Université
Joseph Fourier
GRENOBLE

Université Joseph Fourier

Summer Bachelor Program



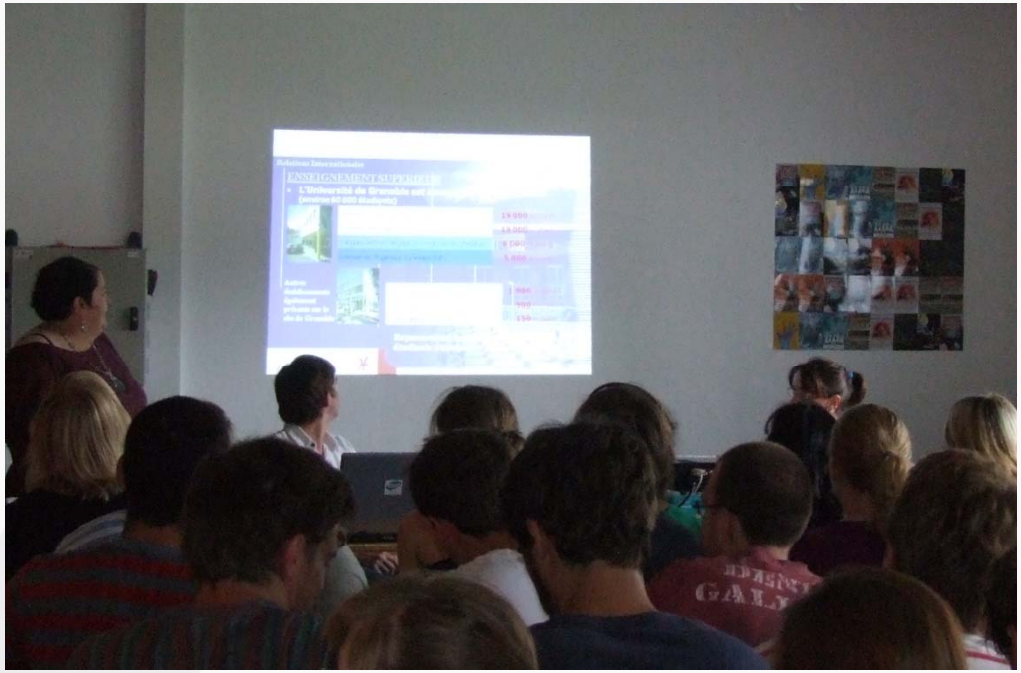

Summer Bachelor Program

6 weeks from june to mid july

- Scientific course (30h or 60h)
- French language (36h)
- Lab/industry visits
- Cultural visits
- Interaction with french science students

First session in june 2012 free of tuition fee

Summer Bachelor Program



Engineering	Physics
Introduction to Physical computing	Introduction to large scale facilities
Maths	
Probability modeling	

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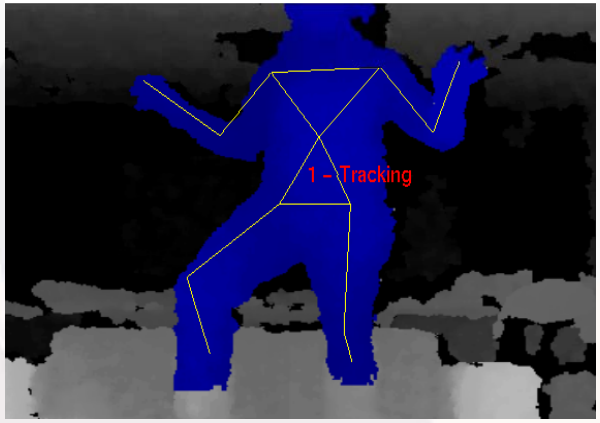

Engineering	
Title	**Introduction to Physical computing**
Instructor	Didier.donsez@imag.fr
Organisation	60 h Lecture / tutorials / lab and company visits
Prerequisites	Basics in programming and electronics
Topic	Computer Science and instrumentation: Physical computing focuses on interactions with the physical world using a variety of sensors and actuators that are controlled by microcontrollers and computers. This module introduces the technical aspects of development with the Arduino platform http://air.imag.fr/ .

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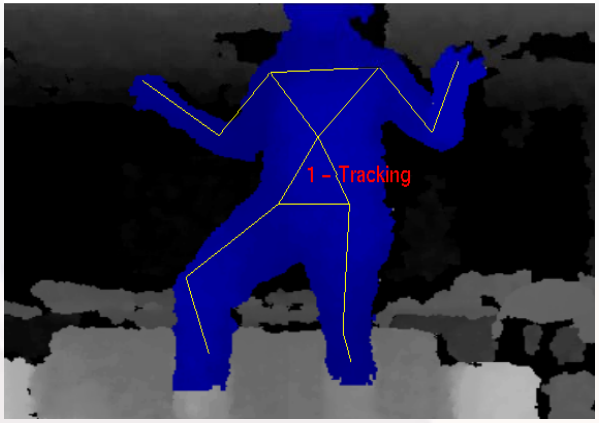

Introduction to Physical computing

Electronics: what you should know to start Physical computing:
Definitions, principles and examples
Microcontroller,s sensors and actuators, simple programming language
Arduino project
Practicals: elementary and basic circuits

Robotics: building an autonomous mobile robot
guiding and moving programming (hard and soft aspects)
Motor driving, collision prevention
Communication protocol between robots
Practicals: building the robot
http://air.imag.fr/mediawiki/index.php/Magician_Chassis

Introduction to Fablab:
digital construction (CAD / CAM)
Designing / cutting / adapting of robot chassis
Construction

Visits:
Schneider Electric Home project, LIG Domus, CCSTI's fablab, Orange Labs' thinging fablab

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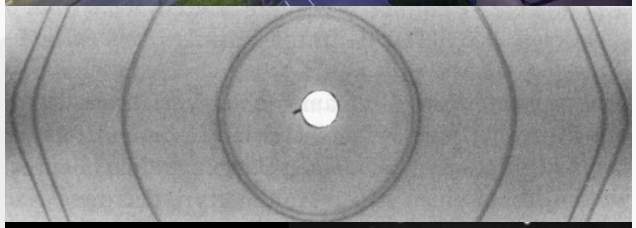

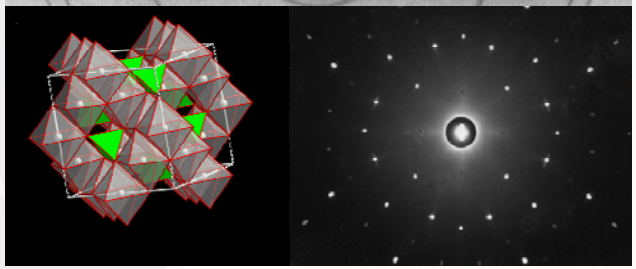

Physics	
Title	**Introduction to large scale facilities: probing matter with neutron and synchrotron radiation**
Instructor	Beatrice.grenier@ill.fr
Organisation	60 h Lecture / tutorials / lab work / ESRF and ILL visit
Prerequisites	Wave propagation and interferences, background in quantum mechanics is useful
Topic	Introduction to crystallography and other neutron and synchrotron techniques. Application to the study of structure in condensed matter and in other domains such as biology, industry, ...

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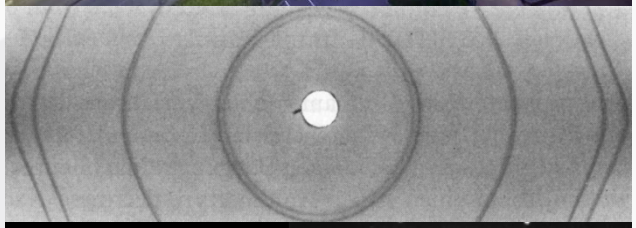

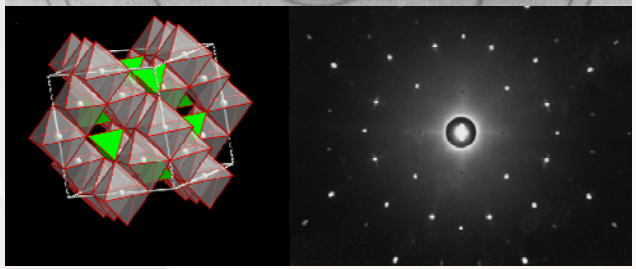

Introduction to large scale facilities: probing matter with neutron and synchrotron radiation

CRYSTALLOGRAPHY

Crystallography in Direct Space

Diffraction – Crystallography in Reciprocal Space

X-ray and neutron diffraction by a crystal

NEUTRON SCATTERING

Neutrons: What for and How ?comparison to X-rays

Instrumentation and experimental results :

Diffraction, Small angle neutron scattering, Liquid scattering, Reflectivity (examples will be given in condensed matter physics, biology, industry, ...)

SYNCHROTRON SCATTERING AND ABSORPTION

X-rays and their interaction with matter

Synchrotron radiation

Refraction and reflection from interfaces

Kinematical diffraction

Scattering from a surface, Scattering from a helix

Photoelectric absorption

Imaging

Lab-works

X-rays – Debye-Scherrer , X-rays – Fluorescence , Neutron – Laue diffraction , Synchrotron – EXAFS

ILL and ESRF visits

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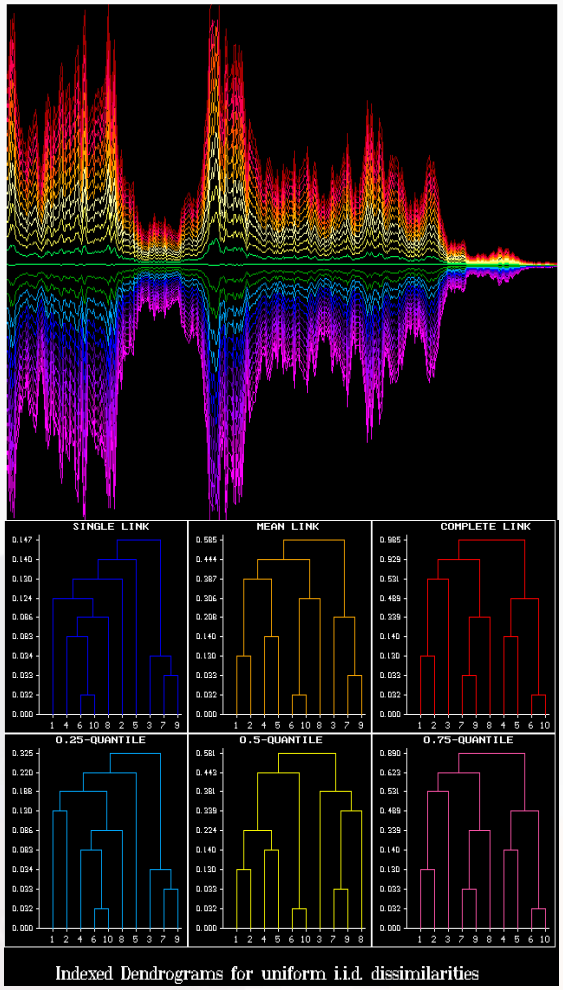

Maths	
Title	**Probability modeling**
Instructor	Bernard.Ycart@imag.fr
Organisation	30 h Lecture / tutorials
Prerequisites	Basics in set theory and elementary calculus including infinite series, partial differentiation, and multiple integration. Some exposure to rudimentary linear algebra (e.g., matrices and determinants) is useful.
Topic	Basics in mathematical probability, discrete and continuous random variables, expectation and variance, random vectors, laws of large numbers and central limit theorem.

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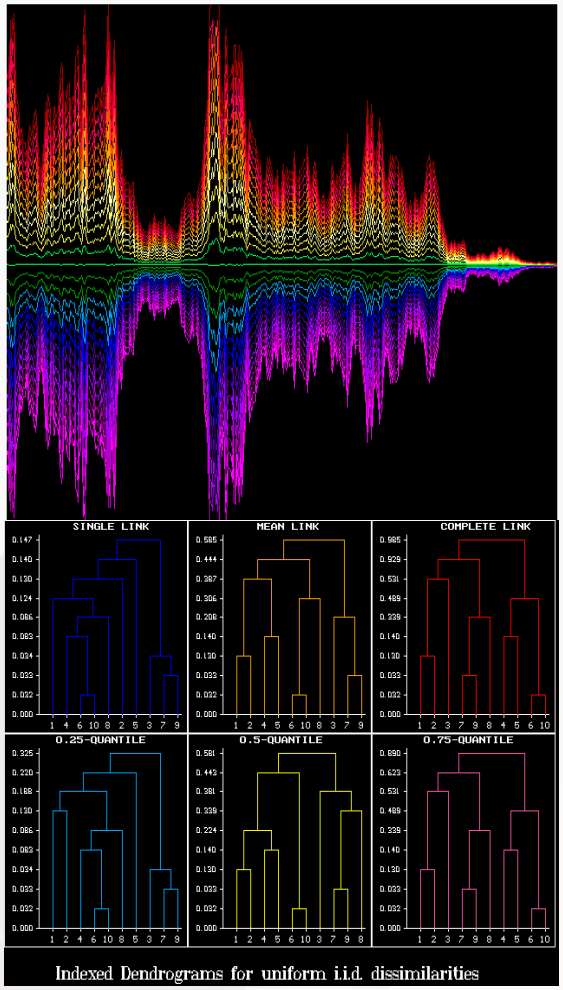

Indexed Dendrograms for uniform i.i.d. dissimilarities

Probability modeling

Random experiments
Events, axioms of probability, probability measurements, conditional probability, independence, random variables, distribution function, expectation, variance, modeling, peudo-random generators, simulation.

Discrete random variables
Bernoulli, binomial, geometric, Poisson, hypergeometric, negative binomial. Applications in biology

Continuous random variables
Uniform, exponential, normal. Change of variables, simulation. Applications in biology, reliability, physics, chemistry.

Random vectors
Covariance and correlation, multidimensional density, change of variables, characteristic function. Gaussian vectors, applications to statistics

Limit theorems
Law of large numbers, central limit theorem

Birth-death processes
Poisson process, basics in queuing theory, birth-and-death processes in biology, stochastic modeling of chemical reactions.

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june 4 - july 13, 2012

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- **French language (36h)**
- **Lab / industry visits**
- **Cultural visits**
- **Interaction with french science students**

Academic coordinator:
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