



PhD in Information Technology and Electrical Engineering
Università degli Studi di Napoli Federico II

PhD Student: Danilo Calderone

Cycle: 37th

Training and Research Activities Report

Year: 2023 Second Year

Student Signature:

Tutor: Prof. Mario Cesarelli

Co-Tutor: Prof. Fabrizio Clemente

Date: December 12, 2023

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Author: Calderone Danilo

1. Information:

- **PhD student:** Calderone Danilo
- **DR number:** DR996114
- **Date of birth:** 14/10/1996
- **Master Science degree:** Biomedical Engineering
- **University:** Università degli Studi di Napoli “Federico II”
- **Doctoral Cycle:** 37th
- **Scholarship type:** *MUR PON*
- **Collaborating company:** Santobono Innovation Srl
- **Period abroad in:** Reykjavik University, Iceland
 - **Period abroad:** 6 months
 - **Period in company:** 10 months
- **Tutor:** Prof. Mario Cesarelli
- **Co-tutor:** Prof. Fabrizio Clemente

2. Study and training activities:

Activity	Type ¹	Hours	Credits	Dates	Organizer	Certificate ²
Biosignal and Postural Control: BioVRSea	Ad hoc course	15	3	01/06/23 – 27/07/23	Reykjavik University	Y
Academic Entrepreneurship	Ad hoc course	20	4	29/05/23 – 22/06/23	DIETI	Y
Using Deep Learning Properly	Ad hoc course	20	4	10/01/23 – 24/01/23	DIETI	Y
Learning gene association networks using single-cell RNA-seq data: a graphical model,	Seminar	1	0,2	31/03/23	DIETI	N
Evolution of the 3D chromatin architecture in acute leukemia	Seminar	1	0,2	24/03/23	DIETI	N
The state of the art of AI and Physics-Based Simulations in drug discovery	Seminar	1	0,2	17/03/23	DIETI	N
Measuring cancer evolution from (epi)genomic data	Seminar	1	0,2	16/06/23	DIETI	N

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AI, Robots and Society: Challenges and Opportunities for Social Innovation	Seminar	1	0,2	25/05/23	DIETI	N
EEG Source Connectivity (Part 1)	Seminar	2	0,4	06/06/23	Reykjavik University	Y
EEG Source Connectivity (Part 2)	Seminar	2	0,4	20/06/23	Reykjavik University	Y
3D Printing Workshop: Anatomy segmentation in Mimics	Seminar	2	0,4	04/07/23	Reykjavik University	Y
3D Printing Workshop: Introduction to advanced 3D printing	Seminar	2	0,4	11/07/23	Reykjavik University	Y
3D Printing Workshop: Introduction to VR segmentation	Seminar	2	0,4	18/07/23	Reykjavik University	Y
3D Printing Workshop: ELUCIS for VR segmentation	Seminar	2	0,4	25/07/23	Reykjavik University	Y
Picariello lectures - Data Excellence Part 1	Seminar	2	0,4	13/11/23	DIETI	N
Picariello lectures – Artificial Intelligence for ocean dynamics	Seminar	2	0,4	04/12/23	DIETI	N

1) Courses, Seminar, Doctoral School, Research, Tutorship

2) Choose: Y or N

2.1. Study and training activities - credits earned

	Courses	Seminars	Research	Tutorship	Total
Bimonth 1	0	0	6	0	6
Bimonth 2	0	0,6	7	0	7,6
Bimonth 3	0	1,2	7	0	8,2
Bimonth 4	7	1,6	8	0	16,6
Bimonth 5	4	0	8	0	12
Bimonth 6	0	0,4	8	0	8,4
Total (Second Year)	11	3,8	44	0	58,8
Total	32,4	9,1	82	0	123,5
Expected	30 - 70	10 - 30	80 - 140	0 - 4.8	

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3. Research activity:

Research activity aimed at studying and creating innovative models and tools for ICT based healthcare, in particular 3D printing technology and telemedicine. In collaboration with Santobono Innovation company, the research activity carried out this year was mostly based on:

- Gathering of clinical and mechanical data of patients enrolled for a telemedicine service for domiciliation of patients treated with mechanical ventilation
- Characterization of the previously stated telemedicine service
- Improvement of Fused Deposition Modeling 3D Printing process for the implementation in clinical treatment
- Review of current literature of 3D printing applications in orthopedic field
- Review of current literature of 3D printing applications in neurosurgical field
- Review of current literature of 3D printing applications in cardiosurgical field
- Use of 3D Printing for supporting orthopedic surgeons and neurosurgeons in pre-operative planning and surgery simulation using patient's 3D Printed anatomical models

Period in company completed: 9 months (in presence)

4. Research products:

- 1) “Guardian Angel 2.0: A telemedicine service for children with home mechanical ventilation”
Authors: Anna Dolcini, Luigi Iuppariello, Danilo Calderone, Mario Cesarelli, Fabrizio Clemente
Journal of publication: “Revue Roumaine Des Sciences Techniques Série Électrotechnique Et Énergétique”, status: published, 2022
- 2) “Use of Three-Dimensional Printing Technology for Supporting the Hip Reconstruction Surgery in Paediatric Patients”, status: submitted Oct. 2023
- 3) “Biomechanics parameters of gait analysis to characterize Parkinson’s disease: a systematic review”, status: submitted Oct. 2023

5. Conferences and seminars attended

MetroXRINE 2023, 25/10 – 27/10, Milan – Organizer of Special Session #12 - Computer-Aided Solutions in Healthcare: Bioimaging and 3D Printing, Chair of General Session #1

2 conference papers presented:

- 1) “Optimization of 3D Fused Deposition Modeling Printing Process For the Manufacturing of Devices For Medical Use”

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Authors: Danilo Calderone, Giuseppe Cesarelli, Mario Cesarelli, Luigi Iuppariello, Pasquale Guida, Antonio Casaburi, Gemma Romano, Fabrizio Clemente, Francesco Amato.

2) “3D Dental Reconstruction with Photogrammetry Technology

Authors: Francesca Angelone, Alfonso Maria Ponsiglione, Emilio Andreozzi, Danilo Calderone, Giuseppe Cesarelli, Francesco Amato, Maria Romano.

E-Health and Bioengineering (EHB) 2023, 9/11-10/11, Iasi, Romania (Online participation).

1) Applications of 3D Printing and Neuronavigation in Neurosurgery: a Literature Review and a Clinical Case Report”

Authors: Danilo Calderone, Giuseppe Cesarelli, Luigi Iuppariello, Giuseppe Mirone, Giuseppe Cinalli, Francesco Amato, Fabrizio Clemente.

6. Periods abroad and/or in international research institutions

Reykjavik University, Iceland: from 11/05/23 to 30/07/23. Abroad Tutor: Prof. Paolo Gargiulo

Period abroad completed: 5 months (2,67 in presence, 2,33 remote)

Activity: Introduction to advanced 3D printing of mixtures of materials: mechanical characterization and comparison with human anatomical tissues in literature. Introduction to advanced segmentation. Introduction to BioVRSea for the study of motion sickness. Introduction to VR segmentation.

7. Tutorship

None

8. Plan for year three

3D printing for neurosurgery: use of 3D printing technology for education of surgeons in the use of LITT (Laser Interstitial Thermal Therapy)

Telemedicine: data analysis of mechanical parameters measured from the mechanical ventilator of pediatric patients in domiciled mechanical ventilation

Abroad collaboration: collaboration with Reykjavik University: Advanced 3D printing for medicine: comparison of mechanical properties of printing materials with mechanical properties of human tissues.

Draft topic of thesis: Innovation in medicine: 3D printing technology and Telemedicine