

# *Physics Updates*

Meeting ATLAS Napoli 25/06/2019

- L. Merola, G. Carlino
- F. Conventi, E. Rossi
- F. Cirotto

### Dottorandi:

- A. Giannini, M. Lavorgna → similmellow

### Laureandi Magistrali:

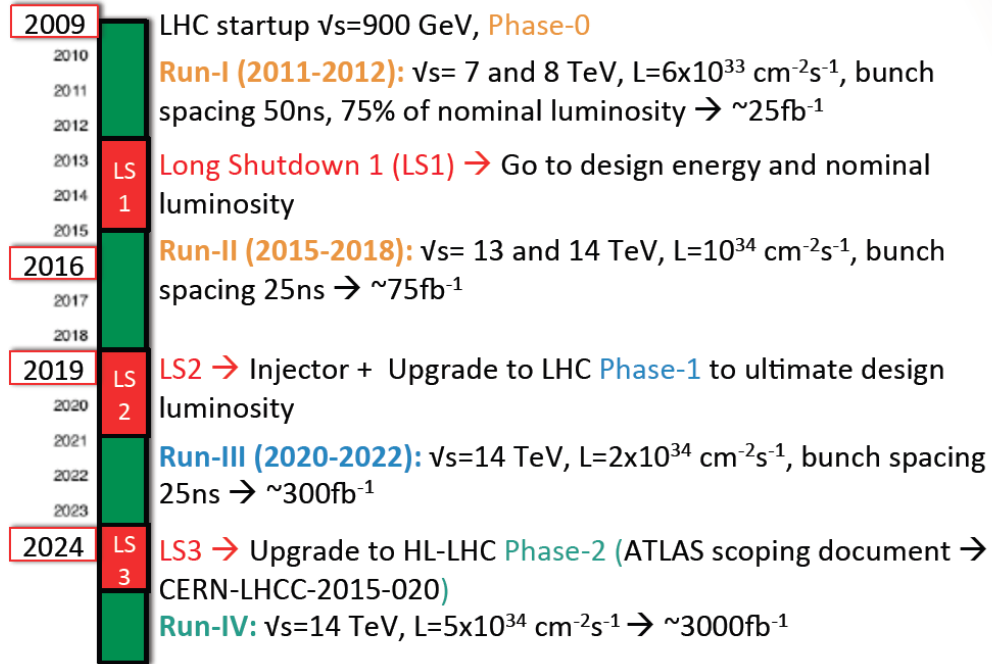
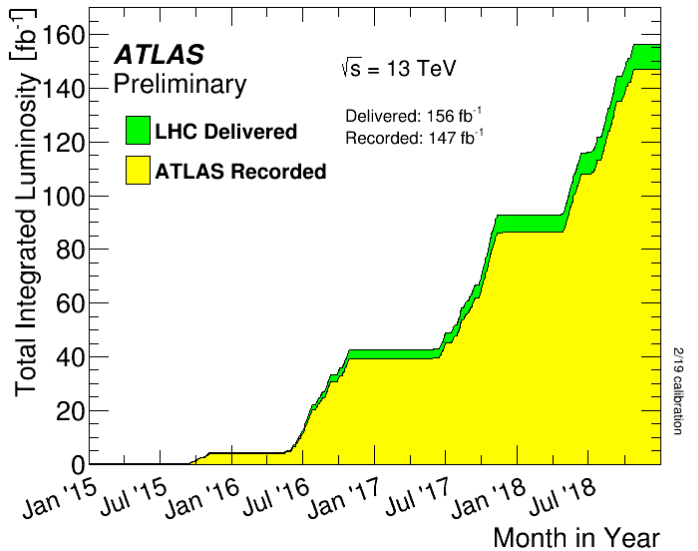
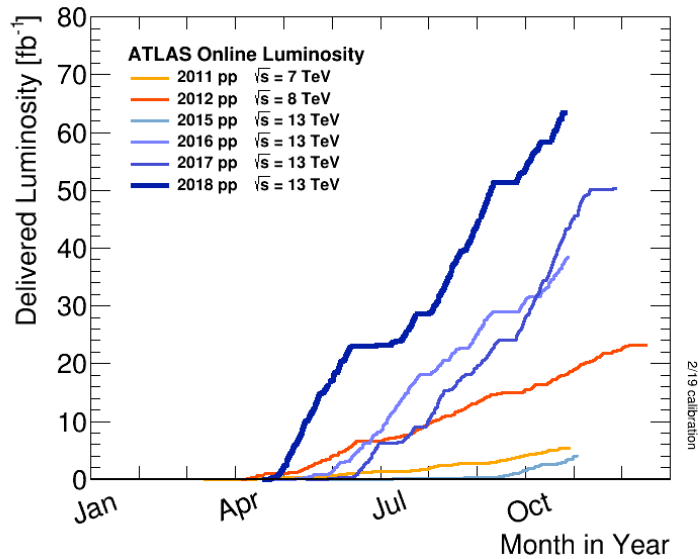
- S. Auricchio → Laurea Luglio 2019

### Laureandi Triennali:

- C. Ciano → Laurea Luglio 2019
- N. De Biase → Laureato a Novembre 2018

Da Settembre → C. Di Donato  
→ nuova laureanda (S. Pinto)

Anyone who wants join is very welcome!



About  $150 \text{ fb}^{-1}$  available for the full Run-II results!!

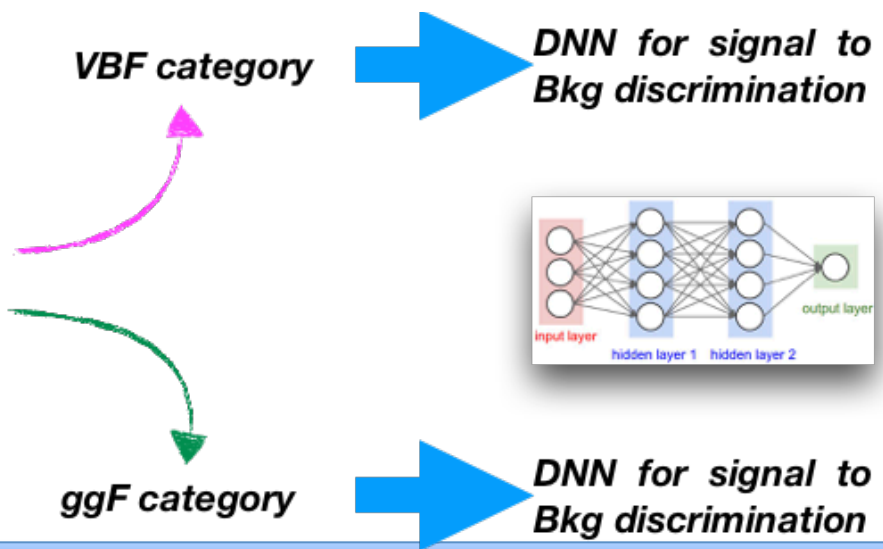
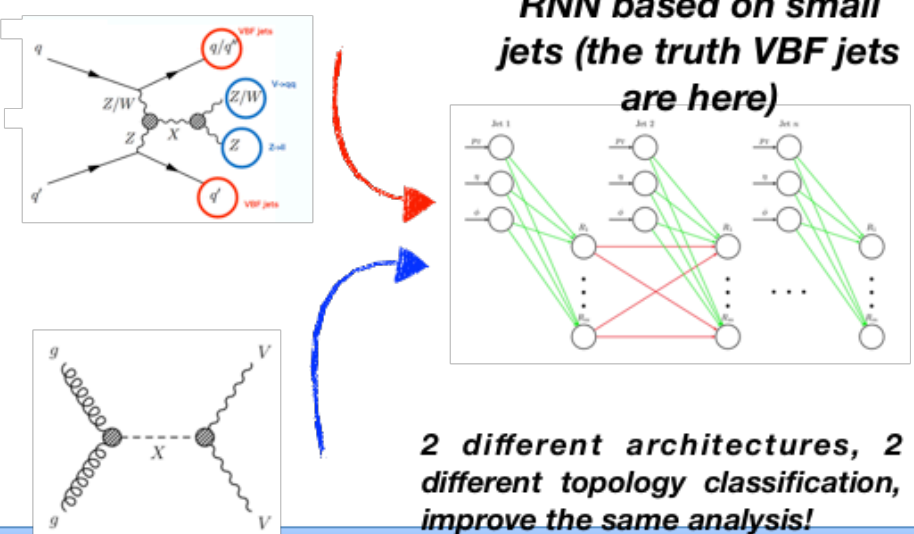
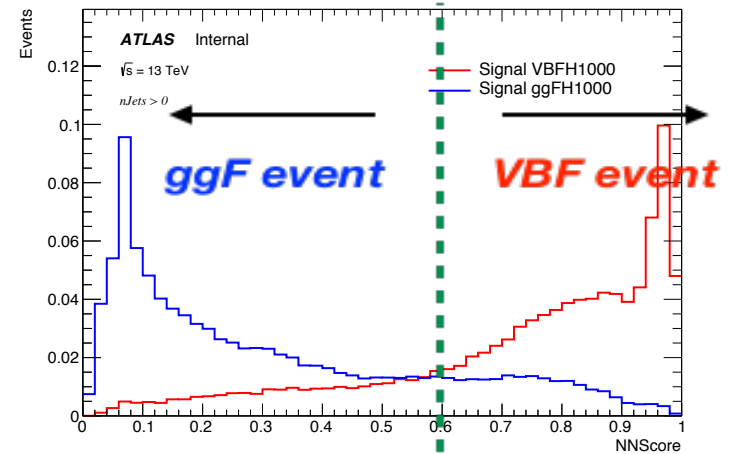
# A general search for **new physics decaying into diboson in semi-leptonic final states**

Combined **0/1/2-lepton channels** ( $ZV \rightarrow \nu\nu qq$ ,  $WV \rightarrow l\nu qq$  and  $ZV \rightarrow ll qq$ )

(S. Auricchio, G. Carlino, F. Conventi, F. Crotto, A. Giannini, M. Lavourga, L. Merola, E. Rossi)

Production mechanism: **ggF/DY** and **VBF**

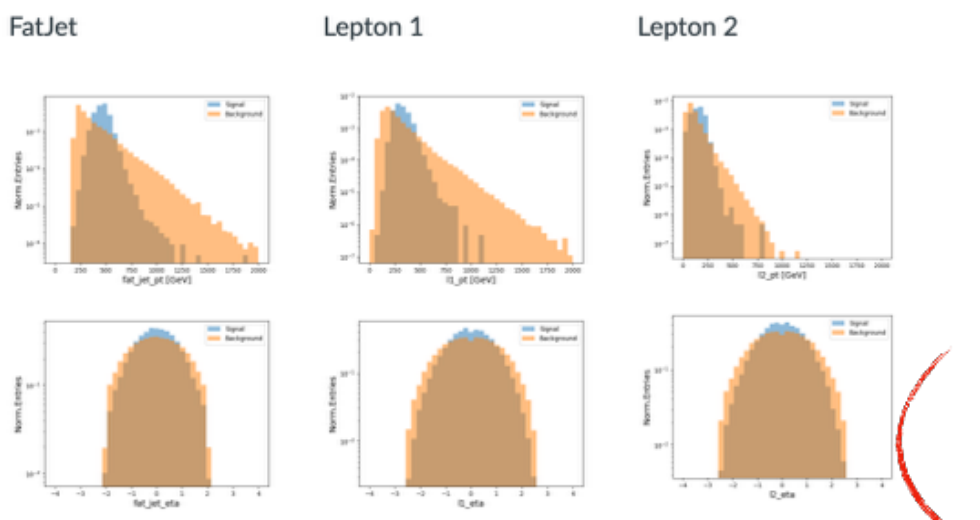
Focus on **Machine Learning application**:  
**Recurrent Neural Network (RNN)** for the VBF/  
 ggF signals classification.  
**parametrised Deep Neural Network (pDNN)**  
 for signal/bkg event classification.



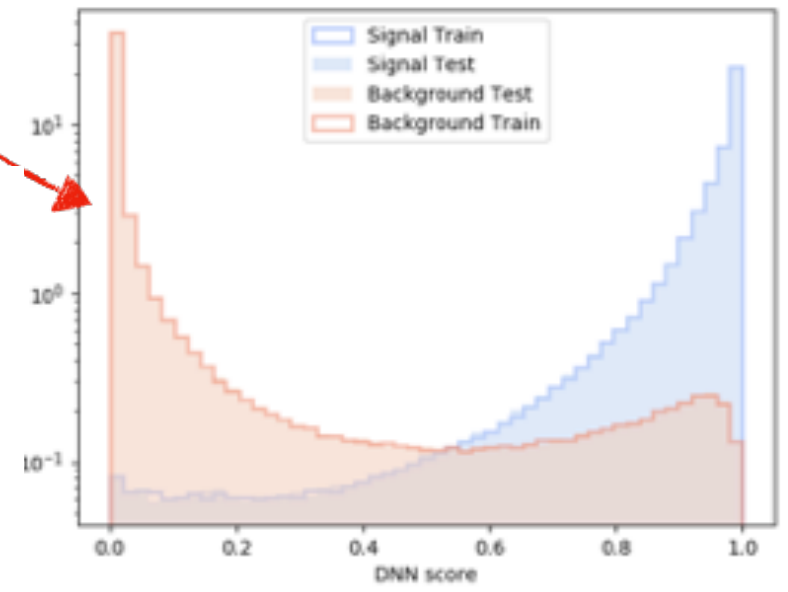
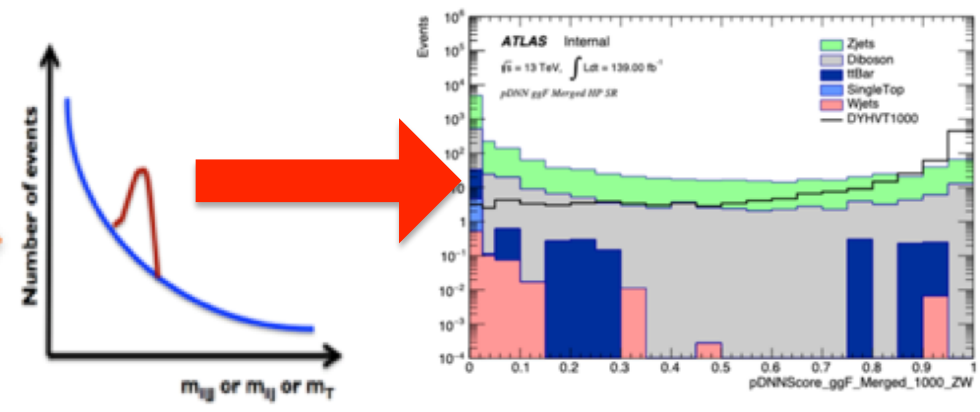
# A general search for **new physics decaying into diboson in semi-leptonic final states**

(S. Auricchio, G. Carlino, F. Conventi, F. Cirotto, A. Giannini, M. Lavourga, L. Merola, E. Rossi)

Focus on **Machine Learning application**: “Parameterised neural networks for HEP”



Since the mass of the resonance is unknown how to best train a DNN?  
Use the approach as in Eur. Phys. J. C (2016) 76:235 where a single parameterised DNN tackles the full set of related tasks



# Search for the electroweak diboson production in association with a high-mass dijet system (SM VBS)



(S. Auricchio, G. Carlino, F. Conventi, F. Cirotto, A. Giannini, M. Lavourga, L. Merola, E. Rossi)

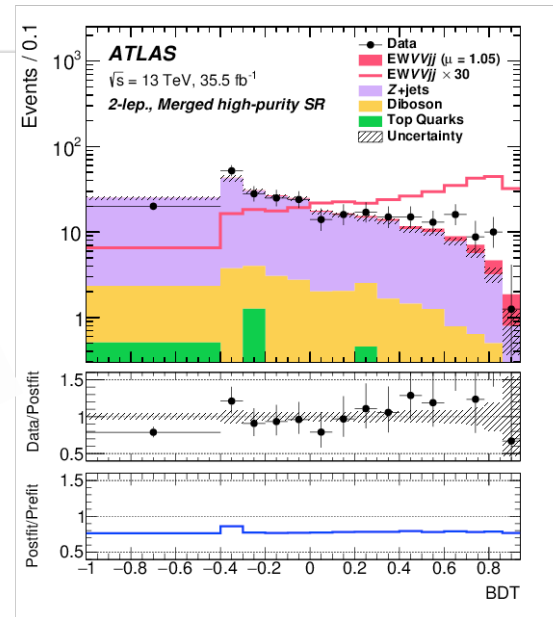
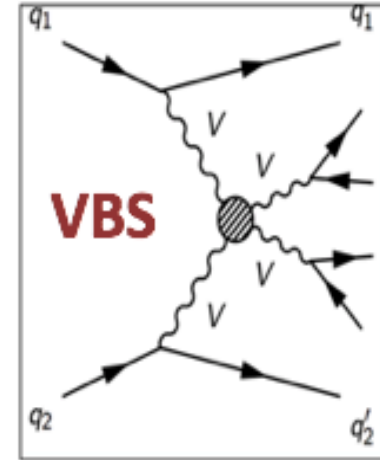
## VBS analysis goals and Physics interpretation:

- Search for anomalous Quartic Gauge Couplings (aQGC)
- Measurement of the VBS  $VV$  cross section production

The electroweak production of  $WW/WZ/ZZ$  in association with two jets is measured with an observed (expected) significance of **2.7** (2.5) standard deviations.

The fiducial cross section is measured to be  $45.1 \pm 8.6(\text{stat.}) + 15.9 - 14.6(\text{syst.}) \text{ fb}$ .

arXiv:1905.07714  
submitted to PRD  
(19 May 2019)



# Search with Jets and Missing energy in final states

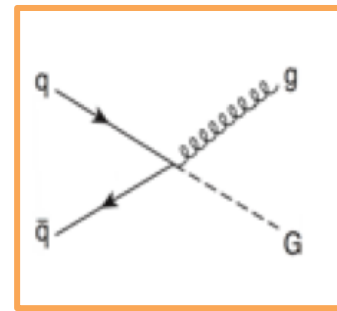
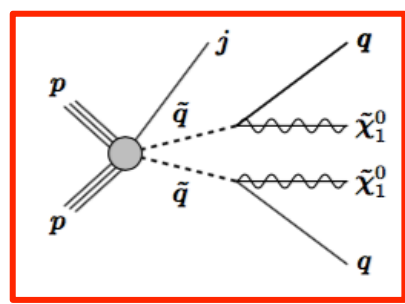
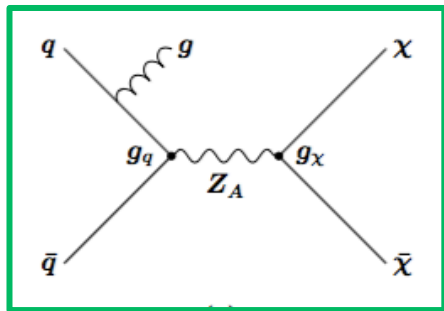
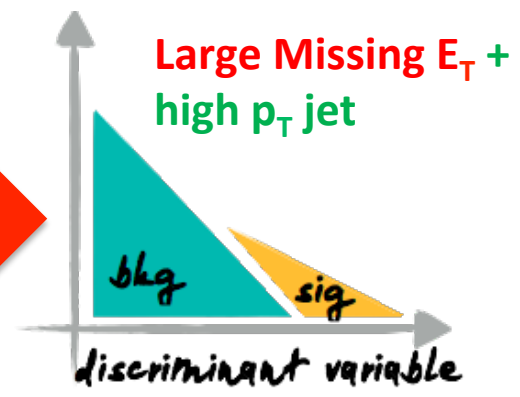
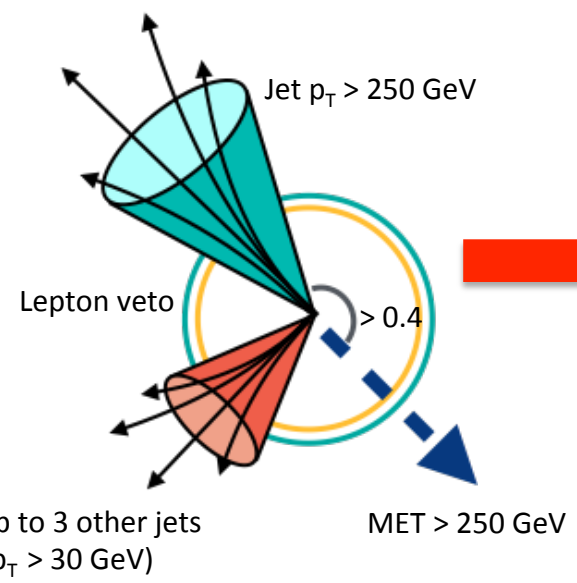


(G. Carlino, F. Conventi, F. Ciotto, A. Giannini, M. Lavourga, L. Merola, E. Rossi)

## Most sensitive channel for DM searches

Look for the production of **invisible particles** recoiling against a high-momentum jet

- Test several BSM scenarios:
- **Dark Matter pair production**
  - **SUSY in compressed scenarios**
  - **Extra spatial dimensions**



- Preparing results with Full Run-2 statistics (Summer)
- Adding new BSM signals (Higgs invisible)

# ATLAS Exotics + HDBS Workshop

11-14 June 2019

Exotics: 11-14 June 2019

HDBS: 11-13 June 2019

 **VILLA DORIA D'ANGRI**

Via Francesco Petrarca 80 Napoli

