

Master of Science in Industrial and Applied Mathematics (MSIAM)

**Opening Orientation Meeting
September 18, 2017**

**Laurent Desbat (UGA) –
Jean-Baptiste Durand (Grenoble INP)**

WELCOME to MSIAM!

Aims of the meeting

- Provide information on practical matters regarding:
 - registration
 - academic tracks
 - choice of courses
 - class schedules
 - master thesis project
 - ...
- To meet each other

Academic and administrative staff

- Academic directors
 - laurent.desbat@imag.fr: Head of MSCI and IM tracks
 - jean-baptiste.durand@univ-grenoble-alpes.fr: Head of DS and Stats tracks
- Administrative secretaries
 - elena.leibowitch@grenoble-inp.fr: Grenoble INP-Ensimag
 - carine.beaujolais@univ-grenoble-alpes.fr: UGA UFR IM²AG
- Whole staff: msiam2@imag.fr

Where are we?



Registration

- MSIAM is a joint academic program between Grenoble INP (Ensimag) and Université Grenoble Alpes (UGA-UFR IM²AG)
- Students from UGA: register at UGA IM²AG (Carine, “scolarité”)
- Students from INP: register at INP Ensimag (Elena, room D101bis)
- Others cases: Check the sheet you signed at arrival.
- Registration meeting: Wednesday, September 20
- Get through the formalities to open computer accounts: **sign two IT conventions (UGA: may be online)**

First semester: September to January

- 30 ECTS scientific courses (3 or 6 ECTS each)
- **language course:** French or English (see slide $n+2$)
- Two periods: Fall and Winter
- Exams: January 22-February 9, 2018 (a subset thereof). Second session: **April 23-27, 2018**. Data Science may have extra second session exams from July 2-6 (unlikely).

Second semester: February to June

- Master thesis project (30 ECTS)
- Project defenses: End of June or beginning of September 2018
- For an application to PhD research grants from doctoral school MSTII, defense in June is mandatory

3rd year Ensimag students

- 3rd year Ensimag students may choose or not some additional registration to get the Master's degree
- **Only if they renounce the Master's degree:**
 - They may choose to earn 24 ECTS instead of 30
- **In every case:**
 - They must earn the following ECTS at Ensimag: 2nd year internship defense, REX (Return of Experience), Innovation and Management, English.

Language courses: French

(FLE: Français Langues Etrangères)

- Optional for non-Erasmus international students who just arrived in France - **Registration now**
- Optional for Erasmus students: contact their University Foreign Office to register
 - UGA: Berengere.Duc@univ-grenoble-alpes.fr
 - INP: Aurelie.Ducarre@grenoble-inp.fr
 - Courses from October 2 to December 22
 - Information on groups and courses timetable will be released after September 29 (?) on: <http://cuef.xtek.fr/>

Language courses: English

- Compulsory for 3rd-year Ensimag students
- All non-Ensimag students are supposed to have already B2 level at least in English (no course offered)

Tracks offered



- **Modeling, Scientific Computing and Image Analysis:** HPC, optimization, inverse problems, medical imaging, deterministic and stochastic modeling
 - **Industrial Mathematics:** theoretical foundations and applied methodology for mathematics in industry
 - **Statistics:** stochastic modeling, mathematical statistics, machine learning, biostatistics,...
 - **Data Science:** optimization, machine learning, HPC, big data analysis, data mining, ...
- Data Science** is common with the master of informatics (MoSIG). Same courses, timetables, exams, ...
- Different websites, Massih-Reza Amini head of DS in MoSIG, maybe different dates for thesis defense, pure research prog., ...
- **2x3 ECTS may be chosen in other Master's programs.**

Modeling, Scientific Computing and Image Analysis (MSCI)

- Efficient methods in optimization
- High performance computing for mathematical models
- High-performance exact computations
- Inverse methods and data assimilation
- Wavelets and applications
- Medical Imaging: tomography and 3D reconstruction
- Optimal Transport, levelset: applications to image
- **Computational Geometry (MoSIG)**
- Software development tools and methods (not for Ensimag students)
- Modelling Seminar and Projects

Industrial Mathematics

- Modeling Seminar and Projects (6ECTS)
 - Software Development Tools and Methods (3ECTS)
 - Convex and distributed optimization (3ECTS)
 - High performance computing for mathematical models (3ECTS)
- 4 compulsory courses
(15ECTS)**

**5 elective courses *a priori* (5x3ECTS) among the MSCI track courses
or in other tracks**

Statistics

- Advanced Algorithms for Machine Learning and Data Mining
- Advanced learning models
- Computational biology
- Efficient methods in optimization
- Fundamentals of probabilistic data mining
- High performance computing for mathematical models
- Machine learning fundamentals
- Modeling seminar and projects (6 ECTS)
- Software development tools and methods (not for Ensimag students)
- Stochastic calculus and applications to finance
- Time series analysis
- Wavelets and applications

Data Science (DS)

- Advanced Algorithms for Machine Learning and Data Mining
- Advanced learning models
- Category Learning and Object Recognition
- Computational biology
- Convex and distributed optimization
- Data Challenges
- Data management in large-scale distributed systems
- Data science seminar
- Distributed System Concepts
- Fundamentals of probabilistic data mining
- High performance computing for mathematical models
- Information access and retrieval
- Information visualization
- Machine learning fundamentals
- Software development tools and methods
- Time series analysis

mandatory courses

elective advanced
ML courses

application courses

Choosing the lectures

- Online form being sent tomorrow.
- Deadline: **Thursday September 28, 7PM**
- Provisional timetable on https://msiam.imag.fr/m2_schedule
- Incomplete online timetable: <https://edt.grenoble-inp.fr/2017-2018/exterieur>
- Pay attention to the balance between fall and winter periods!
- Courses with < 12-15 students may not open

Attending the courses

- Courses start at October 2nd
- Attending the courses (and associated supervised practical work, defenses, etc.) is mandatory
- Absence must be motivated (provide a certificate in case of a disease) and if predictable, must be notified in advance.



Modelling seminar and projects (6 ECTS)

Aim: to go deeper into one subject, by applying to a research or industrial project. The subject could be related two one or several chosen lectures.

Some projects are already proposed and the list will be updated, but you can also ask to your teachers to add such research projects, if you would like to go deeper in the proposed course.

List of proposed projects (detailed description and documents on chamilo) :

Analysis of daily asset returns of 250 companies over 20 years – Jean-Baptiste Durand

Identification of vessels topography and tumor vascularization through image analysis -- Emmanuel Maitre

Medical Imaging, Tomography FBP and “less than short scan” methods -- Laurent Desbat

Motion of red blood cell membrane by diffusion of distance function -- Emmanuel Maitre

Simulation Tools for IMU sensors -- Régis Perrier

see also:

<http://chamilo.grenoble-inp.fr/main/document/document.php?cidReq=ENSIMAGWMM9AM10>

Exotic courses



- Data science seminar (3 ECTS)
 - 6 seminars on Thursdays, 2PM. Involves reading articles and writing reports
- Data challenge (3 ECTS)
 - From October to January, concentrated in end January

Modelling seminar and projects

Aim: to go deeper into one subject, by applying to a research or industrial project. The subject could be related to one or several chosen lectures.

Some projects are already proposed and the list will be updated, but you can also ask to your teachers to add such research projects, if you would like to go deeper in the proposed course.

List of proposed projects (detailed description and documents on chamilo) :

Analysis of daily asset returns of 250 companies over 20 years – Jean-Baptiste Durand

Identification of vessels topography and tumor vascularization through image analysis -- Emmanuel Maitre

Medical Imaging, Tomography FBP and “less than short scan” methods -- Laurent Desbat

Motion of red blood cell membrane by diffusion of distance function -- Emmanuel Maitre

Simulation Tools for IMU sensors -- Régis Perrier

Refresher courses

- from September 25th to 29th
- do not bring ECTS
- matrix numerical analysis
- numerical optimization
- both are mandatory for:
 - non-Ensimag students
 - Ensimag students with grades $< 12/20$ in any of these courses: 1st year probability, 1st year statistics, 2nd year optimization
- Software development tools and methods (3ECTS) is strongly recommended (C++, gdb, valgrind, python, ...) unless you know the meaning of

```
void Obj::f(const double *x, void (*f) (const unsigned int, const double *,void *,double *)) const
```

Master thesis project

- **Research or industrial project in applied mathematics**
- “Research” means “In academic laboratories or research centers in industry”
- “Industrial” means ... “in industry”!
- In France or abroad
- Key dates
 - Full-time: from February to June
 - Defenses first round: June, 19-28 (possibly)
 - Defenses second round: from August 30th to September 4th

Project hosting organisations

- Academic laboratories
 - In Grenoble: LJK, TIMC, LIG, GIPSA, Inria,...
- Research centers
 - In Grenoble: Orange labs, CEA, ST Microelectronics, Schneider Electric, Xerox Research Center, Hewlett-Packard, ...
- In France or abroad
- Rule: students undertaking a project in industry or outside a local academic laboratory must find a local tutor

Examples of 2017 internships

- Improve the ability of robo-traders (Walnut Algorithms)
- Design and implement pretraining and case studies of unstructured data knowledge extraction (Synaplus)
- Machine Learning Approaches for Toxicology (Dassault Systems)
- Comparison of two implementations for a Lane Keeping function (IDIADA Automotive Technology S.A.)
- Semantic Indexing by Word Embedding (LIG)
- Finite Rate of Innovation for Image Coding (LJK)
- Crisis informatics (NII, Japan)
- Deep Recurrent Neural Networks with rich prior knowledge for sequence prediction (Xerox Research Center in Europe, Meylan, France)
- Deep Neural Networks for 3-D body shape and pose prediction in real images (Inria)
- A generic acceleration method for stochastic programming (Inria)
- Hip fracture reduction simulations and semi-automated generation of muscle meshes (TIMC-IMAG)

Graduation rules

Award of Master degree

- Range of marks: 0 to 20
- Mark **of 7 or above** for each unit
- Weighted average mark of 10 or above for both semesters
- In case of failure, a second session is proposed

Grading rules may vary (exam, lab work,...). Check the rules with your lecturer...

Grading system

[16, 20]	Excellent
[14, 16[Very good
[12, 14[Good
[10, 12[Passable
[0, 10[Fail

Plagiarism

- You have to respect the laws of intellectual property-such as copyright
- No one is allowed to appropriate the labor of the original author
- During exams, you must obey the rules

=> University disciplinary commission

Plagiarism

- <http://en.wikipedia.org/wiki/Plagiarism> (especially sections 2, 3.1, 3.3)
- <http://www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize>
- <http://www.writing.utoronto.ca/advice/using-sources/paraphrase>
- <http://www.writing.utoronto.ca/advice/using-sources/quotations>
- Gipp, Bela (2014). Citation-based Plagiarism Detection: Detecting Disguised and Cross-language Plagiarism using Citation Pattern Analysis. Springer Vieweg. ISBN 978-3-658-06393-1. p.10
- In short:
 - Use citations when presenting definitions, theorems, models, results obtained by someone else.
 - Use citations and quoting marks when copying some expression, sentence or paragraph.
 - If you do not cite anyone, this is either personal original work or plagiarism.

Student representatives

- Meeting on October 27th to collect feedback on semester organization
- Taking part to the development council (MSIAM M2)
 - Aims at improving students training, connections with industry, ...
- One student representative and one deputy needed (maybe 1 newcomer + 1 Ensimag student?)
- To apply please contact the heads. Vote if multiple applications?

Information

- MSIAM website: <http://msiam.imag.fr> (see: NEWS2017)
- Timetable: <https://edt.grenoble-inp.fr/2017-2018/exterieur>
- MSIAM billboard in Ensimag's lobby
- Elena's office: Ensimag Registrar's office D101bis
- Carine's office: UFR IM²AG Registrar's office "scolarité"
- msiam2@imag.fr
- After tomorrow: use your university email address
- Students registering to INP: picture taken in October
- "PhD information day" at "amphi Weil" in the "BU Sciences" October 19.

Thank you for your attention

Questions?

msiam.imag.fr