

An Overview of ATIAM International Master Program

(UPMC / Télécom ParisTech / Ircam)

Moreno ANDREATTA Coordination ATIAM IRCAM/CNRS/UPMC UMR 9912







ATIAM's Status



ATIAM's Team & Ircam hosting institution



(a) UPMC / SAR specialization:

- Béatrice Berard (responsible)
- Emmanuel Saint-James

(correspondent)

- Aliénor Le Conte (Pedagogy Secretary)

(a) UPMC / AC specialization:

- François Ollivier
- (responsible)
- Benoît Fabre (correspondent)
- Véronique Prieto (Pedagogy Secretary)

Coordination @ IRCAM:

- Moreno Andreatta
- (coordinator)
- Cyrielle Fiolet (Pedagogy Secretary)



Jean-Claude Risset (© Jean-François Dars)

Teaching staff: (**pedagogical committee*) - Carlos Agon (UPMC, former coord) - Moreno Andreatta* (CNRS/Ircam) - Roland Badeau (Télécom ParisTech) - Georges Bloch (composer) - Michèle Castellengo (CNRS/UPMC) - Arshia Cont (Ircam) - Marc Chemillier (EHESS) - Bertrand David * (Telecom ParisTech) - Philippe Depalle (McGill University) - Philippe Esling (UPMC-Ircam) - *Benoît Fabre** (UPMC) - Hugues Genevois (UPMC) - Thomas Hélie (CNRS/Ircam) - Jean Kergomard (AMU, LMA) - Jean-Loïc Le Carrou (UPMC) - Mikhail Malt (Ircam) - Jean-Dominique Polack (UPMC) - Daniel Pressnitzer (CNRS/Ens) - Emmanuel Saint-James* (UPMC) - Isabelle Viaud Delmon (CNRS/Ircam) - Christophe Vergez (AMU, LMA)



Ircam-Centre G. Pompidou

Other participants: - M. Bergomi (UPMC-LIM-Ircam) - Philippe Cathé (Sorbonne) - Hélianthe Caure (UPMC-Ircam) - René Caussé (Ircam) - Carmine Cella (composer) - Boris Doval (LAM, UPMC) - Laurent Feneyrou (CNRS/Ircam) - Daniele Ghisi (composer) - Philippe Guillemain (AMU) - Karim Haddad (composer) - Matthieu Lagrange (CNRS) - Claudy Malherbe (composer) - Denis Matignon - Angelo Orcalli (University of Udine) - Geoffroy Peeters (Ircam) - Laurent Pottier (Univ. Saint-Etienne) - Gaël Richard (Télécom ParisTech) - Jean-Claude Risset (CNRS/LMA) - Benny Sluchin (EIC) - Barbara Tillman (CNRS)





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ATIAM's New Structure (2014-2018)

| S3 (September - End of January) | S4 (February - July) | |
|--|----------------------|----------|
| "Basics" (60 h) Main courses (240 h) | Internship | |
| Week 1-Week 2 : "Basics" or "Harmonization": Resp. Moreno And • Acoustics (15h) • Signal Processing (15h) • Informatics (15h) | dreatta (CNRS/Ircam) | 60h |
| • Computational Musicology (music theory, formalization of musical structures,) | | (30h) |
| Week 3-End of January: | | |
| • Acoustics: resp. Benoît Fabre (UPMC) | | 60h |
| Signal Processing: resp. Bertrand David (Télécom-ParisTech) | | 60h |
| Informatics: resp. Carlos Agon (UPMC/Ircam) | | 60h |
| • Interdisciplinary Projects and musical applications: resp. Emmanuel Saint-James | | 60h |
| February-July : Internship ("stage" in a research institute, univers | ity lab, company,) | 6 months |

List of Research Labs which will increase the collaboration with ATIAM Master Program:

- USA (CCRMA Stanford, CNMAT Berkeley)
- UK (Goldsmith College, Queen Mary University)
- Italy (Department of Informatics of the University of Pise, LIM Milan)
- Denmark (Aalborg University Copenhagen, Sound & Music Computing Master program)
- Finland (Helsinki University of Technology)
- Austria (The Institute of Electronic Music and Acoustics, Univ. of Music and Performing Arts, Graz)

Brief description of each teaching unit

1. Foundamentals for acoustics, signal processing and informatics applied to music

(resp. M. Andreatta, CNRS/Ircam)

This teaching unit aims to provide the basics enabling the different teaching units to fully develop, as well from a scientific point of view as from the general knowledge of Twentieth-Century music and musicology. The first part of this unit provides a harmonization of different levels with respect to the three main disciplines of ATIAM, i.e. acoustics, signal processing and informatics. The second part provides an introduction to XXth Century music and musicology, by focusing in particular to computational music analysis.

Time schedule : 54 hours for courses and 6 hours practical work



2. Musical Acoustics

(resp. Benoît Fabre, UPMC)

The aim of this UE is to develop a good competence on the main scientific tools of musical acoustics, by enabling a deep understanding of musical instruments, going from physical acoustics and vibrations problems to the perception of musical sound. A good knowledge of some theoretical tools in acoustics (such as frequency/temporal response, Green functions, etc.) coupled with an understanding of dissipative mechanisms should provide the tools for studying the oscillation systems of musical instruments the coupling of the different elements which structure it, the control of the musical instrument by the musician, the diffusion of sound and its perception, also in a concert hall.

Time schedule: 50 hours courses and 10 hours practical work





3. Musical Signal Processing (resp. Bertrand David, Télécom ParisTech)

This teaching unit covers the mathematical aspects of the signal and its representations, the theory of analysis-synthesis transformations of the signal, restoration and denoising and provides an introduction to source separation. More specifically, two types of signals are studied, the deterministic ones (Fourier transforms (TFD, TFTD, Fourier series, Sampling theorem, Filtering (causality, stability, ...), Z-transform and recursive filters, Spectral observation and filter design, Resampling, efficient implementations) and random signals (Wide-sense stationary processes, Autoregressive processes, linear prediction).



(Signal Processing Toolbox, © MathWorks)

Hi, Dr. Elizabeth? Yeah, Uh... I accidentally took the Fourier transform of my cat... Meow!

Other topics include Fourier-type methods (phase vocoder), Sinusoidal + noise methods, Source-filter synthesis, Nonlinear systems and Volterra series theory, Implementing a real-time processing application in FAUST, Frequency modulation, Karplus Strong synthesis based on physical modeling

Time schedule: 44 hours courses eand 16 hours practical work

4. Music Informatics (resp. Carlos Agon, UPMC-Ircam)

The aim of this UE is to develop a good knowledge and competence of the main computer-aided tools which are relevant to music, from the perspective of symbolic representations as well as programming languages. The student will discover the different symbolic representations of musical structures, improve its knowledge of the midi format in music analysis and generation, and identify the different types of programming languages for music (in real time and not real time).



Peter Van Roy's Taxonomy of programming paradigms (in *New Computational Paradigms for Computer Music*, Assayag and Gerzso eds., Ircam-Delatour 2009)

This teaching unit will also provide the basic concepts of the algebraic approach (word and group theory) in the formalization and modeling of musical structures and processes.

Time schedule: 50 hours courses and 10 hours practical work

5. Interdisciplinary projects and musical applications (resp. Emmanuel Saint-James, UPMC)

This teaching unit proposes some practical applications of acoustics, signal processing and computer science to the musical field. Its main objective is to enable the student to integrate the different competences acquired within the different scientific domains by applying them to a musical problem. Based on the project pedagogy, this unit will help students to work in a collective way by developing their competences in a specific personal direction. The contents of the projects are selected by the pedagogical staff in order to facilitate the mutual collaborations around recent research domains (see the list of selected projects on the right)

Time schedule: 20 hours courses and 40 hours projects)

List of selected projects:

(1) Analysis/Synthesis of guitar & HR

(2) Sound recording & sources separation, mono and multi channels

(3) Sign/Signal articulation

(4) Gestural control interfaces for the synthesis of vocal source for augmented/substitution voice

(5) Online perception experiences

(6) Self-oscillation of musical instruments, cartography and descriptors

Prospects and statistics

- Students continue their studies in PhD programs (since 1993, about 400 Master thesis and 70 PhD thesis have been defended)
- They poursue a carreer in public research facilities (University, CNRS, ...)
- They go on to work in private companies (as engeneer in musical industry, multimedia, online digital systems, ...)
- They create their own starts-up (ex. Dualo, ...)
- They are involved in artistic projects (ex. RIM = réalisateur en informatique musicale)



Daniel PRESSNITZER, CNRS Research at the ENS in Paris



Bruno VERBRUGGHE, General Director of the Dualo company



Lionel ROKITA, Clarinettist (groupe Aval'anches) and « conseilleur d'études » at the F. Chopin's Conservatory in Paris



Gilbert NOUNO, Réalisateur en informatique musicale, composer



Geoffroy PEETERS, Researcher Analysis/Synthesis Team at Ircam

Stefania SERAFIN Resp. SMC Master Program Aalborg University

CALL FOR APPLICATION 2014-15 MASTER 2 ATIAM

Acoustics, Signal Processing, and Computer Science Applied to Music a multidisciplinary Master's Degree program in Science and Technology

Pierre and Marie Curie University (UPMC) in collaboration with Télécom ParisTech and IRCAM

PROGRAM OBJECTIVES

The scientific and musical knowledge acquired during the ATIAM Program enables participants to pursue research in the fields of musical acoustics, signal processing, and computer music.

DIPLOMA

UPMC's Science and Technology Master's degree, with a specialization in Computer or Engineering Science and a special mention «ATIAM»

PROFILE

Students at the Master 1 level or equivalent (engineering school, foreign programs, etc.)

PROSPECTS

Students continue their studies in PhD programs, go on to work in private or public research facilities, create their own businesses, are involved in artistic projects.

APPLICATIONS ACCEPTED from May 27th to June 25th 2014

www.atiam.ircam.fr

INTERVIEWS July 2nd 2014

Contact - Coordination ATIAM Ircam - 1, place Igor Stravinsky - 75004 Paris tel. + 33(0)1 44 78 48 23 info-pedagogie@ircam.fr



MULTIDISCIPLINARY TEACHING



Signal Processing Analysis-synthesis processing and



Computer Science

Architectures, formats, languages, algorithms, mathematical models

Applied to Music

Sound and Music Perception, Computational Musicology, Music and Science after 1945

TEACHING UNIT COORDINATORS

Carlos Agon Music Informatics Moreno Andreatta Basics for ATIAM Bertrand David Musical Signal Processing Benoit Fabre Musical Acoustics Emmanuel Saint-James Interdisciplinary Projects Isabelle Viaud-Delmon Employability of ATIAM's Master students

Associated Research Labs

- **@ UPMC-CNRS / LIP6**
- @ UPMC-CNRS / LAM
- **@ UPMC-CNRS / IRCAM**
- @ Aix-Marseille Université (AMU)/ LMA
- **(a)** Telecom-ParisTech / TSI
- **a** McGill University
- (a) Univ Paris Descartes-CNRS-Ens/LPP
- @ EHESS-CNRS / CAMS





laboratoire «mécanique «racoustique





