Dwarf stars are low-mass, relatively cool stellar objects that frequently exhibit unexpected flares, manifested as transient increases in luminosity (i.e., emitted energy). These luminosity enhancements can span a wide range of magnitudes, and the detection of even the least energetic events is crucial for advancing our understanding of the physical processes governing these stars. Contemporary astronomical survey telescopes, both ground-based and space-based, enable nearly continuous monitoring of a vast population of dwarf stars. Given the immense data volume produced by such surveys, the implementation of automated data processing techniques is indispensable, with the automatic detection of stellar flares representing a key analytical challenge.

In the present project, the detection of flares will not rely on conventional Convolutional Neural Network (CNN) architectures. Instead, it will employ Spiking Neural Networks (SNNs), which constitute a class of biologically inspired neural models originating in the field of Computational Neuroscience. These networks emulate the temporal dynamics of biological neurons through discrete spike-based signaling and incorporate learning mechanisms such as Spike-Time Dependent Plasticity (STDP). Owing to their intrinsic capacity to model dynamic systems, SNNs are particularly well-suited for the analysis and processing of temporal data.

This research project is conducted in collaboration with the Department of Quantum Physics and Astrophysics at the University of Barcelona.