Master program
Data Science in Engineering
CSE Special Track

George Fletcher

Kick-off 2017 – 2018
Aud 1.
August 29, 2017
General CSE Goals and Vision

• Graduate has developed
  • *scientific engineering* attitude towards computer science with emphasis on design, construction, and validation of computing systems

• CSE provides
  • sound theoretical foundations
  • methodical application in design & analysis
  • contact with research and industry

• CSE prepares for
  • jobs: sw developer/engineer, consultant, data scientist, data engineer, …
  • training: researcher (PhD), designer (PDEng)
Data Science in Engineering

- Special track of CSE
- Based on collaboration between data-science groups
- Driven by social and industrial needs

MSc in DSE:
- An expert in many aspects of handling data and information
  … who understands how to transform data into actionable information
Data Science in Engineering

In particular, a DSE graduate:

• Has a broad view of data science

• Is fluent in big data management and processing solutions

• Can analyze data to draw meaningful conclusions

• Understands the role of data in organizations

• Understands the legal and social contexts of data science
Data Science in Engineering

Contrast with other related MSc programs in JADS:

• Data Science and Entrepreneurship
• Data Science Business and Governance
• Business Analytics and Operations Research
• Marketing Analytics
CSE-DSE: pre-master program

The pre-master program for a student with a completed polytehninic program in computer science totals to 30 EC and consists of the following units:

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Code</th>
<th>Unit</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2DL10</td>
<td>Premaster calculus and probability</td>
<td>5</td>
</tr>
<tr>
<td>1 or 3</td>
<td>2IT60</td>
<td>Logic and set theory(^1)</td>
<td>5</td>
</tr>
<tr>
<td>2 or 4</td>
<td>2WF20/ 2DBI00</td>
<td>Linear algebra</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>2ID50</td>
<td>Data modeling and databases(^1)</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>2IL50</td>
<td>Data structures</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>2DI90</td>
<td>Probability &amp; statistics</td>
<td>5</td>
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</tbody>
</table>

\(^1\) The course Data modeling and databases should be preceded by Logic and set theory.
CSE-DSE: Program structure (120 ECTS)

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Code</th>
<th>Unit</th>
<th>EC</th>
<th>Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>CSE mandatory course</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2IMA10</td>
<td>Advanced algorithms</td>
<td>5</td>
<td>w+a</td>
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<tr>
<td></td>
<td><strong>Stream mandatory courses</strong></td>
<td></td>
<td>25</td>
<td></td>
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<tr>
<td>2</td>
<td>2DMT00</td>
<td>Applied statistics</td>
<td>5</td>
<td>w+a</td>
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<tr>
<td>2</td>
<td>2IMV20</td>
<td>Visualization</td>
<td>5</td>
<td>a</td>
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<tr>
<td>2</td>
<td>2IMI20</td>
<td>Advanced process mining</td>
<td>5</td>
<td>w+a</td>
</tr>
<tr>
<td>3</td>
<td>2DI70</td>
<td>Statistical learning theory</td>
<td>5</td>
<td>w+a</td>
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<td>4</td>
<td>2IMW10</td>
<td>Data Engineering</td>
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<td>a</td>
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<tr>
<td></td>
<td><strong>Stream electives</strong></td>
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<td>20</td>
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<tr>
<td>1</td>
<td>2IMM15</td>
<td>Web information retrieval and data mining</td>
<td>5</td>
<td>a</td>
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<tr>
<td>1</td>
<td>2IMS25</td>
<td>Principles of data protection</td>
<td>5</td>
<td>w+a</td>
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<tr>
<td>1</td>
<td>2IMG15</td>
<td>Algorithms for geographic data</td>
<td>5</td>
<td>a</td>
</tr>
<tr>
<td>3</td>
<td>2IMI30</td>
<td>Business process simulation</td>
<td>5</td>
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<tr>
<td>3</td>
<td>2IMM20</td>
<td>Foundations of data mining</td>
<td>5</td>
<td>a</td>
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<tr>
<td>3</td>
<td>2IMW20</td>
<td>Database technology</td>
<td>5</td>
<td>w+a</td>
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<td>4</td>
<td>2DD23</td>
<td>Time-series and forecasting</td>
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<td>a+o</td>
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<tr>
<td>4</td>
<td>2MMS20</td>
<td>Statistic for big data</td>
<td>5</td>
<td>w+a</td>
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<td>4</td>
<td>2IMC20</td>
<td>Research methods</td>
<td>5</td>
<td>w+a</td>
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<td><strong>Free electives (possibly including internship)</strong></td>
<td></td>
<td>35</td>
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<tr>
<td></td>
<td><strong>Seminar and master project</strong></td>
<td></td>
<td>35</td>
<td></td>
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<tr>
<td>4 or 6</td>
<td><strong>Seminar</strong></td>
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<td>5</td>
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<tr>
<td>7 and 8</td>
<td><strong>Master project</strong></td>
<td></td>
<td>30</td>
<td>a</td>
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</tbody>
</table>
We offer >50 electives and any course taught on a master level at any university in any country may be suitable, if approved in advance.

Capita Selecta: research assignment by invitation only.

9ST14A Academic writing – foreign students & polytechnic graduates

Internships (abroad): Joaquin Vanschoren & Nicola Zannone
Mentoring: two stages

**Mentor #1:** dr. Andrei Jalba
- international experience
- electives
- scientific integrity
- professional skills

**Mentor #2:** chosen by yourself
- depending on your specialisation choice
- after 6-12 months of study
- ideally also your master thesis advisor
Seminar & Thesis project (35 ECTS)

Show academic maturity in final thesis project:
• theory, practice, design or empirical analysis
• in the Netherlands or abroad
• at the university or in a company
You can graduate in any of these sections!

**Algorithms & Visualization**
- Algorithms
- Visualization
- Applied Geometric Algorithms

**Information Systems**
- Web engineering
- Architecture of information systems
- Data Mining

**Model-Driven Software Engineering**
- Formal system analysis
- Software engineering and technology

**Security and Embedded Networked Systems**
- Security
- System architecture and networking
Thesis project

• **Crucial: duration!**
  • 6 months
  • Supervisor can grant an extension up to 3 months
  • Examination committee can grant another extension up to 3 months
  • After 12 months: *finita*

• **Find yourself**
  • favorite specialization
  • Supervisor/mentor 2 (can also help with selecting electives)
Important

Register for **2IMC90**
- Mentors, stream-focused mailing, …

Questions?
- **Program manager**
  - *dr. George Fletcher*, MF 7.063
  - g.h.l.fletcher@tue.nl
- **Mentor**
  - *dr. Andrei Jalba*, MF 4.063
  - a.c.jalba@tue.nl
- **Study advisor**
  - *dr. Natasha Stash*, MF 7.061
  - n.v.stash@tue.nl