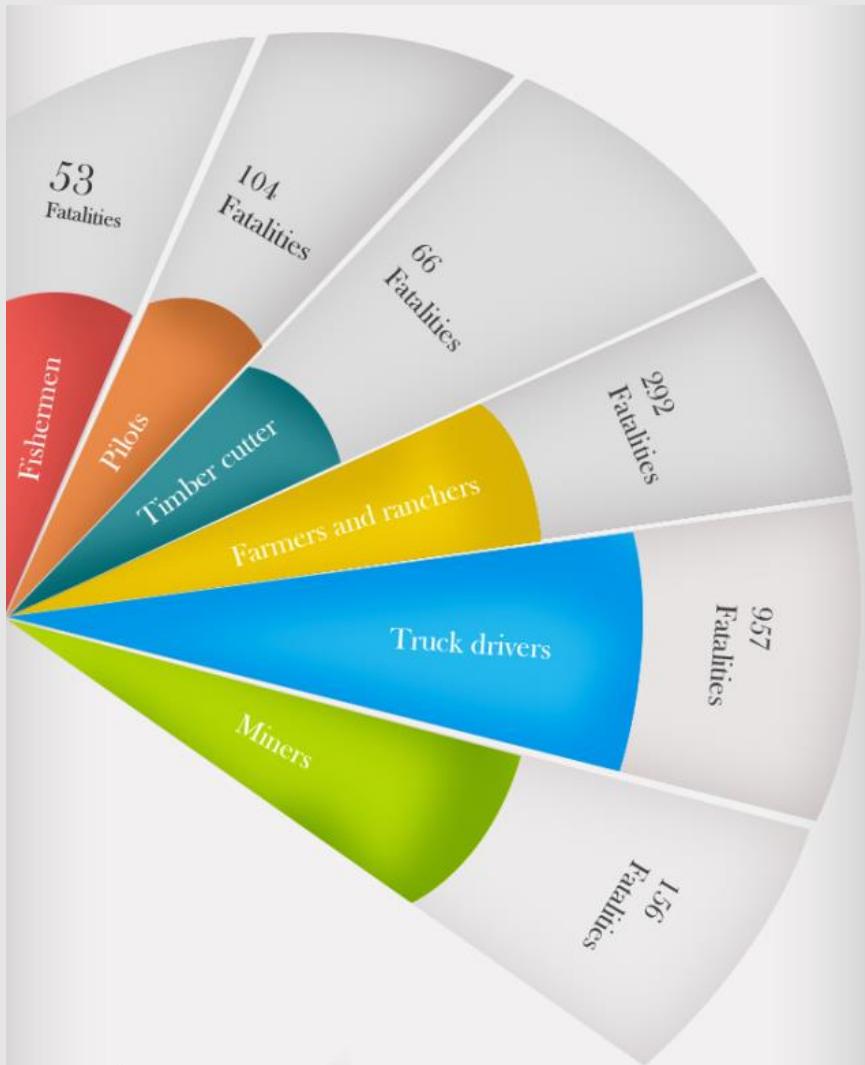


Bayesian Analysis

Machine Learning & Software Engineering



Data visualization



Data Visualization

Proper Pooling

By "properly pooled," the investigators at Berkeley meant "broken down by department." Men more often applied to science departments, while women inclined towards humanities. Science departments require special technical skills but accept a large percentage of qualified applicants. In contrast, humanities departments only require a standard undergrad curriculum but have fewer slots.

The authors concluded that any sexism occurred before Berkeley ever saw the applications:

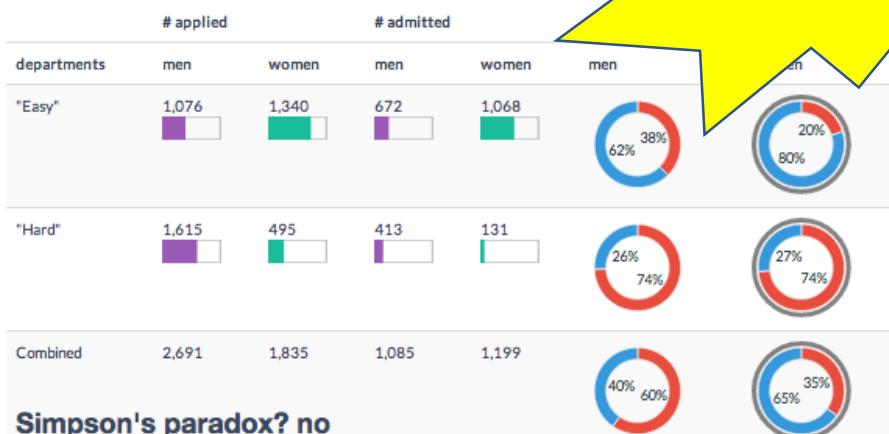
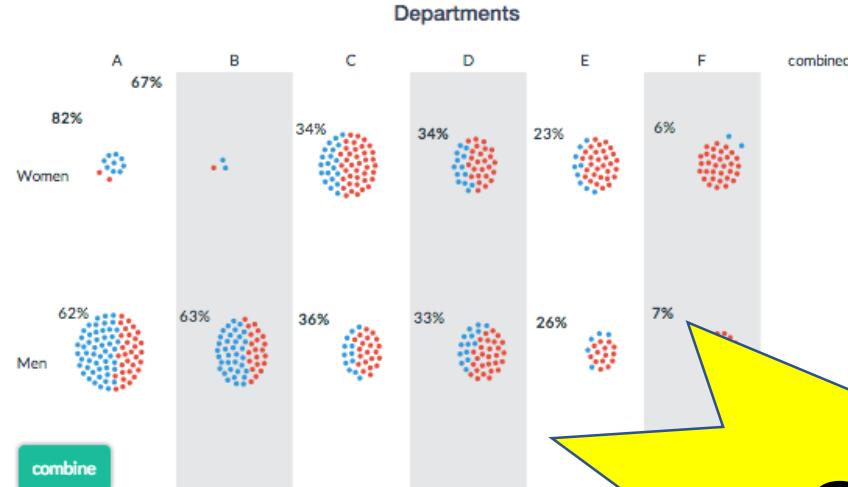
Women are shunted by their socialization and education toward fields of graduate study that are generally more crowded, less productive of completed degrees, and less well funded, and that frequently offer poorer professional employment prospects.

— (p. 403)

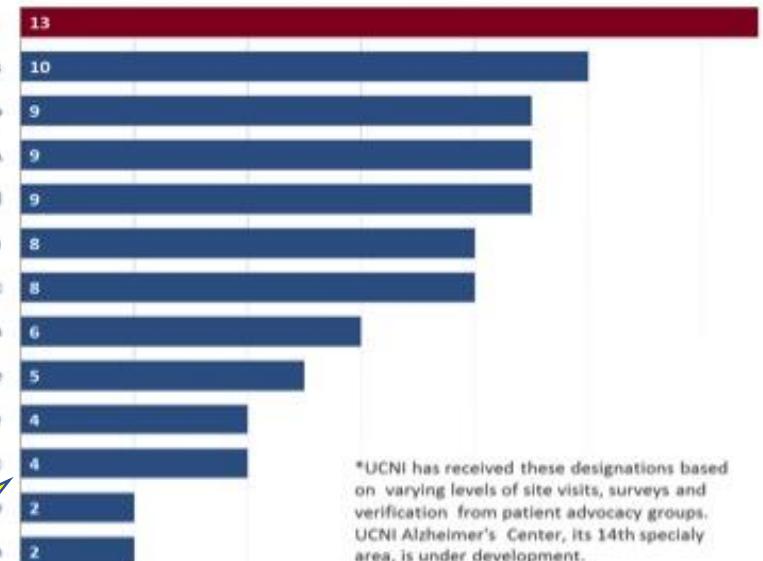
To the right are data on the six largest departments, but the names have been changed to protect the innocent.

Illustration

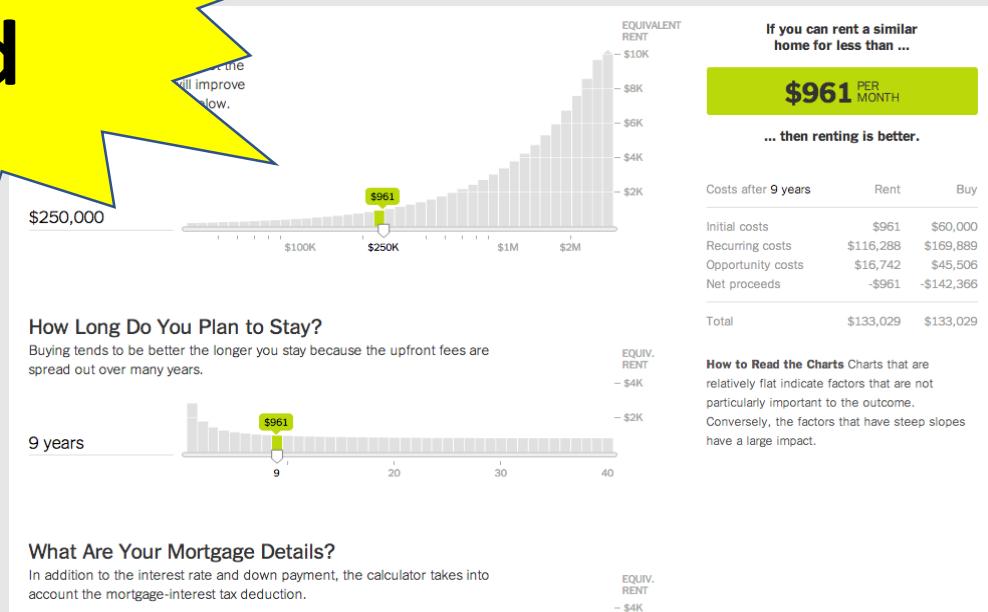
Suppose there are two departments: one easy, one hard ('hard' as in 'hard to get into'). The sliders below set what percentage each gender applies to the easy department. Both departments prefer women, but if too many women apply to the hard one, their acceptance rate drops below the men's.



Number of Verifications in 14 Specialty Areas of Neurological Care



Good



What is the average salary?

Average salary: Data Scientist

Malaysia / Skill/Specialty / Skill: Big Data Analytics Salary

Average Salary for Skill: Big Data Analytics

Salary Bonus Popular Tallies

By Job By Years Experience By Company Size By City By Certification

By Industry More

Skill: Big Data Analytics Median Salary by Job



Singapore / Skill/Specialty / Skill: Big Data Analytics Salary

Average Salary for Skill: Big Data Analytics

Salary Bonus Popular Tallies More

By Job By Years Experience By Company Size By City By Certification

By Industry More

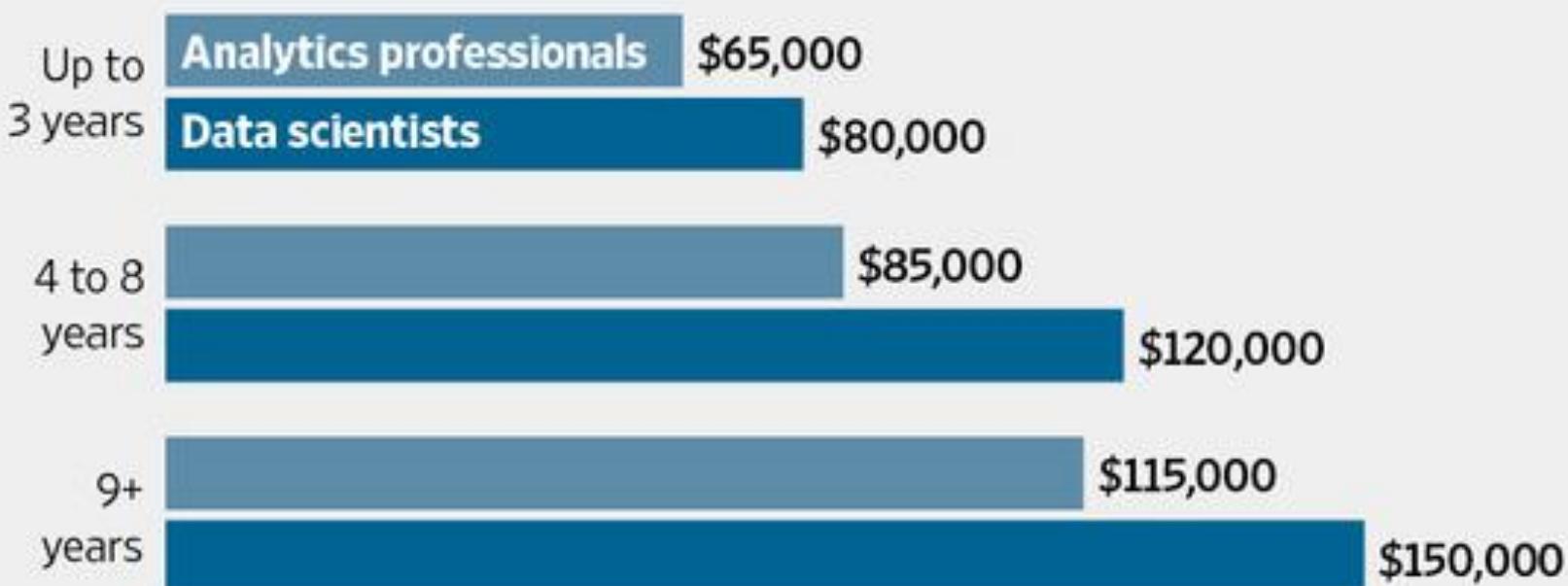
Skill: Big Data Analytics Median Salary by Job



Pays well

Big Data, Big Paycheck

Median salary for analytics professionals and those specifically within data science, by level of experience.



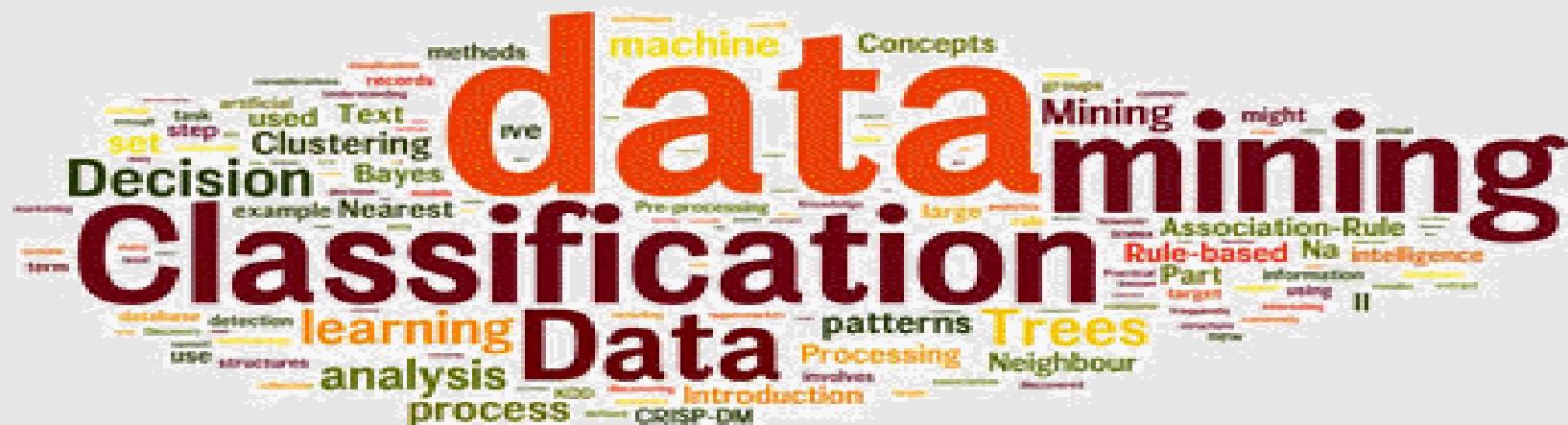
Note: Data do not include managers Source: Burtch Works

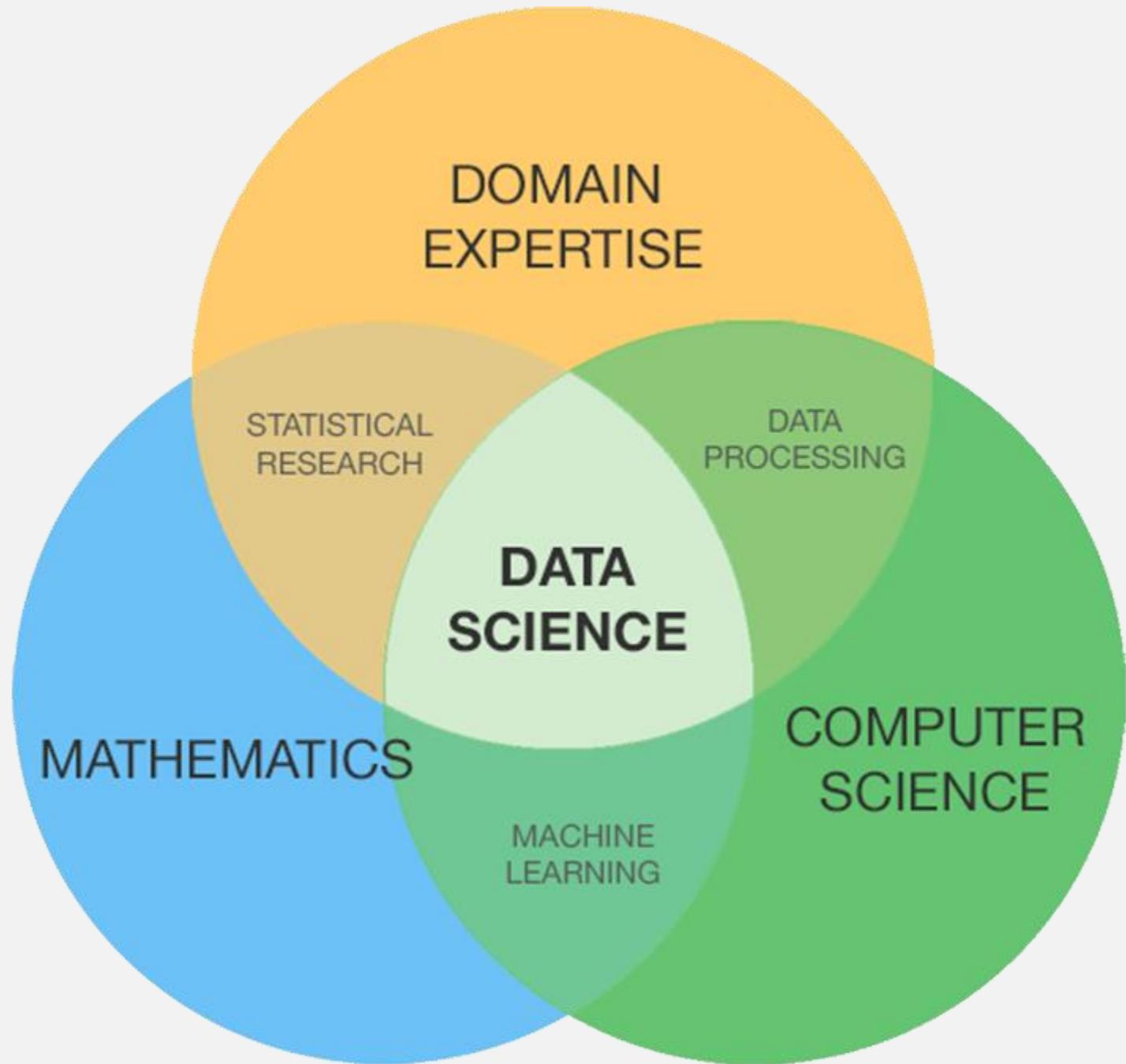
The Wall Street Journal

What is data science?

Data Science

- Data science is as an evolutionary step in interdisciplinary fields like business analysis that incorporate computer science, modeling, statistics, analytics, and mathematics.
 - At its core, data science involves using automated methods to analyze massive amounts of data and to extract knowledge from them.
 - Drawing insight from a piece of data involves understanding how it fits into the larger picture of an organization,





Where do I begin?

Massive Open Online Course (MOOC)

- [The Center of Applied Data Science](#) (MDEC & HRDF)
- John Hopkins University – [Data Science Specialization](#)
- University of Washington - [Data Science at Scale Specialization](#)
- [Data Analyst Nanodegree](#) - Udacity
- [CSCI E-109 Data Science](#) (Harvard Extension School)
- [Machine Learning](#) - Stanford University
- [Microsoft Professional Program for Data Science](#)
- And many more.....

BDA Undergraduate & Postgraduate Programmes

Undergraduate

- Multimedia University – Bachelor of Computer Science (Data Science Specialization)
- Sunway University - BSc (Hons) Information Systems (Business Analytics)
- Universiti Teknologi Malaysia (UTM), International Islamic University Malaysia, Monash University, University Institute Technology Mara (UiTM) & University Teknologi Petronas (UTP) **and many more!!**

Postgraduate

- [Big Data Analytics Post Graduate Programme](#)

Hackathons, Communities & Social Media

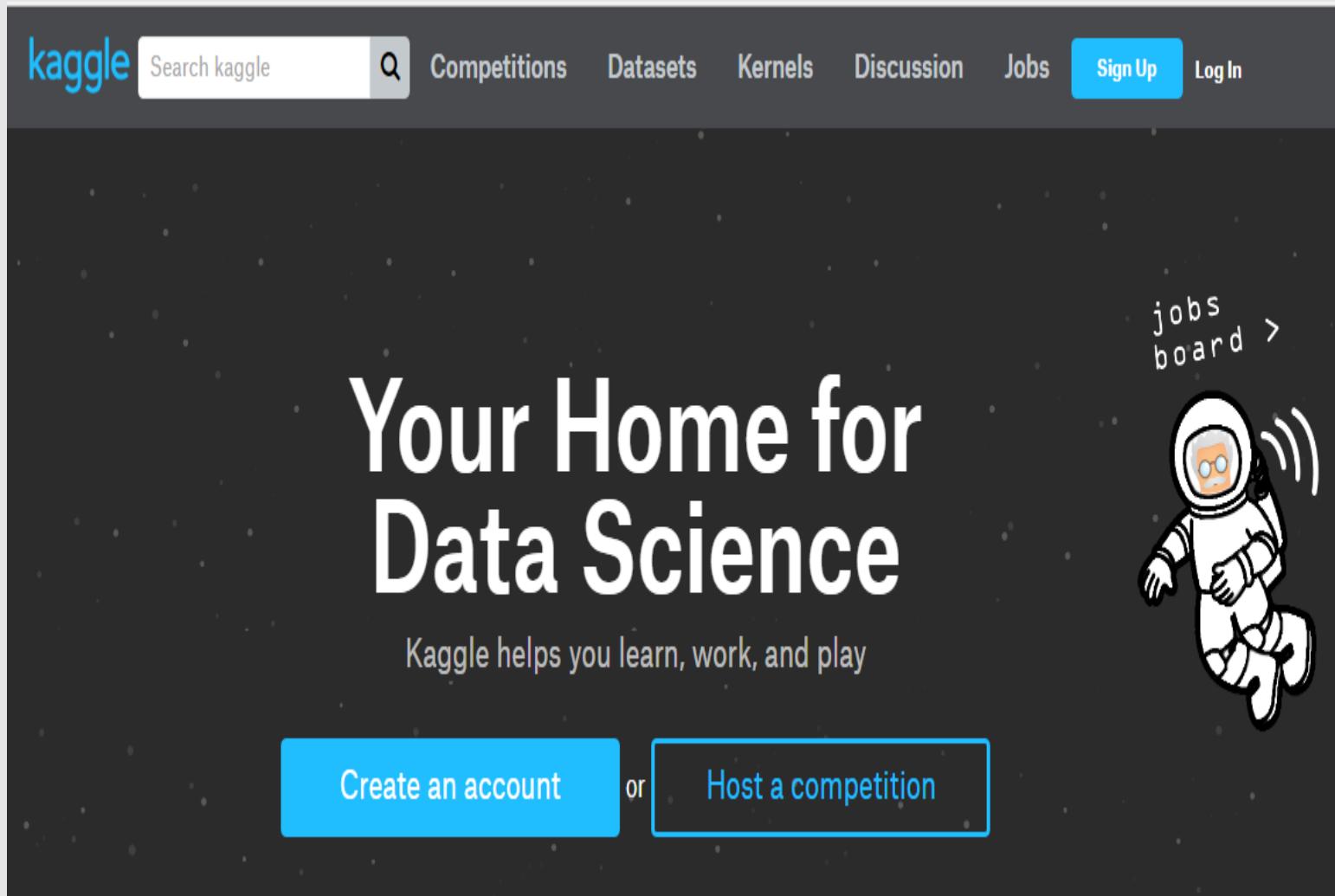
- Take part in hackathons, it is an agile way to improve your skills
- Participate in communities and user groups
- Read [Quora](#), [Reddit](#) and [StackOverFlow](#)
- Follow open source project in [github](#)
- Get yourself updated with the latest updates via Twitter/Google+



Where can I find the data?

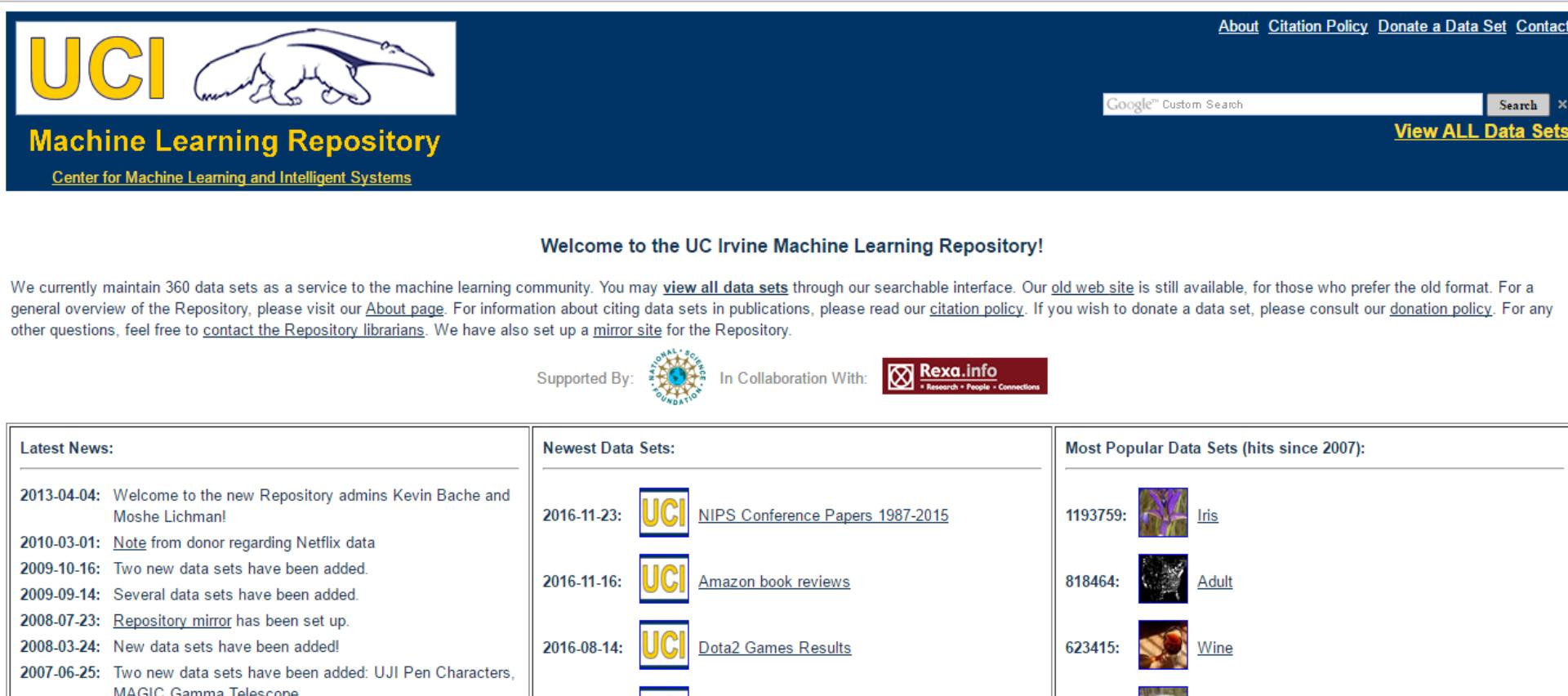
Kaggle

- Data sets, real problems, in unprocessed manner.
- Recommend to go through past competitions.
- Read through the forums with particular competitions to find out useful discussion and tips/hints that will be useful for solving future problems.
- <https://www.kaggle.com/>



UC Irvine Machine Learning Repository

- 360 data sets as a service to the machine learning community
<http://archive.ics.uci.edu/ml/>



The screenshot shows the homepage of the UC Irvine Machine Learning Repository. At the top left is the UCI logo with a stylized anteater icon. To its right are links for "About", "Citation Policy", "Donate a Data Set", and "Contact". Below these are search fields for "Google Custom Search" and a "View ALL Data Sets" link. The main content area features a "Welcome to the UC Irvine Machine Learning Repository!" message, information about maintaining 360 data sets, and logos for National Science Foundation and Rexa.info. Three sidebar boxes at the bottom provide news, newest datasets, and most popular datasets.

Welcome to the UC Irvine Machine Learning Repository!

We currently maintain 360 data sets as a service to the machine learning community. You may [view all data sets](#) through our searchable interface. Our [old web site](#) is still available, for those who prefer the old format. For a general overview of the Repository, please visit our [About page](#). For information about citing data sets in publications, please read our [citation policy](#). If you wish to donate a data set, please consult our [donation policy](#). For any other questions, feel free to [contact the Repository librarians](#). We have also set up a [mirror site](#) for the Repository.

Supported By:  In Collaboration With: 

Latest News:	Newest Data Sets:	Most Popular Data Sets (hits since 2007):
<p>2013-04-04: Welcome to the new Repository admins Kevin Bache and Moshe Lichman!</p> <p>2010-03-01: Note from donor regarding Netflix data</p> <p>2009-10-16: Two new data sets have been added.</p> <p>2009-09-14: Several data sets have been added.</p> <p>2008-07-23: Repository mirror has been set up.</p> <p>2008-03-24: New data sets have been added!</p> <p>2007-06-25: Two new data sets have been added: UJI Pen Characters, MAGIC Gamma Telescone</p>	<p>2016-11-23:  NIPS Conference Papers 1987-2015</p> <p>2016-11-16:  Amazon book reviews</p> <p>2016-08-14:  Dota2 Games Results</p>	<p>1193759:  Iris</p> <p>818464:  Adult</p> <p>623415:  Wine</p>

Open data

- Open data from various countries
- Malaysia - <http://www.data.gov.my/>
- Singapore - <https://data.gov.sg/>



MODERN DATA SCIENTIST

Data Scientist, the sexiest job of 21th century requires a mixture of multidisciplinary skills ranging from an intersection of mathematics, statistics, computer science, communication and business. Finding a data scientist is hard. Finding people who understand who a data scientist is, is equally hard. So here is a little cheat sheet on who the modern data scientist really is.

MATH & STATISTICS

- ★ Machine learning
- ★ Statistical modeling
- ★ Experiment design
- ★ Bayesian inference
- ★ Supervised learning: decision trees, random forests, logistic regression
- ★ Unsupervised learning: clustering, dimensionality reduction
- ★ Optimization: gradient descent and variants

PROGRAMMING & DATABASE

- ★ Computer science fundamentals
- ★ Scripting language e.g. Python
- ★ Statistical computing package e.g. R
- ★ Databases SQL and NoSQL
- ★ Relational algebra
- ★ Parallel databases and parallel query processing
- ★ MapReduce concepts
- ★ Hadoop and Hive/Pig
- ★ Custom reducers
- ★ Experience with xaaS like AWS

DOMAIN KNOWLEDGE & SOFT SKILLS

- ★ Passionate about the business
- ★ Curious about data
- ★ Influence without authority
- ★ Hacker mindset
- ★ Problem solver
- ★ Strategic, proactive, creative, innovative and collaborative



COMMUNICATION & VISUALIZATION

- ★ Able to engage with senior management
- ★ Story telling skills
- ★ Translate data-driven insights into decisions and actions
- ★ Visual art design
- ★ R packages like ggplot or lattice
- ★ Knowledge of any of visualization tools e.g. Flare, D3.js, Tableau

Take away

- There is a huge demand of data professional now
- A data scientist is a new professional with a combination of multiple skillsets
- There are many ways to get yourself on the path to be a data scientist
- Lastly, there is a saying that goes, “Do what makes you **happy**” is wrong!. Instead,
“Do what makes you **great!**”

Thanks!

Questions?



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