# Studies Plan

## Data Science 2019-20

### Master project

<table>
<thead>
<tr>
<th>Courses</th>
<th>Language Code</th>
<th>Section</th>
<th>Teacher</th>
<th>Specialization</th>
<th>Master 1</th>
<th>Master 2</th>
<th>MP Autumn</th>
<th>MP Spring</th>
<th>Exam Session</th>
<th>Exam Credit</th>
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<tbody>
<tr>
<td>Engineering internship credited with Master project (master in Data sciences)</td>
<td>F</td>
<td>COM-596</td>
<td>SC</td>
<td>Prof divers</td>
<td>320h</td>
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<td>Master project in Data science</td>
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<td>COM-598</td>
<td>SC</td>
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### Group 1

<table>
<thead>
<tr>
<th>Courses</th>
<th>Language Code</th>
<th>Section</th>
<th>Teacher</th>
<th>Specialization</th>
<th>Master 1</th>
<th>Master 2</th>
<th>Exam Session</th>
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<tbody>
<tr>
<td>Advanced algorithms</td>
<td>E</td>
<td>CS-450</td>
<td>IN</td>
<td>Kapralov</td>
<td>4h</td>
<td>3h</td>
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<td>Applied data analysis</td>
<td>E</td>
<td>CS-401</td>
<td>SC</td>
<td>West</td>
<td>2h</td>
<td>2h</td>
<td>Win</td>
<td>Written</td>
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<tr>
<td>Information security and privacy</td>
<td>E</td>
<td>COM-402</td>
<td>IN</td>
<td>González Troncoso Hubaux Oechslin</td>
<td>3h</td>
<td>1h</td>
<td>2h</td>
<td>Sum</td>
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<tr>
<td>Information theory and signal processing</td>
<td>E</td>
<td>COM-406</td>
<td>IN</td>
<td>Gastpar Telatar Urbanke</td>
<td>4h</td>
<td>2h</td>
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<tr>
<td>Machine learning</td>
<td>E</td>
<td>CS-433</td>
<td>IN</td>
<td>Jaggi Urbanke</td>
<td>4h</td>
<td>2h</td>
<td>Win</td>
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<td>Optimization for machine learning</td>
<td>E</td>
<td>CS-439</td>
<td>IN</td>
<td>Jaggi</td>
<td>2h</td>
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<tr>
<td>Statistics for data science</td>
<td>E</td>
<td>MATH-413</td>
<td>MA</td>
<td>Olhede</td>
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<tr>
<td>Systems for data science</td>
<td>E</td>
<td>CS-449</td>
<td>IN</td>
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### Group 2 : Options

<table>
<thead>
<tr>
<th>Courses</th>
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<th>Exam Session</th>
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<tbody>
<tr>
<td>Advanced cryptography</td>
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<td>COM-501</td>
<td>SC</td>
<td>Vaudenay</td>
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<td>Advanced probability and applications</td>
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<td>COM-417</td>
<td>SC</td>
<td>Lévêque</td>
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<tr>
<td>Advanced topics on privacy enhancing technologies</td>
<td>E</td>
<td>CS-523</td>
<td>IN</td>
<td>González Troncoso Hubaux</td>
<td>3h</td>
<td>1h</td>
<td>2h</td>
<td>Sum</td>
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<tr>
<td>A Network Tour of Data Science</td>
<td>E</td>
<td>EE-558</td>
<td>EL</td>
<td>Frossard Vanderheyst</td>
<td>2h</td>
<td>2h</td>
<td>Win</td>
<td>During the semester</td>
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<tr>
<td>Applied biostatistics</td>
<td>E</td>
<td>MATH-493</td>
<td>MA</td>
<td>Goldstein</td>
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<td>2h</td>
<td>Sum</td>
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<tr>
<td>Artificial neural networks</td>
<td>E</td>
<td>CS-456</td>
<td>IN</td>
<td>Gerstner</td>
<td>2h</td>
<td>1h</td>
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<td>Audio and acoustic signal processing</td>
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<td>COM-415</td>
<td>SC</td>
<td>Faller Kolundzija</td>
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<td>2h</td>
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Automatic speech processing
EE-554  EL  Bourlard  2h  1h  Win  Written  3

Biological modeling of neural networks
BIO-465  IN  Gerstner  2h  2h  Sum  Written  4

Combinatorial optimization
MATH-460  MA  2h  2h  Win  Written  5

Computational complexity
CS-524  IN  3h  1h  Win  During the semester  4

Computational linear algebra
MATH-453  MA  2h  2h  Sum  Oral  5

Computational photography
CS-413  SC  2h  2h  Sum  During the semester  5

Computer vision
CS-442  IN  Fua  2h  1h  Sum  Written  4

Convex optimization and applications
CS-454  MTE  1h  2h  Sum  During the semester  4

Cryptography and security
COM-401  SC  Vaudenay  4h  2h  Win  Written  7

Data visualization
COM-480  SC  Vuillon  2h  2h  Sum  During the semester  4

Deep learning
EE-559  EL  Fleuret  2h  2h  Sum  Written  4

Digital education & learning analytics
CS-411  IN  Dillenbourg Jermann  2h  2h  Win  Oral  4

Distributed information systems
CS-423  SC  Aberer  2h  1h  Sum  Written  4

Distributed intelligent systems
ENG-466  SIE  Martinoli  2h  3h  Win  Written  5

Formal verification
CS-550  IN  Kuncak  2h  2h  2h  Win  During the semester  6

Foundations and tools for processing tree structured data
CS-525  IN  Vanoirbeek  2h  2h  Win  Written  4

Graph theory
MATH-360  MA  Eisenbrand  2h  2h  Sum  Written  5

Human computer interaction
CS-486  IN  Pu Faltings  2h  1h  1h  Sum  During the semester  4

Image analysis and pattern recognition
EE-451  EL  Thiran  2h  2h  Sum  During the semester  4

Information theory and coding
COM-404  SC  Telatar  4h  2h  Win  Written  7

Intelligent agents
CS-430  IN  Faltings  3h  3h  Win  During the semester  6

Introduction to natural language processing
CS-431  IN  Chappelier Rajman  2h  2h  Win  Written  4

Lab in data science
EE-490(h)  SC  Verscheure  4h  Sum  During the semester  4

Learning theory
CS-526  IN  Macris Urbanke  2h  2h  Sum  Written  4

Linear models
MATH-341  MA  Panaretos  2h  2h  Win  Written  5

Markov chains and algorithmic applications
COM-516  SC  Lévêque Macris  2h  2h  Win  Written  4

Mathematical foundations of signal processing
COM-514  SC  Kolundzija Parhizkar Scholefield  3h  2h  Win  Written  6

Mathematics of data: from theory to computation
EE-556  EL  Cevher  2h  2h  Win  Written  4
Networks out of control

E COM-512 SC Grossglauser Thiran 2h 1h Sum Written 4

Optional project in data science

E COM-508 SC Profs divers 2h 2h Sum Win During the semester 8

Performance evaluation

E COM-503 SC 3h 1h 2h Sum Written 7

Risk, rare events and extremes

E MATH-447 MA Davison 2h 2h Win Written 5

Robust and nonparametric statistics

E MATH-441 MA Morgenthaler 2h 2h Sum Oral 5

Software security

E CS-412 IN Payer 3h 2h 1h Sum During the semester 6

Statistical theory

E MATH-442 MA Koch 2h 2h Win Written 5

Student seminar: security protocols and applications

E COM-506 SC Oechslin Vaudenay Sum Written 3

Technology ventures in IC

E CS-410 IN 2h 2h Sum During the semester 4

Time series

E MATH-342 MA Olhede 2h 2h Sum Written 5

Topics in theoretical computer science

E CS-455 IN Kapralov 3h 1h Sum Win During the semester 4

Virtual reality

E CS-444 IN Boulic 2h 1h Sum During the semester 4

Block "Projects & SHS"

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<td>F</td>
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