



Subject: Internship Proposal

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Project Supervisor






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Project details

<i>Title</i>	NeuroSpark
<p><i>Detailed description:</i> Are you interested in AI, brain-inspired computing, robotics, and future medical technologies? The NeuroComputational Laboratory at the University of Messina invites motivated Bachelor's and Master's students in IT, Computer Science, Engineering, AI, Data Science, Robotics, Biomedical Engineering, and related fields to apply for an internship in neurocomputational modelling and neuromorphic systems. This internship is for students who want to work on something beyond standard software development: brain-inspired AI models that may one day support adaptive robots, neurorehabilitation, electrical stimulation, wearable sensors, and implantable medical devices. You do not need to be a neuroscientist. Interest in Python, AI, simulation, data analysis, and biologically inspired computing is enough to start. The internship focuses on spiking neural networks — AI models inspired by the way real neurons communicate using short electrical pulses called spikes ⚡. These models are useful for building low-power, adaptive systems that can learn from experience and react in real time.</p> <p> Possible research directions</p> <p> Memory-inspired AI: simple models of hippocampal CA1/CA3 circuits, memory recall, pattern completion, and sleep-like replay.</p> <p> Movement and spinal-cord-inspired control: models of rhythmic motor patterns such as walking, with possible links to robotics and exoskeletons.</p> <p> Medical neurotechnology: adaptive electrical or magnetic stimulation, wearable feedback, implantable device concepts, and closed-loop rehabilitation systems.</p> <p> What you may do</p> <p>During the internship, you may write Python simulations, build simple spiking neural network models, analyse firing rates and activity patterns, visualise spikes, test learning rules such as STDP, process EMG/EEG-like signals, or create small software demonstrators. Depending on your interests, the project can be more software-oriented, AI-oriented, robotics-oriented, or medical-technology-oriented. Possible mini-projects include a spiking model that learns and recalls a pattern from</p>	


incomplete input; a small spinal-circuit model that generates alternating flexor/extensor activity; a closed-loop stimulation simulator where sensor feedback changes stimulation over time; or a data-analysis pipeline for neural or biomechanical signals.


 Useful skills


Python, NumPy, Matplotlib, Git, Linux, machine learning basics, signal processing, simulation, or robotics. Experience with NEST, NEURON, Brian2 and basic understanding of neuroscience is welcome but not required. The most important qualities are curiosity, reliability, and willingness to learn interdisciplinary research.

 Expected outcome

By the end of the internship, you may produce a working simulation, a small software prototype, a GitHub repository, a technical report, figures for a paper or grant, or a demonstrator related to memory, movement, neurostimulation, or neuromorphic systems.

 Location and mode: NeuroComputational Laboratory, University of Messina. Hybrid or remote participation may be considered depending on the topic and student profile.

 Duration: typically 3–6 months, with possible extension.

 How to apply: send a short motivation letter, CV, and, if available, links to GitHub projects, thesis work, coding examples, or publications.

<i>Duration (month – max 12)</i>	3-6
<i>Duration (hours)</i>	100
<i>Open positions</i>	Junior researcher

Internship Skills

Technical requirements: Python programming; basic data analysis and visualisation; familiarity with NumPy/Matplotlib/Pandas; basic AI or machine learning knowledge; Git/GitHub; interest in spiking neural networks, signal processing, robotics, neurostimulation, or wearable/implantable medical devices. Experience with NEST, NEURON, Brian2, Nourse, or BindsNET is welcome but not required.



<i>Other skills</i>	curiosity, reliability, willingness to learn, problem-solving attitude, clear communication, ability to work independently and in a team, attention to detail, and interest in interdisciplinary research connecting AI, neuroscience, robotics, and medical technology.
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