Information Sciences and Technology for Healthcare | HealthTech

The Interdisciplinary thematic institutes of the University of Strasbourg & CNRS & Inserm

funded under the Excellence Initiative program

HealthTech

Institute of Information Sciences and Technology for Healthcare

Bernard Bayle, HealthTech project coordinator
Géraldine Gazzo, HealthTech project manager
Florent Nageotte, HealthTech master track coordinator

Politecnico di Milano – Dec. 14th, 2021

ITIs | Interdisciplinary Thematic Institutes

The University of Strasbourg launched in 2019 the development of **Interdisciplinary Thematic Institutes (ITI)**, under the aegis of the *Initiative of Excellence (IdEx)* :

- to promote **interdisciplinarity** and **training through research**
- to reinforce the **visibility of thematic fields** in Strasbourg

A site of excellence at the **University of Strasbourg**

- ✓ One of the first Universities in France
- ✓ 18 Nobel prizes since it was founded
- ✓ World class research facilities

HealthTech | Consortium : a dynamic and effective ecosystem

Institute of Information Sciences and Technology for Healthcare = HealthTech

135 permanent researchers

2 Laboratories

4 Research and transfer partners

5 Institutions and faculties

3 Doctoral Schools

HealthTech | Main lines

Our ambition: develop an international pole of excellence

in the field of innovation in medicine, digital healthcare and computer-assisted interventions

Research

- **Team projects**, in various forms, including Master students, PhD students, researchers and practitioners
- A **cross-disciplinary and translational approach** to the medical systems, with two main research axes:

  (i) systems for assisting diagnosis, medical and surgical procedures

  (ii) science of medical data and patient modeling

Education

- Master training program fully taught in English, multidisciplinary courses
- Research projects providing credits (ECTS)
- Reducing the gap between training and research

http://healthtech.unistra.fr

HealthTech | Funding for a *training through research* excellence program

The project was awarded 8.3M€ for 8 years (2021-2028),
shared between education (28%) and research (72%)

Education

- **Scholarships for fellows,** covering most living expenses
- **Functioning expenses** for research projects, equipment, and involvement of outside experts
  e.g.: Creativ'Lab, mechatronic and imaging platforms
- Welcoming and **networking events** for incoming students, scientific seminars, etc.

Training through research

- **15 internship wages / year** (6-month Master thesis in a research laboratory: 3.5k€ for the second semester)
- **25 full PhD grants** throughout the project duration (2021-28)

http://healthtech.unistra.fr

International 2nd year Master track (Fall semester)

- **Elective** courses and complementary **research modules** in a laboratory
- **Pluridisciplinary training,** involvement of full-time researchers and outside professors
- **Project-integrated teaching**

Data science

- Modeling and simulation
- Artificial intelligence

Biomedical engineering

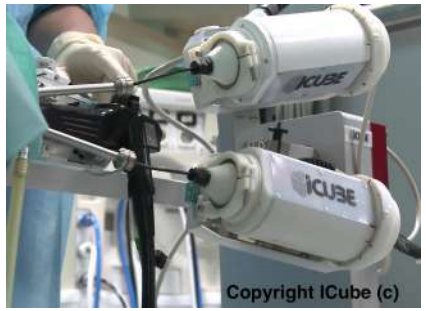
- Quantitative physiology
- Medical robotics
- Medical image processing

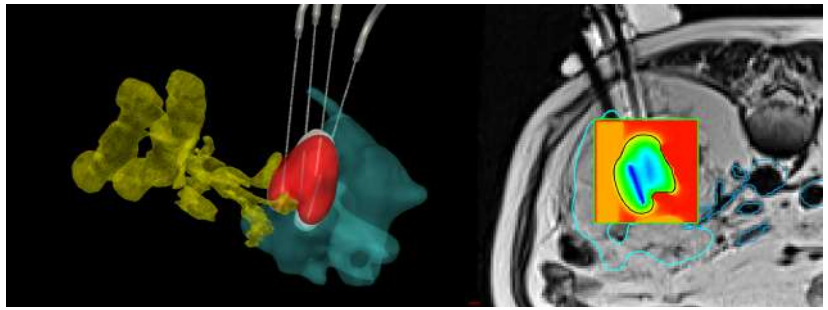
Economics & innovation

- Digital economies & creativity

Research

- Research projects
- Initiation to research





On top of acquiring specific scientific skills, HealthTech students will also acquire the ability to understand the stakes and challenges relative to innovation in healthcare.

HealthTech | Training program (2021-2022 current version)

APOGEE CODE	MC	TEACHING UNITS & COURSES	MAIN LECTURER	NUMBER OF HOURS					COEF	ECTS	EVALUATION METHOD
				CM	CI	TD	TP	TOTAL			
		SEMESTER 3									
	---	**IMAGING AND IMAGE PROCESSING**						24		3	
EP083M15	T	Advanced medical image processing	V. Noblet, J. Lamy, J. Vappou	24				24	3		Final exam 1h
	---	**TRANSVERSAL SKILLS**						30		3	
LD22EM01		English	R. Piotto								Recognition of qualifications
new		Digital economies and creativity	P. Llerena	30				30	3		Continuous assessment
	---	**CROSS-DISCIPLINARY TRAINING**						150		9	
new		Quantitative physiology	J. Vappou	30				30	3		Final exam 1h45
new		Research project 1	B. Bayle				60	60	3		Continuous assessment
new		Research project 2	B. Bayle				60	60	3		Continuous assessment
	---	**HEALTHTECH ELECTIVE COURSES : 2 course units among 3**						196,83		15	
		Course unit 1: Medical robotics						104,25			
new		Mathematics for robotics tutoring	F. Nageotte, B. Bayle	12				12			N/A
EP082M19	T	Robotics	B. Bayle	19,25	12			31,25	3		Final exam 1h45
EP083M03	T	Pose estimation	F. Nageotte	12,25				12,25	1	7,5	Continuous assessment
EP083M04	T	3D medical registration	F. Nageotte	8,75	12			20,75	1,5		Continuous assessment
EP083M07	T	Computer assisted medical interventions	B. Bayle, B. Rosa, O. Piccin, F. Nageotte	28				28	2		Continuous assessment
		Course unit 2: Modeling and simulation						103			
EP083M12	T	Modeling of living systems	D. Baumgartner	21	16			37	2,5		Continuous assessment
EP083M13	T	Real-time simulation	H. Courtecuisse	8,75	24			32,75	2,5	7,5	Continuous assessment
EP083M14	T	Haptics	B. Bayle, L. Barbé	12,25	21			33,25	2,5		Continuous assessment
		Course unit 3: Artificial intelligence						88			
new		Computer science tutoring	C. Essert	20				20			N/A
new		Introduction to AI	N. Padoy	12				12	1		Final exam 1 h
new		Machine learning	G. Exarchakis	20				20	2,5	7,5	Final exam 1 h
new		Deep learning	N. Padoy	20				20	2,5		Final exam 1h
new		Selected topics in AI	N. Padoy, T. Lampert	16				16	1,5		Final exam 1h
			TOTAL :					400,83		30	

APOGEE CODE	MC	TEACHING UNITS & COURSES	MAIN LECTURER	NUMBER OF HOURS					COEF	ECTS	EVALUATION METHOD
				CM	CI	TD	TP	TOTAL			
		SEMESTER 4									
	---	**END-OF-STUDIES INTERNSHIP**								27	
EP19LM01		Master thesis oral defense							5		
EP19LM02		Master thesis written report							5		
EP19LM03	M	Internship work							17		
	---	**INITIATION TO RESEARCH**								3	
new	M	Initiation to research	B. Bayle	5,25				5,25	3		Written report
			TOTAL :	*5,25*	*0*	*0*	*0*	5,25		30	

Master research projects (Spring semester)

- **Early immersion** in a research laboratory (started in Fall semester)
- **Full time internship in the lab** during Spring semester (5 to 6 months)
- Students are fully involved in the **research process**
- With the **perspective of a doctoral** project

2021 Master projects (non exhaustive)

Biomechanics

- Biomechanical modeling and simulation of the human balance system
- Biopsy simulation of musculoskeletal tumors
- Finite element and deep learning joined approach for developing an augmented reality tool dedicated to liver surgery

Artificial intelligence

- Hand fracture surgical video analysis for AI-based training
- An AI-enabled educational tool for laparoscopic intraoperative ultrasound based on automatic and real-time detection of intrahepatic landmarks

Robotics

- Automating OCT scanning for colorectal applications
- Robotic assistance for Blood-Brain-Barrier opening using focused ultrasound
- System for sensorimotor function recovery for hemiparetic patients

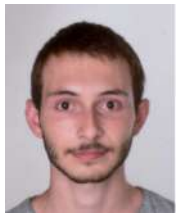
Computer science

- Guiding multiple needles on planned trajectories
- Biomedical sensors network

HealthTech |2021-2022 Healthtech master fellows

Enrolled in the HealthTech Master track

ALBANESI
Alessandro
Politecnico di Milano, Italy



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SALMAN
Nada
Tishreen University, Syria

SAOOD
Adnan
Tishreen University, Syria

WEISSROCK
Edgard
Medical School of Strasbourg

SAND
Jérémy
INSA Strasbourg

and

- 3rd year students from Télécom Physique Strasbourg enrolled in the DTMI track (specialization in Information technology for healthcare): 5 students
- exchange students from *Polytechnique Montréal*, Canada: 2 students

HealthTech | What we offer

After validating the two semesters Healthtech fellows obtain the **IRIV Master, with Healthtech specialty**, from the University of Strasbourg

Training environment

- Small groups (max. 25 students), direct interaction with teachers and Professors
- Involvement of expert teachers (Professors, Chairs-holders, Researchers)
- Specifically developed courses
- Access to Telecom Physique Strasbourg facilities (high-rank engineering school)
- Cultural immersion program

Research environment

- Involvement of top-rank researchers at ICube laboratory
- Large scope of research fields (robotics, IA, signal and image processing, biomechanics, medical imaging)
- Interactions with medical doctors

Studies quality

- Strasbourg: medium-size town, student city
- Scholarship: around 5k€ for Fall semester
- Internship grant : around 3.5 k€ for Spring Semester

HealthTech | Practical information

HealthTech fellows will be selected among our local and international partners
and provided with a **full scholarship** (around 13 scholars)

- If you are a high-ranking student interested in biomedical engineering… join us !

Application procedure

- Three steps : 1/ Apply for Erasmus + mobility to Strasbourg at Polimi
  2/ Application to Healthtech program
  3/ Selection of students by Healthtech recruitment committee (based on documents)
- Applications to Healthtech will be opened **in Spring** on the online platform “eCandidat”
- Full application procedure available on our website http://healthtech.unistra.fr (“admission” & “FAQ” pages)

For further information

- Information on the program: http://healthtech.unistra.fr
- Information on the IRIV Master: https://www.master-iriv.fr/international/healthtech
- Contact us for additional inquiries: **iti-healthtech-master@unistra.fr**

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funded under the **Excellence Initiative** program

In a site of excellence

International graduate program

Biomedical innovation

Questions are welcome!

http://healthtech.unistra.fr

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