

# Master of Science in Industrial and Applied Mathematics (MSIAM)

**Opening Orientation Meeting  
September 16, 2019**

**Pierre Etoré (Grenoble INP) –  
Edouard Oudet (UGA)**

## WELCOME to MSIAM!

### Aims of the meeting

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

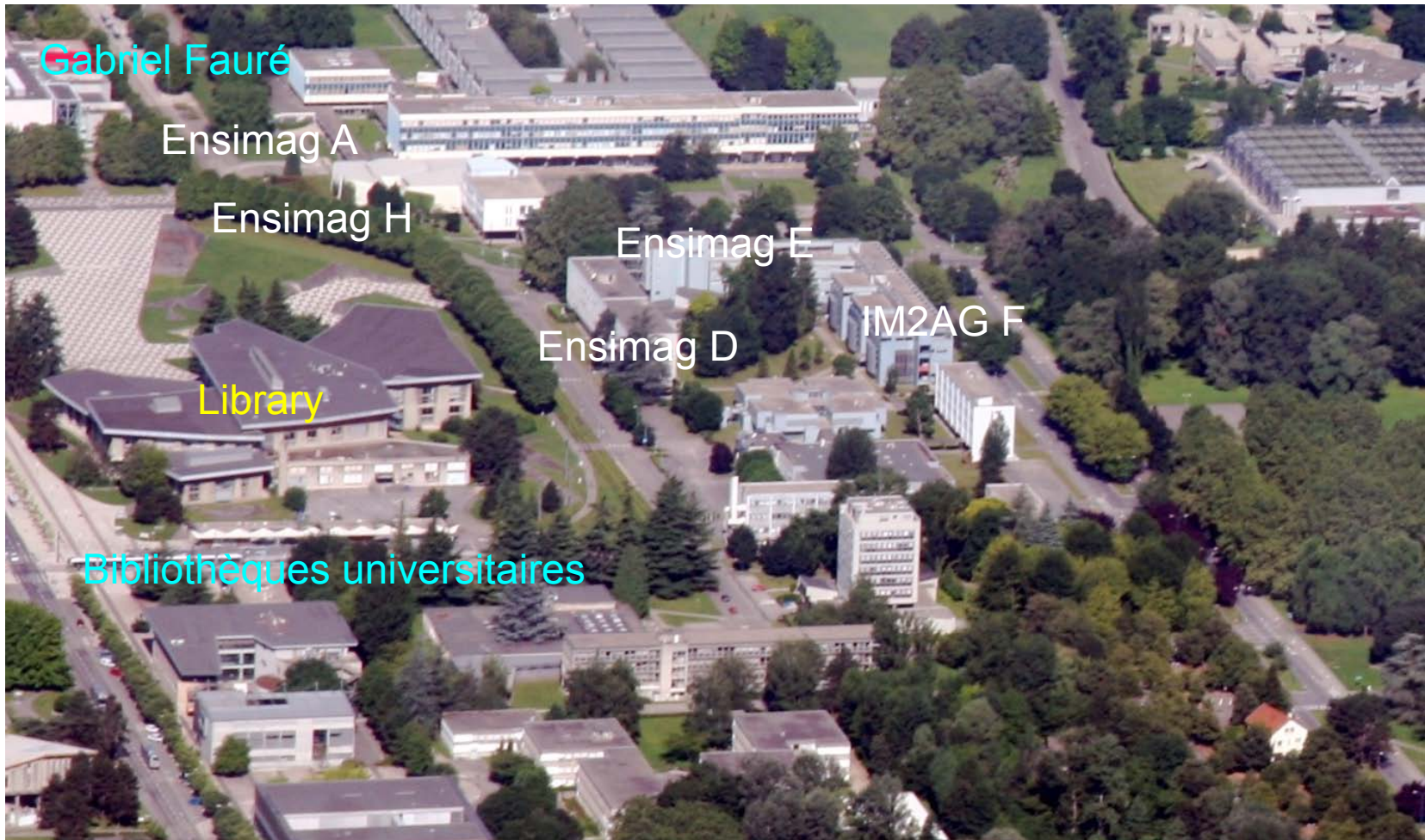
## Academic and administrative staff

- Academic directors
  - [edouard.oudet@univ-grenoble-alpes.fr](mailto:edouard.oudet@univ-grenoble-alpes.fr): Head of MSCl track
  - [Pierre.etore@univ-grenoble-alpes.fr](mailto:Pierre.etore@univ-grenoble-alpes.fr) : Head of DS tracks
- Administrative secretaries

[Emmanuel.villemont@grenoble-inp.fr](mailto:Emmanuel.villemont@grenoble-inp.fr) : Grenoble INP-Ensimag

[Carine.beaujolais@univ-grenoble-alpes.fr](mailto:Carine.beaujolais@univ-grenoble-alpes.fr) : UGA UFR IM<sup>2</sup>AG
- Whole staff: [msiam2@imag.fr](mailto:msiam2@imag.fr)

# Where are we?



## Registration (reminders)

- MSIAM is a joint academic program between Grenoble INP (Ensimag) and Université Grenoble Alpes (UGA-UFR IM<sup>2</sup>AG)
- Students from UGA: register at UGA IM<sup>2</sup>AG (Carine, “scolarité”)
- Students from INP: register at INP Ensimag (Emmanuel, room D101bis)

## 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 28-February 15, 2019 (probably sooner). Second session: **April 15-19, 2019.**

## Second semester: February to June

- Master thesis project (30 ECTS)
- Project defenses: End of June or beginning of September 2019
- For an application to PhD research grants from doctoral school MSTII, defense in June is mandatory (2-3 positions, a lot of other funding possibilities).

## 3rd year Ensimag students

- For 3rd year Ensimag students:
- **In every case:** They must earn the following ECTS at Ensimag: English (6ECTS)
- If they choose an internship that cannot be validated for the MSIAM: they will get the 3rd of ENSIMAG but not the master degree.



## Language courses

### FLE: Français Langues Etrangères

- Optional for non-Erasmus international students who just arrived in France - Registration last Monday.
- Once a week, 2h.
- Optional for Erasmus students: contact their University Foreign Office to register
  - UGA: [Berengere.Duc@univ-grenoble-alpes.fr](mailto:Berengere.Duc@univ-grenoble-alpes.fr)
  - INP: [Aurelie.Ducarre@grenoble-inp.fr](mailto:Aurelie.Ducarre@grenoble-inp.fr)

### English

- Compulsory for 3<sup>rd</sup>-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, optimal transport, medical imaging, deterministic and stochastic modeling

**Data Science:** statistics, stochastic modeling and processes, data mining, machine learning, optimization, informatics, ML theory, distributed computation, data bases and optim.

Some courses are common with the master of informatics (MoSIG). Same courses, timetables, exams, ...

## Mixing tracks

- **2x3 ECTS may be chosen in:**
  - **Other tracks (than your main track in MSIAM)**
  - **Other master programs.**
- **In replacement of 2x3 ECTS of your track**
- **List of master programs:**

<http://formations.univ-grenoble-alpes.fr/fr/catalogue/master-XB.html>

# Modeling, Scientific Computing and Image Analysis (MSCI)

- Advanced Imaging
- Convex and distributed optimization
- Efficient methods in optimization
- GPU computing
- High Performance Computing for Mathematical Models
- Inverse methods and data assimilation
- Level-set methods and optimization algorithms with applications in imaging
- Medical Imaging: tomography and 3D reconstruction from 2D projections
- Model exploration for approximation of complex, high-dimensional problems
- Modelling Seminar and Projects
- Numerical optimal transport and geometry (with MoSIG)
- Software Development Tools and Methods
- Wavelets and applications

# Fundamentals of Data Science

- Advanced algorithms for machine learning and data mining
- Advanced learning models
- Category Learning and Object Recognition
- Convex and distributed optimization
- Computational biology
- Data science seminar
- Data challenge
- Distributed systems concepts
- Efficient methods in optimization
- Fundamentals of probabilistic data mining
- High Performance Computing for Mathematical Models
- GPU computing
- Inverse methods and data assimilation
- Information access and retrieval
- Information visualization

- (1) Machine Learning Fundamentals
- (2) Large scale data management
- (3) Machine Learning Fundamentals
- (4) Model exploration for approximation of complex, high-dimensional problems
- (5) Model selection for large-scale learning
- (6) Modelling Seminar and Projects
- (7) Numerical optimal transport and geometry
- (8) Software Development Tools and Methods
- (9) Stochastic Calculus and Applications to Finance
- (10) Wavelets and applications

# Choosing the lectures

- (1) Fill online and validate online form before **September 13** :)!)
- (2) Warn us if you do not have the link
- (3) Particular cases (**see next slide**): fill online form and send corrections by email before **September 25** to Edouard Oudet and Pierre Etoré.
- (4) Online timetable: [https://msiam.imag.fr/m2\\_timetables](https://msiam.imag.fr/m2_timetables)
- (5) Pay attention to the balance between fall and winter periods!
- (6) Courses with < 12-15 students may not open (second round of choices needed then)



# Modelling seminar and projects (6 ECTS)

**Aim:** to go deeper into one subject, by applying to a research or industrial project. The subject generally related two one lecture or more.

A list of topics will be released soon. Possibility to ask your teachers to add some specific topic to go deeper in the proposed course.

Supervised teamwork during your free time. Choose 2 projects.

Examples of proposed projects in 2017-2018:

*Analysis of daily asset returns of 250 companies over 20 years*

*Identification of vessels topography and tumor vascularization through image analysis*

*Medical Imaging, Tomography FBP and “less than short scan” methods*

*Motion of red blood cell membrane by diffusion of distance function*

*Simulation Tools for IMU sensors*



## Exotic courses



Data science seminar (3 ECTS) in common with MOSIG and SIGMA

(1) 6 seminars on Thursdays, 3:45PM. Involves reading articles and writing reports. Hot topics in data science.

Data challenge (3 ECTS) in common with MOSIG and SIGMA

(1) From October to February, including 3 days (full-time)  
February 5-7

(2) Intermediate milestones from October to December

(3) Composition of snowpack from satellite radar images

## Attending the courses

- (1) Courses start on Monday September 30.
- (1) Attending the courses (and associated supervised practical work, defenses, etc.) is mandatory.
- (1) Absence must be motivated (provide a certificate in case of a disease) and if predictable, must be notified in advance to the teacher.

- (1) From September 23 to 27
- (2) Do not bring ECTS
- (3) Linux systems
- (4) Introduction to python
- (5) Matrix numerical analysis & numerical optimization
  - (1) Those are mandatory for:
    - (1) non-Ensimag students
    - (2) Ensimag students with grades  $< 12/20$  in any of these courses: 1st year probability, 1st year statistics, 2nd year optimization
- (6) 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

**(1) Research or industrial project in applied mathematics**

(2) “Research” means “In academic laboratories or research centers in industry”

(3) “Industrial” means ... “in industry”!

(4) In France or abroad

(5) Key dates

(1) Full-time: from February to June (after examinations!)

(2) Defenses first round: June, 22-26 (possibly)

(3) Defenses second round: August 24-28 approx.

## Project hosting organisations

### (1) Academic laboratories

(1) In Grenoble: LJK, TIMC, LIG, GIPSA-lab, Inria, ...

### (1) Research centers

(1) In Grenoble: Orange labs, CEA, ST Microelectronics, Schneider Electric, Xerox Research Center, Hewlett-Packard, ...

### (1) In France or abroad

(2) Rule: students undertaking a project in industry or outside a local academic laboratory must find a local tutor

## Examples of 2019 internships

- (1) Autonomous vehicle navigation among people (Inria, Grenoble)
- (2) Learning to grasp with visual guidance (Inria, Grenoble)
- (3) Multi-class semi-supervised learning through pseudo-labelling (LIG, Grenoble)
- (4) Uplift prediction in auctions for on-line advertisement (Criteo, Grenoble)
- (5) Continuous learning for document categorization (Tessilab, Grenoble)
- (6) Artificial neural network potential for molecular dynamics simulations (The Hong Kong Polytechnic University)
- (7) Développement d'une méthode de suivi Lagrangien de particules dans un code CFD
- (8) Acceleration methods for convergence of convex optimization algorithms (University of Washington, USA)
- (9) Hybrid numerical methods for multiphase flows (LJK, Grenoble)
- (10) Introduction to quantum computing (Cerfacs, Toulouse)
- (11) Lagrangian particle tracking in CFD codes (Cerfacs, Toulouse)

## Graduation rules

### Award of Master degree

- (1) Range of marks: 0 to 20
- (2) Mark **of 7 or above** for each unit
- (3) Weighted average mark of 10 or above for both semesters
- (4) 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://advice.writing.utoronto.ca/using-sources/how-not-to-plagiarize/>
- <http://advice.writing.utoronto.ca/using-sources/paraphrase>
- <http://advice.writing.utoronto.ca/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 November 5 12:30PM to collect feedback on semester organization
- Taking part to the development council (MSIAM M2)
  - Aims at improving students training, connections with industry, ...
- Two students representative (maybe 1 newcomer + 1 Ensimag or M1 MSIAM student?)
- To apply please contact the heads. Organize a vote if needed ...

## Future meetings

### Plenary:

- Presentation of semester 2 (internship projects and rules)
- PhD fellowships, the French system (takes about a day ;-) !)

### Representatives:

- Pedagogical committee
- Orientation council

- European Consortium for Mathematics in Industry
- <https://ecmiindmath.org/>
- Modeling weeks
  - Training in mathematical modelling
  - International
  - 2018: Serbia. 2019: Germany (Spring) and Spain (Summer)
  - Teamwork
  - Support for 2 MSIAM students

## Meetings: jobs in applied maths

- Forum for Maths in Industry
  - October 15 in Paris
  - Attend conferences, meet companies, receive job offers
  - Possible support from the French Society for Maths in Industry (SMAI): 2 students last year
  - <http://www.forum-emploi-maths.org/>
- PhD Day
  - October 17 in Grenoble (PM only)
  - Be informed about PhD theses.
  - Plenary conference (in French), presentation of doctoral schools (in English), meeting with PhD students



## Our webpage

- MSIAM website: <http://msiam.imag.fr>
- News
- Timetables
- Job offers (PhD Positions)
- Internship positions
- PhD grants
- FAQ
  - Grades, examinations, diploma
  - Do I write to Carine, Emmanuel, Edouard, Pierre or to all of them?
  - Official rules and documents

## Summary

- MSIAM website: <http://msiam.imag.fr>
- [msiam2@imag.fr](mailto:msiam2@imag.fr)
- Timetable: <https://edt.grenoble-inp.fr/2019-2020/exterieur>
- MSIAM billboard in Ensimag's lobby
- Emmanuel's office: Ensimag Registrar's office D101bis
- Carine's office: UFR IM<sup>2</sup>AG Registrar's office "scolarité"
- Use your Grenoble university email address as soon as you have one

**Thank you for your attention**

**Questions?**

[msiam.imag.fr](http://msiam.imag.fr)