COLLABORATION BETWEEN BORDEAUX-INP AND UTP, FROM RESEARCH TO EDUCATION, IN THE FIELD OF SIGNAL PROCESSING

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Towards a long-term collaboration

- In research, not necessarily easy to launch new collaborations or to have long-term exchanges.
- Millions of mobile students, but not necessarily easy to manage their mobilities.
- How to encourage that research and teaching activities are mutually interactive?
- Our purpose: sharing our positive experience to address these issues, through various aspects of the collaboration between Bordeaux and Panama

What did we do in the field of signal processing?

Towards a long-term collaboration involving several other actors

SENACYT
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INSTITUT FRANÇAIS
Amérique centrale

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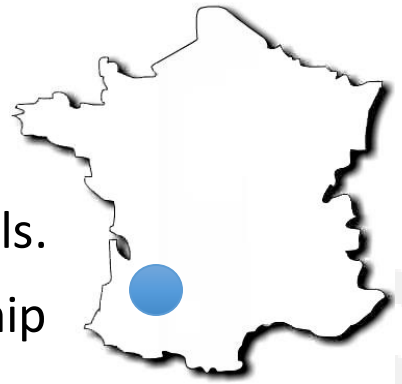
Who are we?

A collaboration between Bordeaux INP…



- Campus located in Talence (near Bordeaux, France).
- 3,400 students.
- A public institution with 5 internal schools and 3 partner schools.
- 19 engineering specializations including 5 through apprenticeship programmes in various fields:
  - ➔ cognitics, biology, food sciences, chemistry, physics, geological resources, environment, electronics, computer science, telecommunications, mathematics, mechanics and biotechnologies.
- Supported by 11 joint research laboratories, with University of Bordeaux, Bordeaux Montaigne University, Arts et Metiers Paris Tech, INRA and CNRS.

Bordeaux INP AQUITAINE

A collaboration between Bordeaux INP… -more particularly ENSEIRB-MATMECA-

- ✓ 4 engineering specializations and 2 through apprenticeship programmes:
  - Electronics
  - Telecommunications
  - Computer sciences
  - Math. and Mecanics
- ✓ 1200 students.
- ✓ Supported by 5 joint research laboratories:

LaBRI · ims · Institut de Mathématiques de Bordeaux · I2M Bordeaux · Inria Inventeurs du monde numérique

…and UTP -La Tecnológica-

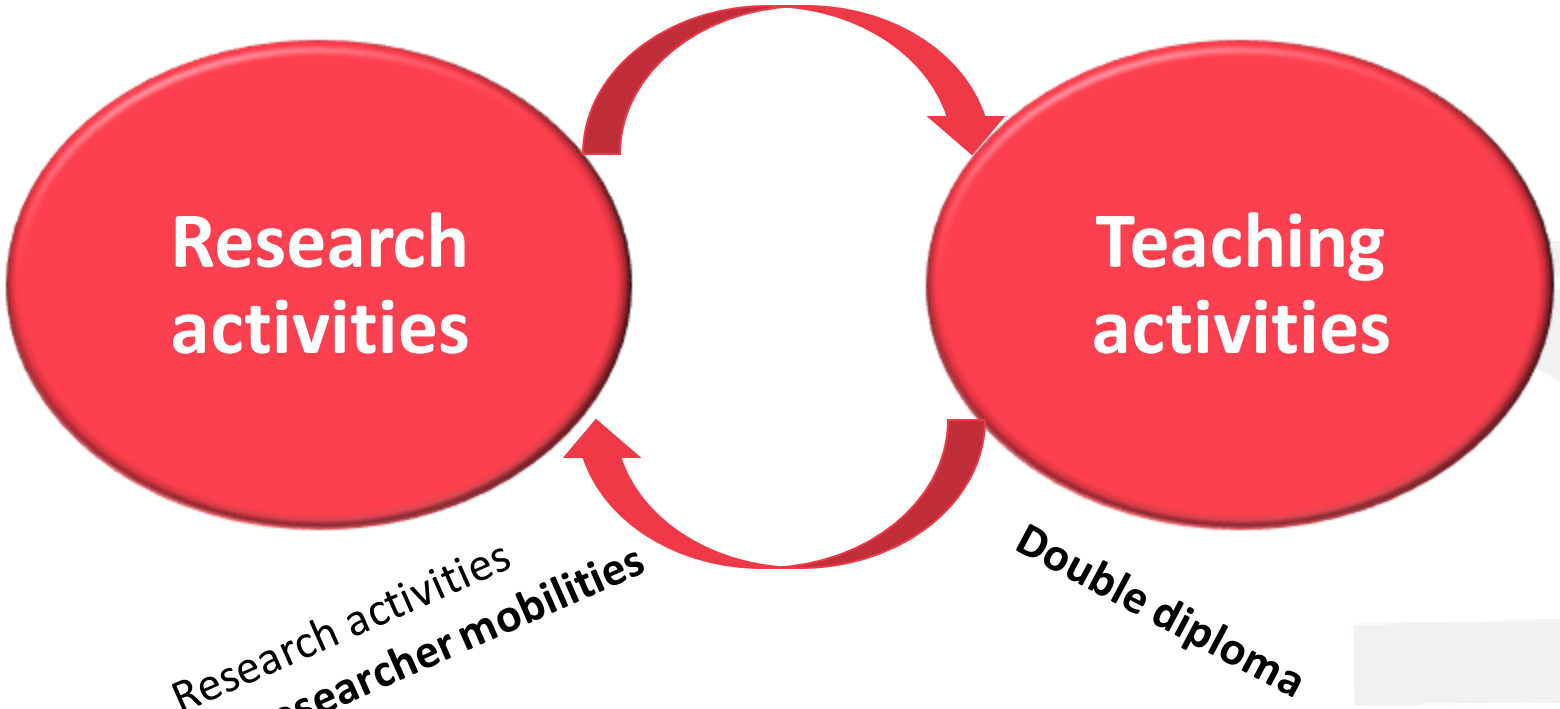
- Main campus located in Panama City, Republic of Panama.
- 23,000 students.
- a public institution.
- 6 schools in different domains including
  - ➔ civil, electrical, mechanical, industrial, computer systems,
  - ➔ and food engineering.
- Supported by 6 research centers.

and UTP -La Tecnológica-

- 139 Degrees (Phd, Master, « Licenciaturas en Ingenierías », etc.) .
- 26 « Licenciaturas en Ingenierías ».
- 65, 000 graduate students.

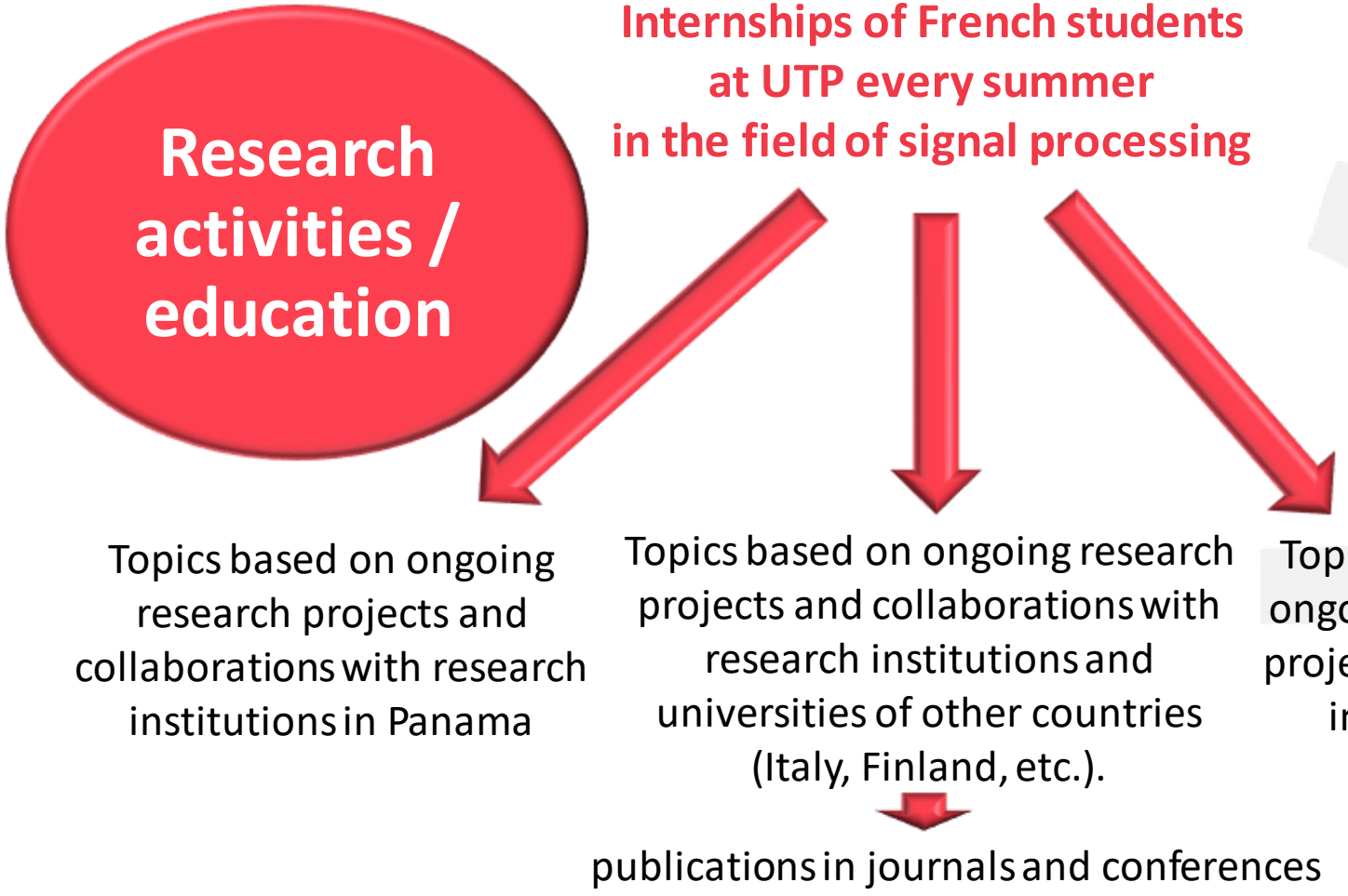
What did we do in the field of signal processing?

Pillars of our collaborations



Student mobilities

Student mobilities through internship



Student mobilities through internship

Research activities / education

1st example:
noisy ARMA model identification based on an Errors-In-Variable approach

with University of Bologna

Subject adressed by the interns:

- Time series parametric modeling (AR, MA, ARMA) and estimations of the parameters and the order,
- Denoising approaches,
- Error-in-variables approach (Frisch scheme): identification problem from noisy data.

The internship was a way to start the collaboration between Panama, University of Bologna and France. Since then, this is a collaborative work leading to one paper every year.

Student mobilities through internship

Research activities / education

2nd example: manatee vocalization modeling, classification and clustering

with Smithsonian Tropical Research Institute

Methodology to count manatee populations by analyzing underwater recordings.
Premise: manatee individuals calls vary significantly.
Includes:

- Signal detection methods based on wavelets and Fourier.
- Denoising using signal subspace approaches
- Identification and counting: spectrogram PCA, signal dissimilarities (Jeffreys divergence) and clustering methods.

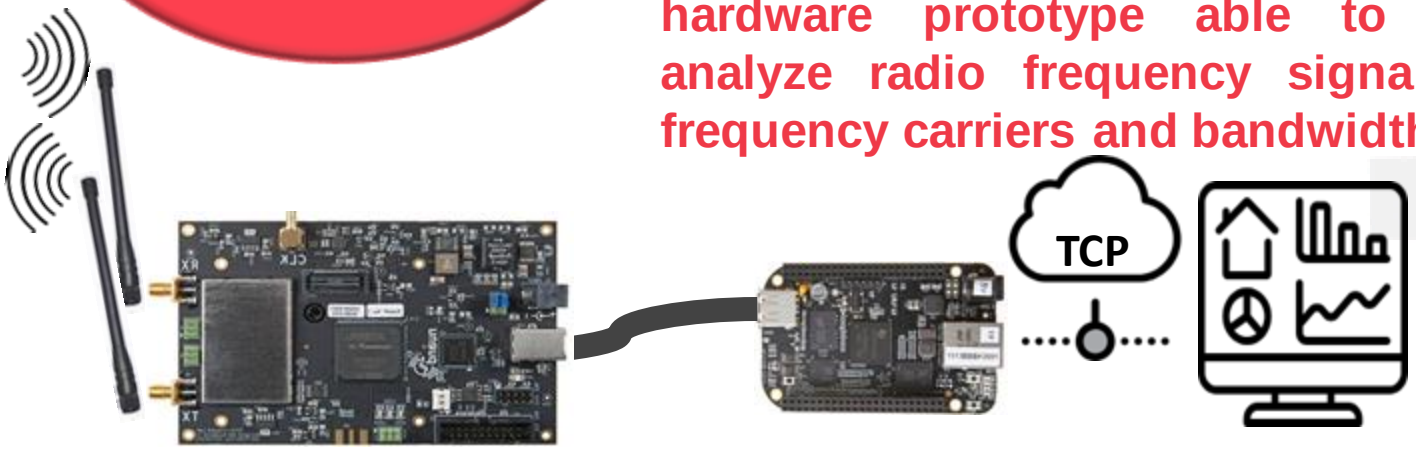
Student mobilities through internship

Research activities / education

3rd example: Implementation of a prototype for interference characterization

with Aalto University and Ericsson (Finland)

Design of a low-cost, open-source, open-hardware prototype able to receive and analyze radio frequency signals in tunable frequency carriers and bandwidth



SDR | Embedded computer | User interface

Double diploma

Bordeaux INP
AQUITAINE

UNIVERSIDAD TECNOLÓGICA DE PANAMÁ
UTP
1981

1st Double diploma between France and a country in Central America

Teaching activities

Signed on December the 11th 2017
in the presence
of the French ambassador

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MINISTÈRE DE L'EUROPE ET DES AFFAIRES ÉTRANGÈRES

La France au Panama et aux Bahamas
Ambassade de France à Panama

1st Double diploma between France and a country in Central America

From France to Panama

	August – Dec.	Jan. – May
1st year	SELECTIVE NATIONAL EXAMS	
2nd year		
3rd year	S5 - ENSEIRB	S6 - ENSEIRB
4th year	S7 - ENSEIRB	S8 - ENSEIRB
5th year		S9 –UTP
6th year	S10 - UTP	Stage (PFE)

Teaching activities

Total duration: 6 years

1st Double diploma between France and a country in Central America

From Panama to France

	Mar. – Jul.	Août – Mai
1st Year	S1 – UTP	S2 – UTP
2nd Year	S3 – UTP	S4 – UTP
3rd Year	S5 – UTP	S6 – UTP
4th Year	S7 – UTP	S8 – UTP
5th Year		S8 – ENSEIRB
6th Year	S9 – ENSEIRB	S10 ENSEIRB
	Stage (PFE)	

Teaching activities

Total duration: 6,5 years

Conclusions and perspectives

Conclusions

- A Win-Win collaboration taking into account both research and education issues in the field of signal processing.
- Way to collaborate promoted during workshops, organized by IFAC, with the French embassies of the countries in Central America (i.e. 7 countries: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama).
  - ➔Costa Rica on September the 26–27th 2016
  - ➔Guatemala on March the 13rd-14th 2018

Perspectives

- Main difficulties : finding fundings
  - ➔ERAMUS + program to get more fundings
- Organizing some events in Panama to promote the double diploma and attract new students to go to Bordeaux on order to prepare the double degree.
- Opening to other topics: control (1 PhD starting on September 2019, nutrition, etc.).

Thank you for your attention