Cédric Girerd, PhD

CNRS Researcher, Robotics

Last updated: Oct. 2025

Research Interests

Medical Robots, Continuum Robots, Soft Robots, Inspection devices

Positions Held

Since Feb. 2022 — **CNRS Researcher - CR2 (Faculty-level tenured position), Section 07**, *LIRMM*, Montpellier, France

Feb. 2019 – Jan. 2022 — **Postdoctoral Scholar**, *University of California San Diego, MAE Department*, San Diego, USA,
Advisor: Tania K. Morimoto
Design and control of continuum and soft robots for medical applications

Feb. 2018 – Feb. 2019 — **Postdoctoral Researcher**, *FEMTO-ST*, Besançon, France,
Advisor: Kanty Rabenorosoa
Design and control of continuum robots for medical applications

Feb. 2015 - Jan. 2018 — **PhD Student, Robotics**, *AVR-ICube (Strasbourg), FEMTO-ST (Besançon)*, France,
Advisors: Pierre Renaud and Kanty Rabenorosoa
Design of concentric tube robots and application to the inspection of the olfactory cells

Apr. 2014 – Oct. 2014 — **Engineer**, *University of Cambridge, Department of Engineering*, Cambridge, UK,
Advisor: Peter J.G. Long
Design of an autonomous system for tunnel inspection

Jun. 2013 – Oct. 2013 — **Engineer**, *Fraunhofer ISE*, Freiburg im Breisgau, Germany,
Advisor: Maximilian Pospischil
Development of a high-throughput fine line metallization process for solar cells

Invited Positions

June 2022 – Dec. 2022 — **Visiting Scholar**, *University of California San Diego, ECE Department*, San Diego, USA,
Advisor: Michael C. Yip
Design and control of continuum and soft robots for medical applications

Feb. 2022 – June 2022 — **Visiting Scholar**, *University of California San Diego, MAE Department*, San Diego, USA,
Advisor: Tania K. Morimoto
Design and control of continuum and soft robots for medical applications

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Age: 35

Education - Science

2015–2018 **PhD, Medical Robotics**, *Université de Strasbourg*, Strasbourg, France
- Title: Design of concentric tube robots and application to the inspection of the olfactory cells
- Laboratories: ICube-AVR (Strasbourg, France) and FEMTO-ST (Besançon, France)
- Advisors: Pierre Renaud and Kanty Rabenorosoa
- Committee: Jocelyne Trocaz, Jérôme Szewczyk and Etienne Dombre
- Duration: 36 months
- Qualification obtained in both CNU sections 60 and 61

2013–2014 **M.Sc. "Mechanical and Civil Engineering, Automation, Robotics"**, *Université Blaise-Pascal*, Clermont-Ferrand, France
Internship: Mobile robotics at the University of Cambridge (UK)

2011–2014 **Engineer (≈ M.Sc.), Mechatronics**, *SIGMA Clermont*, Clermont-Ferrand, France
Member of the consortium Mines-Télécom Institute

2008–2010 **CPGE**, *La Martinière Monplaisir*, Lyon, France
2-year intensive program preparing for the national competitive exam for entry to French top engineering schools - Physics and Engineering Science

Education - Others

2020 **Micro-MBA**, *Rady School of Management, University of California San Diego*, San Diego, USA

Teaching Activity

2024–2025 **Faculté des Sciences**, Montpellier, France
- Mechanical design (6h, Level: Master 2 (graduate))
- Project mentoring (6h, Level: Master 2 (graduate))
- Masters defense (3h, Level: Master 2 (graduate))

2023–2024 **Faculté des Sciences**, Montpellier, France
- Mechanical design (6h, Level: Master 2 (graduate))
- Masters defense (3h, Level: Master 2 (graduate))

2017–2018 **ENSMM**, Besançon, France
- Control theory (27h, Level: Licence 3 (undergraduate))

2016–2017 **ENSMM**, Besançon, France
- Control theory (64h, Level: Licence 3 (undergraduate))

2015–2016 **INSA Strasbourg**, Strasbourg, France
- Introduction to robotics 2 (18h, Level: Licence 2 (undergraduate))
- Introduction to robotics 3 (new course) (12h, Level: Licence 2 (undergraduate))
- Control theory (36h, Level: Licence 3 (undergraduate))
- Additive manufacturing (15h, Level: Master 1 (graduate))

Awards and Recognitions

2025-2029 **PI of the ANR JCJC EXTRACT Project**, *ANR JCJCs are the most selective French starting grants. Funding: 318k€*

2023 **Poster award: 3rd best prize**, *IEEE ICRA Workshop on Soft Growing Robots*

Fundings

2026-2030 **ANR PRCE RESPIRE: Robotic Eversion System for complex Patient Intubation using stiffness REgulation**
Role: Leader of one Work Package
Funding: 997k€

2025-2029 **ANR JCJC EXTRACT: EXploring Tip-everting Robot retrACTion**
Role: Project Coordinator and leader of all Work Packages
Funding: 318k€

Participation to Evaluation and Selection Panels

2023 NExT Talent evaluation committee for NExT Initiative "Trajectoire d'Excellence pour Nantes".

Editorial Activity

Conferences
- Associate Editor, IEEE RoboSoft 2024, 2025, 2026

Reviewing Activity

Journals
- IEEE Transactions on Robotics (T-RO) — **24 papers**
- IEEE/ASME Transactions on Mechatronics (T-Mech) — **5 papers**
- IEEE Robotics and Automation Letters (RA-L) — **47 papers**
- IEEE Transactions on Medical Robotics and Bionics (TMRB) — **2 papers**
- International Journal of Advanced Robotic Systems (IJARS) — **1 paper**

Conferences
- IEEE Inter. Conf. on Robotics and Automation (ICRA) — **7 papers**
- IEEE/RSJ Inter. Conf. on Intelligent Robots and Systems (IROS) — **1 paper**
- IEEE-RAS Inter. Conf. on Soft Robotics (RoboSoft) — **2 papers**
- IEEE RAS/EMBS IEEE Inter. Conf. on Biomedical Robotics and Biomechatronics (BioRob) — **1 paper**
- IEEE Inter. Conf. on Automation Science and Engineering (CASE) — **1 paper**
- Hamlyn Symposium on Medical Robotics (HSMR) — **1 paper**

Publications

International journals with peer-review

[IJ1] S. A. Harthy, S. Sadati, **C. Girerd**, S. Kim, A. Mondini, Z. Wu, B. Saldarriaga, C. A. Seneci, B. Mazzolai, T. K. Morimoto, and C. Bergeles, "Tip-growing robots: Design, theory, application," *IEEE Transactions on Robotics (T-RO)*, 2025, doi: 10.1109/TRO.2025.3608701.

[IJ2] A. Giri, **C. Girerd**, J. Cervera-Torralba, M. Tolley, and T. K. Morimoto, "Towards enabling vine robots for colonoscopy using an inchworm inspired device," *IEEE/ASME Transactions on Mechatronics (TMech)*, 2025, doi: 10.1109/TMECH.2025.3535876.

[IJ3] J.-T. Lin, **C. Girerd**, B. T. Ostrander, P. Molaei, H. B. Gilbert, P. A. Weissbrod, J. Hwang, and T. K. Morimoto, "Closing the loop on concentric tube robot design: A case study on micro-laryngeal surgery," *IEEE Transactions on Biomedical Engineering (TBME)*, 2024, doi: 10.1109/TBME.2024.3426489.

[IJ4] **C. Girerd**, A. Alvarez, E. W. Hawkes, and T. K. Morimoto, "Material scrunching enables working channels in miniaturized vine-inspired robots," *IEEE Transactions on Robotics (T-RO)*, 2024, doi: 10.1109/TRO.2024.3370088.

[IJ5] R. Dunn, A. J. Joshy, J.-T. Lin, **C. Girerd**, T. K. Morimoto, and J. T. Hwang, "Scalable enforcement of geometric non-interference constraints for gradient-based optimization," *Structural and Multidisciplinary Optimization*, 2023, doi: 10.1007/s11081-023-09864-2.

[IJ6] C. Nwafor, **C. Girerd**, G. Laurent, T. K. Morimoto, and K. Rabenorosoa, "Design and fabrication of concentric tube robots: A survey," *IEEE Transactions on Robotics (T-RO)*, vol. 39, no. 4, pp. 2510–2528, 2023, doi: 10.1109/TRO.2023.3255512.

[IJ7] A. Gupta, D. Park, S. Bashar, **C. Girerd**, T. K. Morimoto, and D. Bharadia, "Forces-ticker: Wireless, batteryless, thin flexible force sensors," *Proc. ACM Interact. Mob. Wearable Ubiquitous Technol.*, vol. 7, no. 1, mar 2023, doi: 10.1145/3580793.

[IJ8] J.-T. Lin, **C. Girerd**, J. Yan, J. Hwang, and T. K. Morimoto, "A generalized framework for concentric tube robot design using gradient-based optimization," *IEEE Transactions on Robotics (T-RO)*, vol. 38, no. 6, pp. 3774–3791, 2022, doi: 10.1109/TRO.2022.3180627.

[IJ9] D. Park, A. Gupta, S. Bashar, **C. Girerd**, D. Bharadia, and T. K. Morimoto, "Design and evaluation of a miniaturized force sensor based on wave backscattering," *IEEE Robotics and Automation Letters (RA-L)*, vol. 7, no. 3, pp. 7550–7557, 2022, doi: 10.1109/LRA.2022.3184767.

[IJ10] D. V. A. Nguyen, **C. Girerd**, P. Rougeot, O. Lehmann, L. Tavernier, J. Szewczyk, and K. Rabenorosoa, "A hybrid concentric tube robot for cholesteatoma laser surgery," *IEEE Robotics and Automation Letters (RA-L)*, vol. 7, pp. 462–469, January 2022, doi: 10.1109/LRA.2021.3128685.

[IJ11] **C. Girerd**, Q. Zhang, A. Gupta, M. Dunna, D. Bharadia, and T. K. Morimoto, "Towards a wireless force sensor based on wave backscattering for medical applications,"

IEEE Sensors Journal, vol. 21, no. 7, pp. 8903–8915, April 2021, doi: 10.1109/JSEN.2021.3049225.

[IJ12] **C. Girerd** and T. K. Morimoto, "Design and control of a hand-held concentric tube robot for minimally invasive surgery," *IEEE Transactions on Robotics (T-RO)*, vol. 37, no. 4, pp. 1022–1038, August 2021, doi: 10.1109/TRO.2020.3043668.

[IJ13] **C. Girerd**, A. V. Kudryavtsev, P. Rougeot, P. Renaud, K. Rabenorosoa, and B. Tamadazte, "Automatic follow-the-leader deployment of concentric tube robots in the trachea based on visual slam," *Transactions of Biomedical Engineering and Bionics (T-MRB)*, vol. 2, no. 4, pp. 582–585, November 2020, doi: 10.1109/TMRB.2020.3034720.

[IJ14] **C. Girerd**, T. Schlinquer, N. Andreff, P. Renaud, and K. Rabenorosoa, "Design of concentric tube robots using tube patterning for follow-the-leader deployment," *Journal of Mechanisms and Robotics (JMR)*, vol. 13, no. 1, pp. 1–8, August 2020, doi: 10.1115/1.4047983.

[IJ15] **C. Girerd**, A. V. Kudryavtsev, P. Rougeot, P. Renaud, K. Rabenorosoa, and B. Tamadazte, "Slam-based follow-the-leader deployment of concentric tube robots," *IEEE Robotics and Automation Letters (RA-L)*, vol. 5, no. 2, pp. 548–555, April 2020, doi: 10.1109/LRA.2019.2963821.

[IJ16] **C. Girerd**, T. Lihoreau, K. Rabenorosoa, B. Tamadazte, M. Benassarou, L. Tavernier, L. Pazart, E. Haffen, N. Andreff, and P. Renaud, "In vivo inspection of the olfactory epithelium: Feasibility of robotized optical biopsy," *Annals of Biomedical Engineering (ABME)*, vol. 46, pp. 1951–1961, June 2018, doi: 10.1007/s10439-018-2076-9.

International conferences with peer-review and proceedings

[IC1] C. Benoist, **C. Girerd**, N. Zemiti, P. Poignet, and P. Berthet-Rayne, "Tendon-driven vs rod-driven continuum robots: A bench test evaluation," in *Conference on New Technologies for Computer and Robot Assisted Surgery (CRAS)*, Odense, Denmark, September 2024.

[IC2] J. Lu, F. Liu, **C. Girerd**, and M. C. Yip, "Image-based pose estimation and shape reconstruction for robot manipulators and soft, continuum robots via differentiable rendering," in *International Conference on Robotics and Automation (ICRA)*, 2023, pp. 560–567, doi: 10.1109/ICRA48891.2023.10161066.

[IC3] M. Xie, **C. Girerd**, and T. K. Morimoto, "A 3-d haptic trackball interface for teleoperating continuum robots," in *2022 11th IEEE International Conference on Biomedical Robotics and Biomechatronics (Biorob)*, 2022, doi: 10.1109/BioRob52689.2022.9925384.

[IC4] A. Giri, **C. Girerd**, X. Luo, R. Broderick, and T. K. Morimoto, "Modeling and design of soft, positive-pressure actuated suction cups for anchoring in minimally invasive surgery," in *2022 11th IEEE International Conference on Biomedical Robotics and Biomechatronics (Biorob)*, 2022, doi: 10.1109/BioRob52689.2022.9925508.

[IC5] A. Gupta, **C. Girerd**, M. Dunna, Q. Zhang, T. K. Morimoto, and D. Bharadia, "Wi-force: Wireless sensing and localization of contact

forces on a space continuum," in *18th USENIX Symposium on Networked Systems Design and Implementation (NSDI 21)*. Boston, USA: USENIX Association, April 2021. ISBN 978-1-939133-21-2 pp. 827–844. [Online]. Available: https://www.usenix.org/conference/nsdi21/presentation/gupta

[IC6] **C. Girerd**, K. Rabenorosoa, P. Rougeot, and P. Renaud, "Towards optical biopsy of olfactory cells using concentric tube robots with follow-the-leader deployment," in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Vancouver, Canada, September 2017, pp. 5661–5887, doi: 10.1109/IROS.2017.8206455.

[IC7] **C. Girerd**, K. Rabenorosoa, and P. Renaud, "Synthesis of a new concentric tube robot for olfactory cells exploration," in *CRAS: Computer/Robot Assisted Surgery*, Pisa, Italy, September 2016.

[IC8] **C. Girerd**, K. Rabenorosoa, and P. Renaud, "Combining tube design and simple kinematic strategy for follow-the-leader deployment of concentric tube robots," in *Advances in Robot Kinematics 2016*, J. Lenarcic and J.-P. Merlet, Eds. Grasse, France: Springer International Publishing, June 2017, ch. 10, pp. 266–290. ISBN 978-3-319-56802-7 Doi: 10.1007/978-3-319-56802-7_3.

[IC9] S. Stent, **C. Girerd**, P. Long, and R. Cipolla, "A low-cost robotic system for the efficient visual inspection of tunnels," in *Proceedings of the 32nd International Symposium on Automation and Robotics in Construction (ISARC)*, Oulu, Finland, June 2015, pp. 523–530, doi: 10.22260/ISARC2015/0070.

National conferences with peer-review

[NC1] L. Tavernier, E. Haffen, **C. Girerd**, K. Rabenorosoa, P. Renaud, and B. Tamadazte, "Détection optique endonasale de la maladie d'alzheimer," in *8èmes Rencontres Corses en ORL et Chirurgie Cervico-Faciale*, Porto-Vecchio, Corse, June 2019.

[NC2] **C. Girerd**, K. Rabenorosoa, and P. Renaud, "Toward a robotized inspection of the olfactory epithelium," in *Surgetica*, Strasbourg, France, November 2017.

[NC3] **C. Girerd**, K. Rabenorosoa, and P. Renaud, "Concentric tube robots for inspection of olfactory cells," in *Journées des Jeunes Chercheurs en Robotique*, Paris, France, November 2016.

International workshop

[IW1] **C. Girerd**, A. Alvarez, E. W. Hawkes, and T. K. Morimoto, "Miniaturized vine robots with working channels," in *IEEE ICRA Workshop on Soft Growing Robots: From Search-and-Rescue to Intraluminal Interventions*, London, UK, May 2023 (**Poster award: 3rd best prize**).

Communications

[COM1] A. Gupta, **C. Girerd**, M. Dunna, Q. Zhang, T. K. Morimoto, and D. Bharadia, "Expanding the horizons of wireless sensing: Sensing and localizing contact forces with signal reflections," *GetMobile: Mobile Comp. and Comm.*, vol. 25, no. 3, p. 38–42, jan 2022, doi: 10.1145/3511285.3511296.

Patents

[PAT1] **C. Girerd**, T. K. Morimoto, and E. W. Hawkes, "Wireless contact force sensing and localization," International Patent, 6, 2024. [Online]. Available: https://patents.google.com/patent/WO2024118652A1/en

[PAT2] A. Gupta, **C. Girerd**, M. Dunna, T. K. Morimoto, D. Bharadia, R. Subbaraman, and Q. Zhang, "Wireless contact force sensing and localization," U.S. Patent 18 554 726, 27, 2024. [Online]. Available: https://patents.google.com/patent/US20240206996A1/en

Invited Talks and Presentations

Sept. 2025 **Journées Nationales de la Recherche en Robotique**, Rennes, France, "Soft everting vine robots: Miniaturization and medical applications"

Sept. 2025 **CoSuR: Summer School on Control of Surgical Robots**, Lisbon, Portugal, "Sensor development and integration: Towards continuum robots autonomy"

March 2025 **LS2N Seminar**, Nantes, France, "Functionalization of inflatable vine growing robots: towards medical applications"

Nov. 2024 **Journée des Jeunes Chercheurs en Robotique**, Paris, France
Discussion panel on research career after a PhD

Sept. 2024 **ICRA@40 (40th Anniversary of the IEEE Conference on Robotics and Automation)**, Rotterdam, Netherlands, "Material Scrunching Enables Working Channels in Miniaturized Vine-Inspired Robots"
Invited presentation from accepted TRO paper

July 2024 **International Conference on Manipulation, Automation and Robotics at Small Scales (MARSS)**, *Delft University of Technology (TU Delft)*, Delft, Netherlands, "Miniaturization of vine growing robots with working channels"

March 2024 **HK AI & Robotics Forum for Healthcare, Center for Artificial Intelligence and Robotics**, *Hong Kong Institute of Science & Innovation, Chinese Academy of Sciences*, Hong Kong, China, "Miniaturization of vine growing robots with working channels"

Oct. 2023 **Susan Calvin Colloquium**, *MEETT - Parc des Expositions et Centre de Conventions & Congrès de Toulouse*, Toulouse, France, "Vine robots for the deployment in fragile and complex environments"

July 2022 **Continuum Robotics Laboratory**, *University of Toronto Mississauga*, Toronto, Canada (remote), "Hand-held continuum robots and wireless force sensors for medical applications"

June 2021 **ICRA 2021**, *Xi'an International Convention and Exhibition Center*, Xi'an, China (remote), "Design and Control of a Hand-Held Concentric Tube Robot for Minimally Invasive Surgery"
Invited presentation from accepted TRO paper

Student Examinations

Participation to CSI, Preliminary / Qualifying / Senate Examinations

2025 Adrien Mabire (LS2N, IMT Atlantique), Kevin Gaitan (LS2N, IMT Atlantique)

2024 Zainab Awada (LIRMM, University of Montpellier), Arthur Lacroix (LIRMM, University of Montpellier)

2023 Zainab Awada (LIRMM, University of Montpellier), Arthur Lacroix (LIRMM, University of Montpellier)

Mentorship

PhD Students

2025-2029 Juliana Dreyer (60%, co-advised with N. Zemiti)

2023-2026 Camille Benoist, CIFRE PhD Student with CARANX (30%, co-advised with P. Poignet and N. Zemiti)

2019-2024 Ayush Giri, UCSD (30%, co-advised with T. K. Morimoto)

2019-2024 Fred Lin, UCSD (30%, co-advised with T. K. Morimoto)

Graduate Students

2025 Pedro Campos Afonso Serra Menezes, Polytech Montpellier, 90%

2025 Helwan Dufeal, Polytech Montpellier, 90%

2025 Pierre Guittard, SIGMA Clermont, 50%

2025 Marouane Haouas, Faculté des Sciences de Montpellier, 60%

2021 Kristina Chan, UCSD, 10%

2018 Quentin Savy, SIGMA Clermont, 10%

2018 Ali El Khatib, Lebanese University, 10%

2017 Lucas Sanchez, École Centrale Nantes, 20%

2017 Leonardo Mastrototaro, ENSMM and Polytechnic University of Turin, 30%

2015 Thomas Bressac, INSA Strasbourg, 30%

Undergrads

2020 Qiming Zhang, UCSD, 30%

2020 Rachel Luu, Agustin Manriquez, Jacqueline Guzman, UCSD GEAR program, 40%

2019 Alejandro Hernandez, Ian Villegas Cruz, Takumi Miyawaki, UCSD, ENLACE exchange program, 50%

Languages

French Native language

English Fluent

German Basic knowledge

Hobbies and Interests

Sports Road cycling, running

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Age: 35