TEACHING STATEMENT

“Give a man a fish; you have fed him for today. Teach a man to fish; and you have fed him for a lifetime” – Author unknown

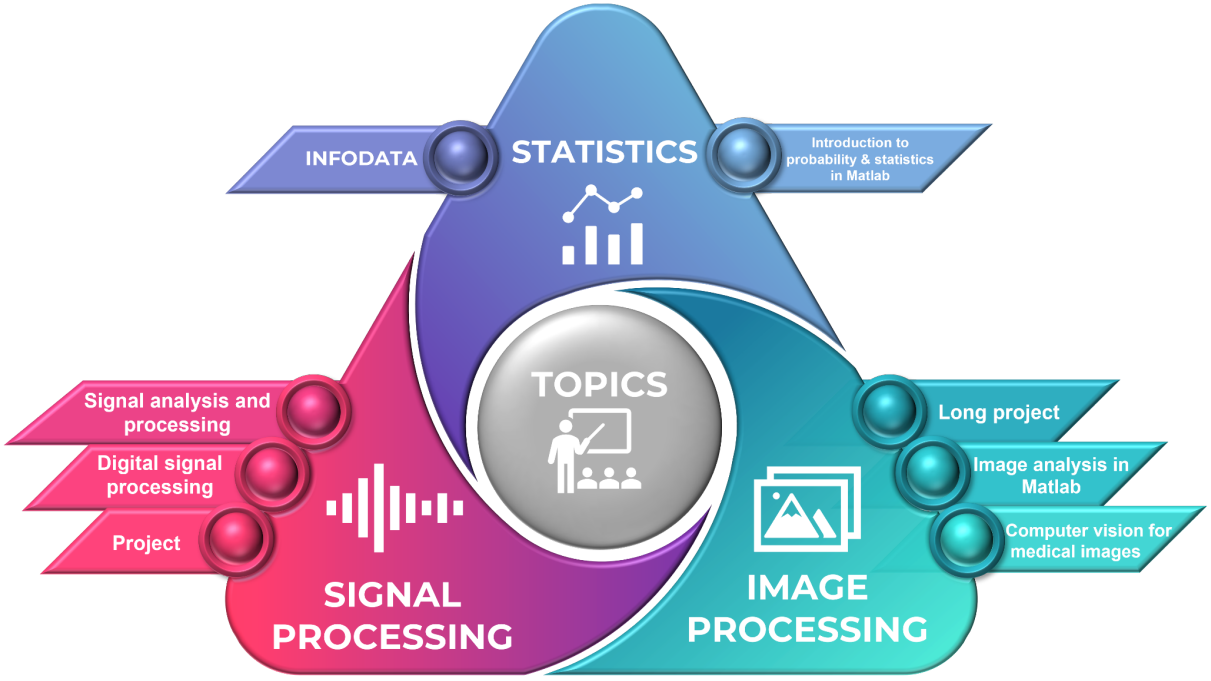
WHAT TEACHING MEANS TO ME

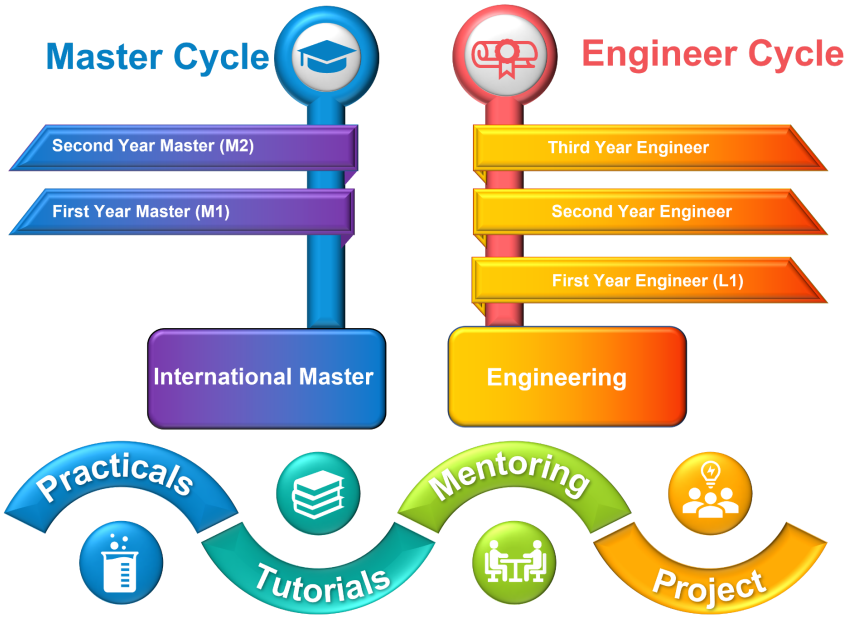
Teaching is sharing the gift of knowledge, inspiring young men and women and making them eager to learn and discover. Teaching and research are two complementary aspects of humankind's endless pursuit of knowledge and an academic environment provides an opportunity to integrate them in a way not possible in any other setting. My goal as a teacher is to foster critical thinking, facilitate the acquisition of life-long learning skills, and prepare students to be competitive in today’s society.

Teaching activities

1. Synopsis

My teaching experience was acquired during my three years of thesis. During my PhD thesis, I was a contractual PhD student in charge of teaching at the National Polytechnic Institute of Toulouse (INPT). During these three years of thesis, I had an annual load of 64 hours TD equivalent during which I acquired most of my teaching experience. All my teachings were done in the 1st year (equivalent to bachelor), the second and third year (equivalent master 1 and 2) of the engineering school ENSEEIHT. I present in the following the details of the teaching, the administrative responsibilities as well as the supervisory activities.





2. Teaching details

Table 1 summarizes by year and type of training the lessons I have done. A more detailed description of these courses is also given below.

Topic	Courses	Level	Type of instruction	Number of hours
Statistics	Introduction to probability and statistics in Matlab	1st year engineer	Practical work	51
Signal Processing	Digital signal processing	1st year engineer	Practical work	55
	Signal project	1st year engineer	Supervision	30
	Signal analysis and processing in MATLAB	1st year engineer	Practical work	24
Image Processing & computer science	Image analysis in Matlab	2nd year of engineer	Practical work	12
	Long project: spectral variability in hyperspectral imaging	3rd year engineer	Supervision	8
	computer vision	3rd year		

	for medical images	engineer	Practical work	12
Total				192

Table1: Summary of teaching activities.

2.1. Introduction to probability and statistics in Matlab

I have taught a total of 51 hours of practical work (TPs) of this course in the first year of the Telecommunications & Networks (TR) and electronics & signal processing (EN) departments. The main objective of this teaching module is to introduce the essential notions of statistical and probabilistic signal processing in Matlab. In a first step, students get familiar with the Matlab tool through the execution of several basic functions. The theoretical tools of statistical signal processing (learned in class) are then put into practice through numerous exercises. A non-exhaustive list of the elements of this course is given below:

- file management in Matlab (functions, scripts, backup, graphic tools ...)
- introduction to matrix calculation with Matlab
- simulation and analysis of discrete and continuous random variables (calculation of the normalized histogram, drawing of probability densities)
- detection (Neyman-Pearson test)
- statistical estimators (maximum likelihood estimator, Bayesian estimators, Cramér-Rao bound)

2.2. Digital signal processing

During my 3 years of thesis, I have provided 55 hours of practical work (TPs) of the first year digital signal processing course in the TR and EN departments. This course redefines the tools of continuous time signal theory to the discrete time case:

- signal representation: correlations and spectra, spectral density
- estimators of the correlation function (properties of biased and unbiased autocorrelation)
- Power Spectral Density estimators (periodogram, correlogram)
- discrete Fourier transform: properties and implementation (FFT)
- digital filtering: properties of finite impulse response (FIR) and infinite impulse response (IIR) filters, stability, rational filters, direct synthesis, standard implementations

2.3. Signal Project

I did 30 hours of signal project (TPs) in the first year of the TR department. This project aims to put into practice the theoretical notions of signal processing through the realization of a project under Matlab. It offers a first experience to the students in terms of project

management. The latter work in pairs and must choose a project among the 4 provided to them. These projects come from studies previously conducted in our research group:

- Project 1, SAR image segmentation: this project aims at dividing a SAR image into several homogeneous regions (according to a certain criterion) by using the edge detection method proposed in [1]
- Project 2, Universal Remote Signal Acquisition For health (URSAFE): this project aims at the recognition of cardiac pathologies through the study of electrocardiographic signals (ECG signals),
- Project 3, detection of transients on system power supply signals: this project seeks to detect and isolate transients (electric arcs) that appear between the electrical cables of a system due to the wear of the insulation sheaths,
- Project 4, MF-TDMA (multi-frequency time division multiple access) receiver: the objective of this project is the recovery of a satellite message transmitted using MF-TDMA modulation.

2.4. Signal analysis and processing in MATLAB

I have provided 24 hours of practical work (TPs) of the course analysis and signal processing under Matlab in the first year of engineering. The objective of this module is to introduce some signal processing tools and to use them in different domains:

- Telecommunications: amplitude modulation, phase multiplexing
- Antennas: directivity of an antenna, sensor networks
- Mechanics: vibratory monitoring of a ball bearing.

2.5. Image analysis in Matlab

I performed 12 hours of practical work for the course Image analysis in Matlab. The practical work was intended for the first year Master students and aimed at putting into practice the theoretical image processing tools seen in class (filtering, compression, etc).

2.6. computer vision for medical images

During my 3 years of thesis, I was in charge of the practical works (TPs) of the medical image processing course which were addressed to the third year students of engineering in Applied Mathematics and Computer Science (3IN). I participated in the creation of the topics of these practical works, in the writing of the Matlab codes, in the conduct of the practical works and finally in the correction of the students' reports. A non-exhaustive list of the elements of the labs is given as follows:

- Calculation of the Radon matrix
- Generation of Poissonian data
- Simulation of positron emission tomography (PET) images
- PET image reconstruction using two main types of methods:
    - Analytical methods: Filtered back-propagation (FBP).
    - Iterative methods:
        - Maximum-Likelihood Expectation-Maximization (MLEM)

    - Ordered Subsets Expectation-Maximization (OSEM)
- Registration of PET and CT images.
- Fusion of PET and CT images.

3. Supervision Activities

- During my thesis, I participated in the supervision of three students in a third year project at ENSEEIHT (Master II, duration 6 weeks). The students were interested in the implementation of several algorithms (optimization and Bayesian simulation) for linear unmixing in hyperspectral imaging. These algorithms operate in an unsupervised way and take into account the spectral variability of pure spectra.
- I participated during my thesis in the co-supervision of a third year student at ENSEEIHT (Master II). The students were interested in the implementation of an optimization algorithm for tumor classification in medical imaging.
- I have also been a member of the jury for the defense of several projects in medical image processing for second year engineers in electronics and signal processing (2EN)
- I am currently participating in the supervision of 3rd year students at atos on the classification of wood texture to combat illegal wood fraud.

Suitability for teaching profile

My academic background as well as the teaching experience I have acquired during my thesis and as a data scientist correspond well to the teaching profile required by the Assisstant professor position at **…..** . Indeed, my master degree, obtained at the University of science and Technology Houari Boumedienne in Algeria, is in the field of electronics and offers me a good approach for the training of engineers at **……** . This initial training was followed by an international research master's degree in "signal, image processing" and a PhD thesis involving additional knowledge in statistics,applied mathematics and artificial intelligence. I also taught during my thesis (as an instructor) in the field of signal and image processing, with additional knowledge in probability and statistics and in communication, which is in line with the teachings given at **…….** (see also Table 2). All these teachings have been done in the form of practical work, design offices or by supervising projects. This diversity awakened my interest in teaching and reinforced my desire to follow a career as a teacher-researcher. All these elements facilitate my integration in the teaching team of the **…….** department and allow the implementation of teaching in the field of statistical signal and image processing, taking into account new methods developed in the scientific world.
In addition, I will participate in the development of the training of engineers by apprenticeship (FIPA) as I will have an opening on other formations and disciplines according to the needs of the teaching team of the department. I will contribute to the development of teaching modules (courses, tutorials or practical work), the creation of training courses, as well as to the proposal of internship subjects, projects, and doctoral thesis subjects for **……** students. I will also participate in the sharing of administrative responsibilities within the existing pedagogical team (responsibility for training, diploma, timetable,...), as well as having an

opening on the training courses requiring specific timetables (evening classes) to share the teaching load with the colleagues of the department.

Topics	Experiences
Statistical processing of signals and images (probability and statistics, segmentation, hypothesis testing, spectral analysis)	Taught at ENSEEIHT as an instructor
Communications	Taught at ENSEEIHT and ATOS through projects
Applied mathematics & IA	Is part of my my research work

Table 2: Summary of my fit with the teaching profile.

TEACHING PHILOSOPHY

My goal as a teacher is to prepare students to be thinkers. Today's fast-paced society puts students at a high risk of becoming good test-takers rather than thinkers. The principles that guide my teaching are respect and clarity, and the tools I employ to achieve my goals are an interactive classroom environment and hands-on experience.
First, I strongly believe that any educational institution in the world has the primary responsibility of contributing to training the citizens of tomorrow, and instilling civic values. Respect is one of the fundamental values that a teacher must pass on to students, and to do so, he or she must set the example by showing respect for his or her students. I always treat my students with respect and dignity, and I expect them to treat their classmates and their instructor in the same way. I am attentive to their needs, and prone to accept their suggestions or their critics.

Second, teachers must clearly state the goals of the course in advance and convey its contents with clarity, and try to look at the subject from the perspective of a student who is approaching a new field for the first time. Students are often intimidated by the amount of new or complex materials presented in a course. Although I always encourage students to step out of their "comfort zone", suddenly forcing them to do so may have the effect of driving some students away from the subject. Trying to convey too much information may also be detrimental to the students.

Good principles, however, are not sufficient to deliver a compelling learning experience, if they are not implemented through adequate tools. I firmly believe that keeping students engaged through an interactive classroom experience enhances their learning process. Consequently, I set an expectation that I will be asking questions, and initiating discussions that require active participation, and I explicitly allocate time for class discussions. Of course, active participation may be difficult to achieve, because not all students may be ready to participate actively in the classroom. My approach is to stimulate their interest by showing

them how the contents of the course apply to real problems, and illustrating difficult or highly theoretical concepts through compelling examples or live demonstrations.

As part of my effort to keep students actively involved, I also require them to present their class projects in front of the class, at the end of the course. Most students are nervous when asked to talk in front of an audience, especially the first few times, so it is important to get them used to the idea gradually. On the very first day, I ask students to introduce themselves to their classmates and tell something about their background. This keeps students in their seats yet they have to say something to the class.

Finally, providing students with hands-on experience is fundamental to the success of their learning experience. To this end, I try to incorporate as many live demonstrations as possible in my lectures, and always invite students to practice with the tools I show in class, both in class or from the comfort of their homes.