Andrea Baldoni, *Ph.D.*

MSc. Mechanical Engineer & Inventor

Education:

Ph.D. in BioRobotics

The BioRobotics Institute of Scuola Superiore Sant'Anna di Pisa in Wearable Robotics Lab. – Head Prof. Nicola Vitiello

Thesis: ***Design & Development of Novel Wearable Robots***

Date defence: 28/05/2019

Mark: 100/100 cum laude

MSc Mechanical Engineering (LM33)

Università degli Studi di Perugia – Laurea magistrale in ingegneria meccanica

Thesis: ***Feasibility Study to develop a sail Suez-Max Tanker***

Date defence: 18/07/2013

Mark: 102/110

BSc Mechanical Engineering

Università degli Studi di Perugia – Laurea magistrale in ingegneria meccanica

Date defence: 18/07/2013

Mark: 96/110

Assistant Researcher (Post Doc)

@The BioRobotics Institute in Wearable Robotics Laboratory – Head: Prof. Nicola Vitiello & Dr. Simona Crea & Dr. Emilio Trigili

I am a mechanical engineer with many years of significant work experience. I am currently leading the hardware R&D Team where we design and conceive many prototypes and complex mechatronic devices (i.e., exoskeletons, prostheses, and hybrid technology) with very good results.

In these years I invented and conceived several novel robots, mechanisms, concepts, and layouts (mostly) related to the Wearable Robotics field.

I am also taking care of most of the Intellectual Property (IP) management of the WR Lab (i.e., patent applications), certification processes, and much of the micro-management of the whole Team (i.e.: orders, budget, facilities, etc.).

With some colleagues of mine we founded IUVO S.r.L in 2016. Nowaday controlled by a joint venture between COMAU and OSSUR.

Knowledge Transfer Manager

@ Transfer Technology Office of Scuola Superiore Sant'Anna – Head: Prof. Marco Frey & Dr. Monia Gentile

As a Technology Transfer Office, we deal with sharing or disseminating knowledge and providing inputs to problem-solving. We seek to organize, create, capture, or distribute knowledge born in the University and ensure its availability for future users (ie: spinoffs, enterprises but also other users).

Technically speaking I deal whit (i) the management of the entire patent portfolio (230 patent family) and all intellectual property of the SSSA; (ii) establishment of new spin-offs; (iii) management of relationships between spin-offs, University, and networking; (iv) enhancement of patents and know-how; (v) supports the projects who the office is involved in; (vi) reporting; etc.

Scientific Production:

Patents family:

1) **Variable stiffness orthotic shell** – WO 2021/124198– 17/12/19 – Baldoni et al.
2) **Method for optimizing the arrangement of pressure sensors and device obtained by this method** – WO2021/084427 – 28/10/2019 – Martini et al.
3) **Kinematic chain to assist flexion-extension of a joint** – WO2021/064544 – 30/09/2019 – Baldoni et al.
4) **Telaio di sostegno ad un esoscheletro di mano** – n°102019000005476 – 13/07/2017 – Baldoni et al.
5) **Telaio di sostegno per esoscheletro di arto superiore** – n°102019000001843 – 08/02/2019 – Baldoni et al.
6) **Wearable robotic device for moving a user** – WO2020/109996 – 27/11/2018 – Baldoni et al.
7) **A planar torsional spring** – WO2020/104962 – 21/11/2018 – Baldoni et al.

8) **Wearable active robot for body joints in series** – WO2020/070705 - 05/10/2017 – Baldoni et al.
9) **Wearable active robot with sensor means for feedback control** – WO2020/070703 - 05/10/2017 – Baldoni et al.
10) **Wearable active robot with spinal polyarticular chain** – WO2020/070704 – 05/10/2017 – Baldoni et al.
11) **Multiple output actuation system for robotic joints** – WO2020/070711 – 05/10/2017 – Baldoni et al.
12) **Device for the selective transmission of driving torques** – WO2020/070712 – 05/10/2017 – Baldoni et al.
13) **Exoskeleton for the assistance of polyarticular joints** – WO2020/070713 – 05/10/2017 – Baldoni et al.
14) **Kinematical chain for assisting the motion of a spherical joint** - WO2019/012429 – 13/07/2017 – Baldoni et al.
15) **Exoskeleton for upper arm** – WO2018/207073 – 08/05/2017 – Baldoni et al.
16) **Joint for transmitting a torsional load with elastic response** – WO2017/216740 – 17/06/2016 – Baldoni et al.
17) **Kinematic chain for transmission of mechanical torques** – WO2017/216663 – 14/06/2016 – Baldoni et al.

Journal papers

1) Pan et al. (2023) – **A self-aligning upper-limb exoskeleton preserving natural shoulder movements:kinematic compatibility analysis –** TNSRE
2) SanzMorere et al. (2023) – **An Active Knee Orthosis with a variable transmission ratio through a motorized dual clutch** – Mechatronics.
3) Mazzarini et al. (2023) – **A low-power ankle-foot prosthesis for push-off enhancement** – Cambridge**.**
4) Peperoni et al. (2023) – **Self-Aligning Finger Exoskeleton for the Mobilization of the Metacarpophalangeal Joint** – IEEE Transactions on Neural Systems and Rehabilitation Engineering.
5) Pan et al. (2022) – **NESM-gamma: An Upper-limb Exoskeleton with Compliant Actuators for Clinical Deployment** – Robotics and Automation Letters (RA-L).
6) Fiumalbi et al. (2022) – **A Multimodal Sensory Apparatus for Robotic Prosthetic Feet Combining Optoelectronic Pressure Transducers and IMU** – Sensors.
7) Fanciullacci, McKinney, et al. (2021) – **Survey of transfemoral amputee experience and priorities for the user-centered design of powered robotic transfemoral prostheses** – Journal of NeuroEngineering and Rehabilitation 18.1: 1-25.
8) Capotorti et al. (2021) – **Decoding Intended Hand Movements Through an Algorithm Combining EMG with Fingers Kinematics: a Feasibility Study with a Torque-Controlled Hand Exoskeleton** – IEEE Robotics and Automation Letters (RA-L).
9) Fanciullacci et al. (2020) – **Evaluation of Human Factors for the User-centered Design of Powered Robotic Transfemoral Prostheses: A Survey of Transfemoral Amputee Experience and Priorities** – Research Square.
10) Trigili et al. (2019) – **Design and experimental characterization of a shoulder-elbow exoskeleton with compliant joints for post-stroke rehabilitation** – IEEE/ASME Transactions on Mechatronics, 24(4), 1485-1496.
11) Marconi et al. (2019) – **A novel Hand Exoskeleton with Series Elastic Actuation for modulated torque transfer** – Transaction of Mechatronics – Mechatronics 61, 69-82.
12) Ercolini et al. (2018) – **Powered exoskeletons for arm rehabilitation** – Robotica Ercolino 37 (12), 2056-2072.
13) Crea et al. (2018) – **Feasibility and safety of shared EEG/EOG and vision-guided autonomous whole-arm exoskeleton control to perform activities of daily living**. Scientific reports, 8(1), 10823.
14) Baldoni et al. (2018) – **Design and Validation of a Miniaturized SEA Transmission System** – Mechatronics (Elsevier), Vol. 49, pp 149-156
15) Crea et al. (2017) – **Validation of a Gravity Compensation Algorithm for a Shoulder-Elbow Exoskeleton for Neurological Rehabilitation**. In Converging Clinical and Engineering Research on Neurorehabilitation II (pp. 495-499). Springer, Cham.
16) Crea et al. (2016, June) – **A novel shoulder-elbow exoskeleton with series elastic actuators**. In 2016 6th IEEE International Conference on Biomedical Robotics and Biomechatronics (BioRob) (pp. 1248-1253). IEEE.

Book chapters or conference papers

1) Astarita et al. (2023) – **Design and characterization of hand exoskeleton for assessment and treatment in neurological rehabilitation** – ICORR
2) Pan et al. (2023) – **NESM-gamma: An Upper-limb Exoskeleton with Compliant Actuators for Clinical Deployment** – ICRA 2023
3) Lanotte et al. – Design and characterization of a multi-joint underactuated low-back exoskeleton for lifting tasks – BioRob 2020
4) Pilla et al. – **Design and clinical testing of compliant upper-limb exoskeletons for stroke rehabilitation and assistance** – WearRAcon 2019
5) Trigili et al. – **Series-elastic actuators for Wearable Robotics: Test bench and Applications** – Poster section EXO Berlin 2019
6) Crea et al. (2016) – **Control and performance of upper- and lower-extremity SEA-based exoskeletons.** Wearable Exoskeleton Systems: Design control and application, Institution of Engineering and Technology (IET Book).
7) Sanz-Morè et al. (2018, August) – **A bioinspired control strategy for the CYBERLEGs knee-ankle-foot orthosis: feasibility study with lower-limb amputees.** In 2018 7th IEEE International Conference on Biomedical Robotics and Biomechatronics (Biorob) (pp. 503-508). IEEE.

8) Giudetti et al. – **RONDA: A Robotic Gym for Neurorehabilitation of Stroke Patients**. The 40th IEEE Engineering in Medicine and Biology Society. Honolulu, Hawaii from July 17-21, 2018 (EMBC'18).

9) Sanz-Morè et al. – **A bioinspired control strategy for the CYBERLEGs knee ankle foot orthosis: feasibility study with lower-limb amputees** – In 2018 8th IEEE International Conference on Biomedical Robotics and Biomechatronics (BioRob)

10) Trigili et al. – **Multi-Degree-of-Freedom Arm Exoskeleton with Compliant Actuators** – In 2016 6th IEEE International Conference on Biomedical Robotics and Biomechatronics (BioRob)

11) Pilla et al. – **Sviluppo di un metodo innovativo di valutazione della spasticità tramite l'utilizzo di un esoscheletro di gomito: uno studio preliminare** – Prima giornata toscana della ricerca in riabilitazione. Montevarchi (AR), Ospedale Santa Maria alla Gruccia, Sala congressi CRT. 4 Maggio 2018

Involvement in projects:

1) **MOTU++** – PR19-PAI-P2 – Protesi robotica di arto inferiore con smart socket ed interfaccia bidirezionale per amputati di arto inferiore: personalizzazione mediante human-in-the loop optimization – From January 1, 2021 up to 3 years

2) **HABILIS++** - 19-RR-P4 – Nuovi dispositivi robotici indossabili per la riabilitazione e il recupero funzionale della mano" From January 1, 2021 up to 3 years

3) **Mari4_YARD** – User-centric solutions for a flexible and modular manufacturing in small and medium-sized shipyards – From December 1, 2020, up to 4 years

4) **INAIL BIOARM** – Esoscheletro portatile per la riabilitazione e l'assistenza del paziente plesso-leso – From November 2020 up to 3 years.

5) **COMBOTs** – CONnected through roBOTS: physically coupling humans to boost handwriting and music learning) – From Jan 2020 up to 3,5 years.

6) **ReHyb** – Rehabilitation based on Hybrid neuroprosthesis – From Jan 2020 up to 4 years project.

7) **INAIL HABILIS** – Nuovi dispositive robotici per la riabilitazione e il recupero funzionale della mano – From Oct. 2017 to Sep. 2018

8) **INAIL MOTU Project** (Protesi robotica di arto inferiore con smart socket ed interfaccia bidirezionale per amputati di arto inferiore) – From 04/05/2017 to 03/05/2020

9) **CYBERLEGs Plus Plus Project** (The CYBERnetic LowEr-Limb CoGnitive Ortho-prosthesis) – *H2020-ICT-25-2016-2017 – From 01/01/2017 to 31/01/2020*

10) **HUMAN Project** (HUman MANufacturing) H2020-FOF-2016 from 01/10/2016 to 30/09/2019.

11) **CENTAURO Project** (Colavoro, efficienza e prevenzione nell'industria dei motoveicoli mediante tecnologia di automazione e robotica) – *Bando FAR-FAS 2014 Regione Toscana.*

12) **RONDA Project** (RObotica Indossabile personalizzata per la riabilitazioNe motoria Dell'arto superiore di pAzienti neurologici) Bando PAR FAS Salute 2014 – From 01/07/2015 to 30/06/2015

13) **AIDE Project** (Adaptive Multimodal Interfaces to Assist Disabled People in Daily Activities) – H2020-ICT-22-2014 from 01/02/2015 to 31/01/2018.

14) **IUVO Project** – Fondazione Pisa - from Apr.2013 to Sept.2016.

15) **CYBERLEGs Project** (The CYBERnetic LowEr-Limb CoGnitive Ortho-prosthesis) FP7-ICT-2011-7 – From 01/02/2012 to 31/01/2015.

16) **Early ReHab** – Funded by Regione Toscana - From Dic 2011 to Nov 2013

17) **AMULOs Project** (Advanced Motorized Upper Limb Orthotic System)

18) **WAY Project** (Wearable interfaces for hAnd function recovery) FP7-ICT-2011-7 from 01/10/2011 to 31/05/2015

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Pontedera, 02/11/2023 Andrea Baldoni