

Curriculum Vitae and Track Record

Andrea Cafarelli

July, 2020

1. Personal Information



Name and Surname: Andrea Cafarelli

Birthdate: 21/07/1988

Born in: Carrara (MS) -Italy

Citizenship: Italian

Spoken languages: Italian, English

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2. Short bio: professional and scientific highlights

I obtained a M.Sc. Degree (Laurea Specialistica) in Biomedical Engineering at University of Pisa in 2013 (full marks, *cum laude*). In June 2017 I obtained the Ph.D. in Biorobotics (full marks, *cum laude*) at the BioRobotics Institute of Scuola Superiore Sant'Anna (SSSA), with a thesis regarding innovative therapeutic applications of ultrasound for targeted therapies.




My scientific activity has been characterized from the beginning by a strongly interdisciplinary and curiosity-driven approach. This allowed me to carry out innovative research efforts at the interface between different disciplines, such as robotics, therapeutic ultrasound, ultrasound imaging, materials science, and biotechnologies.

From 2019 I am co-founder of River Global Scientific Lab srl, a spin-off company of Scuola Superiore Sant'Anna dedicated to technological advances in the therapeutic ultrasound field (e.g. high intensity ultrasound for cancer treatment).

3. Employment history

<p><u>06/2019 – Present</u></p> 	<p>Co-founder and Chief Technology Officer (CTO) of River Global Scientific Lab, Spin-off company of Scuola Superiore Sant’Anna (SSSA).</p>
<p><u>06/2017 – 06/2019</u></p> 	<p>Postdoctoral fellow (assegno di ricerca ING-IND/34) in Bioengineering and BioRobotics at the BioRobotics Institute of SSSA.</p>
<p><u>11/2013 – 06/2017</u></p> 	<p>Ph.D. in BioRobotics, Scuola Superiore di Studi Universitari e Perfezionamento Sant’Anna (SSSA). International Doctoral School in Biorobotics.</p>

4. Education

<p><u>11/2013 – 06/2017</u></p> 	<p>Ph.D in BioRobotics (100/100 cum laude), at the Scuola Superiore di Studi Universitari e Perfezionamento Sant’Anna, Pisa (Italy). Ph.D. Thesis entitled “<i>Controlled ultrasound exposure for innovative therapeutic applications</i>”. Tutor: Prof. Arianna Menciacchi, Supervisor: Prof. Leonardo Ricotti.</p>
<p><u>10/2010 – 07/2013</u></p> 	<p>M.Sc. Degree (Laurea Magistrale) in Biomedical Engineering, “Industrial” curriculum (110/110 cum laude), at University of Pisa (Italy).</p>
<p><u>10/2007 – 12/2010</u></p> 	<p>B.Sc. Degree (Laurea Triennale) in Biomedical Engineering, “Industrial” curriculum” (110/110 cum laude), at University of Pisa (Italy), with additional Certificate of “Excellence courses”.</p>
<p><u>09/2002 – 07/2007</u></p>	<p>High School Degree (100/100 cum laude) at the Scientific Lyceum “G. Marconi”, Carrara (Italy)</p>

Other Education

07/2016 - 01/2017 : **Visiting Ph.D. student** (6 months) at the Molecular Imaging and Delivery of Active Substances lab, Neurospin, Commissariat à l'énergie atomique et aux énergies alternatives (CEA) in Saclay, Paris (France), under the supervision of Dr. B. Larrat.

02/11/2015 - 09/11/2015: **7th Surgical Robotics Summer School**, Ecole Doctorale I2S, University de Montpellier (France)

08/03/2015 - 13/03/2015: **Winter School on Therapeutic Ultrasound 2015**, Institute Langevin, Ecole de Physique, Les Houches (France)

26/11/2014 - 29/11/2014: **GMSI-GSDM Summer Camp**. (Graduate Program for Mechanical System Innovation; Global Leader program for Social Design and Management), University of Tokyo, Tokyo (Japan)

5. Additional professional information and memberships

11/2013: Italian license “*abilitazione*” for the profession of Industrial Engineering, obtained after a written and oral exam (*Esame di Stato*), held on November 2013. The license was issued by MIUR (Ministero dell'Istruzione, dell'Università e della Ricerca) on 03/07/2014.

6. Teaching and supervision activities

Teaching activity

- Didactic activity for the course of “Robotics for surgery and targeted therapy” (M.Sc. Bionics Engineering, University of Pisa – Scuola Superiore Sant’Anna, Italy). (Academic Year 2016/2017, 2017/2018, 2018/2019 and 2019/2020).
- Extracurricular didactic activity on photonics and biomaterials (within the project “MA DAI! Materiali da innovazione!”), Università degli Studi Aldo Moro di Bari, November-December 2018. Theme of the course: Biomaterials and Acoustically Tuned Materials (16 hours – 2 CFU). Academic Year 2018/2019 and 2019/2020).
- Didactic activity for the Summer School MΣSh - Materials SUMmer School, (within the project: “MA DAI! Materiali da innovazione!”), Università degli Studi Aldo Moro di Bari, September 2018. Theme of the course: Biomaterials and Acoustically Tuned Materials (6 hours).

Supervision activity – M.Sc. Students and PhD Students

- Aliria Poliziani: “Sintesi e caratterizzazione acustica/meccanica di materiali e nanocompositi per applicazioni biomediche”, M.Sc. Thesis in Biomedical Engineering (University of Pisa) –Thesis defense: December 2016;

- Virginia Simoni: “Validazione e caratterizzazione di terapie basate sull'utilizzo di ultrasuoni focalizzati ad alta intensità”, M.Sc. Thesis in Biomedical Engineering (University of Pisa) –Thesis defense: December 2017;
- Giulia Mosconi: “Elastografia ARFI pre e post-trattamento HIFU: studio di fattibilità su phantom e su tessuti ex-vivo” M.Sc. Thesis in Biomedical Engineering (University of Pisa) –Thesis defense: February 2018;
- Sabrina Ciancia: “Development of a US-responsive patch for controlled drug release”, M.Sc. Thesis in Biomedical Engineering (University of Pisa) – Thesis defence: June 2018
- Laura Morchi: PhD Student. “Focused Ultrasound Surgery: methods for a quantitative evaluation of the therapy”

7. Awards and distinctions

16/10/2015

Best Oral Presentation Award. The paper “A tissue-mimicking phantom for in-vitro accuracy evaluation of USgHIFU procedures” was awarded as best oral presentation during the 3rd European Symposium on Focused Ultrasound Therapy (EUFUS) - London (UK) – 15-16 October 2015.

07/2013

Winner of a three-years fellowship (PhD in BioRobotics at Scuola Superiore Sant’Anna) funded by the Italian Ministry of Instruction, University, Research (ranked 5th over more than 90 international applicants).

07/12/2010

Certificate of "Excellence courses". Certificate assigned at the end of the B.Sc. Degree (Laurea Triennale) in Biomedical Engineering.

2020

KUKA Innovation Award 2020. The Sant’Anna research team composed of Laura Morchi, Andrea Mariani,, Selene Tognarelli, Andrea Cafarelli and Alessandro Diodato under the supervision of Professor Arianna Menciassi is one of the five successful finalists of the “KUKA Innovation Award 2020 – Medical Robotics Challenge”.

8. Publications and Patents

Papers on International Journals

1. A. Novell, H. A. S Kamimura, **A. Cafarelli**, M. Gerstenmayer, J. Flament, J. Valette, P. Agou, A. Conti, E. Salingue, R. Aron Badin, P. Hantraye & B. Larrat. A new safety index based on intrapulse monitoring of ultra-harmonic cavitation during ultrasound-induced blood-brain barrier opening procedures. *Scientific Reports*, 2020. (I.F. = 4.011)
2. S. Ciancia, **A. Cafarelli**, A. Zahoranova, A. Menciassi, & L. Ricotti. Pulsatile Drug Delivery System Triggered by Acoustic Radiation Force. *Frontiers in Bioengineering and Biotechnology*, 2020. (I.F. = 4.21)
3. F. Dedola, F. P. U Severino, N. Meneghetti, T. Lemaire, **A. Cafarelli**, L. Ricotti, A. Menciassi, A. Cutrone, A. Mazzoni & S. Micera. Ultrasound stimulations induce prolonged depolarization and fast action potentials in leech neurons. *IEEE Open Journal of Engineering in Medicine and Biology*, 2020.
4. **A. Cafarelli**, P. Losi, A.R. Salgarella, M.C. Barsotti, I.B. Di Cioccio, I. Foffa, L. Vannozzi, P. Pingue, G. Soldani, L. Ricotti. Small-caliber vascular grafts based on a piezoelectric nanocomposite elastomer: Mechanical properties and biocompatibility. *Journal of the mechanical behavior of biomedical materials*, 2019. (I.F. = 3.239)
5. A. Diodato*, **A. Cafarelli***, A. Schiappacasse*, S. Tognarelli, G. Ciuti, A. Menciassi. Motion compensation with skin contact control for high intensity focused ultrasound surgery in moving organs. *Physics in Medicine and biology*, 2018. (* Equally contributing authors) (I.F. = 2.742)
6. H. A. S. Kamimura, J. Flament, J. Valette, **A. Cafarelli**, R. A. Badin, P. Hantraye, B. Larrat. Feedback control of microbubble cavitation for ultrasound-mediated blood-brain barrier disruption in non-human primates under magnetic resonance guidance. *Journal of Cerebral Blood Flow & Metabolism*, 2018. (I.F. = 5.081)
7. **A. Cafarelli**, L. Ricotti, A. Verbeni, A. Poliziani, P. Dario, A. Menciassi. "Tuning mechanical and acoustic properties of materials for ultrasound phantoms and smart substrates for cell cultures". *Acta Biomaterialia*, 2016. (I.F. = 6.319)
8. S. Tognarelli, G. Ciuti, A. Diodato, **A. Cafarelli**, A. Menciassi. "Robotic Platform for High-Intensity Focused Ultrasound Surgery under Ultrasound Tracking: the FUTURA Platform", *Journal of Medical Robotic Research*, 2017.
9. A. R. Salgarella, **A. Cafarelli**, L. Ricotti, L. Capineri, P. Dario, A. Menciassi. "Optimal ultrasound exposure conditions for maximizing C2C12 muscle cell proliferation and differentiation". *Ultrasound in Medicine and Biology*, 2017. (I.F. = 2.494)
10. **A. Cafarelli**, P. Miloro, A. Verbeni, M. Carbone, and A. Menciassi. "Speed of sound in rubber-based materials for ultrasonic phantoms". *Journal of Ultrasound*, 2016.

11. L. Ricotti, **A. Cafarelli***, V. Iacovacci*, L. Vannozzi*, and A. Menciassi. “Advanced Micro-Nano-Bio Systems for Future Targeted Therapies”. *Current nanoscience*, 2014. (* Equally contributing authors) (**I.F. = 1.24**)

Papers on International peer-reviewed Conferences.

(*) = Andrea Cafarelli was the presenter/speaker

1. A. Novell, H.A.S. Kamimura, **A. Cafarelli**, M. Gerstenmayer, J. Flament, J. Valette, P. Agou, E. Selingue, A. Conti, R. Aron Badin, P. Hantraye and B. Larrat. "Intra-pulse monitoring of microbubble destabilization during ultrasound-induced blood-brain barrier opening". 2019 IEEE International Ultrasonics Symposium (IUS), Glasgow, 6-9 October, 2019
2. L Morchi, A Mariani, **A Cafarelli**, A Diodato, S Tognarelli, A Menciassi. "A Pilot Study for a Quantitative Evaluation of Acoustic Coupling in US-guided Focused Ultrasound Surgery". 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC). Berlin, July, 2019.
3. F Fontana, F Iberite, L Morchi, T Pratellesi, **A Cafarelli**, L Ricotti. "Highly controlled and usable system for Low-Intensity Pulsed Ultrasound Stimulation of Cells". 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC). Berlin, July, 2019.
4. A. Mariani, L. Morchi, A. Diodato, **A. Cafarelli**, S. Tognarelli, A. Menciassi. "Ultrasound-based Safety Assessment during Moving Organ Tracking Towards In vivo Focused Ultrasound Therapy". 12th Hamlyn Symposium on Medical Robotics. London, June 2019.
5. L. Morchi, A. Mariani, **A. Cafarelli**, A. Diodato, S. Tognarelli, A. Menciassi. "Quantitative acoustic coupling evaluation in US-guided focused ultrasound surgery". 19th International Symposium of ISTU; 5th European Symposium of EUFUS. Barcelona 13-15 June 2019.
6. A. Novell, H.A.S. Kamimura, **A. Cafarelli**, M. Gerstenmayer, J. Flament, J. Valette, P. Agou, E. Selingue, A. Conti, R. Aron Badin, P. Hantraye and B. Larrat. "Intra-pulse monitoring of microbubble destabilization during ultrasound induced blood-brain barrier opening". 19th International Symposium of ISTU; 5th European Symposium of EUFUS. Barcelona 13-15 June 2019.
7. (*) **A. Cafarelli**, A. Diodato, S. Tognarelli, A. Menciassi. "US guided robotic strategy for continuous FUS treatment of moving organs". 6th International Symposium on Focused Ultrasound. Reston (Virginia), October, 2018;
8. **A. Cafarelli**, L. A. Chanel, F. Di Bartolo, H. Locteau, S. Tognarelli, E. Dumont, A. Menciassi. "Ultrasound Acoustic Radiation Force Impulse Imaging for High Intensity Focused Ultrasound Focal Spot Localization". 40th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC). Honolulu, July, 2018.
9. V. Simoni, **A. Cafarelli**, S. Tognarelli, A. Menciassi. "Ex Vivo Assessment of Multiple Parameters in High Intensity Focused Ultrasound". 40th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC). Honolulu, July, 2018

10. C. Sozer, **A. Cafarelli**, M. Brancadoro, A. Menciassi. "Design and development of a miniaturized intra-abdominal flexible HIFU system: a proof of concept". 11th Hamlyn Symposium on Medical Robotics. London, June 2018.
11. (*) **A. Cafarelli**, A. Diodato, A. Schiappacasse, S. Tognarelli, G. Ciuti, A. Melzer, A. Menciassi. "A robotic approach for FUS in moving organs". 29th Conference of the international Society for Medical Innovation and Technology (SMIT). Torino, November, 2017.
12. L. Ricotti, I. Di Cioccio, A. R. Salgarella, **A. Cafarelli**, P. Losi, M. C. Barsotti, I. Foffa, P. Dario, A. Menciassi and G. Soldani. "Nanocomposite small diameter vascular graft stimulated by ultrasound waves". 2017 Materials Research Society (MRS) Fall Meeting & Exhibit. Boston, November 2017.
13. M. Gherardini, L. Morchi, **A. Cafarelli**, S. Tognarelli, A. Menciassi. "Development of a fat tissue mimicking phantom for lesion assessment in USgHIFU". 4th European Symposium on Focused Ultrasound Therapy (EUFUS). Leipzig, October, 2017.
14. H. A. S. Kamimura, J. Flament, J. Valette, **A. Cafarelli**, R. A. Badin, P. Hantraye, & B. Larrat. "MRI guided ultrasound-mediated blood-brain barrier opening in non-human primates using passive cavitation detection based feedback control". 2017 IEEE International Ultrasonics Symposium (IUS). Washington, 6-9 Sept 2017.
15. A. Diodato, A. Schiappacasse, **A. Cafarelli**, S. Tognarelli, G. Ciuti and A. Menciassi. "Robotic-assisted platform for USgFUS treatment of moving organs". 10th Hamlyn Symposium on Medical Robotics. London, 25-28 June 2017.
16. **A. Cafarelli**, A. Diodato, S. Tognarelli, M. Mura, G. Ciuti, A. Menciassi, "The FUTURA robotic platform for USgFUS". 28th Conference of the international Society for Medical Innovation and Technology (SMIT). Delft, October, 2016.
17. A. Diodato, **A. Cafarelli**, A. Schiappacasse, L.A. Chanel, S. Tognarelli, G. Ciuti, A. Menciassi, "Computer-assisted robotic platform for USgFUS treatment". 6th Joint Workshop on New Technologies for Computer Assisted Surgery (CRAS). Pisa, September, 2016;
18. A. Menciassi, S. Tognarelli, **A. Cafarelli**, A. Diodato, G. Ciuti, "Multifunctional robotic platform for USgFUS". 5th International Symposium on Focused Ultrasound. Washington, August, 2016;
19. (*) **A. Cafarelli**, A. Diodato, A. Schiappacasse, S. Tognarelli, G. Ciuti, A. Menciassi, "Robotic platform for Focused Ultrasound Surgery". 6th Congresso Gruppo Nazionale di Bioingegneria (GNB). Napoli, June, 2016;
20. (*) **A. Cafarelli**, A. Diodato, M. Mura, S. Tognarelli, L. Ricotti, G. Ciuti, A. Menciassi, "A tissue-mimicking phantom for in-vitro accuracy evaluation of USgHIFU procedures". 3rd

European Symposium on Focused Ultrasound Therapy. London, October, 2015; Awarded as Best Oral Presentation.

21. S. Tognarelli, G. Ciuti, A. Diodato, **A. Cafarelli**, M. Mura & A. Menciassi. "Robotic platform for high-intensity focused ultrasound surgery under ultrasound monitoring and guidance: the FUTURA platform". 5th Joint Workshop on New Technologies for Computer Assisted Surgery (CRAS). Brussels, September, 2015;
22. **A. Cafarelli**, M. Mura, A. Diodato, A. Schiappacasse, M. Santoro, G. Ciuti, A. Menciassi. "A computer-assisted robotic platform for Focused Ultrasound Surgery: assessment of high intensity focused ultrasound delivery ". 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC). Milan, August, 2015;
23. A. R. Salgarella, L. Ricotti, G. Giudetti, J. Kronek, M. Righi, A. Cutrone, **A. Cafarelli**, A. Zahoranová, P. Šramková, D. Treľová, S. Bossi, S. Micera, I. Lacík, A. Menciassi. "Advanced nano-doped materials for long-term neural interfaces". 15th International Conference on Nanotechnology (IEEE NANO). Rome, July, 2015;
24. S. Tognarelli, G. Ciuti, A. Diodato, P. Miloro, A. Verbeni, **A. Cafarelli**, & A. Menciassi. "FUTURA: a computer-assisted robotic platform for high-intensity focused ultrasound". 4th Joint Workshop on New Technologies for Computer Assisted Surgery (CRAS). Genova, October, 2014;
25. A. Verbeni, **A. Cafarelli**, P. Miloro, and A. Menciassi, "Inertial cavitation detection during in-vitro sonothrombolysis". Abstract. *Journal of Therapeutic Ultrasound*. 2014;
26. A. Verbeni, **A. Cafarelli**, P. Miloro and A. Menciassi, "An experimental system for the study of the mechanism of sonothrombolysis" .5th Congresso Gruppo Nazionale di Bioingegneria (GNB). Pavia, June, 2014;
27. A. Verbeni, G. Ciuti, **A. Cafarelli**, P. Miloro, A. Diodato, S. Tognarelli, & A. Menciassi. "The FUTURA platform: a new approach merging non-invasive ultrasound therapy with surgical robotics". 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC). Chicago, August, 2014;
28. S. Tognarelli, P. Miloro, A. Verbeni, M. Mura, **A. Cafarelli**, G. Ciuti, P. Dario, A. Menciassi. "Low invasive therapy under robotic guidance in the vascular district: a case study". 3rd Joint Workshop on New Technologies for Computer/Robot Assisted Surgery (CRAS). Verona, September, 2013;
29. (*) **A. Cafarelli**, A. Verbeni, P. Miloro and A. Menciassi, "Qualitative Assessment of Thermal Effects in High Intensity Ultrasound Thrombolysis Experiments" . 25th International Conference of the Society for Medical Innovation and Technology (SMIT) . Baden-Baden, September, 2013;

Patents

1. Italian patent Application n. 02016000052583. "Sistema di stimolazione ad ultrasuoni di un campione in vitro". **A. Cafarelli**, L. Ricotti, A. Menciasci.
2. Italian Patent Application n. 102019000012696: "Supporto per colture cellulari per stimolazione ultrasonica controllata". F. Fontana, L. Ricotti, T. Pratells, **A. Cafarelli**.
3. Italian Patent Application n. 102019000002697: "Material and system for the therapeutic treatment of joints". Assignees: Scuola Superiore Sant'Anna, Bar Ilan University, Istituto Ortopedico Rizzoli, Regentis Biomaterials Ltd., Image Guided Therapy SA, PlasmaChem Produktions und Handel GmbH, Vimex Endoscopy sp. z o.o., H&D Wireless AB.

9. Scientific collaboration in International and National research projects

Long-standing experience in International and National projects (proposals writing, technical tasks, reports and deliverables writing,...)

01/2019 – Present. **ADMAIORA** (ADvanced nanocomposite MAterials fOr in situ treatment and ultrASound-mediated management of osteoarthritis), <https://www.admaiora-project.com/> H2020-NMBP-TR-IND-2018

01/2020 – Present. **IMMUNIVERSE** (Better control and treatment of immune-mediated diseases by exploring the universe of microenvironment imposed tissue signatures and their correlates in liquid biopsies) <https://cordis.europa.eu/project/id/853995> H2020-EU.3.1.7. GA N. 853935)

09/2018 – 02/2020: **FUTURA2020** (Focused Ultrasound Therapy Using Robotics Approaches towards 2020) Project funded by Scuola Superiore Sant'Anna, <http://www.futuraproject.eu/>, H2020-FETOPEN-2016-2017 – 801451

11/2013 – 11/2016 : **FUTURA** (Focused Ultrasound Therapy Using Robotic Approaches) Project funded by Scuola Superiore Sant'Anna, <http://www.futuraproject.eu/>, FP7-ICT-2013-10-611963

11/2014 – 11/2017 : **M2Neural** (Multifunctional Materials for advanced Neural Interfaces) Project funded by Scuola Superiore Sant'Anna, <http://www.m2neural.eu/>, FP7- M-ERA.NET 2014/2017

09/2012 – 06/2014 : **MICROVAST** project, Italian project founded by Cassa di Risparmio di Pisa, funded by Scuola Superiore Sant'Anna, <http://www.microvast.it/>, Prog. 153/09

Pisa, July 2020
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