

# Santiago Fernandez Scagliusi

Seville, Spain • +34 653 080 131

[sanfersca@gmail.com](mailto:sanfersca@gmail.com) • [linkedin.com/in/santifs](https://www.linkedin.com/in/santifs) • [github.com/santifs](https://github.com/santifs) • [www.santiagofs.com](http://www.santiagofs.com)

## PROFILE

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PhD in Electronics Engineering specializing in wearable medical devices for disease prevention and remote monitoring. Expert in bioimpedance-based sensing, circuit design, embedded systems, and AI-driven health analytics. Proven ability to lead multidisciplinary teams from concept to clinical-ready prototypes, integrating advanced technology into scalable, patient-centric solutions. Strong background in hardware-software integration, project management, and cross-disciplinary collaboration. Passionate about bridging engineering and healthcare to improve patient outcomes and reduce hospitalizations.

## EDUCATION

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Oct 2020 – **PhD in Electronics Technology**

June 2024 *University of Seville (Spain)*

- **Research project:** Design of a wearable device for continuous bioimpedance monitoring in congestive heart failure patients.

Oct 2019 – **Master's Degree in Biomedical Engineering and Digital Health**

Sept 2020 *University of Seville (Spain)*

Sept 2014 – **Double BSc. in Electrical Engineering and Industry Electronics Engineering**

Oct 2019 *University of Seville (Spain)*

## WORK EXPERIENCE

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Oct 2023 – **Assistant Professor in Electronics Engineering (Tenure-track)**

Present *University of Seville (Spain)*

- Teach Microcontrollers and Embedded Systems (3rd year, Electronic Engineering) to 100+ students, integrating AI-powered tools, Notion pages, and fine-tuned LLM chatbots to optimize learning.
- Conduct Electromedicine Lab (2nd year) and Computer Architecture (1st year), focusing on applied research and hands-on experimentation.
- Engage in science communication by producing short-form educational content on electronics, amassing a 50K+ audience across social media, fostering interest in hardware-based innovation (@dr.santi.scagliusi).

Jul 2023 – **Technical Lead - Electronics**

Oct 2023 *Biothink (Startup in Seville, Spain)*

- Implemented filtering algorithms for the NTC temperature reading system, achieving a 10% reduction in measurement errors, enhancing device accuracy and reliability.
- Addressed and resolved design flaws in multi-microcontroller PCBs, significantly expediting hospital machine testing by weeks and demonstrating adeptness in Fusion 360 and STM32 C programming.

- Elevated device usability and control through the design of an enhanced web interface, utilizing HTML, CSS, JavaScript, and Python on a Raspberry Pi platform.

Jan 2021 – **Researcher in Electronic and Biomedical Engineering**  
 Jul 2023 *University of Seville and Institute of Microelectronics (Spain)*

Developed VOLUM, a groundbreaking, miniaturized wearable device for detecting fluid retention in the ankles of heart failure patients—the leading cause of hospitalization in people over 65, affecting 10% of the elderly population.

- VOLUM enables non-invasive continuous 24/7 hydration monitoring for heart failure patients, a significant advancement over existing bioimpedance measuring devices that are large, heavy, and costly, thus limited to sporadic hospital use.
- Engineered both the hardware and software, including circuit analysis, PCB design, microcontroller programming (C), Android app development, database implementation (InfluxDB and Grafana), 3D printing for casing design and data analysis (Python and Matlab). The device showed a 1% error rate in measuring electrical models of ankle tissue.
- Secured €20,000 from 3 entrepreneurship awards, funding the spin-off's launch and prototype development of an ankle bracelet, leveraging skills in funding acquisition, communication, business model development and patent application.

Sept 2022 – **Fulbright Scholar, Predoctoral Research in Biomedical Engineering**  
 May 2023 *Swarthmore College (Pennsylvania, United States)*

- Identified and studied a low-frequency artifact in bioimpedance measurements caused by electrode mismatch, which leads to errors of up to 90% and had not been characterized before.
- Developed a measurement method to mitigate this artifact, reducing the error to less than 2% in simulations (LTspice) and electronic models (Altium), while optimizing data acquisition and analysis, leveraging tools such as Nordic NRF52 and Matlab.

## TECHNICAL SKILLS

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- **Bioimpedance Analysis:** electrode characterization, error reduction, wearable device integration, measurements in electronic lab setting and in hospital inpatients.
- **Hardware Design:** PCB design (Fusion 360, Altium), circuit simulation (LTspice), 4-layer PCB prototyping, microcontroller integration (STM32, NRF52), soldering and wiring.
- **Software Development:** embedded systems programming (C for STM32, NRF52), Android app development, database implementation (InfluxDB, Grafana), web interface enhancement (HTML, CSS, JavaScript, Flask).
- **Data Analysis:** algorithm development (Matlab, Python), data acquisition optimization, graphical data presentation (matplotlib, pandas), filtering algorithm implementation.

## HONOURS AND AWARDS

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- 2024 • **Best Researcher Under 30 in Experimental Sciences in Seville** – Awarded by the City Council for outstanding contributions to scientific research and innovation in Seville, Spain.
  - **1<sup>st</sup> Place in HackForGood Spain** – Won the National 1st Place Award among 1,000+ participants across multiple cities in Spain. Developed SignTune, a web platform that automatically translates video content into sign language.
  - **Nodal Award (Shark Tank Edition)** – Awarded \$2,100 in the 10<sup>th</sup> IMFAHE Excellence in Entrepreneurship and Innovation International Program.
- 2023 • **1<sup>st</sup> Place in Three Minute Thesis Competition (3MT®)** – A competitive forum of 48 candidates presenting PhD research within three minutes to a non-specialist audience at the International Doctorate School, Seville, Spain.
  - **Best Paper Award in 16th International Workshop on Impedance Spectroscopy** – Recognized among 150+ experts from 19 countries for research on impedance measurement systems, a core technique in my PhD, at Chemnitz University of Technology, Germany.
- 2022 • **Fulbright Predoctoral Research Grant** – Selected as 1 of 15 recipients for a prestigious U.S. - Spain international research exchange.
- 2021 • **1<sup>st</sup> Place in XVI Entrepreneurship Ideas Competition** – Won 1st Place for innovative business idea development among 110 entries at the University of Seville, Spain.
  - **1<sup>st</sup> Place in II University Spin-offs Competition** – Won 1<sup>st</sup> Place for Best Knowledge Transfer Project among 11 spin-offs at the University of Seville, Spain.
  - **Finalist (Top 5) Product and Business Model Development** – A 3-week event that gathered 400+ participants and 55+ teams from across the world at the European Innovation Academy.
- 2020 • **Best Master's Thesis in Biomedical Engineering** – Awarded by Telefonica Spain, highlighting significant academic research in the field.

## OTHER ENGINEERING PROJECTS

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**2017-2018 - Formula Student (FSAE):** Team ARUS Andalucia Racing Team, University of Seville.

- Engaged in a 1.5-year commitment with Formula Student, an international contest challenging teams to design and construct single-seater race cars, where I played a pivotal role in ARUS, the first Spanish team to enter both electric and combustion vehicles.
- Successfully engineered a critical redesign of the power distribution system, resolving previous issues that led to disqualification, thereby restoring the team's competitive standing and enhancing vehicle performance and safety.
- Applied technical and leadership skills including KiCad PCB design, C programming, and use of electronics lab tools (soldering, oscilloscope, signal generators), underpinning the project's success and honing problem-solving abilities.

## LANGUAGES

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- **Spanish:** Native speaker
- **English:** Advanced level – TOEFL 105/120 (May 2020)
- **Italian:** Basic conversational level

## PHD PUBLICATIONS

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- Santiago F. Scagliusi, Pablo Perez et al. **Enhancing the Precision of AD5940 Segmental Bioimpedance Measurements through Self-Calibration.** *IEEE Biosensors Conference, 2023*
- Santiago F. Scagliusi, Maggie Delano et al. **A Novel Wearable Device for Continuous Bioimpedance Monitoring in Congestive Heart Failure Patients.** *16<sup>th</sup> International Workshop on Impedance Spectroscopy, 2023*
- Santiago F. Scagliusi, Maggie Delano. **Characterization and Correction of Low Frequency Artifacts in Segmental Bioimpedance Measurements.** *Annual International Conference of the IEEE Engineering in Medicine and Biology Society, 2023.*
- Santiago F. Scagliusi, Pablo Perez Garcia et al. **Body posture determination for Heart Failure patients from ankle orientation measurements.** *IEEE. 1 - 1, pp. 1 - 8. IEEE, 24/03/2023. ISSN 2169-3536*
- Santiago F. Scagliusi, Luis Gimenez Miranda et al. **From Bioimpedance to Volume Estimation: A Model for Edema Calculus in Human Legs.** *MDPI Electronics. 12 - 6, pp. 1 - 19. MDPI, 14/03/2023. ISSN 2079-9292*
- Santiago F. Scagliusi, Luis Gimenez-Miranda et al. **Bioimpedance Spectroscopy-Based Edema Supervision Wearable System for Noninvasive Monitoring of Heart Failure.** *IEEE Transactions on Instrumentation and Measurement, vol. 72, pp. 1-8, 2023, Art no. 4006608, doi: 10.1109/TIM.2023.3273662.*
- Santiago F. Scagliusi, Daniel Martin Fernandez et al. **A low power approach to body position estimation for HF patient monitoring by an ankle positioned Inertial Measurement Unit (IMU).** *2022 37th Conference on Design of Circuits and Integrated Circuits (DCIS). ISSN 2640-5563*

## OTHER PUBLICATIONS

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- Pablo Perez Garcia, Juan A. Serrano, Santiago F. Scagliusi et al. **Oscillation-Based Spectroscopy for Cell-Culture Monitorization.** *Frontiers in Electronics: Bioelectronics. 3 - 1, pp. 1 - 14. 22/07/2022. ISSN 2673-5857*
- Enrique Rando Carrion, Pablo Perez Garcia, Santiago F. Scagliusi et al. **A Plethysmography Capacitive Sensor for Real-Time Monitoring of Volume Changes in Acute Heart Failure.** *IEEE Transactions On Instrumentation And Measurement. 70 - 1, pp. 1 - 12. IEEE, 23/06/2021. ISSN 1557-9662*
- Alejandro Pliego Prenda, Alberto Olmo Fernandez, Alberto Yufera Garcia, Santiago F. Scagliusi et al. **Bioimpedance Simulations for the Monitoring of Fluid Overload in Heart Failure Patients.** *Proceedings of the 16th International Joint Conference on Biomedical Engineering Systems and Technologies (BIOSTEC 2023). 1, pp. 164 - 168. 2023. ISSN 2184-4305*
- Martin Puertas, Luis Gimenez Miranda, Ana Perez Polo, Santiago F. Scagliusi et al. **Modeling Edema Evolution with Electrical Bioimpedance: Application to Heart Fail Patients.** *2021 XXXVI Conference on Design of Circuits and Integrated Systems (DCIS). ISSN 2640-5563*