PhD Student

Danilo Calderone

Innovative diagnostic/therapeutic models and tools for healthcare based on ICT Technologies

Tutor:

Prof. Mario Cesarelli

co-Tutor:

Prof. Fabrizio Clemente

Cycle: 37th

Year: Second

My background

Education

- MSc degree: Biomedical Engineering MSc
- University: University of Naples “Federico II”

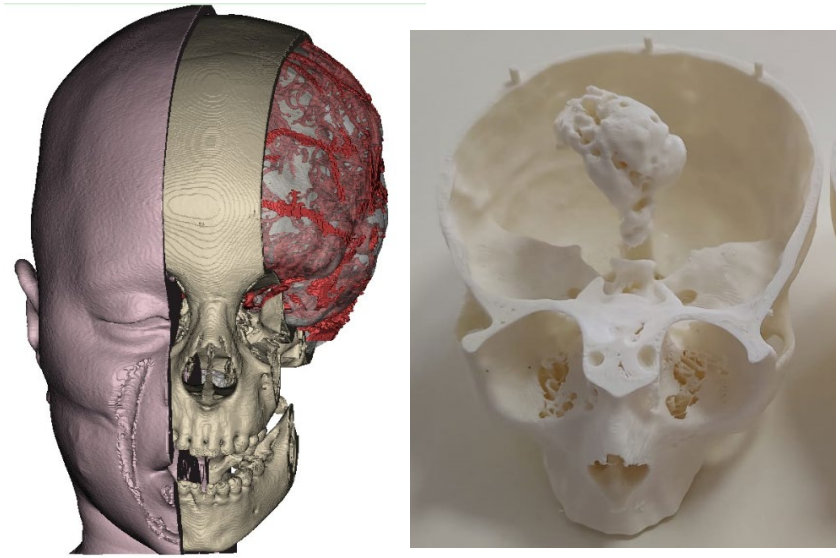
PhD Student

- PhD start date: 01/01/2022
- Scholarship type: **PON MUR**
- Period abroad: 6 months in **Reykjavik University, Iceland**
- Period in company: 10 months in **Santobono Innovation Srl**

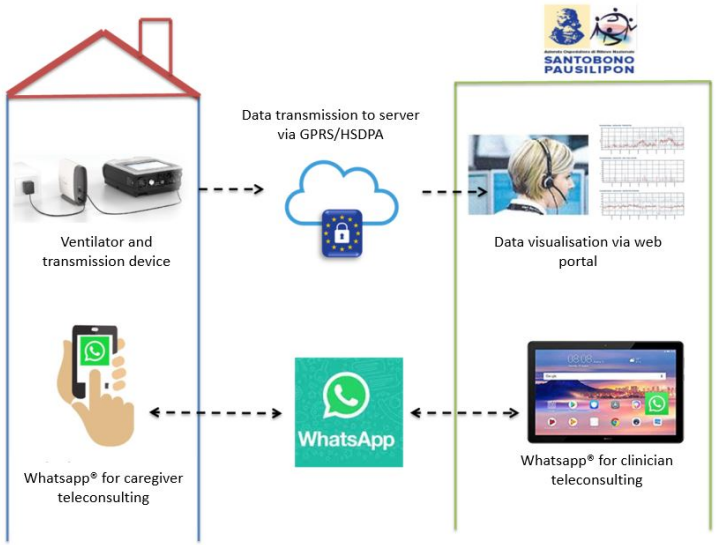
Research field of interest

Two main research topics

3D Printing in medicine



Telemedicine



Research activity: Overview

Application of 3D printing technology in healthcare

Improvement of 3D printing process of anatomical models for the implementation in standard clinical treatment

SANTOBONO INNOVATION

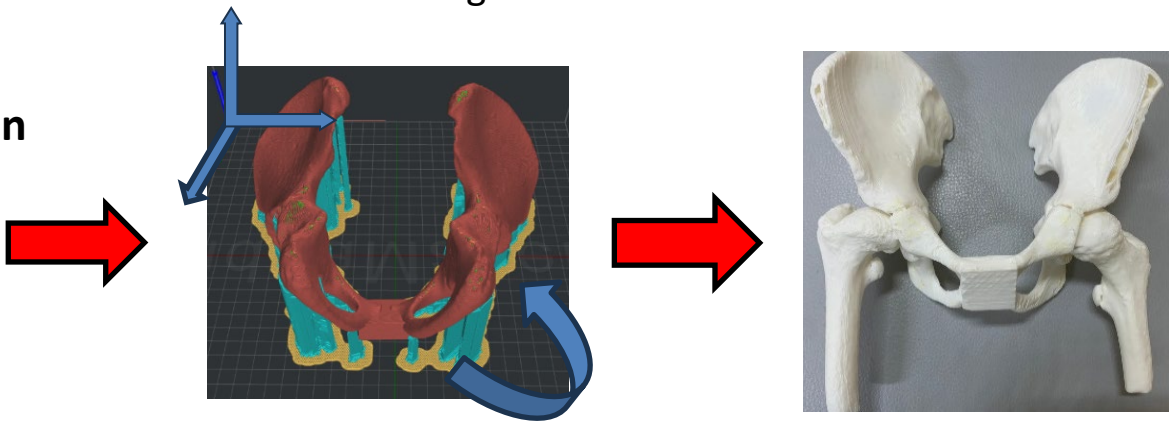
Despite the **numerous advantage** obtained from 3D printing for clinical use, clinicians still **do not** consider this strategy as a standard procedure in patient treatment.

Among the limitations of 3D FDM printing technology, particularly crucial is the **high printing time**

Objective of this research activity was to improve the 3D printing process by reducing the printing time without losing resolution

Orientation optimization
(position + rotation)

Parameter optimization



Research activity: Overview

Guardian Angel: a telemonitoring service for pediatric patients on home pulmonary ventilation

*Characterization of "**Guardian Angel**" telemonitoring service*

Data gathering and initial analysis

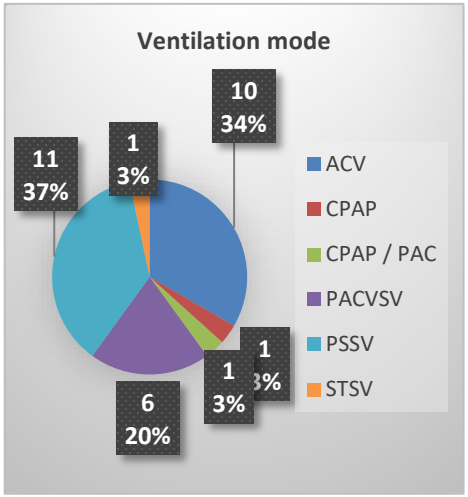
Consiglio Nazionale delle Ricerche

Azienda Ospedaliera di Rilievo Nazionale SANTOBONO PAUSILIPON

Dati monitorati								
Trigger spontaneo (%)					Ciclo Spontaneo (%)			
1/01/223 - 3123-15/03/23)					1/01/223 - 3123-15/03/23)			
/	/	3,00	/		/	/	0,00	/
35,00	38,00	35,00	47,00		79,00	72,00	77,00	68,00
0,00	1,00	1,00	0,00		0,00	1,00	1,00	0,00
89,00	91,00	93,00	96,00		25,00	24,00	28,00	25,00
5,00	16,00	17,00	43,00		90,00	83,00	85,00	79,00
/	/	/	0,00		/	/	/	0,00
/	/	10,00	6,00		/	/	0,00	0,00
1,00	1,00	2,00	1,00		0,00	0,00	0,00	0,00
/	/	/	/		/	/	/	/
/	/	/	/		/	/	/	/
/	0,00	0,00	23,00		/	97,00	93,00	91,00
4,00	20,00	24,00	26,00		0,00	6,00	0,00	0,00
/	/	/	/		/	/	/	/
18,00	35,00	/	0,00		0,00	0,00	/	0,00

Number of patients enrolled: **30**

- Obtainment of mechanical and clinical data from the telemonitoring cloud platform
- Evaluation of initial statistics based on the pathology and the therapy settings
- Evaluation of outliers by clinical-mechanical definition



itee PhD information technology electrical engineering

Summary of research activities

Events and conferences

MetroXRAINE Conference 2023, 25th - 27th October, Milan (Italy)

E-Health and Bioengineering (EHB) Conference 2023, 9th – 10th November, Iasi (Romania)

Ad Hoc PhD courses

Biosignal and Postural Control: BioVRSea

Academic Entrepreneurship

Using Deep Learning Properly

Period completed

Period in company completed: **9 months (in presence)**
Period abroad completed: **5 months (2,67 in presence, 2,33 remote)**

Summary of research activities

Period Abroad

Reykjavik University, Iceland: from 11/05/23 to 30/07/23

Abroad Tutor: Prof. Paolo Gargiulo

Activity: Advanced 3D printing of mixtures of materials using Stratasys J850 printer: mechanical characterization of material mixtures and comparison with human anatomical tissues in literature.

Advanced segmentation using Mimics.

Introduction to VR segmentation.

Introduction to BioVRSea for the study of motion sickness.

Products

Research Paper	
[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*
Conference Paper	
[4]	*"Optimization of 3D Fused Deposition Modeling Printing Process For the Manufacturing of Devices For Medical Use"* *Authors: Danilo Calderone, Giuseppe Cesarelli, Mario Cesarelli, Luigi Iuppariello, Pasquale Guida, Antonio Casaburi, Gemma Romano, Fabrizio Clemente, Francesco Amato. MetroXRAINE Conference 2023, Milan, Italy.*
[5]	*"3D Dental Reconstruction with Photogrammetry Technology* *Authors: Francesca Angelone, Alfonso Maria Ponsiglione, Emilio Andreozzi, Danilo Calderone, Giuseppe Cesarelli, Francesco Amato, Maria Romano. MetroXRAINE Conference 2023, Milan, Italy*
[6]	*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. E-HB Conference 2023, Iasi, Romania*

Future developements

- **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

Thank you for your attention