Master in Applied Computer Science

http://www.vub.ac.be/en
Master in Applied Computer Science

“The MACS provides challenging learning opportunities with the scope to transform students with a Bachelor in Engineering or Applied Sciences into the next generation data science and data engineering experts.”

Open jobs asking for analytics skills in 2015

2.3M

Forecast of population with analytics skills by 2018

2.9M

Notes: US data only.


source: PwC
Master in Applied Computer Science

Data science and analytics skills, by 2021
How will employers fill the talent pipeline?

Student supply

Employer demand

23% of educators say all graduates will have data science and analytics skills.

69% of employers say they will prefer job candidates with these skills over ones without.

Base: Higher education: 127; Business: 63

Source: Gallup and BHEF, Data Science and Analytics Higher Education Survey (December 2016).

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MODERN DATA SCIENTIST

Data Scientist, the sexiest job of 21st 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 IaaS 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
Master in Applied Computer Science

- The MACS focuses on the design and engineering of computer-based smart systems, spanning the entire associated technology spectrum:
  - Hardware technologies, including, sensors, actuators, electronic and photonic devices
  - Advanced networking and internet-of-things systems
  - Data processing and management, including database systems and distributed computing;
  - Data analysis, including artificial intelligence and machine learning.
Specializations

**Smart Cities**
You will study logistics, mobility and IoT problems with a focus on finding sustainable solutions for smart cities.

**Digital Health**
You will learn how to adopt a multidisciplinary approach to health, biology and medicine, from a data-driven and a computational angle.

**Environmental Informatics**
You will learn how to perform analytics on diverse sensory data to address problems related to the climate, the water resources and the quality of air.

**Business Intelligence**
You will learn technologies and practices for the integration and analysis of business data that support business decision making.
Programme Overview

1st Year

Compulsory Courses (42 ECTS)
- Smart Cities (18 ECTS)
  - Mobility and logistics, embedded systems, wireless sensor networks
- Business Intelligence (18 ECTS)
  - Business aspects of software industry, Entrepreneurship, Business development
- Digital Health (18 ECTS)
  - Computational Biology and bioinformatics, medical informatics, machine learning
- Environmental Informatics (18 ECTS)
  - Land and climate dynamics, water Management and Modelling

2nd Year

Compulsory Courses (19 ECTS)
- Data Analytics, Distributed computing, Modelling languages, Tech. of micro-electronics and photonics

Master Thesis (24 ECTS)
- Smart Cities (3 ECTS)
- Digital Health (3 ECTS)
- Business Intel. (3 ECTS)
- Environment Inf. (3 ECTS)
- Elective Courses (14 ECTS)
- Entrepreneurship (14 ECTS)
- Internship (14 ECTS)
Supporting Departments

Departments

• Department of Electronics and Informatics – ETRO
  http://www.etrovub.be

• Department of Computer Science – DINF
  http://we.vub.ac.be/en/computer-science-department

• Department of Business technology and Operations – BUTO

• Department of Hydrology and Hydraulic Engineering – HYDR
  http://www.hydr.vub.ac.be

Application domains

- Mobility and Big Data
- Multimedia
- Security
- Healthcare
- Industry 4.0
- Agro & Environment
Pathways to a Successful Career

Industrial Partners
- Consulting
- Fintech, Marketing
- Smart Cities

Academic Partners
- Big Data and Security
- Video Analytics
- Digital Health

Video Analytics
- Citrix ByteMobile
- GE Healthcare
- Materialize
- Medtronic Philips Healthcare
- VASCO
- BAFTA
- BARCO
- fourcast

Academic Partners
- Duke University
- Technical University
- EPFL
- VRIJE UNIVERSITEIT BRUSSEL

Ensemble
Testimonials

“*This programme does not only help students to gain a solid knowledge of Computer Science technologies, but also provides numerous practical sessions to gain hands-on experience.*”

Ting Ting Liu, Tom Tom

“I highly recommend this program to anyone with an academic bachelor’s degree in another scientific field who wants to pursue his/her academic career in the field of Computer Science.”

Saba Faraz, Altran

“The unique strength of this program is the combination of computer science knowledge and the personal scientific area of expertise. I am genuinely grateful to the VUB professors who made this all possible. They gave me passion and nothing is more important than that.”

Inez Van Laer, Delaware
# MACS Thesis

## Predict Product Ratings

Netflix: Users rate movies using a 0-5 star rating

<table>
<thead>
<tr>
<th>Movie</th>
<th>Nikos (1)</th>
<th>Eva (2)</th>
<th>Duc (3)</th>
<th>Tien (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.S. I love you</td>
<td>?</td>
<td>5</td>
<td>?</td>
<td>0</td>
</tr>
<tr>
<td>Lord of the rings</td>
<td>1</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Interstellar</td>
<td>?</td>
<td>?</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Spectre</td>
<td>?</td>
<td>0</td>
<td>4</td>
<td>?</td>
</tr>
<tr>
<td>Crazy, stupid love</td>
<td>5</td>
<td>?</td>
<td>0</td>
<td>?</td>
</tr>
</tbody>
</table>
3D visualization map of the frequency of tweets in Brussels.

[Superposition of a high-resolution texture of the region, and a so-called height-map]
MACS Thesis

Content-based image-text retrieval

Demo:
Thank you for your attention!

and ...

Just Google: macs vub