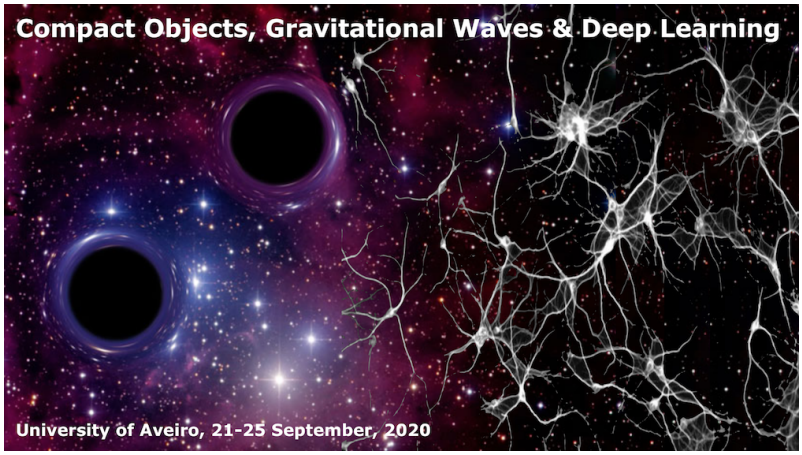
Workshop on Compact Objects, Gravitational Waves and Deep Learning



Monday 21 September 2020 - Friday 25 September 2020

University of Aveiro

Scientific Programme

I- LECTURES

Black Holes and Exotic Compact Objects (Carlos Herdeiro, Dep.Mathematics, Univ.Aveiro)

Black Holes: Astrophysical Evidence
Spherical and Spinning Black Holes in General Relativity
"Hairy" Black Holes and Exotic Compact Objects

Gravitational Waves (Nico Sanchis-Gual, CENTRA)

Introduction to Gravitational-Waves: from Theory to Numerical Simulations
Current Gravitational-Waves State of the Art Observations
(LIGO, Virgo and KAGRA)
Fundamentals of Gravitational Radiation and Properties
Numerical Simulations of Gravitational-Waves
Gravitational Radiation from Exotic Objects (Boson Stars)

Machine Learning and Deep Learning (Felipe Freitas, Dep.Physics, Univ.Aveiro)

Detecting Binary Black Hole Merges (BBH) with Deep Learning
Building, Analyzing and Setting Up Deep Learning Models
Anaconda Environments, Jupyter notebooks and kernels (Google collab environment).
Introduction to FastAI
The pycbc and GWpy Packages: Dataset Generation.
Building a First Model: DataLoaders, Convolutional Neural Networks, FastAI Learner.
Fine Tunning and Transfer Learning.
Some Novel applications and What Can FastAI Do

II- TALKS

-The (ultra) light in the dark: A potential vector boson of 8.7×10−13 eV from GW190521, Juan C. Bustillo (Univ.Hong Kong, Monash Univ., OzGrav)
-Exploring Gravitational Waves Detection Using Deep Learning Methods, Osvaldo G. Freitas, (Univ.Minho, CFUMUP)
-Primordial Gravitational Waves as a Portal to Particle Physics, António Morais (Univ.Aveiro)
-Phenomenology of Vector Like Leptons with Deep Learning @ LHC, João Pino (Univ.Aveiro)