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Instituto Brasileiro de Geografia e Estatística

Educating Professional Statisticians: Some thoughts from Brazil

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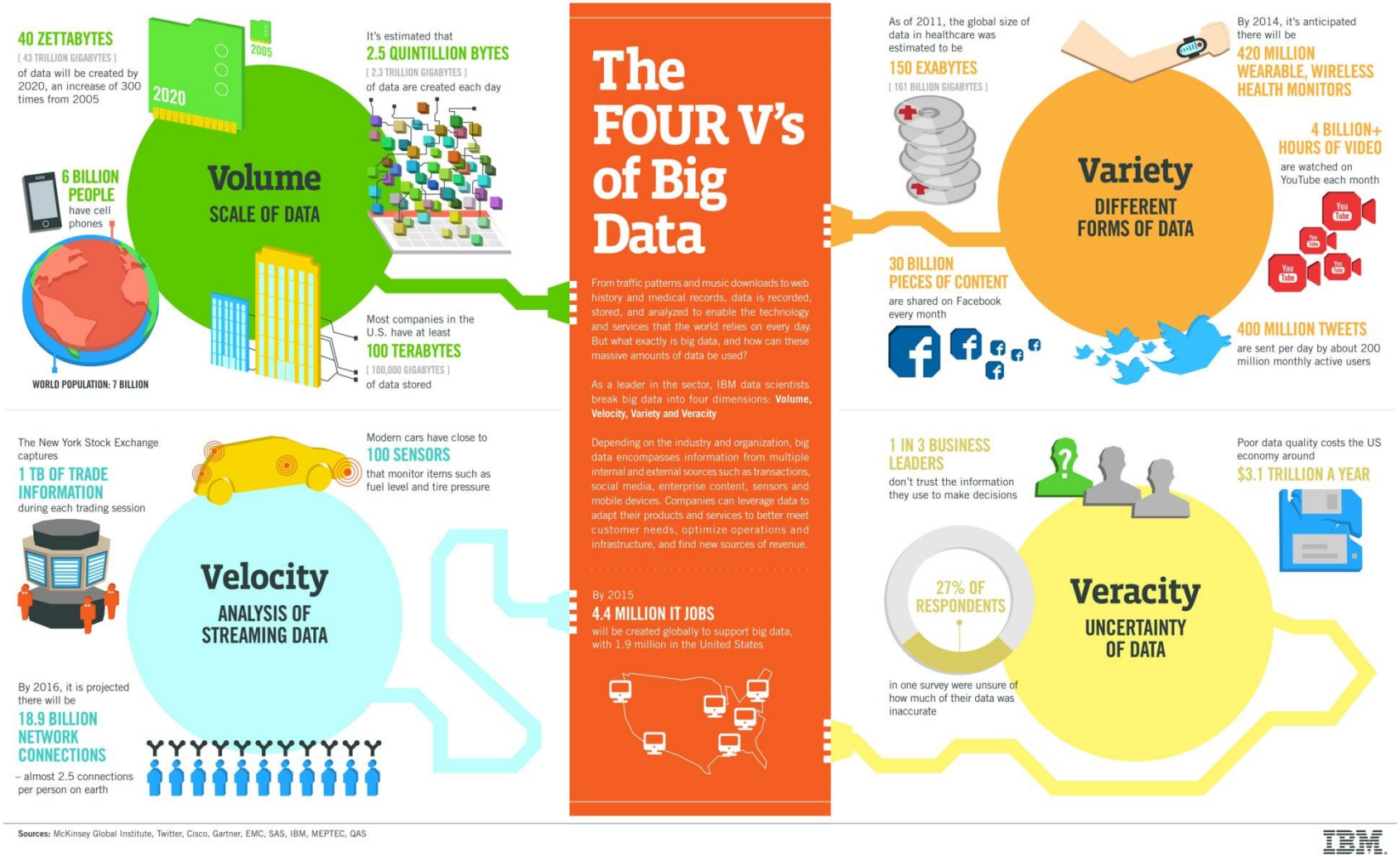
The Profession & The Challenges

Big data and the associated revolution in data availability, accessibility, speed of production and pressure to ‘do something’ with the available data.



Source:

http://www-01.ibm.com/software/data/bigdata/

The Profession & The Challenges

Modern approaches where the ‘art and science’ of data analysis, modeling and inference are being built up into software:

- Machine learning;
- **Artificial intelligence**;
- **Data mining;**
- Etc.

The Profession & The Challenges

Rapidly evolving software, which aims to be less dependent on the skills of the users;

Source:
http://www.youngandprosperous.com/2010/09/fear-of-automation/

The Profession & The Challenges

- **Increasing costs** of traditional in-person education.
- **Fast evolution** of methodology and technology, demanding time and effort to keep up with the developments.
- Ever **wider areas of application** of Statistics with their own dialects and promotion of 'DIY' by users:
  - Often lacking broader statistical education,
  - but using complex and specialized statistical tools (models , methods and software) relevant to their fields.

Professional Education (in Brazil)

Three levels of higher education:

- BSc (4 years) – 34 institutions
- MSc (2 years) – 9 institutions
- Doctorate (4 years) – 7 institutions

Two main routes for statistical education:

- **BSc. in Statistics**
- Undergraduate degree in other areas + graduate degree in Statistics

Skills Guidelines (2008)

- Scientific culture
- Communication skills
- Design & planning for data collection & measurement
- Data organization and processing
- Numerical and graphical synthesis of data
- Statistical modelling and analysis
- Proposing decisions based on data analysis
- Critical capacity & ability to work in multidisciplinary teams
- Managerial ability

http://portal.mec.gov.br/cne/arquivos/pdf/2008/rces008_08.pdf

Professional Education (in Brazil)

BSc degrees, offered mostly by public institutions (federal or state universities).

'Traditional' educational approach:

- First teach (lots of) maths;
- Then probability & mathematical statistics;
- Then teach modelling & methods (linear models, design of experiments, time series, multivariate analysis, etc.);
- Not enough computing; not enough practice…

Table 1 – Some data for Statistics Undergraduate Degrees – Brazil, 2013

Item	Number
Places offered	1.798
Demand	13.667
Intake	1.572
Enrollment	4.796
Graduates	448
Demand / Place	7,6
Graduates / Place	24,9%
Source: INEP	

Undergraduate Assessment

- Exam carried out in 2012 with BSc. graduates.
- Exam covered core curriculum topics described on national undergraduate guidelines.
- 20 institutions participated.
- 17 out of 20 institutions got average grades below 60%!

ASA Guidelines for Undergrad. Majors

- Key points:
  - Increased importance of data science.
  - Real applications + more practice.
  - More diverse models and approaches.
  - Ability to communicate.

http://www.amstat.org/education/curriculumguidelines.cfm

- These imply the need to rethink the curriculum as well as the modes of teaching / learning.

‘Professional Statistician’

- Getting more and more difficult to define.
- Challenges from emerging ‘areas’ / trends:
- Implications for job naming:
  - Data Scientist;
  - Data Analytics Consultant;
  - Digital Data Analyst;
  - Research / Marketing Web Analyst;
  - Research Statistician and Data Manager;
  - Etc.

Professional Statisticians

- Why look at accreditation: for a definition of what is required to become a ‘Professional’ (US) or ‘Chartered’ (UK) Statistician.
- **Accreditation** is offered in some countries.
- US and UK adopt **voluntary** accreditation schemes.
- Brazil adopts **compulsory** accreditation.
- Accreditation based solely on completion on BSc. Degree in Statistics!

PStat® Scheme in the US

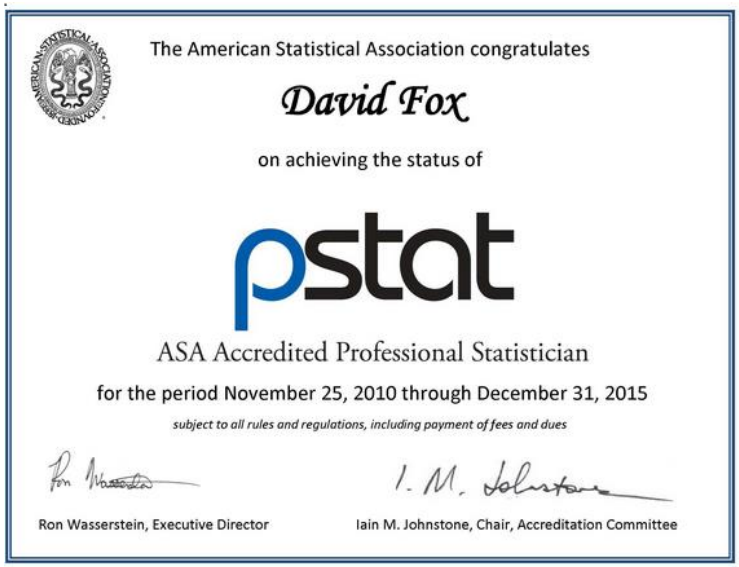
- **PStat® scheme** requires **peer recognition** that applicants have:
  - **Statistical training and knowledge** (MSc. or PhD.);
  - **Experience** in applying the expertise competently (> 5 years since graduating);
  - Maintenance of appropriate **professional development**;
  - Agreement to abide by professional **code of ethics**;
  - **Ability to communicate effectively**.

Source:

https://www.amstat.org/accreditation/pdfs/Guidelines_for_ASAVoluntary_Professional_Accreditation.pdf

PStat® Educational Requirements

- Advanced degree in Statistics or related quantitative field, with sufficient concentration of Statistics.
- Field may include mathematical or applied Statistics, or major application areas, such as Biostatistics.


The American Statistical Association congratulates

David Fox

on achieving the status of

pstat

ASA Accredited Professional Statistician

for the period November 25, 2010 through December 31, 2015

subject to all rules and regulations, including payment of fees and dues

Ron Wasserstein, Executive Director

Iain M. Johnstone, Chair, Accreditation Committee

GStat® Scheme in the US

- **GStat® scheme** is the entry level of accreditation created by ASA.
- A Graduate Statistician is an individual who has achieved the educational level required for full Professional Statistician status, but has not yet reached the level of experience and expertise required of a Professional Statistician (PStat®).
- Source:

  http://community.amstat.org/blogs/ronald-wasserstein/2014/03/24/asa-at-175-gstat-accreditation

Professional Statistical Experience

- Undertaking statistical analysis of data and reporting on the results;
- Having responsibility for the interpretation and presentation of statistical information;
- Leading projects with a substantial amount of statistical analysis or modelling;
- Teaching statistics based on practice;
- Work/consulting/collaboration and any resulting teaching of statistics for a field of application;

Professional Statistical Experience

- Working as a statistical consultant;
- Carrying out and implementing research to develop new methods to solve significant applied statistical problems;
- Taking responsibility for the design and analysis of statistically based surveys (or experiments);
- Managing a statistics section with work in one or more of the above areas;
- Generally recognized as having made a substantial contribution to the sound practice of statistics.

Professional Competence

Evidence that work as an applied statistician is of high quality, by demonstrating:

- Substantial positive impact on decision making;
- Appropriately applied methods and techniques;
- Adequate discussion of limitations of the data, methods, techniques;
- Proper attention to accuracy, reliability, relevance, reproducibility and transparency;
- Recognition of applied work by peers.

Some ideas for improving undergraduate programs

Directions for Change

- More flexible curricula, enabling stronger connections to particular fields of application;
- Less compulsory maths courses;
- Increased opportunities for statistical practice;
- Increased emphasis on computing and data management skills;
- Exposure to modern ‘Data Science’ topics not covered in traditional statistical education;
- Develop and practice communication skills.

Source: Horton (2015).

After graduating, how to ‘keep fit’?

Some approaches to ‘keep fit’

- Read, listen, reach out
- Present and discuss your work
- Write-up your work
- Develop and teach courses
- Supervise, mentor junior colleagues
- Attend conferences
- Join professional or academic society
- Take courses
- Consider distance learning opportunities
- Consult & collaborate

Read, listen, reach out

- Lots going on ‘around’ Statistics.
- Read frequently.
- Read outside of your own area of expertise.
- Review work of others (refereeing, etc.).
- Attend seminars / talks / conferences in other areas, not only in ‘Statistics’.
- Join ‘study groups’ or ‘learning communities’.

Present and discuss your work

- Make sure that you present and discuss your work with peers and with ‘users’.
- Good presentations always raise good questions and discussion, which can lead to improvement and learning.
- They also create opportunities for legitimate challenges to be identified.

Write-up your work

- Make sure that you write-up your work.
- Writing-up helps focus on the important ideas, concepts, methods and results.
- It is also essential to get it more thoroughly reviewed.
- Another good way of creating opportunities for legitimate challenges to be identified.
- Organizations may help with policies on writing and reviewing.

Develop and teach courses

- Teaching a course is a fantastic opportunity to learn / consolidate knowledge.
- It helps you to revisit the topics of the course, broaden your own knowledge.
- It also raises opportunities for questions, which you may use to learn more.
- Make sure your teaching is assessed and take notice of the outcome and comments.
- Organizations may assist with policies to encourage continued professional education.

Supervise, mentor, junior colleagues

- Supervising or mentoring the work of others also provides opportunities for learning.
- When possible, engage formally in such activities.
- Example: joint appointments.
- Mentoring is also great to keep abreast of new trends and perceptions prevailing with the younger generations.

Attend conferences

- Plan for and invest in attending professional conferences.
- They enable opportunities for concentrated exposure to what's going on and novelties.
- Use them to plan your forthcoming personal development activities, by defining priority areas or topics.
- Exploit their networking opportunities to engage in the other learning activities.

Join a professional society

- Professional & academic societies facilitate all of the above mentioned activities.
- Yet not all professionals join or take part.
- The cost of joining societies is modest, for the services they provide.
- They offer a convenient and focused approach to networking and to be involved.
- They also provide many opportunities for continued education.

Take courses

- Formal courses are a good source of learning.
- They have the benefit of structure and a natural learning community.
- They may lack the precise focus you need.
- But they will help you focus on learning for a well defined period of time.
- They also help with record keeping.

Distance learning

- A powerful new approach for learning (and teaching) Statistics (and many other things).
- Challenge: Statisticians must be more pro-active in the learning process.
- Opportunity: Distance learning makes it possible to learn from the best.
- It enables continued education both at home or at the workplace.

Statistical software

- Professional statisticians must be proficient in at least one major statistical software.
- R seems the current best possible choice.
- Because it is free and open source, in theory you can use it ‘wherever you are’, ‘forever’.
- What if you don’t know R yet?
- Here is a good opportunity to start those plans and actions toward learning something.

Consult & collaborate

- Consulting and collaborating is another good approach to learn.
- You will face new problems.
- You will often need to learn something new to be able to tackle the problems.
- Even if you can solve a problem with the tools you know, you will have learned something about their use in each situation.

Thank you for your attention!

Professional Development

- PStat ® accreditation requires **maintaining competence** in the chosen area of statistical practice.
- Must complete at least **60 hours** of professional development **each year**.
- Must keep and submit records of professional development activities to apply for renewal of accreditation (**every 5 years**).

➔ Accreditation is NOT permanent.

Professional Development

- What counts towards professional development:
  - Work-based learning;
  - Professional activity;
  - Formal / educational activities;
  - Self-directed learning;
  - Other (??).
- Professionals must have activities in at least three of the categories above.

Save and invest in ‘keeping fit’

- Each professional should take control of their continued professional education.
- Saving and investing in your own continued development does not depend on others.
- Employers may help, but you should not rely solely on others for this.
- Programme your savings, keep to the plan.
- Then enjoy the ‘freedom’ to invest in what you find most profitable or effective.

Societies and what they can do

- Promote the idea that continued professional development is essential.
- Offer all the current activities and innovate to keep up with times.
- Facilitate engagement of professionals from the earliest stages of their education / career.
- Provide focal point for continued professional development.

Employers and what they can do

- Promote the idea that continued professional development is essential.
- Encourage / support activities that lead to continued professional development.
- Invest in the promotion of CPD for their staff.
- Engage with their staff in planning and implementing their CPD.

Teachers and what they can do

- Lead by example.
- Formally discuss ideas of how one can and should take charge of their own CPD.
- Demonstrate the importance of `keeping fit` for a profession that depends heavily on technology and methodology.
- Promote the attitude and develop the skills needed for independent learning.

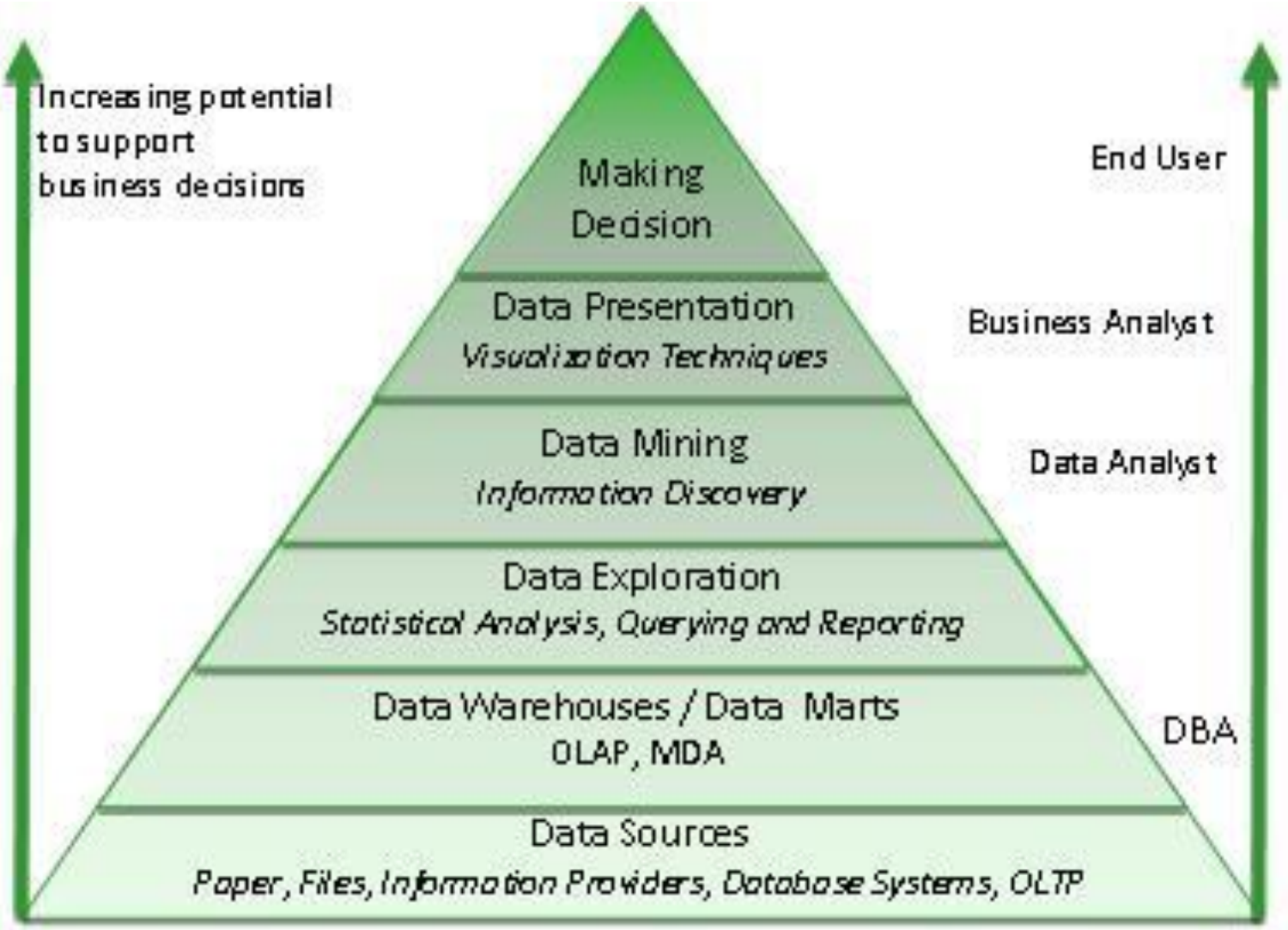
Above All

- Develop an attitude to learn continuously.
- After all, who can say that what he/she learned at University will suffice for doing Statistics professionally after 20 years?

Source: my ICOTS7 presentation in Salvador.

Source:

http://reason.cs.uiuc.edu/jaesik/research/probabilistic-artificial-intelligence-lab/



Source:

http://www.ppdm.org/wiki/index.php/Data_Mining

Data Scientist

London, GB-LND | **Competitive Salary**

theguardian

Guardian News & Media Ltd. is one of the most successful and innovative media organisations in the world, renowned for leading edge journalism, product and commercial development, and famous for nurturing talented individuals. The Guardian is committe

All jobs from: GUARDIAN NEWS AND MEDIA

Data Analysts

1 day left

Northern Quarter, Manchester City Centre |
£18K - £35K dependent on experience

Lots of Data Nerds Analysed! Morris Hargreaves McIntyre, award-winning international consultancy in the cultural sector, seeks data analysts to join its talented team. Rapid expansion and a growing client base means we have a lot of data to analyse.

Employer: MORRIS HARGREAVES MCINTYRE ★ Add to Shortlist

Lead Data Scientist- Media Analytics

London | **£36000 - £39000 per annum**

One of the market leaders in media analytics is recruiting a lead data scientist to help them bring analytics to life for their clients and to eventually become a data guru for the agency.

Data Mining Manager - Weymouth

Weymouth, Dorset | **£35,373 PA**

Counter Fraud Skills are currently seeking a Data Mining Manager to work in a permanent role based in Weymouth.

Employer: COUNTER FRAUD SKILLS ★ Add to Shortlist

Insight Analyst

London
£26,000 - £32,000 per annum + Excellent benefits

Are you a highly skilled Data Analyst with experience in delivering insights and analytical solutions? Do you use analytics to influence and improve marketing strategies?

Statistical/ Analytical Modeler

Dublin | **Negotiable**

LexisNexis

Statistical Modeler - Based in central Dublin This position exists to provide consulting/advisory services and to conduct statistical analysis and build predictive models for a variety of performance outcomes such as risk, fraud, and collections for one o

All jobs from: LEXIS NEXIS ★ Add to Shortlist

Research/ Marketing Web Analyst

Working for this international client to **provide data, reports and analysis** to inform the strategic decision making.

The role will focus on the **provision and analysis of marketing, web and usage data and analytics**.

The Guardian

http://jobs.theguardian.com/st/jobs-analytics.html

Captured on 6/Jul/2014.

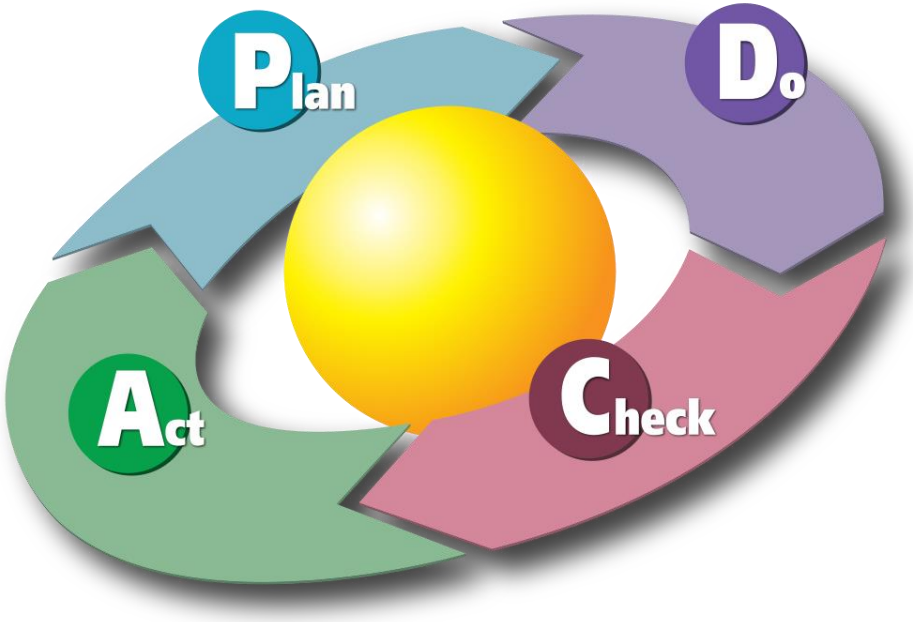
Job searches on Google

Search terms	Hits (Thousands)
job statistician	4.220
statistics jobs	548.000
jobs in statistics	746.000
analytics jobs	74.800
job analytics	187.000
jobs in analytics	171.000
jobs data mining	136.000
jobs in data science	479.000
jobs big data	837.000

Searched on 7/7/14.

Some tools which can be used

- PDCA cycle
  - Plan, develop, check/assess, adjust/review.



- Apply to personal development strategy.

Period		Activity								
		Read, listen, reach out	Present and discuss your work	Write-up your work	Develop and teach courses	Supervise, mentor colleagues	Attend conferences	Join a professional or academic society	Take courses	Consult & collaborate
2014	Jan				Analysis of complex survey data	PhD Thesis A. Gutierrez		ISI, IASS, ABE, ASA, RSS,		
	Feb									
	Mar		Methodology Dept. Seminar	Survey on Cardiovascular Risk in Adolescents	Introd. Stats for Journalists					Survey on Cardiovascular Risk in Adolescents
	Apr			Household Survey of Drug Consumption						Household Survey of Drug Consumption
	May		Seminar São Carlos							
	Jun			Survey of lan houses						Survey of lan houses
	Jul					BSc Mon. H. Souza	ICOTS9, SINAPE			
	Aug				Data Editing & Imputation	MSc diss. R. Caumo	JSM			
	Sep				Analysis of complex survey data					
	Oct									
	Nov				Designing Surveys for Policy Evaluation		ISI Regional Conf. Malaysia			
	Dec									