Business Analytics (B.Sc.)
Degree Programme

From Data to Better Business Decisions
Business Analytics (B.Sc.)
Degree Programme

Associate Prof. Goh Khim Yong
Department of Information Systems
School of Computing
What is Business Analytics?

Can You Live Without a Data Scientist?
by Tom Davenport | 11:00 AM September 26, 2012

How Obama's data crunchers helped him win - CNN.com
By Michael Scherer
November 7, 2012 -- Updated 21:43 GMT (05:43 HKT) | Filed under: Web

Math Will Rock Your World
A generation ago, quants turned finance upside down. Now they're mapping out ad campaigns and building new businesses from mountains of personal data

Social Networks Can Affect Voter Turnout, Study Says
By JOHN MARKOFF | SEPT. 12, 2012

Today is Election Day
Find your polling place on the U.S. Politics Page and click the "I Voted" button to tell your friends you voted.

For Today's Graduate, Just One Word: Statistics

August 6, 2009 The New York Times
What is Business Analytics?

…the intersection of business, computing & data

to improve financial performance, operational efficiency and strategic advantage

in EVERY sector, in EVERY economy, in EVERY organisation.
What is Business Analytics?

- Google Flu Trends

**Using Google to Monitor the Flu**

Google Flu Trends can estimate the spread of the disease by measuring the frequency of certain search terms. Its findings closely track actual C.D.C. data and can, at times, anticipate the government reports.

Flu-related Google search

Flu incidences by US CDC

Healthcare system advisory, planning & optimisation
What is Business Analytics?

- Twitter Tweets and Social-Mobile Advertising

World Cup 2014 Semi-Final: Brazil vs. Germany

- 580,166 tweets per minute

- 35.6M tweets, most-discussed sporting event ever on Twitter

- Total revenue (2nd qtr 2014)
  US$312.2M

- Mobile ad revenue (2nd qtr 2014)
  US$224.0M
What do BA Professionals Do?

Stage 1: Reporting
Stage 2: Analysis
Stage 3: Prediction
Stage 4: Operationalize
Stage 5: Activate

WHAT happened?
WHY did it happen?
What WILL happen?
What IS happening?
Take action!

Pre-Defined Queries | Ad-Hoc Queries | Analytical Modeling | Tactical Queries | Automated Decisions
What do BA Professionals Do?

- A Day in the Life of a Data Scientist
Skill Categories for Business Analytics

- **Manipulate, integrate and analyse big data**
- **Domain knowledge and skills to develop right questions, determine which data is important**

- **Mathematics, statistics and computer science to develop analytics algorithms**
- **Executive and management skills to know when and how to use data for making decisions**

- **Develop tools to mask the complexity of data and analytics to lower skill boundaries**
- **Visualisation skills to interpret data and present in meaningful ways**
How BIG is the Big Data Market?

90.0% Fortune 500 companies are likely to have big data initiatives

1,500,000 Data-savvy managers are needed by 2018 to capably exploit data for strategic business decisions

$114 billion Total industry market value for big data hardware, software and services by 2018
What You Will Learn in Business Analytics

- Mathematics & Statistics
- Computing
- Business
- Data & Methods
What You Will Learn in Business Analytics

- Matrix Algebra & Applications
- Linear Algebra
- Calculus for Computing
- Probability
- Mathematical Statistics
- Regression Analysis
- Statistical Methods for Finance
What You Will Learn in Business Analytics

Programming Methodology
Data Structures and Algorithms
Strategic IT Applications
E-Business Essentials
IT and Decision Making
Computational Methods for Business Analytics
Business Intelligence Systems
What You Will Learn in Business Analytics

- Financial Accounting
- Principles of Economics
- Operations Research
- Applied Market Research
- Economics of E-Business
- Forecasting for Managerial Decisions
- Dynamic Pricing and Revenue Management
What You Will Learn in Business Analytics

Data & Methods

Data-Driven Marketing
Search Engine Optimization and Analytics
Healthcare Analytics
Big Data Techniques and Technologies
Mining Web Data for Business Insights
Social Media Network Analysis
Data Mining
Degree Educational Philosophy

• Inter-disciplinary foundation of BA curriculum
  – Multi-disciplinary approach that transcend disciplinary borders across humanities, social sciences, science and mathematics

• Industry-linked internships, capstone & final-year projects
  – Experiential learning beyond classrooms through engaging in projects and self-directed learning in a constructive and responsible approach with resourceful and enterprising spirits

• Overseas industry attachment and student exchange programmes
  – Global education and experiential learning to develop sense of global citizenship and unique Singapore or Asian identities
Structure and Curriculum

- **Four-year direct honours** Bachelor of Science (Business Analytics) degree programme

- **Core modules** in 1\textsuperscript{st} and 2\textsuperscript{nd} years of study
  - Common modules at level 1000/2000 = 64 MCs
  - Common modules at level 3000/4000 = 20 MCs
  - Internship = 12 MCs

- **Common two-year** broad-based inter-disciplinary curriculum where all students will read modules in
  - Mathematics, Statistics, Economics, Accounting, Marketing, Decision Science, Industrial and Systems Engineering, Computer Science and Information Systems
Structure and Curriculum

• **Elective modules** in 3rd and 4th years of study
  – **Functional modules**: marketing, retailing, logistics, healthcare, etc.
  – **Methodological modules**: big data techniques, statistics, text mining, data mining, social network analysis, econometrics, forecasting, operations research, etc.
  – B.Sc. Dissertation (optional)

• **160 MCs** requirement for graduation are broken down as
  – Core modules = 96 MCs (21 modules x 4 MCs + Internship 12 MCs)
  – Elective modules = 24 MCs (6 modules x 4 MCs)
  – ULR (University level requirements) = 20 MCs
  – UE (Unrestricted electives) = 20 MCs
• Newly designed BA modules are
  – BT1101 Introduction to Business Analytics
  – BT2101 IT and Decision Making
  – BT3101 Business Analytics Capstone Project
  – BT3102 Computational Methods for Business Analytics
  – BT4211 Data-Driven Marketing
  – BT4212 Search Engine Optimization and Analytics
  – BT4221 Big Data Techniques and Technologies
  – BT4222 Mining Web Data for Business Insights
## Sample Study Plan

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Semester 3</th>
<th>Semester 4</th>
<th>Semester 5</th>
<th>Semester 6</th>
<th>Semester 7</th>
<th>Semester 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA1311 or MA1101R</td>
<td>MA1521 or MA1102R</td>
<td>ST2131 Probability</td>
<td>ST2132 Mathematical Statistics</td>
<td>ST3131 Regression Analysis</td>
<td>BT3101 Business Analytics Capstone Project</td>
<td>BT4101 B.Sc. (BA) Dissertation</td>
<td>BT4101 B.Sc. (BA) Dissertation</td>
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<tr>
<td>BT1101 Introduction to Business Analytics</td>
<td>IS1112 E-Business Essentials</td>
<td>BT2101 IT and Decision Making</td>
<td>IS2101 Business and Technical Communication</td>
<td>BT3102 Computational Methods for Business Analytics</td>
<td>IS4240 Business Intelligence Systems</td>
<td>PE3</td>
<td>PE6</td>
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<tr>
<td>IS1103 Computing and Society</td>
<td>IS1105 Strategic IT Applications</td>
<td>MKT1003X Marketing</td>
<td>EC1301 Principles of Economics</td>
<td>DSC3215 Stochastic Models in Management</td>
<td>PE1</td>
<td>PE4</td>
<td>UE4</td>
</tr>
<tr>
<td>CS1010 Programming Methodology</td>
<td>CS1020 Data Structures and Algorithms I</td>
<td>IE2110 Operations Research I or ULR3</td>
<td>DSC3214 Introduction to Optimisation or ULR4</td>
<td>ACC1002X Financial Accounting</td>
<td>PE2</td>
<td>PE5</td>
<td>UE5</td>
</tr>
<tr>
<td>ULR1</td>
<td>ULR2</td>
<td>ULR3 or ULR4</td>
<td>ULR5</td>
<td>UE1</td>
<td>UE2</td>
<td>UE3</td>
<td></td>
</tr>
<tr>
<td>20 MCs</td>
<td>20 MCs</td>
<td>20 MCs</td>
<td>20 MCs</td>
<td>20 MCs</td>
<td>20 MCs</td>
<td>22 MCs</td>
<td>18 MCs</td>
</tr>
</tbody>
</table>
NUS, IBM set up Centre for Business Analytics

14 June 2013

Professionals and students looking for a leg up in their future career will be able to acquire value-added business skills at the new NUS Centre for Business Analytics being set up by NUS and IBM, with the support of Singapore Economic Development Board.

The Centre will address rising industry demand for making business sense out of massive quantity of data and incorporating the relevant intelligence. In its report about Asia Pacific IT spending, research firm Gartner predicted “big data” demand to hit 4.4 million jobs worldwide by 2015, and expected only one-third of those jobs to be filled.

The Centre for Business Analytics will commence a new one-year Master of Science degree programme in Business Analytics (MSBA) from August this year. This will be the first in Singapore to offer in-depth business strategy thinking and data analytics.

NUS Business School and the School of Computing will jointly develop the curriculum to be taught by leading experts and faculty members. IBM will provide complementary industry support by appointing the Centre's Industry Director, as well as contributing its expertise to analytics technology and solutions.
Internships: Business Analytics Centre

- ANZ
  - Treasure Analytics for Enterprise Clients
  - Big Data, Big Output, Awareness: Perception and Reality in Accidents

- AXA
  - Car-Park Utilization Business Intelligence
  - Airport Communication Platform
  - CAG Enterprise Business Intelligence

- Changi Airport Singapore
  - Detecting Customer Sentiments and Early Feedback in Social Media
  - Cross-brand Targeted Marketing Analytics

- DBS
  - Finance-Close Process Re-engineering
  - Reserve Quantum Updates
  - Daily Market Developments

- IBM
  - Revenue Management for Maintenance Service
  - Small Deals Projection

- JLL
  - Analyzing Profitability of a Future Set Up and Current Competitor Details using ESRI

- Lenovo
  - Social Media Analysis (Listening Team)
  - Classification of Social Media Posts using Machine Learning

- Fortress
  - Volatility Monitoring Framework

- OCBC Bank
  - BOS Stress Test Model

- Singapore General Hospital SingHealth
  - Emergency Department Process Review to Reduce Waiting Times
  - Emergency Department and Hospital Re-admission within 72 Hours

- SPH
  - Subscriber Segmentation and Retention Analytics

- SingTel
  - WHOIS4TV (SingTel - MioTV Segmentation Profiling)

- StarHub
  - Detecting Customer Sentiments and Early Feedback in Social Media

- Unilever
  - Improving ROI from International Assignment program
  - Unilever vs Competitor Digital & Mobile Ad Spend
  - Competitive Marketing using Game Theory
  - Channel P&L Reporting

- WingTai Asia
  - Cross-brand Targeted Marketing Analytics
Internships: New Collaborations
Business Analytics Careers & Jobs

- Data Analyst
- Business Intelligence Analyst
- Marketing Analyst
- IT Business Analyst
- Data Scientist
- Web Analytics Consultant
- Management Consultant
- Project Manager (Business Analytics/Intelligence)
- Business Analytics Manager
- Director (Business Analytics & Planning)
- Chief Information Officer
Salary: Business Analytics Professionals

Admission Requirements

• For Polytechnic Diploma Holders:
  – Selected (on case-by-case basis) Polytechnic Diploma* or Polytechnic Diploma* with at least an A2 grade in GCE O level Elementary Mathematics or at least a B4 grade in GCE O level Additional Mathematics
    • *: Students without the relevant “A” level subject may need to take specified bridging modules (e.g., MA1301 Introductory Mathematics offered by the Faculty of Science).

• For “A” Level or IB Diploma Holders:
  – Pass in either GCE “A” H2 or IB HL level Mathematics
Your Choice or Decision?

Bachelor of Science
(Business Analytics)

School of Computing, Information Systems

Thank you!
Guest Speaker

Ms. Goh Sei Yi
Director, Talent Management

Mr. Vic Bui
SMB Data Analyst

Singtel-NUS Analytics Undergrad Scholarships:
http://info.singtel.com/about-us/careers/students

Eligible degrees:
1) Bachelor of Science (Business Analytics)
2) Bachelor of Computing (Information Systems)
SMB Analytics at Facebook
Past: Microsoft Singapore and nesto

Studied at National University of Singapore
Graduated in 2011
Bachelor of Computing in Information Systems

Exchange Study : Sweden

Internship : Microsoft, Facebook

U21 Undergraduate Research Conference - Universitas 21, 2012, Tokyo

Lee Kuan Yew Gold Medalist
Typical Data Science projects
Descriptive Analysis → Actionable results

Increase investment on the most effective acquisition channels.
Text mining – Prediction model

What is written in the post is essential to performance, but not very well understood…..
The top 400 words in terms of frequency of appearance

[Word cloud image]
## 18 common types of posts identified text-mining algorithm (k-means clustering)

<table>
<thead>
<tr>
<th>Cluster name (Post type)</th>
<th>Key words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q&amp;A</td>
<td>answer post time question facebook excla number we</td>
</tr>
<tr>
<td>Win a Prize!</td>
<td>win enter chanc competit number you excla prize</td>
</tr>
<tr>
<td>Closed on a Holiday</td>
<td>time number eventday close monady open sunday day</td>
</tr>
<tr>
<td>Fan on our Facebook Page</td>
<td>fan page number excla facebook we placeofinterest like</td>
</tr>
<tr>
<td>Discounts!</td>
<td>money number placeofinterest excla http you we store</td>
</tr>
<tr>
<td>Share a Photo</td>
<td>photo share we excla post you number week</td>
</tr>
<tr>
<td>Happy Holiday!</td>
<td>day happy eventday today you excla celebr question</td>
</tr>
<tr>
<td>Checkout Our Products Here</td>
<td>number money bit http prize year we when</td>
</tr>
<tr>
<td>What’s your Favourite ___?</td>
<td>favourit what question number excla you time we</td>
</tr>
<tr>
<td>Click Like!</td>
<td>click like win excla http money today day</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Cluster name (Post type)</th>
<th>Key words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congratulations Winner</td>
<td>winner congratul competit announc prize excla we email</td>
</tr>
<tr>
<td>Bitly Link</td>
<td>bit http number check week you special question</td>
</tr>
<tr>
<td>Weekend Plans</td>
<td>go weekend question who you excla day placeofinterest</td>
</tr>
<tr>
<td>Brand Information</td>
<td>brandnam number time placeofinterest call http check money</td>
</tr>
<tr>
<td>Like this Post</td>
<td>like hit you excla post question we number</td>
</tr>
<tr>
<td>Ticket to a Party</td>
<td>ticket number win placeofinterest email excla you we</td>
</tr>
<tr>
<td>What Question</td>
<td>what question weekend you long plan excla tell</td>
</tr>
<tr>
<td>General Question</td>
<td>question you excla who placeofinterest we number today</td>
</tr>
</tbody>
</table>
Combine with multi-variate regression model to determine Top 15 positive engagement rate influencers
Among all active pages, the average Messages/Page to advertising pages in TH is 18X more than in AU.

What happens?
Seller post items on his page. Buyer sees a post and messages via Facebook Messenger to buy. not buying through Website/Shopping Cart
Data Scientist Skill-sets

T-Shaped Skillset

Software Engineering
Business Acumen
Distributed Computing
Communication

Machine Learning,
Statistics, Domain Knowledge

https://www.facebook.com/careers/

- BA/BSc in Computer Science, Math, Physics, Engineering, Statistics or other technical field. Advanced degrees preferred.
- Fluency in SQL or other programming languages. Some development experience in at least one scripting language (PHP, Python, Perl, etc.)
- Ability to initiate and drive projects to completion with minimal guidance
- The ability to communicate the results of analyses in a clear and effective manner
- Basic understanding of statistical analysis.
- Preferred experience with a statistical package such as R, MATLAB, SPSS, SAS, Stata, etc.
- Preferred experience with an Internet-based company.
- Experience with large data sets and distributed computing (Hive/Hadoop) a plus.

* Ryan Orban @ zipfianacademy