Industry-Driven Master Certificate in Data Science

Gianluca Reali
Outline

- External Contexts
- Academic Program Design Approach
- Analysis of the LinkedIn Data
- Mix of Competences
- Academic programs at the University of Perugia
- Conclusion and Further Activities
External Contexts

Data Scientist: The Sexiest Job of the 21st Century

by Thomas H. Davenport and D.J. Patil
External Contexts

Gartner Hype Cycle for emerging technologies

source: http://www.gartner.com/newsroom/id/3114217

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Focused Market Analyses

Source: SCM World + Big Data Analytics, Mobile Technologies And Robotics Defining The Future Of Digital Factories, Louis Columbus, Forbes, February 2015
External Contexts

- Retail
- Financial Services
- Healthcare
- Energy
- Telcos
- Web/Social/Media
- Government
- Manufacturing

Google Trends

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## Related academic initiatives worldwide

<table>
<thead>
<tr>
<th>School</th>
<th>Undergraduate</th>
<th>Degrees</th>
<th>Masters</th>
<th>Certificate</th>
<th>Ph.D</th>
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<tbody>
<tr>
<td>George Mason University</td>
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<td>B.S.</td>
<td>Bentley University</td>
<td>iSchool @ Syracuse</td>
<td>George Mason University Ph.D.</td>
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<tr>
<td>Illinois Institute of Technology</td>
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<td>B.S.</td>
<td>Carnegie Mellon</td>
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<td>Oxford University</td>
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<td>Adv. Diploma</td>
<td>DePaul University</td>
<td>Stanford University</td>
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<td>University of Washington</td>
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<td>Grad Cert. 5 courses</td>
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<td>Grad Cert. 6 courses</td>
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<td>Cert.</td>
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</table>

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**Industry-Driven Master Certificate in Data Science**
Academic Program Design Approach

- Analysis of data
- Interaction and coordination with interested companies.
- Analysis of the existing academic programs and similar projects
- Reference profile from IWA Italy Chapter, “DATA SCIENTIST” - June 30, 2014.
Analysis of the LinkedIn data

- Thousands of job offers


- Dimensionality reduction through PCA

- Extraction of the most significant competences
The two most significant components cannot capture most of the process energy.

The third component is necessary for collecting a significant percentage of energy.

The remaining energy is still significant. It shows the heterogeneous nature of Data Science.
Analysis of the LinkedIn data

PCA results
MIX of Competences

- Computational System (concurrency and distributed systems)
- Programming Languages and Paradigm (C, R, OpenMPI, Python)
- Tools (Big Data, Cloud Platforms, Databases, Sensors, …)
- Data sources (Open and Linked Data) curation
- Standards and Certification for the domain
- Interpretation skills (Knowledge extraction)
- Marketing and Market Analysis (Innovation leadership)
- Legal and Ethical elements
- Data Visualisation and Communication Skills
- Statistics and Probability; Algebra and Calculus
- Machine Learning
- Data Mining And Business Intelligence
Data Science: Academic programs at the University of Perugia

Master of Science degree in Computer Engineering and Robotics

- **Data Science Program**
  - Focus on data engineering and analytics with applications to business intelligence
- **Robotics Program**
  - Focus on cloud robotics driven by machine learning

Post-graduate International, Industry Driven Master Certificate in Data Science

- Focus on Finance, Energy & Utilities, Telcos, Social & Media, Industry/Manufacturing, Services
- Industry driven.
## Detailed program of the Master Certificate

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
<th>ECTS</th>
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<tbody>
<tr>
<td>Fundamentals of Computer Science</td>
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<tr>
<td>Fundamentals of Statistics</td>
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<td>Big data Processing and Tools</td>
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<td>4</td>
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<tr>
<td>Business Intelligence</td>
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<tr>
<td>Cloud Computing</td>
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<td>Data Science Tools</td>
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<tr>
<td>Networking and Data Security</td>
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<td>4</td>
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<tr>
<td>Data Mining and Machine Learning</td>
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<td>6</td>
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<tr>
<td>Visual Analytics</td>
<td>40</td>
<td>5</td>
</tr>
<tr>
<td>Communication and Presentation Skills</td>
<td>21</td>
<td>3</td>
</tr>
<tr>
<td>Data-driven Marketing</td>
<td>21</td>
<td>3</td>
</tr>
<tr>
<td>Seminars focussed on Finance, Energy &amp; Utilities, Telcos, Social &amp; Media Industry/Manufacturing Services</td>
<td>42</td>
<td>6</td>
</tr>
<tr>
<td>Stage in Industries</td>
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<td>9</td>
</tr>
<tr>
<td>Final project preparation</td>
<td>150</td>
<td>6</td>
</tr>
</tbody>
</table>

- Designed to be completed in 12 months,
- Over 1500 hours of lectures, lab experiments, business focused seminars, individual and group study and project design.
- Lectures in English
- International guest lecturers, from academy, industry, service providers.
Conclusion and Further Activities

- Design of the program in Data Science at the University of Perugia, tailored to the Industry Needs.
- Corresponding PhD research activities
- Continuous monitoring of results and expectations
- Candidate to become champion in the Edison Project [http://edison-project.eu/](http://edison-project.eu/)
- Open to further collaborations