Autoencoders for VIRGO GW signal analysis

First ML-INFN Hackaton

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GW and GWOSC

International Gravitational Wave Observatory Network (IGWN)

Data are freely accessible via GWOSC



Three antennas to listen to the Universe

Data easly accessible with dedicated python software

Gravitational Waves

Gravitational waves are 'ripples' in space-time caused by some of the most violent and energetic processes in the Universe



First Observation

The first direct observation of gravitational waves was made on 14 September 2015 and was announced by the LIGO and Virgo collaborations on 11 February 2016







How many GWs now?

Tens of events, many populations and physics to explore









Autoencoders



- Dim(X')=Dim(X)
- Dim(Z)<Dim(X)
- X'->X

Learn a representation for a set of data, typically for dimensionality reduction, by training the network to ignore signal "noise".

Workflow

- Explore and transform GW data;
- Create your autoencoder model, play with batch size, epochs, layers and regularization;
- Test with random gaussian data;
- Apply to GW data chunks;
- Plot output and compare with input data.