MINES ParisTech

PSL UNIVERSITÉ PARIS

Post-Master's Degree

MASTÈRE SPÉCIALISÉ®

AI Move

ARTIFICIAL INTELLIGENCE and MOVEMENT in Industries and Creation

ARISTOTLE UNIVERSITY OF THESSALONIKI

idiap RESEARCH INSTITUTE

ircam Centre Pompidou

LABORATOIRE ARTS DES IMAGES & ART CONTEMPORAIN

IMAGE NUMERIQUE & REALITE VIRTUELLE

UNIVERSITÉ PARIS 8 VINCENNES-SAINT-DENIS

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AIMove Overview

Scope and objectives

The AIMove programme aims

- to train project managers able to conceive, implement and take over interactive systems or intelligent workspace projects by enhancing the sensorimotor and cognitive capabilities of the user.
- to create experts in movement engineering, prepared to take responsibility in the industry, integrating motion capturing, machine learning and movement-based interaction.
- promote an interdisciplinary AI engagement

The need for AIMove

Industrial - Addressing the challenges where «movement and AI» can bring solutions
Networking - Creation of a hub of professionals and experts
Skills for Jobs - A well-rounded educational programme for a professionnal transformation of the engineer
Academic - Emerging pedagogical methods through R&D

Targeted competencies

AI and societal challenges

Motion capture, modeling and gesture recognition

User Interaction/User Experience (UI/UX)

Humans, machines and connected objects

Movement and European industrial leadership

Interdisciplinary AI engagement

Movement engineers'career paths

The movement engineer could pursue a career as (among others):

Project leader in Collaborative Robotics
Project leader in Game Building and Gameplay
Concept engineer for the developement of movement-based interactive systems
Innovation manager for the Factory of the Future
TEL Manager in industry
Expert industrial coach on movement and AI
SME-founder on movement and AI
Machine Learning Engineer
Computer Vision Engineer

Targeted industrial sectors

Creative Industries

Security and Defense

Smart Automotive Vehicles

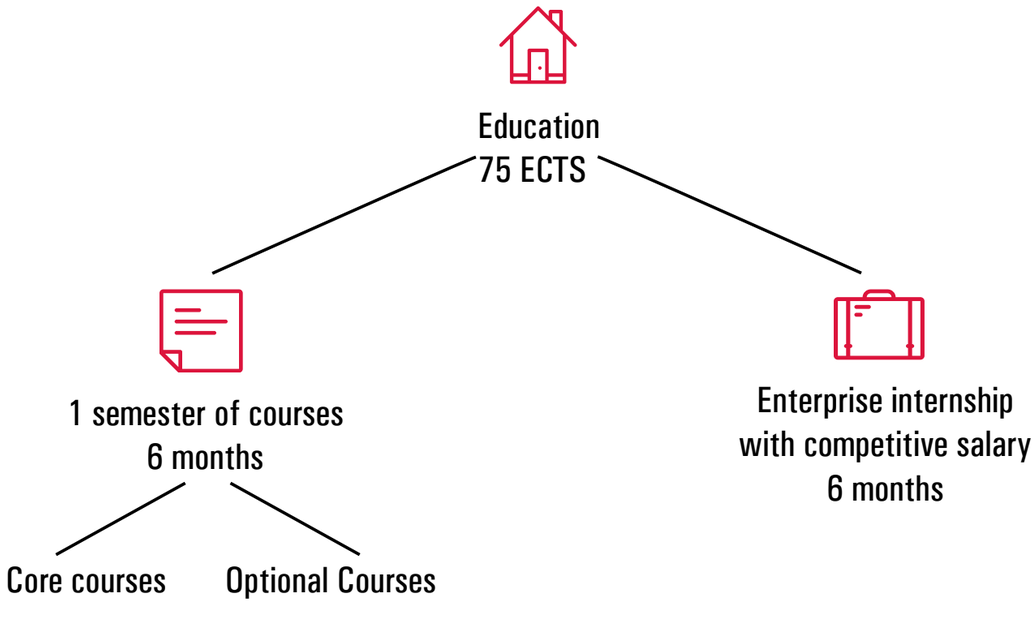
Manufacturing

Arts, Cultural Industries and Museums

Entry requirements

5 years at University level
or
4 years at University level
and 3 years' professional experience
and
IELTS score: 6.5

AIMove structure



Tuition Fees

14 800 € for
students or life-long learning

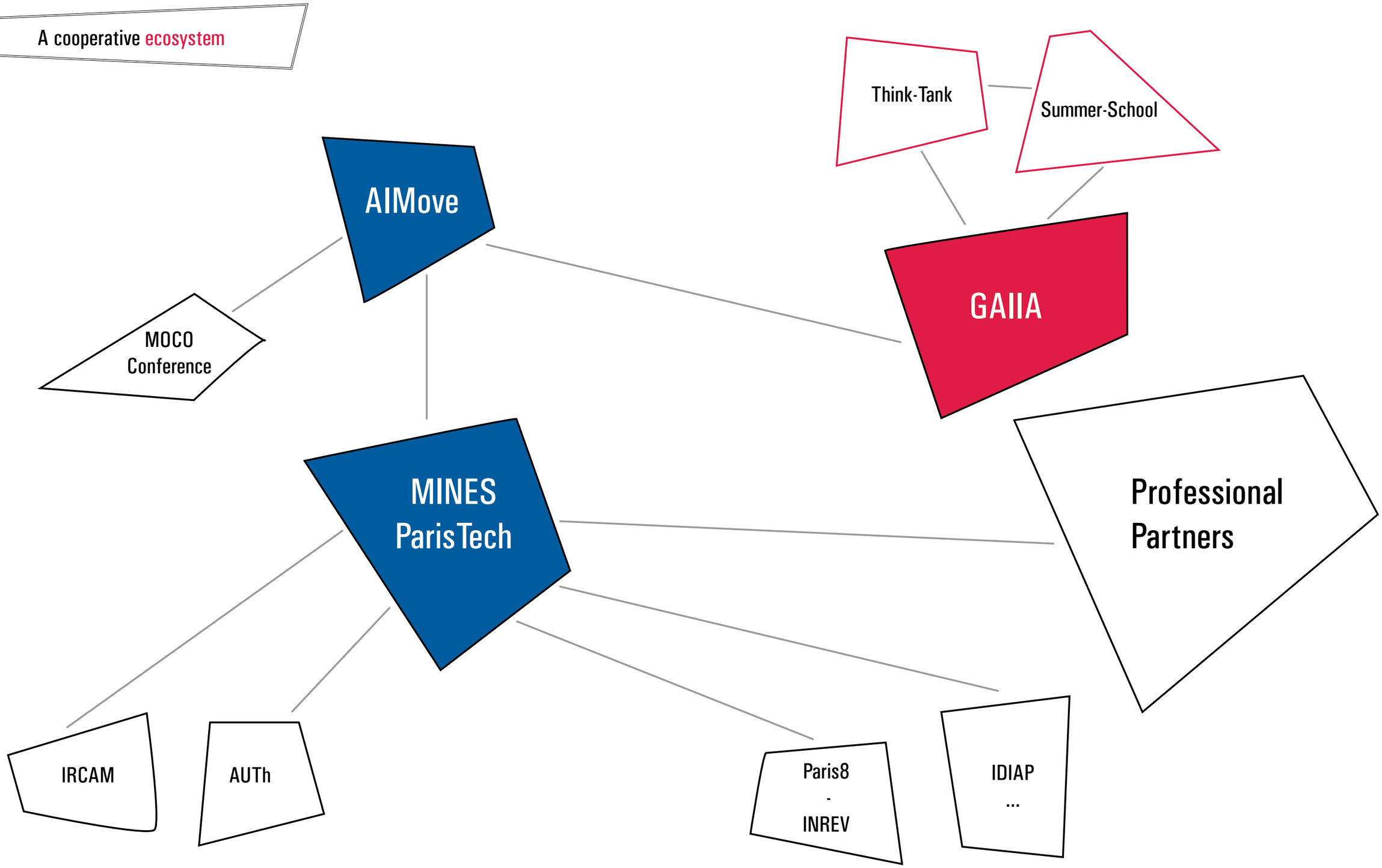
Applications for admissions

April 10th - May 31st 2018

Important dates

April 10th	Admissions begin
May 31st	Admissions' deadline
early July	Response to admissions. Selected candidates will be invited for interview
mid July	Interviews
end of July	Application outcomes will be announced to candidates
September	Enrolment

A cooperative ecosystem



Almove Course list

Module 1 : AI and Societal Challenges

AI for Movement Applications in the Economy and Society
Anthropology of the Body and Sociology of Interaction
Ethics and Privacy by Design
Perception, Emotion and Aesthetics of Movement

Module 2 : Motion Capture, Modelling and Gesture Recognition

Motion Capturing: Studio-based experience
Machine Learning
Gesture Recognition
Statistical, Geometrical and Dynamic Representations of Movement
Computer Vision for Scene Analysis

Module 3 : User Interaction and User Experience

Virtual and Augmented Reality
User Interaction/User Experience (UI/UX)
Human Motion Analysis in Interactive Environments

Module 4 Humans, Machines and Connected Objects

Human-Robot Interaction and Collaborative Robotics
Movement-based Interactive Systems and Sonification
Creative Robotics
Personalised Healthcare and IoT (Internet of Things)
Sensorimotor Learning and Vocational Training

Module 5 : Movement and European Industrial Leadership

Project Coordination for Human-Centered Engineering
Challenges for Cultural & Creative Industries*
Challenges for the Factory of the Future*
Challenges for Intelligent Vehicles*

*choose one among optional courses

Module 6 : Interdisciplinary AI Engagement

(GAIIA Association)
Think-Tank
Summer-School GAIIA
MOCO : International Conference on Movement and Computing

Module 1: AI and Societal Challenges

AI for Movement Applications in the Economy and Society

Course description

In recent years AI applications have increasingly been dealing with "touching" the human body and aim at its' understanding and modeling for the creation of new interactive systems. Providing machines with intelligence for better collaboration, living and learning, has not only economic but also social consequences. Thus, AI is currently at the center of discussions and debates that go beyond the digital domain because of the changes they may entail. This module aims to introduce students to the various applications of AI in relation to body and movement in industry and more professional context, as well as in creation and arts (manufacturing, healthcare, art/creativity, sports, education, intelligent vehicles etc.).

Objectives

- Introduction to the basic theoretical notions of AI
- Presentation of a wide range of applications
- Identification of the strengths and weaknesses of these applications through sucess and failure stories

Academic Instructor

Alina Glushkova | MINES ParisTech

Anthropology of the Body and Sociology of Interaction

Course description

Being closer to ideas that speech, gestures make us what we are: human beings. Since they exist as invisible forms, which can only be captured through traces, gestures form the source of most of our communication systems. Even if today, motion capture permits the recording of gestures in refined ways, digitalization provides only limited access to understanding them. After all, their 'capture' is only generated through a series of still images (Deleuze, 1983). Furthermore, any technological apparatus (Agamben, 1996) poses the question of remediation of gesture: once it is reincorporated, it gets played and arranged by machines (Schnell, 2013).

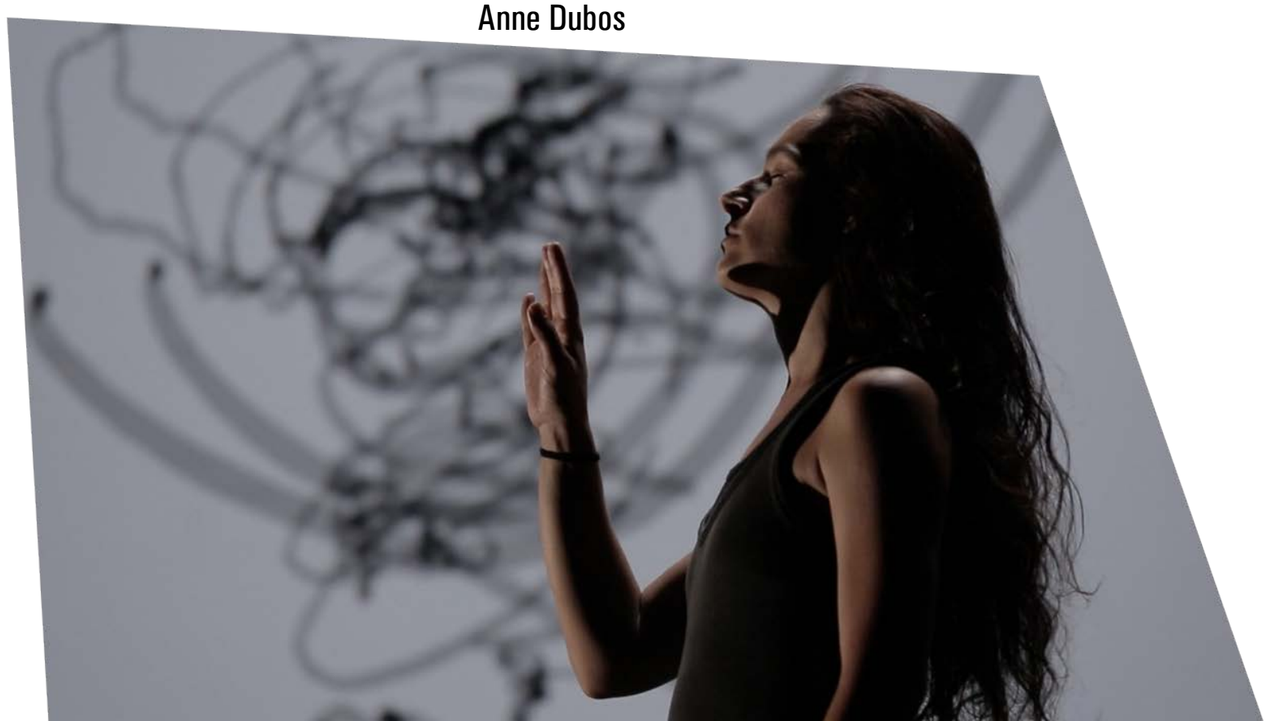
As the use of technology requires us to question the transformation of gestures into texts, codes, and images, the key topic of this course will be: how to build society through media, devices, or any technological apparatus (Latour, 1992).
In line with the teachings of Marcel Mauss, André Leroi-Gourhan, Adam Kendon or Marcel Jousse, this course in anthropology is set at the confluence of theories of perception, cognition, as well as the history of science and technology.
By initiating research through practice, we invite you to participate in a first mapping of this emerging field of research, which responds to the rapid growth of technology. What will possible worlds and people of tomorrow look like? And above all, what kind of society do you want to build and live in?

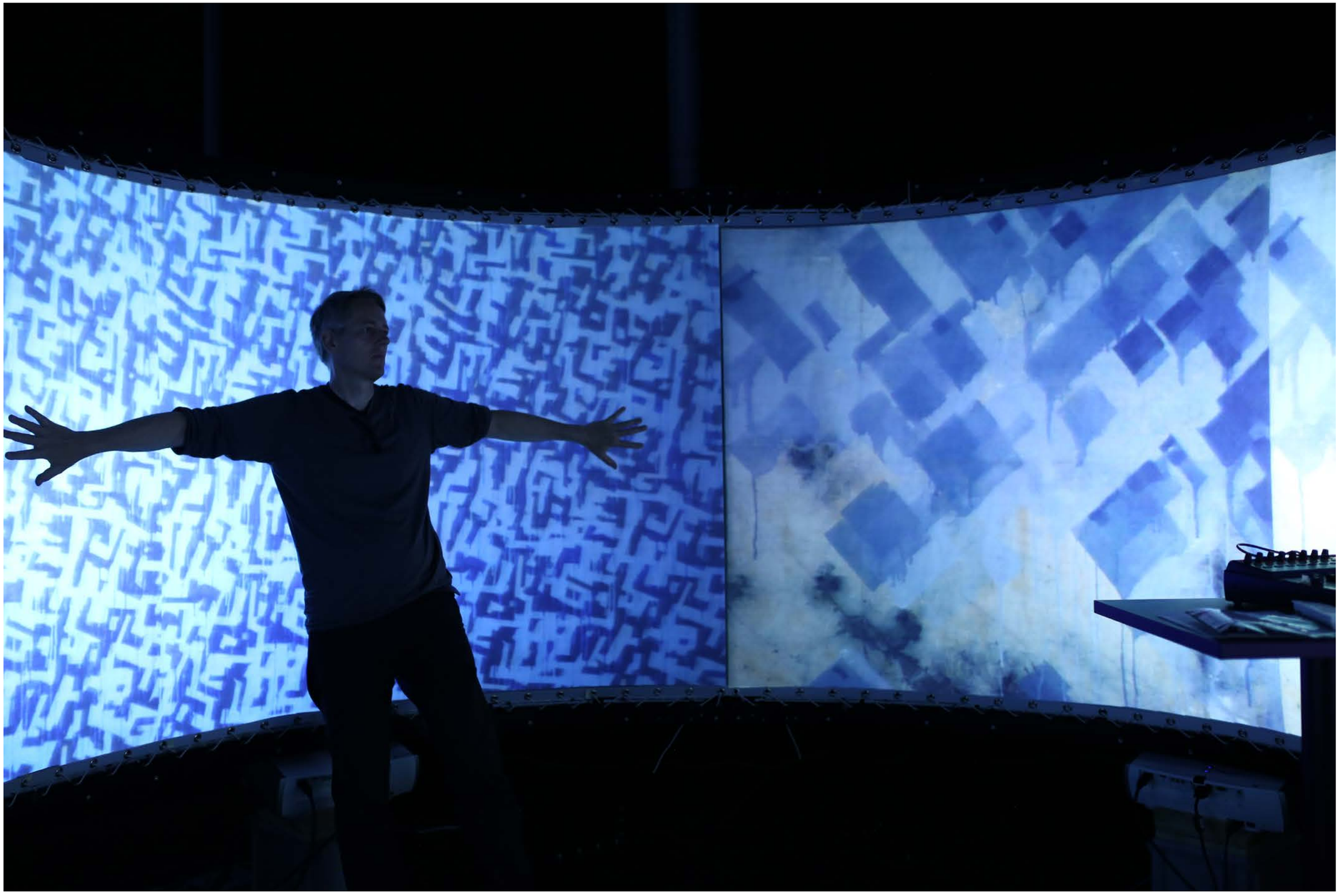
Academic Instructor

Yves Winkin | Director of National Conservatory of Arts and Crafts (CNAM), Anne Dubos

Objectives

- Understand the theoretical bases of anthropology and the sociology of the body
- Use ethnographic analysis tools through participatory observation and qualitative interview techniques
- Identify behavioural patterns; develop a know-how towards to criticize them
- Apply knowledge gained, in the context of a field-based survey and relating bodies in interaction with urban settings





Ethics and Privacy by Design

Course description

Today, as we work, consume, move around, we almost inevitably 'produce' data. In addition to this exponential growth in Big Data, to all the data which comes directly from the human activity, there is also the data produced by connected objects, which are more and more numerous, as well as the metadata, that is to say the data generated automatically in the context of transactions and communications via the Internet.

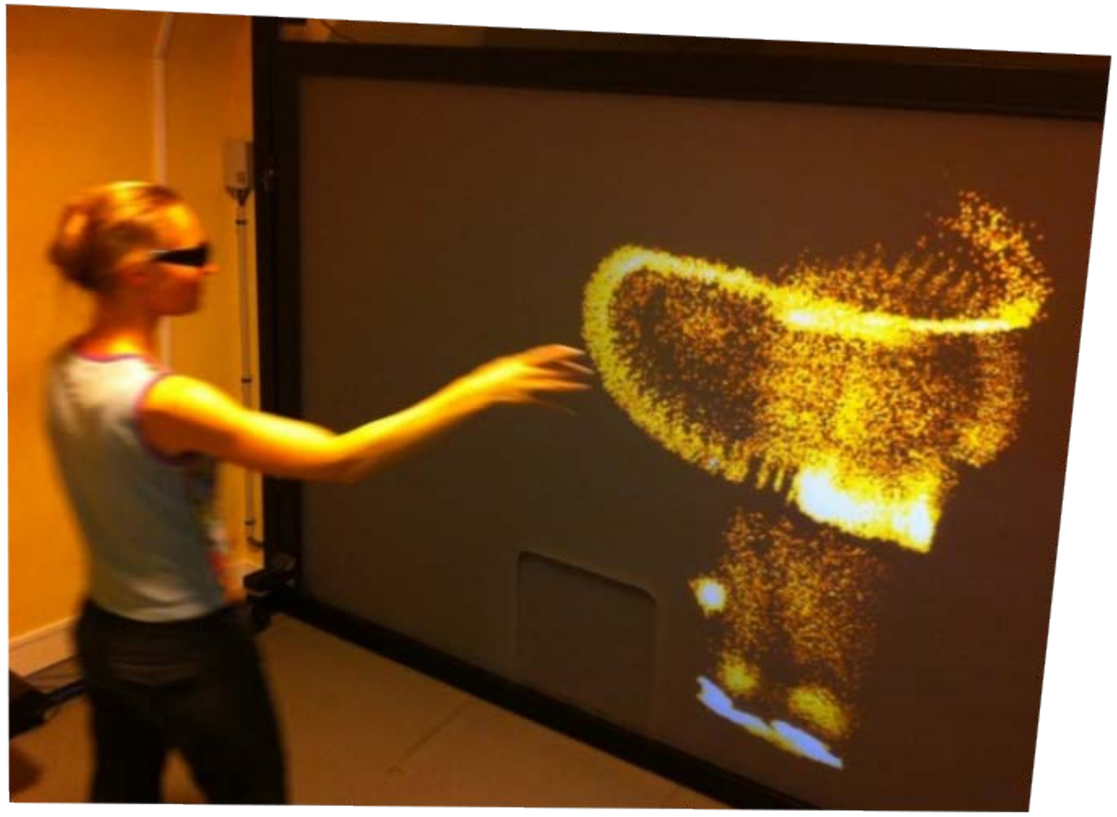
This module is an introduction to the general philosophy of data protection instruments and ethics by design. A global picture will be given to the student, including the phenomena that lead to a new state of computer law. Topics such as "Ethical Criticism of the Algorithm" and "The Right to Data Protection" will be addressed.

Objectives

- Acquire a basic knowledge around law and key principles of data protection
- Perceive the main concepts by concrete examples that emerge today
- Develop critical thinking in front of a new state of law
- Use data protection theories as tools for designing one's own projects
- Understand how digital transformation affects legal regimes of data protection

Academic Instructor

Alina Glushkova | MINES ParisTech



Immersive Augmented Gesture - Thesis Project Jean-François Jego - Mines ParisTech 2013

Perception, Emotion and the Aesthetics of Movement

Course description

"*A gesture is a motion of the body that contains information. Waving goodbye is a gesture. Pressing a key on a keyboard is not a gesture, all that matters is which key was pressed. This is true regardless of the gesture that was used to push the key. It could have been pushed lovingly or in anger*" (Billinghurst 2011). The understanding of movement quality is a new challenge that goes beyond the arts such as dance or performance which explore it since the last century. Movement quality and emotions are deeply related, and human gesture is directly influenced. This course allows to explore gesture and movement through quantitative and also traditional qualitative descriptors. The goals are to consider movement both as an interactive input but also as an output regarding interactive applications. We will focus on artistic and prospective use cases and applications in different use cases.

Objectives

- Open to the challenges in movement quantity and quality
- Explore human perception of gesture and cognitive considerations
- Understand the relations and connections between emotions and movement
- Open the knowledge considering aesthetics of movement in arts and digital arts

Academic Instructor

Jean-François Jégo, Vincent Meyrueis | AIMove's Academic Directors for Paris8

Module 2: Motion Capture, Modelling and Gesture Recognition

Motion Capturing: Studio-based experience

Course description

This module aims to put students in the situation of a 'movement engineer' who aims to record, edit, and return movements for a given project. Beyond the pure description of biomechanics of the human body and the diverse available tools, the main goal will be to make students aware of what the nature of the 'signal' movement is and what needs to be done to respect him in their work. They will discover the aspects related to the facial, the eyes, the fingers, accessories, but also the matter of re-targetting, post-animation or style.

The main approach will be based on the concrete experience of a project conceived and directed by and for themselves, including a real recording session on a very high-quality platform. (1 day)

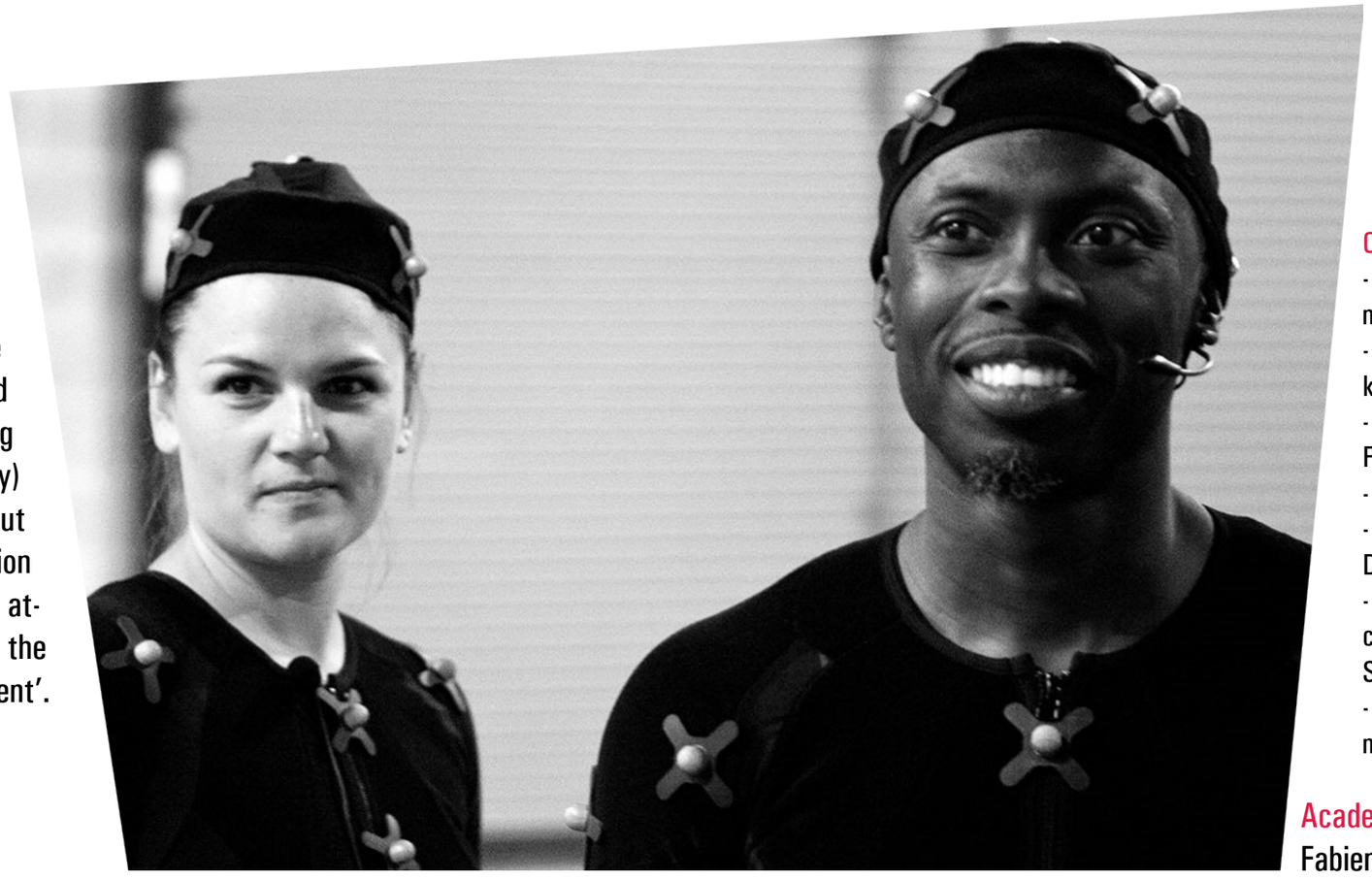
On the one hand, they will be able to carry out all the necessary steps (preparation, distribution of tasks, possible tools, post-treatments, traps, attention to detail...), but also to experiment live the extreme subtlety and finesse of actual 'movement'.

Objectives

- Become aware of the extreme finesse of the "movement" material
- Experiment on a high-end professional tool
- Make a personal project
- Discover fundamental notions such as retargetting, uncanny valley, VOR etc.

Academic Instructor

Rémi Brun | Mocaplab



Actors wearing motion sensors for cinema production

Machine Learning

Course description

The goal of this course is to present the general principles and methodology of statistical machine-learning algorithms, and a typology of learning tasks (supervised classification or regression, unsupervised clustering etc.). At the same time, students will be provided with quite a wide range of the most commonly used 'standard' machine-learning algorithms (Support Vector Machines, Decision Trees and Random Forests, boosting, neural networks, k-Means, Kohonen Self-Organizing Maps, etc.), as well as the specifics of the Deep-Learning approach, and details of main Deep-Learning algorithms (Convolutional Neural Networks, etc.)

The course also includes a significant proportion of practical work on the computer, to provide "hands-on" experience and understanding of main parameters of algorithms.

Objectives

- Introduction, principles and methodology of Machine-Learning
- Support Vector Machines and kernel methods
- Decision Trees and Random Forests, boosting
- Multi-layer neural networks
- Convolutional Neural Network and Deep-Learning
- Unsupervised learning and clustering (k-means, Kohonen SOM, etc.)
- Genetic Algorithms and other meta-heuristics

Academic Instructor

Fabien Moutarde | MINES ParisTech

Gesture Recognition

Course description

Gesture recognition is the scientific and technological field in which learning machines are utilized to understand human motions and interact accordingly. Since « gestures are everywhere », there is a great range of applications, which includes the safeguarding of gestural know-how or even the movement-based interfaces in musical interaction for the Cultural and Creative Industries, the collaborative robotics for the Smart Manufacturing, the interaction between passengers and vehicles for Automotive Industries, etc..

This course presents a generic methodology for gesture recognition that has been validated through both industry-oriented and artistic projects. Topics include: (i) motion capturing, (ii) movement analysis, (iii) feature extraction, (iv) deterministic and stochastic modeling of temporal series, (v) continuous and early recognition. Particular emphasis will be placed on relevant machine learning and computer vision methods for motion tracking. The course will also draw on technological paradigms conceived for real-life situations.

Academic Instructor

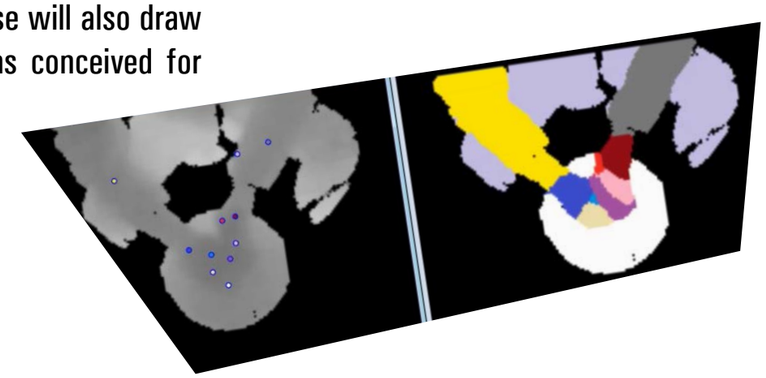
Sotiris Manitsaris | MINES ParisTech

Suit with motion sensors

Objectives

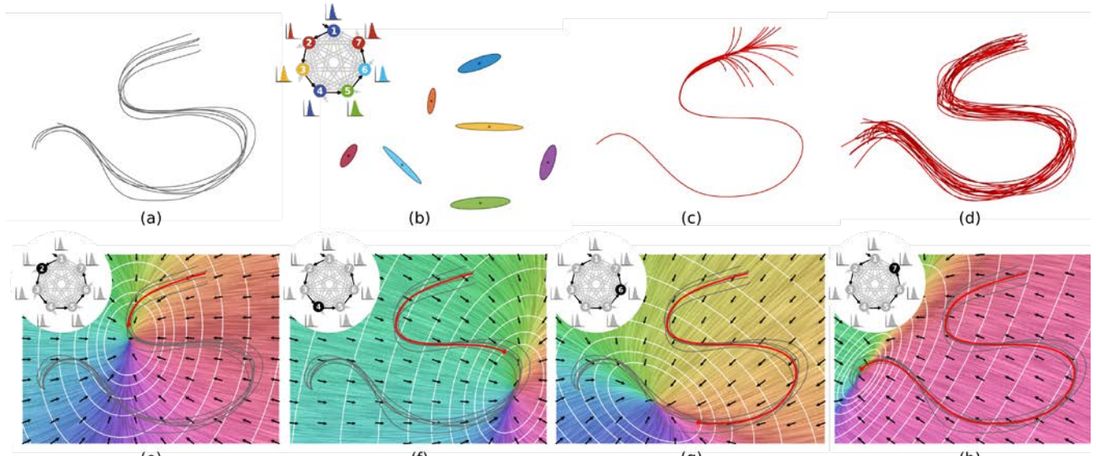
This cours aims to provide with all the necessary knowledge for:

- identifying the appropriate sensor according to the movement scenario and application
- implementing a motion capture by putting a special focus on vision-based sensors
- extracting features from the signal based on machine learning methods
- recognizing isolated and multi-user gestures (using HMMs, GMMs, DTW, etc..) based on training sets with single (one-shot learning) or multiple executions (using C++, Max/MSP etc..)



Automatic professional scene segmentation, tools and body tracking (i-treasures, FP7)

Statistical, Geometrical and Dynamic Representations of Movement



Encoding of the variation and coordination patterns of a movement as a sequence of dynamical systems, allowing the system to generate new movements while adapting those to new situations or constraints.

Course description

This course will present various ways of representing movement data and gestures in a mathematical manner, with the goal of analyzing, compressing or generating movements. Several examples of applications will be covered, from generation of manipulation skills in robotics to the analysis of motion capture data. The principle of movement primitives will be presented, which allows reorganization in parallel and in series of 'motion bricks', in order to create new gestures or to adapt a gesture to a new situation or to a new kinematic chain. Several movement representations will be covered in the course, arising from different research domains, including statistical modeling (hidden Markov models), differential geometry (Riemannian manifolds) and dynamic systems (dynamic movement primitives).

Objectives

- acquire an overview of existing techniques, at theoretical, practical and implementation levels
- cover various examples of applications; examples of implementation in Matlab, C++ and Python will be presented, with source codes provided to the course attendees, which will be exploited to test and explore the techniques described in the course

Academic Instructor

Sylvain Calinon | AIMove's Academic Director for IDIAP

Computer Vision for Scene Analysis

Course description

Images are everywhere and so intuitive for humans, but require complex analysis of colors, texture and geometry for a computer. Through a mix of lectures and practices this class will introduce computer vision and the key algorithms to extract semantic information, objects or structure. The course will cover introduction to pixel-level representations to segment textures, shadows, skins or to detect simple objects; model fitting techniques to extract geometrical information in the scene. Using spatial information and learning techniques, we'll build higher level representation used for scene semantic labeling, or human pose/ skeleton estimation which is required for interactive use. Finally, we'll introduce time and motion processing to estimate the scene structure such as its geometry and dynamics.

Objectives

The class will require knowledge of signal processing and coding skills (Python). The students shall acquire the following knowledge:

- Introduction to computer vision
- Texture segmentation (colors, light, texture, objects)
- Clustering and model fitting (geometry)
- Estimation of image semantic (pixel-wise labeling)
- Silhouette and Skeleton extraction (pose estimation)
- Time and Structure from Motion (tracking, reconstruction)

Academic Instructor

Raoul de Charette | INRIA

Module 3 : User Interaction and User Experience

Virtual and Augmented Reality

Course description

Virtual Reality and Augmented Reality are technologies with the experience at their heart. This experience with can be realistic, symbolic or can come from the imagination. The main objective of the course is to learn the fundamentals of Virtual Reality and Augmented Reality, questioning what are immersion and interaction processes involved creating and 'living' in the virtual environments. The course articulates definition, theory about Sensory-motor, Cognitive and Functional levels and hands-on with hardware devices and software. We will detail then immersion in regards to these levels and we will focus then on the increasing use of gestures in AR and VR to interact. The final goal is to give the students the autonomy to understand the limits and the possibilities of the medium.

Objectives

- Learn the basics concerning Augmented Reality and Virtual Reality and examine the processes of immersion and interaction
- Articulate a definition and master the theory on sensorimotor, cognitive and functional levels, and practice with hardware and software devices
- Acquire the tools to be autonomous to understand the limits and possibilities of the medium "RV and RA"

Academic Instructor

Philippe Fuchs | MINES ParisTech

User Interaction/User Experience (UI/UX)

Course description

In this course, we propose to explore the basis of User Interaction and User Experience in order to assess and understand the methodologies for Interaction Design and gestural interface creation wirth gestures. After a brief overview of the areas of expertise with the analysis of the main use cases regarding Human Computer Interface (HCI), video games interaction, and interactive installation in new media arts. This course deals with fundamental concepts of cognitive science and ergonomics analysis.

InterACTE: Gestural interaction with a virtual actor in Virtual reality, CIGALE Project Labex ArtsH2H, 2015

We also explore the emotional aspect of interaction with such approach like Kensai engineering. We propose then some tools and methodology in order to collect and evaluate user experience regarding interaction using gestures.

Objectives

- The fundamental concept of User Interfaces
- The fundamental concept of User Experiences
- The fundamental concepts of cognitive science and ergonomics
- To explore and to analyze the main design studies on UI/UX
- The methodology for usage and gesture interaction analysis
- The methodology for Interaction Design and user interface creation

Academic Instructor

Vincent Meyrueis | Academic Director for Paris8

Human Motion Analysis in Interactive Environments

Course description

The course focuses on human motion analysis in interactive environments with special emphasis on serious games. This course will survey state-of-the-art techniques, in the industry and academia, related to the capturing, modelling, and analysis of human motion. It will involve an in-depth study of pattern recognition techniques and state of the art human motion recognition algorithms, such as Hidden Markov Models, Dynamic Time Warping, Linear Dynamic Models and Deep Learning approaches. Moreover, it will present techniques related to emotion recognition, through facial expression and body motion analysis, and engagement recognition in serious games. Finally, the course will introduce students to Artificial Intelligence (AI) algorithms for personalization and adaptation in serious games.

Objectives

On completion of the course, the student should be able to:

- Use different motion capture technologies
- Apply various human motion recognition algorithms
- Understand basic pattern recognition approaches
- Use eye tracking technologies
- Apply human emotion recognition algorithms
- Discuss theories and models of user's engagement
- Have a basic understanding of Artificial Intelligence (AI) algorithms for personalization and game adaptation

Academic Instructor

Kosmas Dimitropoulos | AIMove's Academic Director for CERTH

Module 4: Humans, Machines and Connected Objects

Human-Robot Interaction and Collaborative Robotics

Course description

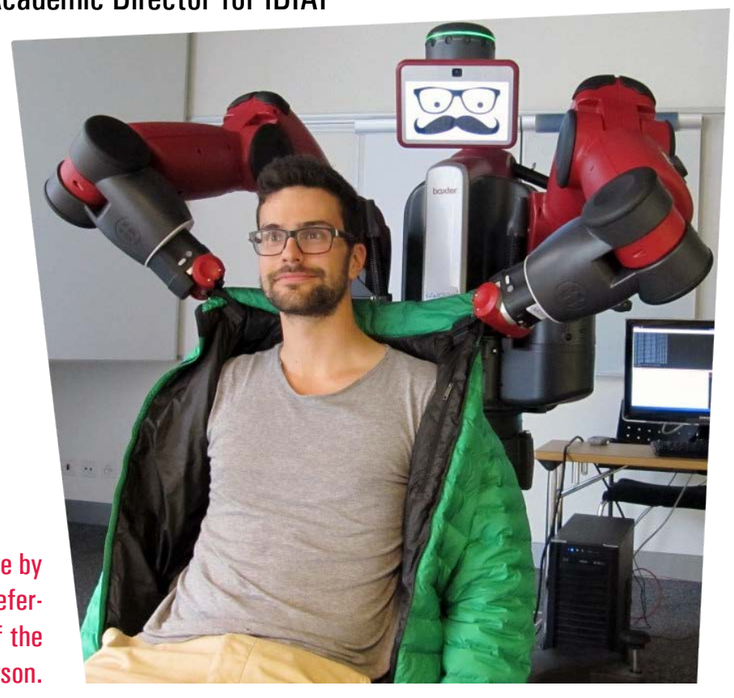
This course presents the use of artificial intelligence and machine learning techniques in human-robot interaction applications. In particular, it will focus on techniques to transfer skills by demonstration, inspired by imitation mechanisms to teach new skills to robots with an intuitive interface for the end-user. Several examples will be presented, notably in human-robot collaboration applications in which the users share the same workspace as the robots, and/or achieve joint manipulation tasks with the robots.

Objectives

- acquire an overview of existing techniques in learning by interacting with the end-users, within industrial robotics or service robotics applications
- be presented with case studies and recent developments in research labs

Academic Instructor

Sylvain Calinon | AIMove's Academic Director for IDIAP



Personalized dressing assistance by adapting the gesture to the preferences and movement capability of the person.

Towards a Human - Robot coexistence

Movement-based Interactive Systems and Sonification

Course description

This module introduces the main methods for designing movement-based interactive systems. The course is comprised of theoretical and methodological contents, as well as practice-based projects equating with realistic use cases. The course will cover the main concepts of user-centered interaction design, as well as the technical bases of movement analysis and sonication (sensors, signal processing, motion analysis, gesture recognition, sound synthesis). These notions will then be further developed in group projects based on actual cases of movement-based interactive systems.

Objectives

- learn to design movement-based interactive systems in a participatory way
- identify appropriate motion capture solutions
- understand the technical bases of movement signal processing and gesture recognition as well as their context of application
- use tools for motion analysis, sound synthesis and mapping
- leaarn to apply knowledge in designing an actual case study and implement an interactive system linking human movement and sonification

Academic Instructor

Frédéric Bevilacqua | AIMove's Academic Director for IRCAM,
Jules Françoise | CNRS-LIMSI,
Baptiste Caramiaux | CNRS-LRI

Creative Robotics

Course description

The module focuses on developing models of human intelligence in the context of creative activities, where such models can be implemented, tested, and further refined via computational and robotic (embodied) systems. By creative activities, we understand those displayed in the visual arts, music performance, dance, crafts and related human activities. The body, its use in a creative activity, such as drawing, provides constraints which are not naturally taken into account with a traditional
computational approach. The body and its uses will impact on the engineering of design system. It will also prescribe what movements are likely and desirable and those which are not. It impacts on the strategies put in place: e.g. one draws using a limb, with a hand, which may get in the way of what is visible.

The course will take a multidisciplinary approach. We will consider how robotics systems can be built by combining a deeper understanding from: the psychology of visual perception, human movement science (such as found in graphonomics), the psychology of visual art, AI for creative systems and artistic support, recent progress with Neural networks (such as Deep Learning approaches used to isolate and transfer painting styles). Quality evaluation by robotics systems will be introduced: how can a robot be able to measure the quality of an artefact either as it is produced or once completed; for example, what is the influence of movements used to create a drawing or painting. In the course, we will consider a number of philosophy of AI questions, such as: How to make a robotic system a useful collaborator to the human artist? What other applications, e.g. in training and education are possible? What is the impact of movement mimicry for the social acceptance of robots? The state of the art at the intersection of AI, robotics, creative and artistic applications will be presented.

Academic Instructor

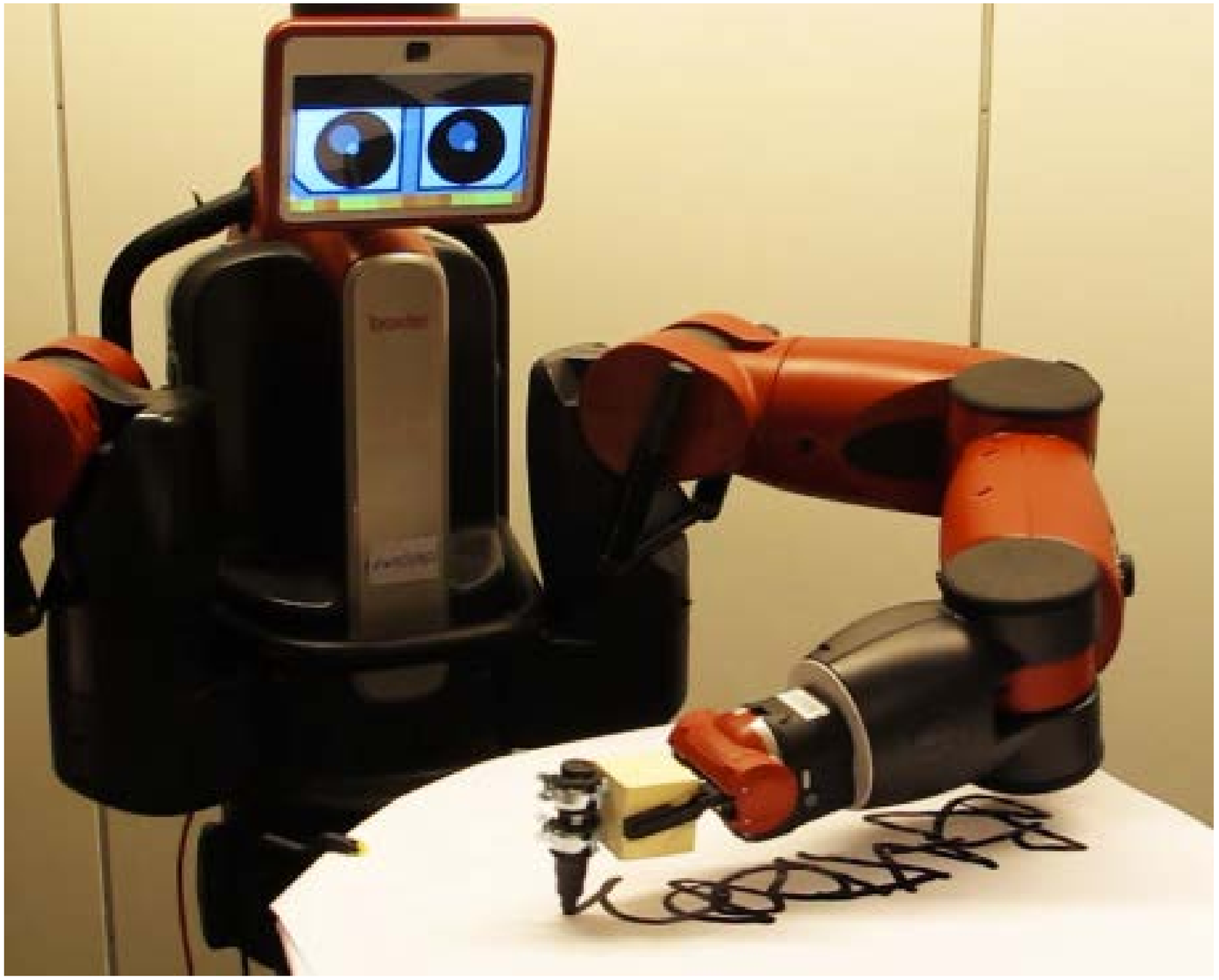
Frederic Fol Leymarie |
Goldsmiths, University of London

Objectives

On completion of the course, the student should be able to:

- understand the importance of movement in artistic or creative practices and applications
- be able to describe some current state-of-the-art embodied creative systems and applications
- be able to design a system architecture for a simplified robot arm with sensors (e.g.camera) towards creative applications (e.g. drawing)
- understand how recent machine learning can be used for creative robotics; e.g. compliant motor control, learning from examples, deep learning for style transfer
- be aware of what advances in technologies will help make robots more able to collaborate with humans in creative practices (and why) e.g. in soft robotics, human movement science, perception, software engineering, haptics

AIkon-2 and the early versions of Paul the robot (www.aikon-gold.com), a project with Patrick Tresset (Goldsmiths) supported by the Leverhulme Trust (circa 2011).



AutoGraff project with
Daniel Berio (Goldsmiths) and
Sylvain Calinon (Idiap))

Personalised Healthcare and IoT (Internet of Things)

Course description

Remarkably, due to the rapid proliferation of wearable devices and smartphones, the Internet of Things (IoT)-enabled technology is evolving with regard to healthcare from providing conventional hub-based system to more personalized healthcare system (PHS). The successful utilization of IoT enabled technology in PHS will facilitate faster and safer preventive care, lower overall cost, improved patient-centered practice and enhanced sustainability. Future IoT-enabled PHSs will be realized by providing highly customized access to rich medical information and efficient clinical decision-making to each individual with unobtrusive and successive sensing and monitoring. This module will focus on: a) the state-of-the-art research and applications in utilizing IoT-enabled technology for healthcare systems, b) analysis of efficient scientific and engineering solutions, c) address of the needs and challenges for integration with new technologies, and d) provision of visions for future research and development in the area via novel smart sensing technologies, IoT architectures, services, applications, and AI-based data analytics for PHS and applications.

Objectives

- understand the basic terminology and parameters involved in PHS and IoT spectrum
- explore the IoT System Architectures in Healthcare, Optimization of Healthcare Systems and Network Communications/Data Transmission for Health Sensor Data
- understand the types of Wearable Sensor Integration for Healthcare
- apply data mining and exploration of health data
- understand the standards and interoperability, Security and Privacy in IoT Healthcare
- explore Cloud Technologies for IoT Healthcare
- build knowledge for social impact and perspective of PHS/IoT as enablers in the improvement of the healthcare system

Academic Instructor

Leontios Hadjileontiadis | AIMove's Academic Director for AUTh

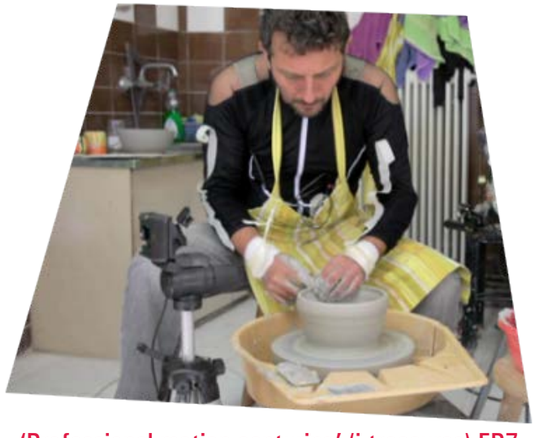
Sensorimotor Learning and Vocational Training

Course description

This course will introduce the basics of sensorimotor learning (Piaget Theory etc.) by focusing on the contribution of interactive systems to know-how transmission. In industrial or cultural field, in order to learn «how to perform » an expert gesture the transmission 'in person' is used. It means that the learner observes his master, tries to imitate his gestures and assimulation of the teached information is based on the interaction installed between them. However for various reasons the master can't assure his presence for the entire learning process and the learner needs to train himself alone. In industrial context this need is even more important, since productivity issues appear when the master spends time with the trainee. New technologies can bring a partial solution to this issue, by providing interactive systems able to assist gestural learning during the self trainings.

For the creation of such systems it is essential to identify and understand all the gestural know-how components, to model and analyze them. Students will thus discover different movement modelling and analysis methods as well as different types of feedback that can be provided in order to guide the learner and permit him to adjust his gestural errors.

In a second part of the course, a methodology will be presented to highlight gesture recognition technologies for vocational training. This methodology consists of several stages going from gestural vocabulary definition to motion capture, data processing and feature extraction, comparison of gestural data and use of sensorimotor feedback for the guidance of gestural performance. Several applications in different fields will be presented (learning of artistic-musical gesture, technical gesture in the factory etc.)



'Professional motion capturing' (i-treasures) FP7

Objectives

- familiarity with the basics of learning theories
- model and analyze gestural data
- present a methodology for the design of interactive systems for know-how transmission based on sensorimotor learning principles

Academic Instructor

Alina Glushkova | MINES ParisTech

Module 5 : Movement and European Industrial Leadership

Project Coordination for Human-Centered Engineering

Course description

This module deals with project management. The fundamental concepts are: typology of projects and structuring, graphic representation tools (Gantt chart, networks, critical road), anteriority between the tasks, critical path and lead-time margins, allocation of resources, levelling and smoothing of the load, costs, uncertain environment, project monitoring, organizational change and existing software. These notions are then illustrated through real-life cases. Particular attention will be paid to the notion of variability of tasks, which is inherent in human-centred engineering.

Objectives

- Mastery of the fundamental concepts of project management
- Understanding of the roles of the different actors in a project: director, steering committee, project manager, business engineer, architect, partners, customers, etc.
- Following the 4 main stages of a project: 1) Structuring, 2) Planning, 3) Follow-up and 4) Feedback
- Understanding the limitations of existing software in assigning resources to differ-ent tasks
- Planning the initial costs of a project (CBTP), then tracking the project using the CBTE and CRTE curves

Academic Instructor

Simon Tamayo | MINES ParisTech

Challenges for Cultural & Creative Industries

Course description

The cultural and creative industries cover a wide spectrum of fields such as advertising, visual arts, performing arts, crafts, design, fashion and luxury, music, television, video games, corporate Living Heritage (EPV), etc. AI is revolutionizing the way that digital content is produced and managed. digital content. In parallel, movement capture and gesture recognition technologies indicate new perspectives for the creation of interactive interfaces and their integration into everyday life.

This course will focus on the contribution of AI and motion capture technologies to the fashion and luxury industries, including Virtual Reality and Augmented Reality, Digitalization and Robotization of the processes, Sensory Design etc.

Objectives

- Understanding virtual prototyping;
- Learning to feed on the intersectorial experience in terms of sensoriality
- Development of critical thinking around the robotization of processes
- Adoption of technological methods for the transmission of know-how and the iden-tification of skills

Academic Instructor

Sotiris Manitsaris, Edgar Heremy | MINES ParisTech

Katerina El Raheb | University of Athens

'Intangible Musical Instrument' (i-treasures) FP7
'Embodme' Spin-off MINES ParisTech.

Challenges for the Factory of the Future

Course description

This module introduces the main issues involved in the industrial processes of tomorrow. It is presented in the form of business testimonies led by the Faculty of the Post Master's Programme and by industrial stakeholders. The objective of this module is to address, with regard to the notion of Industry 4.0, the main challenges and opportunities associated with the different industrial sectors: automotive, agro-food, retail, luxury, creative and cultural industries. The following topics will be addressed:

- The significance of technical developments: digital technology, robotics and artificial intelligence;
- the computation of costs and monitoring of industrial performance of cyber-physical industrial systems;
- the notion of time to market and its importance in innovation processes;
- the production planning, workload management and workforce.

Academic Instructor

Simon Tamayo | MINES ParisTech

Objectives

- understand the main industrial challenges of the industry of the future in France and abroad
- identify key skills needed by today's industry managers when preparing the future

Gesture recognition for Human-Robot Collaboration in the Factory of the Future (Industrial Chair Groupe PSA- MINES ParisTech, 'Robotics and Virtual Reality').

Challenges for Intelligent Vehicles

Course description

Cars are incorporating more and more 'intelligent' driver assistance functions, and the first 'autonomous' vehicles (which means that can autopilot without a driver) will soon make their appearance on the market. All this is made possible in particular by progress with real-time intelligent analysis of videos. The purpose of this course is to present the specific issues in the field of intelligent vehicles, and to provide an overview of the various types of AI that they use, especially those that allow real-time 'understanding' of visual scenes.

Objectives

By the end of the module, student:

- will have an overall picture of what the intelligent vehicle is, as well as the domain issues
- will haved acquired technical expertise in terms of the application of AI on smart vehicles
- will have reached a better understanding of the challenges of the sector and will be able to propose concrete and innovative solutions, based on AI

Motion and scene descriptors exportation

Academic Instructor

Fabien Moutarde | MINES ParisTech

Module 6 : Interdisciplinary AI Engagement

GAIIA: Gesture and AI in Industry and Arts

GAIIA is an association that serves as an advisory board, working side by side with AIMove, ensuring a flexible and hands-on educational approach for the Post Master's qualification.
GAIIA operates as a hub which brings closer experts and the large public-at-large in the field of motion capturing and gesture recognition technologies.
The team consists of researchers, engineers, digital artists, performer artists and academics, in order to expand the potential outreach of applied research.
In this way, courses in AIMove are accompanied and supported by an extra-curricular agenda, including workshops, international conferences, a Think-Tank and a Summer School.

GAIIA
Gesture & AI in Industry & Arts

Think-Tank

Description

The body and gesture play a crucial role in all human activity. From an early age humans develop sensory and motor skills through their interaction with the surrounding environment. We accumulate these experiences and enrich our abilities. Our body is transformed, allowing us to express ourselves, communicate and interact with others and with our environment. New technologies contribute to a deeper understanding of this interaction, through motion capture, gesture modeling, machine learning and analysis of artistic but also of technical gestures. This event aims to bring together gesture professionals, scientists, artists, ergonomists etc., to discuss the potential of synergies between art and industry. The goal is to identify the new uses of motion capture and 'embodiment' in creative and industrial processes. During the think-tank perspectives and suggestions for long-term research around human gesture will defined. Proceedings of the collegial discussions and the exchanges which take place will be drafted.

Objectives

- students should emerge with a global picture of issues related to AI and movement in industry and art
- meetings and exchanges between students and professionals/scientists in the field will be encouraged
- development of students' critical thinking skills

Academic Instructor

Sotiris Manitsaris | MINES ParisTech

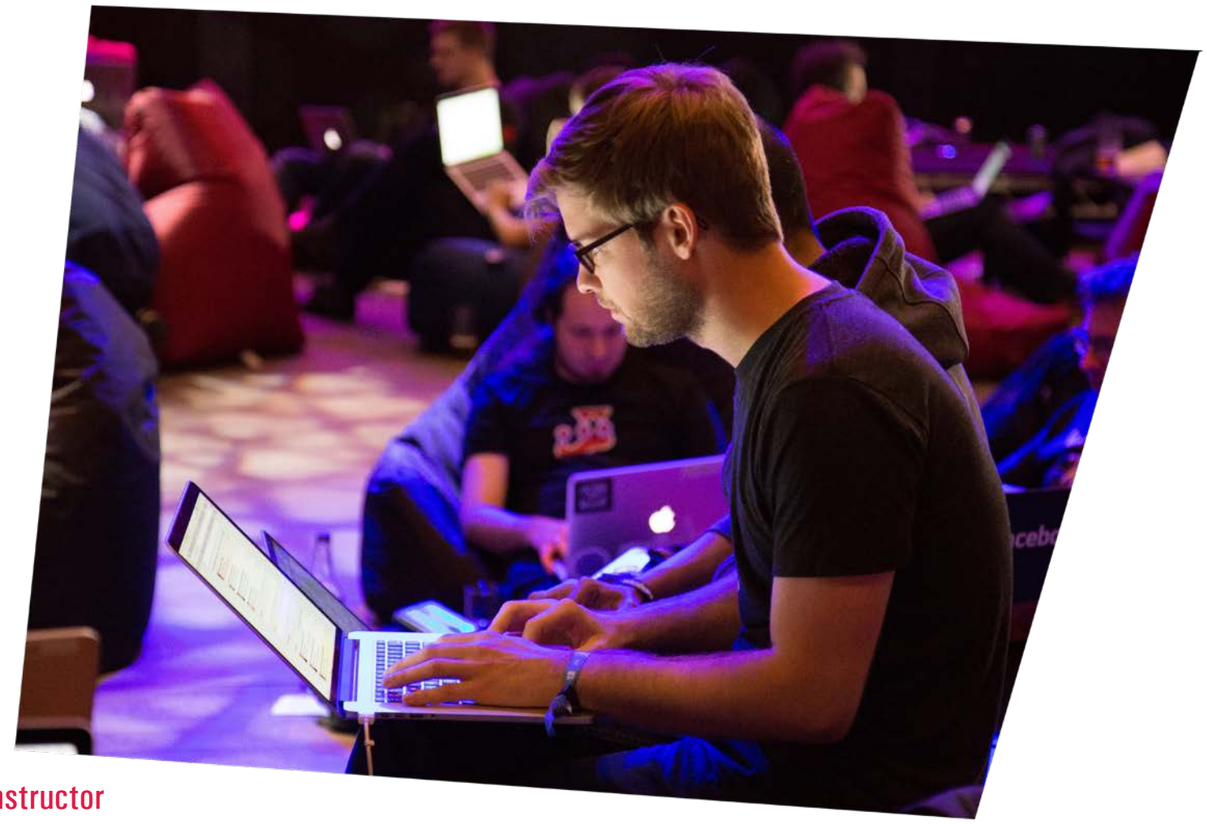
Rémi Brun, Think-Tank, Thessaloniki, Greece, June 2017.

Summer-School GAIIA

Like the Think-Tank, the Summer School aims to bring together professionals of Artificial Intelligence and Movement field, to reinforce exchanges between industries, scientists, artists and students but in a more pedagogical perspective. The curriculum is structured in the form of courses with specific learning objectives. The theoretical themes adressed in the MS will be completed here by technical aspects. For example, students will be able to experiment with software and algorithms for data processing, gesture recognition, creation of interactive interfaces and VR / AR. Unlike the Think-Tank which aims stimulate global thinking around AI, the summer school has a more applied and concrete objective, giving them the possibility to develop mini-projects or a group project and present them at the end of the summer school.

Objectives

- discover scientific methods and tools used for interaction in the field of AI and movement
- learn how to design digital interfaces using motion capture and gesture recognition technologies
- develop a creative and innovative approach in the design and deployment of interactive systems



Academic Instructor

Sotiris Manitsaris | MINES ParisTech

MOCO : Movement and Computing

Description

MOCO is the International Conference on Movement and Computing. MOCO aims to gather academics and practitioners interested in computational study, modelling, representation, segmentation, recognition, classification, or generation of movement information. It is positioned within emerging interdisciplinary domains between art andscience. The conference brings together a large number of scientists from the field and offers a wide range of topics from philosophical perspectives to more specific topics such as sonification and visualization of movement, movement notation systems and data analysis etc. AIMove Students (individually or in groups) will submit a paper / poster to the ‘Doctoral Symposium’ of MOCO.

Academic Instructor

Sotiris Manitsaris | MINES ParisTech

Objectives

- acquire a global vision of current research topics
- be informed about the emerging methods and technologies
- learn the basics of writing a scientific paper
- bring AIMove students closer to the “movement and computing” scientific community

AIMove Partners

IRCAM, the Institute for Research and Coordination in Acoustics/ Music is one of the world's largest public research centers dedicated to musical creation and scientific research.

INREV is the research team 'Digital Image & Virtual Reality' of the Laboratory 'Image Art and Contemporary Art' of the University Paris 8 in Paris. The field of research expands in digital art, virtual reality, 3D computer image, etc.

AUTh is the largest University in Greece covering all disciplines. It is widely recognized as a vibrant center of learning which draws its inspiration from a long tradition of academic achievement.

The Idiap Research Institute is among the most active independent research institutions in information technology. Based in Switzerland, the Idiap Research Institute is a non-profit foundation that conducts basic research and technology transfer activities in the area of Artificial Intelligence for Society

AIMove

List of academic faculty members

Anne DUBOS

Based on the analysis of actual cases of performance, Anne Dubos' research project aims to analyse the transformation of human movement and gesture through time and space. During her PhD studies, Dubos studied Indian theatre and reported on the variety in the actor's body techniques. Pursuing her research beyond this context, she aims at challenging both epistemological and technological current advancements in movement capture and analysis by designing several transmedia installations that will combine traditional performance and digital arts. The long-term goal of the project is to propose novel methodologies and interactive tools where knowledge is closely associated to body performance. This cross-disciplinary research aims at creating new archiving tools for social sciences and artistic practices while questioning heritage conservation policies and the archiving of technical gesture.

Yves WINKIN

Yves Winkin is a professor-researcher of Belgian nationality, who has contributed to introducing into the French-speaking world several currents of ideas of the American human and social sciences, which he has integrated into an "anthropology of communication", methodologically based on a ethnographic approach. Professor at the University of Liège, then at the Ecole Normale Supérieure de Lyon, he is now Professor at the National Conservatory of Arts and Crafts, Director Delegate for Scientific and Technical Culture, Director of the Museum of Arts and Crafts.

Jean-François JEGO

Jean-François Jégo is associate professor at the Arts & Technologies de l'Image department of the Faculty of Arts at the Université Paris 8 in France. He is also digital artist and researcher at the INReV Virtual Reality Laboratory where he creates immersive and interactive experiences, art installations and digital performances hybridizing Virtual and Augmented Reality.

Vincent MEYRUEIS

Vincent Meyrueis is an associate professor at the Image Arts and Technology department of Paris 8 University. He is conducting research by developing tools and methods for industrial design and creation using virtual reality and motion capture focusing on new interactive creative technology. He joined the INREV research team at the AI-AC Laboratory of Paris 8 University in 2015.

Rémi BRUN

Rémi Brun is one of the pioneers of motion capture. As an engineer in Arts and Métiers, PhD in Biomechanics, after a few years in research, in 1993 he became one of the 3 partners of Actisystem, the first movement capture service company in Europe, for research, industry, video games, TV and cinema. After a stint in special effects in London, he moved to Attitude Studio's Mocap department in 2000 before creating his own Mocap studio in 2007, MocapLab, which in 10 years became one of the most innovative Mocap studios in Europe.

Fabien MOUTARDE

Fabien Moutarde is professor of AI for Robotics at MINES ParisTech, where he teaches (as well as at SJTU-ParisTech-Shanghai) the algorithms of statistical learning. His research has been focused for more than 10 years on AI and machine-learning applications for autonomous vehicles, driving aids, and Intelligent Transport Systems, as well as mobile robotics and collaborative robots. Most of his work has been conducted in collaboration with industry R & D departments, including Valeo and PSA in the automotive industry, as well as Aldebaran / SoftBank-Robotics Europe, which designs and manufactures humanoid robots.

Sotiris MANITSARIS

Dr. Sotiris Manitsaris is a Senior Researcher and Research Project Leader at the Center for Robotics of MINES ParisTech, PSL Research University. Through his studies in Applied Mathematics (Diploma), Territorial Dynamics for Local Development (Master) and Computer Vision (PhD Thesis), he has developed skills in gesture recognition of professional and artistic backgrounds. Dr.Manitsaris specializes in capturing, modelling and recognizing gestural behaviours and embodiment, having applications in various fields such as the transmission of intangible cultural heritage, human-robot collaboration, interactive machine learning, etc. He currently coordinates a number of research projects around the topics of gesture recognition for Cultural and Creative Industries and the Automobile Industry. In addition, he is responsible for the course "Gesture and Artificial Intelligence" at MINES ParisTech.

Alina GLUSHKOVA

Dr. Alina Glushkova is a Research Engineer at Ecole Nationale Superieure des Mines de Paris. As part of her thesis she studied the use of gesture recognition technologies for know-how

management, and more specifically the use of sensorimotor feedback as a game mechanism. She has thus worked on technology-enhanced learning , on the use of motion capture technologies for know-how preservation and transmission, as well as the design of intelligent workspace for better movement ergonomics.

Sylvain CALINON

Dr Sylvain Calinon is a permanent senior researcher at the Idiap Research Institute, with research interests covering robot learning and human-robot interaction. He is also a lecturer at the Ecole Polytechnique Fédérale de Lausanne (EPFL), and an external collaborator at the Department of Advanced Robotics (ADVR), Italian Institute of Technology (IIT). From 2009 to 2014, he was a Team Leader at ADVR, IIT. From 2007 to 2009, he was a Postdoc at the Learning Algorithms and Systems Laboratory, EPFL, where he obtained his PhD in 2007. He is the author of 100+ publications and a book in the field of robot learning and human-robot interaction, with recognition including Best Paper Awards in the journal of Intelligent Service Robotics (2017) and at IEEE Ro-Man'2007, as well as Best Paper Award Finalist at ICRA'2016, ICIRA'2015, IROS'2013 and Humanoids'2009. He currently serves as Associate Editor in IEEE Transactions on Robotics (T-RO), IEEE Robotics and Automation Letters (RA-L), Intelligent Service Robotics (Springer), and Frontiers in Robotics and AI.

Kosmas DIMITROPOULOS

Dr. Kosmas Dimitropoulos is a senior researcher in the VCL lab (Visual Computing Lab) of the Information Technologies Institute - Centre for Research and Technology Hellas (ITI-CERTH). He holds a diploma in Electrical and Computer Engineering and a Ph.D. degree in Applied Informatics. His main research interests lie in the fields of 2D/3D data modelling and analysis, human computer interaction, virtual reality and serious games. His involvement with these research areas has led to the co-authoring of more than a hundred publications in refereed journals and international conference proceedings. He has received as a co-author in scientific papers: the IET ITS Premium Award (The IET Premium Awards 2012, London), the Euromed 2012 Best Full Paper Award and the CONTACT/ECCV 2014 Best Student Paper Award. He has been the technical coordinator, quality project manager, deputy project coordinator and work-package leader in several European and national research projects and he has served as a regular reviewer for a number of international journals and conferences. He is a member of IEEE and the Technical Chamber of Greece.

Frédéric BEVILACQUA

Mr. Frédéric Bevilacqua is Director of Research at UMRS9912 STMS Ircam-CNRS-Sorbonne Université. He holds an HDR from Pierre et Marie Curie Université, and is a member of the steering committee of the MOCO (Movement & Computing) conference. His research interests are movement-based interactive systems and the relationship between movement and sound.

Jules FRANCOISE

Mr. Jules Françoise is a CNRS researcher at LIMSI. He holds a PhD in computer science from Pierre et Marie Curie Université, and is a member of the steering committee of the MOCO conference (Movement & Computing). His research interests are concerned with movement Gesture-based & Whole-body Interaction and Expressive Movement.

Baptiste CARAMIAUX

Dr. Baptiste Caramiaux is a CNRS researcher at the LRI. He holds a PhD in Computer Science from Pierre et Marie Curie Université. His research focuses on motor skills learning in music and dance, using methods from cognitive psychology, human-machine interaction, and artificial intelligence.

Frédéric FOL LEYMARIE

Prof. Frederic Fol Leymarie leads research in creative robotics at Goldsmiths, University of London, U.K. He was trained in computer vision, biomedical imagery, visual perception, applied mathematics, at Ecole Polytechnique of Montreal, McGill University (Centre for Intelligent Machines), Mathematical Morphology Centre (Ecole des Mines, Fontainebleau), Brown University (Division of Engineering). He has conducted research at the crossroads between: computer vision and graphics, visual perception, creative robotics, biomedical interactive visualisation (including the use of VR), gamification for science and education. He also has experience working in commercial contexts, in the field of Geographical Information Systems (with Thales, Paris), and with various startups and seed projects (in the USA and the UK). In the recent past he has established fruitful collaborations at the frontier of AI and robotics with a sculptor (USA based Brower Hatcher), a pioneer of evolutionary computer art (British artist and entrepreneur William Latham), a portrait draughtsman and painter (French artist Patrick Tresset), a media artist and developer (Portuguese Rui Felipe Antunes), an animator and dance annotator (British artist and educator Carol MacGillivray) and, in progress, a collaboration with a calligrapher (Italian graffiti artist and machine builder Daniel

Berio).

Leontios HADJILEONTIADIS

Professor Leontios Hadjileontiadis (Dept. of ECE, AUTh) is working in the fields of advanced signal processing, biomedical engineering, affective computing and active and healthy ageing. His publication record includes 100 papers in peer-reviewed international journals, 150 papers in peer-reviewed international conference proceedings, 6 authored books, 2 books edited, 24 book chapters and 3 patents [h-index=34 (Google scholar), 28 (Scopus)]. He has a vast experience in project management and coordination of European projects. Prof. Hadjileontiadis has been recognised, as innovative researcher and champion faculty from Microsoft, USA (2012) and received the Silver Award in Teaching Delivery at the Reimagine Education Awards (2017-2018). He is a Senior Member of IEEE.

Simon TAMAYO

Mr. Simon TAMAYO is associate professor at MINES ParisTech. His research interests include industrial optimization, data mining and applications of artificial intelligence in industry. He is responsible for the courses “operations research applied to industrial management”, “SAP ERP systems” and “stochastic methods applied to logistics”. He is an expert in decision support and optimization systems, applied to the planning and organization of industrial and logistics systems. He is author of the book “Operational Research Applied to Industrial Management” (ISBN 978-1530248728). He is fluent in English, Spanish and Italian.

Katerina EL RAHEB

PhD Candidate under the supervision of Prof. Y. Ioannidis on “Semantic Representation Analysis and Search for Dance” and has been teaching assistant of “Human Computer Interaction” at the Department of Informatics and Telecommunications (2011-2016), University of Athens. Currently she works as a senior researcher and project manager in the the EU-funded project WhoLoDancE (Whole Body interaction Learning for Dance Education), as external scientific collaborator at “Athena” Research and Innovation Center. She has joined the MADgIK (Management of Data, Information and Knowledge) research group since 2009, and worked for several European Research and Innovation projects related to Digital Libraries, Data Research Infrastructures and ICT for Cultural Heritage (eCultValue, DL.org, e.nventory). She has experience in working with multinational company as Information System consultant. She holds an MSc. in Advanced Information Systems from the University of Athens, a BSc. in Ch. Engineering from the National Technical University of Athens. In parallel, she has a Diploma from N. Kontaxaki Higher Professional Dance School is an active dance practitioner, interested in movement from scientific, artistic and cultural perspective, as well as in the intersections of culture, creativity and technology. She has been member of the program committee in international conferences and journals, such as ISEA2015-2018 (International Symposium of Electronic Art), MOCO2014-2018 (Movement Computing) and BIT journal (Behaviour and Information Technology).

Edgar HEMERY

Edgar Hemery works in the field of music technology and human-computer interaction, where he has been developing musical interfaces and installations for the past 7 years. Previous experiences, both in the music industry and academic research (University of Edinburgh, IRCAM, Mines ParisTech) has lead him to specialize in the design of musical interactions, based on gesture recognition. He has recently finished his PhD thesis at Mines ParisTech, where he imagined the Embodme project.

Raoul de Charett

As a researcher in computer vision, Raoul de Charette is working in the computer vision group of RITS Team on autonomous vehicles in the research institute Inria Paris.

His own researches include scene understanding, object reconstruction, vision in degraded weather, etc. He has also worked in Mines ParisTech (France), Carnegie Mellon Univ. (USA) and Univ. Of Makedonia (Greece).

MINES ParisTech at a glance

Every year, MINES ParisTech welcomes more than 1000 carefully-selected students: about one third in the Civil Engineer cycle, one third in PhD studies and one third in Specialized Training (Post Master's Degree).

To be a student at MINES ParisTech is to enter the MINES family and benefit not only from our network of graduates and partner companies, but also from the density of our international relations.

Being a student at MINES ParisTech also means adhering to our pedagogical model based on teaching in a small group, a strong relationship with the supervisors, and a strong proximity between training and research-oriented to best meet the needs of companies.

This mode of research, whose central objective naturally remains to increase knowledge, takes place in direct contact with our partners in the socio-economic world. Their issues form the basis of our educational programs.

Finally, being a student at MINES ParisTech means benefiting from our membership of the ComUE-Idex Paris Sciences and Letters (PSL), a group of excellence located mainly in the Latin Quarter, at the Institut Mines-Télécom which unites schools resolutely committed in favor of companies, and of course ParisTech, which brings together the best engineering schools in the Paris region.

the rooftop at MINES ParisTech

Key numbers

- 3rd worldwide in industry contribution (contractual research)

- 15th worldwide for co-signed papers with industry

- 36th in the Global Employability ranking

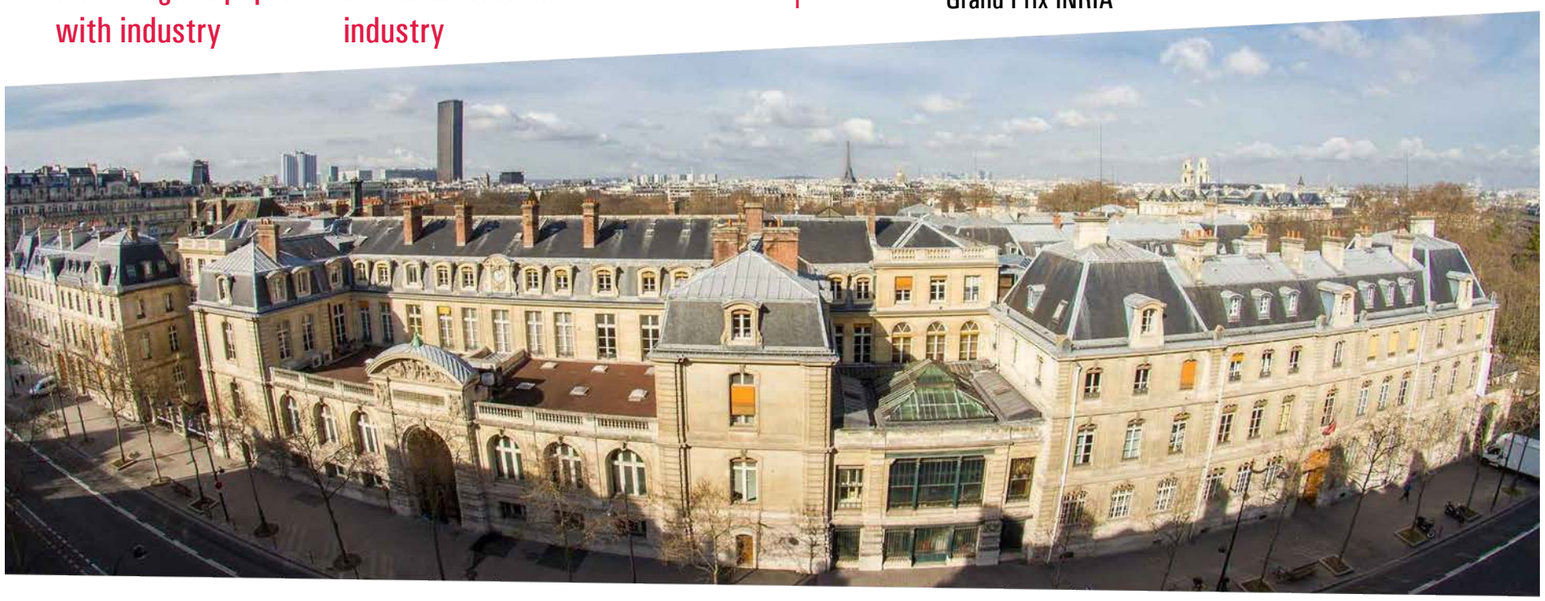
- 1st in France for contractual research with the industry

MINES ParisTech is member of the PSL Research University that unites the 20 most prestigious parisian University institutions:

20	Partner Institutions
14 000	Students
2 500	Researchers
107	Laboratories
+ 3	Millions of documents
1	Idex
11	Labex
8	Equipex
10	Nobel Prize in physics
5	Nobel Prize in chemistry
3	Nobel Prize in litterature
2	Nobel Prize in physiolody and medicine
1	Nobel Prize in economy
10	Médailles Fields
29	Gold medals
4	Grands Prix INSERM
1	Grand Prix INRIA

Alumni association

Among Specialized Courses, only graduates of Specialized Masters are enrolled in the Alumni Association of MINES ParisTech.



Partnership with
GAIIA

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Operating as a hub, GAIIA brings together experts and the wider community in the field of motion capturing and gesture recognition technologies.

GAIIA
Gesture & AI in Industry & Arts

http://gaiia.online/

Also partnership
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