Alice Giannotti

europass

SUMMARY

Biomedical Engineer with a strong interest in **translational research** and **bioelectronic medicine**. Passionate in **Neuro-Urology** as a mean to improve people quality of life.
Background in **design**, **development**, ***in vitro*** and ***in vivo*** **characterization** of **innovative neural interfaces** aimed at restoring **lower urinary tract dysfunction** using **closed-loop neuromodulation strategies**. **Preclinical studies** planning and performing on porcine **pudendal nerve**. **Histological** and **immunohistochemical analysis** of nerves through image segmentation.
Developed an **innovative neural interface** with **patent** submitted to evaluation.

EXPERTISE

TECHNICAL

- Electrochemical characterization: Electrode Impedance Spectroscopy, Cyclic Voltammetry, Voltage Transient Measurement
- Optical and Electronic microscope (SEM)
- Microfabrication (carbon fibers handling, micro-soldering, photo- and soft-lithography)
- Clean-room, chemical lab
- 3d printing and additive manufacturing

DIGITAL

- Fusion 360 for PCB design (Basic)
- SolidWorks (Intermediate)
- MATLAB (Intermediate)
- COMSOL Multiphysics (Basic)

LANGUAGES

Italian

Mother tongue

English

Fluent speaking, writing, and reading (Ph.D. Course attended in English, Teaching activities)

French

Basic knowledge

EDUCATION

Sep 2020 – Present

Ph.D. in BioRobotics Engineering at Translational Neural Engineering Laboratory

The Biorobotics Institute, Scuola Superiore Sant'Anna, Pontedera, Italy

- Full Scholarship from Scuola Superiore Sant'Anna

Aug 2020

Industrial Engineering License

University of Pisa, Pisa

Sep 2017 – Apr 2020

MASTER'S DEGREE in Biomedical Engineering (Biomedical Technology Curriculum LM-21 DM 270/2004)

Department of Information Engineer, University of Pisa, Italy

Thesis title: **"A neural electrode for the stimulation and recording of the vagus nerve to contro cardiac reflexes"**

Supervisor: Professor Silvestro Micera

- 110/110 with honours
- Best thesis award

Sep 2013 – Feb 2017

BACHELOR'S DEGREE in Biomedical Engineering (Industrial Curriculum)

Department of Information Engineer, University of Pisa, Italy

Thesis title: "**Fabrication and nanomechanics characterization of collagen gel for in vitro engineering of liver fibrosis"**

Supervisor: Professor Arti Alhuwalia

- 105/110

Sep 2008 – Jul 2013

SCIENTIFIC HIGH SCHOOL DIPLOMA

U. Dini Scientific High School, Pisa, Italy

- 100/100 with honours
- Best student award (500 €)

EXPERIENCE

Ph.D. student in BioRobotics, Translational Neural Engineering Lab

Sant'Anna School of Advanced study, Pisa | Oct 2020 - Present

- **Design of neural electrodes**: **nerve histology** acquisition (collaboration with veterinaries) and analysis (manual or automatic segmentation), **Mechanical** and **Electrical Finite Element Method models**
- **Fabrication of polyimide and carbon fibers based neural electrodes** in a clean room using photolithography and additive manufacturing
- Mechanical and electrochemical **characterization of neural electrodes**
- **Preclinical studies** on animal model (pigs) of neural interfaces applied to somatic and autonomic nerves: protocols writing, experiment planning, and performing with clinicians. Experience with sciatic, vagus, pudendal nerve stimulation, and recording. **Electromyographic** and **Electroneurographic** data acquisition and pre-processing.
- **Ethical committee protocols** writing authorized by Italian Health Minister

Master's thesis Project, Translational Neural Engineering Lab

Sant'Anna School of Advanced study, Pisa | Sep 2019 – Apr 2020

Thesis title: **"A neural electrode for the stimulation and recording of the vagus nerve to control cardiac reflexes"** Supervisor: Professor Silvestro Micera.

- **3D reconstruction of peripheral nerves** based on real nerves histology
- **CAD design of innovative electrodes** based on reconstructed nerves
- **Microfabrication of neural electrodes** (3D printing, casting, soldering)
- **Electrochemical characterization of** Platinum-Iridium PEDOT:PSS coated **neural electrodes**

Bachelor's thesis Project, E.Piaggio Research Center

University of Pisa, Pisa | Sep 2016 – Feb 2017

Thesis title: "**Fabrication and nanomechanics characterization of collagen gel for in vitro engineering of liver fibrosis**" Supervisor: Professor Arti Alhuwalia.

- **Fabrication of 3D cell-laden hydrogels** crosslinked with biological catalysts
- **Nanoindentation** tests (stress-strain curve, elastic moduli)

PROFESSIONAL DEVELOPMENT

2022 Visiting at Center of MicroNanoTechnology (CMi)

Three weeks visiting program offered by École Polytechnique Fédérale de Lausanne (EPFL) at CMi, a complex of **clean rooms** and processing equipment for the training and scientific experimentation devoted to the users of **microtechnologies**. Fabrication of **highly innovative neural interfaces** by using standard photolithographic techniques together with high-resolution ***2-photon lithography.***

Project: **SpiCE** *"Design and development of an innovative minimally invasive intraneural interface".*

2022 Cleveland NeuroDesign Entrepreneurs Workshop (CNEW2022)

Four days interactive program offered by the Case Western Reserve University in Cleveland (Ohio) to build **entrepreneurial skills** in **healthtech** (focus on **neurotechnology**) using the Stanford **Biodesign method** (lectures on financing strategy, intellectual property, regulatory, market, reimbursement, and business strategies).

Project: **aero-thera** *"AI-based Neuro-Mechanical Solution to prevent loss of musculoskeletal system function in hemiparetic post-stroke patients"*

2021 PhD+: Enhancing Research, Innovation and Entrepreneurial Spirit

Program (26 hours) offered by the University of Pisa aimed at promoting and encouraging the **entrepreneurial skills** and **innovation mindset**.

Project: **Ne-URO** *"Neuromodulation device for restoring bladder function and fullness sensory feedback"*

2021 European School On Nanosciences & Nanotechnologies (ESONN'**2021**)

Three-week program in Grenoble (France). Practical courses **in clean-room facilities** to use **micro-fabrication** (UV-photolithography, e-beam Lithography & Focus Ion Beam (FIB)) and **micro-characterization tools** for Micro-Electro-Mechanical Systems (**MEMS**) and **micro-fluidic device**.

2020 Training Course for Preclinical Animal Studies

Center for Experimental Biomedicine, National Research Center, Pisa, Italy

15-hours course about: Basic **Organ** and **Tissue Harvesting Techniques**; Legislative and practical aspects in **laboratory animal management; Principles of the 3Rs** (Replacement, Reducement, Refinement): calculation of **sample size** and statistical analysis of data, humanitarian **endpoints** and **animal well-being** assessment.

2018 Second UBORA Design School

One-week program in Pisa (Italy) offered by the University of Pisa aimed at design **medical devices** compliant to relevant **standards**.

Project: **HERO** *"Hand of Elderly Rehabilitation Opensource device"*. Hand muscular rehabilitation prototype based on a **3D-printed** customized frame and a silicone a stretchable membrane (**mechanical modeling**-based design). **3rd place award**

PROJECTS

- **BioSUP project responsible** (**1.350 million** funded by **INAIL Prosthesis Center**). Topic: *Innovative and modular solutions for the restoration of urinary function following neurological damage or surgical removal.* Responsibilities: Speaker at **design reviews**, **deliverables** writing, **coordination,** and active working on 4/7 Work Packages

- **NeuHeart project participant** (**5 million** funded by **H2020-EU.1.2.2. - FET Proactive**). Topic: *A neuroprosthesis to restore the vagal-cardiac closed-loop connection after heart transplantation*

ACHIEVEMENTS

2023 Italian Society of Urodynamics (SIUD) Abstract Award - GOLD Category

Best abstract award for the scientific work *"**Intraneural pudendal** nerve recording and stimulation in **animal** models for the **closed-loop control of lower urinary tract dysfunction**"*

2023 Swiss Continence Foundation Award 2023 – "The future of Neuro-Urology"

Award candidate for the scientific work *"A **bidirectional neural prosthesis** for the **closed-loop** control of the **pudendal** nerve"*

2020 "Vincenzo Tagliasco" National Group of Bioengineering

Best thesis award for *"the development of a neural interface with **innovative** and useful features for a **clinical application**"*

TUTORING AND SUPERVISION OF STUDENTS

- **Teaching and tutoring activities** to master students (**15x**). Topic: *Carbon fiber insertion in nerves, polymeric carbon fibers coating, carbon fibers embedding in soft polymer for neural electrodes applications. Innovative methods to realize neural electrodes. Innovative methods to optimize in vivo stimulation protocols*
- **Mentoring of Ph.D. candidates (2x).** Topic: *Closed-loop wireless pudendal stimulator for chronic implantation in patients affected by urinary dysfunctions*

PATENTS

- Title: ***"SpiCE: SELF-INSERTING PERIPHERAL NEURAL ELECTRODE",*** Nr.: 102022000023493, Filing date: 15/11/2023, Inventors: **Giannotti A.**, Strauss I., Sinibaldi E., Micera S.

- Title: **Elettrodo Neurale interamente realizzato con polimeri soft e tecniche di Rapid Prototyping,** Nr.: 102022000014269, Filing date: 5/07/2023, Inventors: Zinno C., Cedrola I., **Giannotti A.**, Redolfi Riva E., Agnesi F., Micera S., Rizzuto E.

PUBLICATIONS

Peer-reviewed in scientific journals:

Giannotti A., Lo Vecchio S., Pollina L., Vallone F., Paggi V., Strauss I., Bernini F., Gabisonia K., Carlucci L., Lenzi C., Pirone A., Giannessi E., Miragliotta V., Musco S., Del Popolo G., Lacour S., Moccia S., and Micera S. (2023). "Decoding bladder state from pudendal intraneural signals in pigs". **APL Bioengineering** – Under revision

Strauss, I., Niederhoffer T., **Giannotti A.**, Panarese A., Bernini F., Gabisonia K., Ottaviani M., Petrini F., Recchia F., Raspopovic S., Micera S. (2020). "*Quick-to-implant, peripheral intra-neural electrode (Q-PINE): development and testing*" **JNE** – 10.1088/1741- 2552/abc52a

bioRxiv preprint:

Strauss I., Agnesi F., Zinno C., **Giannotti A.**, Dushpanova A., Casieri V., Terlizzi D., Bernini F., Gabisonia K., Wu Y., Jiang D., Paggi V., Lacour S., Recchia F., Demosthenous A., Lionetti V., Micera S. (2023). *"Neural stimulation hardware for the selective intrafascicular modulation of the vagus nerve".* **bioRxiv** - https://doi.org/10.1101/2023.07.14.548991

Conference papers:

Romeni S., Ziliotto B., Herve N., **Giannotti A.**, Micera S. (2023). *"Reconstruction of nerve functional topography using recruitment curves enables selective electrical stimulation"* **11th International IEEE/EMBS Conference on Neural Engineering (NER)** - 10.1109/NER52421.2023.10123775

Zinno C., Cedrola I., **Giannotti A**., Redolfi Riva E., Micera S. (2023). *"Development of a 3D Printing Strategy for Completely Polymeric Neural Interfaces Fabrication"* **11th International IEEE/EMBS Conference on Neural Engineering (NER)** - 10.1109/NER52421.2023.10123838

Strauss I., Zinno C., Giannotti A., Ottaviani M., Recchia F. A., Micera S. (2021). *"Adaptation and Optimization of an Intraneural Electrode to Interface with the Cervical Vagus Nerve"* **10th International IEEE/EMBS Conference on Neural Engineering (NER)** - 10.1109/NER49283.2021.9441131

Conference abstracts:

Giannotti A.*, Romeni S.*, Faoro G., Cocchetti C., Lenzi C, Pirone A., Giannessi E., Miragliotta V., Menciassi A., Moccia S., Micera S. (2023) *"Combining automatic segmentation of nerve histology and computational modeling of neuromodulation"* **Society for Neuroscience 2023 - Accepted**

Giannotti A., Lo Vecchio S., Salatino L., Paggi V., Bernini F., Gabisonia K., Carlucci L., Musco S., Recchia F. A., Del Popolo G., Micera S. (2023). *"Intraneural pudendal nerve recording and stimulation in animal models for the closed-loop control of lower urinary tract dysfunction"* **21th National Congress SIUD-FIO (SIUD2023) - 10.1016/j.cont.2023.100670**

Giannotti A., Lo Vecchio S., Salatino L., Paggi V., Bernini F., Gabisonia K., Carlucci L., Musco S., Recchia F. A., Del Popolo G., Micera S. (2023). *"Intraneural pudendal nerve recording and stimulation in animal models for the closed-loop control of lower urinary tract dysfunction"* **International Neuro-Urology Society (INUS)**

Giannotti A.*, Aprea E.*, Akouissi O., Micera S. (2023). "*Mechanical validation of an innovative intrafascicular neural interface to restore urinary bladder dysfunctions*". **Congress of the National Group of Bioengineering (GNB)**

Giannotti A., Vallone F., Pizzinga M., Shulga D., Strauss I., Paggi V., Lacour S., Bernini F., Carlucci L., Gabisonia K., Musco S., Recchia F. A., Del Popolo G., Micera S. (2022). *"Decoding the bladder fullness from intramural pudendal nerve signals using a machine learning algorithm"* **Society for Neuroscience 2022**

Giannotti A., Strauss I., Musco S., Bernini F., Lenzi C., Coli A., Giannessi E., Recchia F.A., Del Popolo G. , Micera S. (2021). *"Surgical access and stimulation of pudendal nerve in pigs to restore the micturition control"***, International Conference Society 2021 (ICS2021)**

Giannotti A., Strauss I., Musco S., Bernini F., Lenzi C., Coli A., Giannessi E., Recchia F.A., Del Popolo G. , Micera S. (2021). *"Surgical access and stimulation of pudendal nerve in pigs to restore the micturition control"***, 19th National Congress SIUD-FIO**

Giannotti A., Strauss I., Musco S., Recchia F. A., Del Popolo G., Micera S. (2021). "*Pudendal Nerve Stimulation to Restore Bladder Fullness Perception*". **10th International IEEE EMBS Conference on Neural Engineering (NER)**

Giannotti A., Strauss I., Micera S. (2020) "*A neural electrode for closed-loop vagus nerve recording and stimulation to control autonomic reflexes*". **VII Congress of the National Group of Bioengineering (GNB)**