Interview for PhD position at University of Wuppertal

Ismail EZZAKI

12 mai 2022

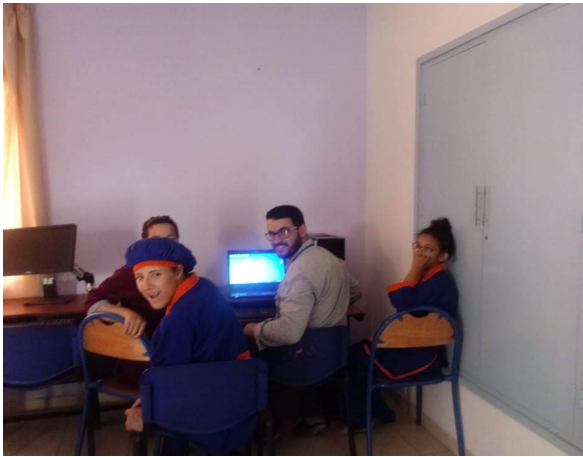
Plan

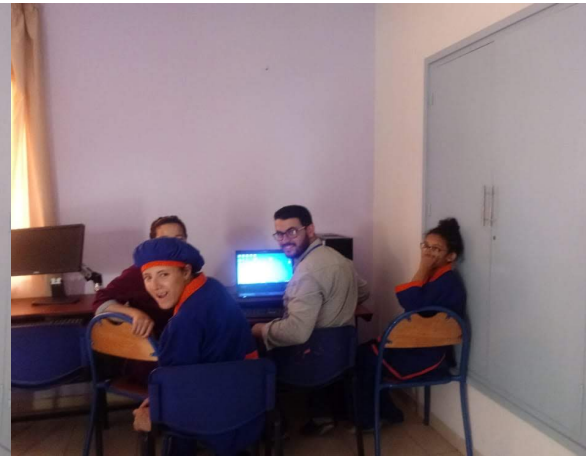
About me

- Full name : Ismail EZZAKI
- Age : 22 years old
- Country : Morocco
- I’ve always been interested in discovering how things work
- Childhood dream (age =< 12 yrs) : Win a Nobel prize in physics
- Realistic dream (age > 12 yrs) : Be an academic researcher

About me

Spare time activities





About me

Academic background

- 2014 : High School in Experimental sciences
- 2018 : B.Sc. in Fundamental Physics
- 2020 : M.Sc. in High energy physics and computational physics first in class

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Skills

- theoretical knowledge in particle physics
- Statistics & probability in HEP
- Programming (C++ & Python & ... any OOP language) Soft Skills : Critical Thinking, Effective Communication, Problem solving and logical thinking ////////// As a software engineer at MogulWare, I collaborated with fellow developers on several finance tracker applications for our clients. I used my knowledge of Java and Python to customize functions, troubleshoot issues and

Research Interests & Experience

My correct research interest is in the area of machine learning & experimental particle physics

- symmetry and the standard model (M1 project)
- The Standard Model : clifford algebra
- image equation to latex (NLP)
- Breast Cancer Classification (image Classification)
- Higgs ML (RNN and xgboost)

I am available immediately to start an internship before the beginning of the PhD.

unfortunately, my master thesis is not related to this PhD position so I worked on a project to show that I am capable to pursue this PhD

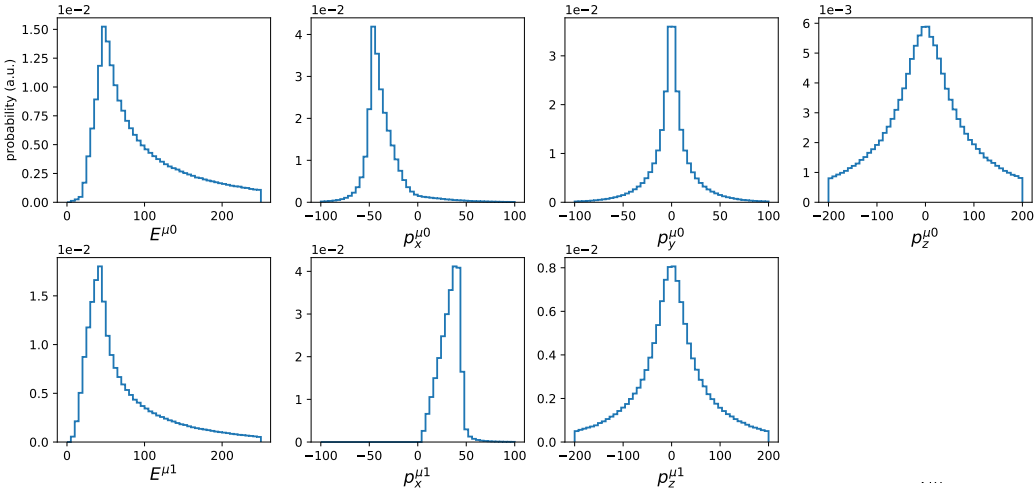
GANs to simulate Drell-Yan events in ATLAS experiment

My first use of machine learning but i overcome this problem

- Considering a sample of $Z \to \mu\mu$ events in proton-proton collisions,
- generated using the PYTHIA8 event generator at a center-of-mass energy of 13 TeV.
- Detector resolution and efficiency are taken into account using the parametric description of the ATLAS detector provided by the DELPHES detector simulation library.
- Events are generated with an average of 20 simultaneous collisions (pileup)
- A rotation of the two four-momenta is applied, so that $p_y^{\mu 1} = 0$, after the rotation. Once this is done, $p_y^{\mu 1}$ is discarded from the dataset.

Research Interests & Experience : My Master Project

GANs to simulate Drell-Yan events in ATLAS experiment



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GANs to simulate Drell-Yan events in ATLAS experiment

- The generator network consists of 7 fully connected layers with 64, 128, 256, 512, 256, 128, 7 neurons. Neurons in the inner layers are activated by leaky ReLU functions, while linear activation functions are used for the output layers. The input to the generator network consists of 7 “noise” floating-point numbers, sampled from a Gaussian distribution centered at 0 with unit variance.
- The discriminator network consists of 9 hidden dense layers with 128, 128, 256, 256, 128, 64, 32, 16, and 8 neurons, activated by a leaky ReLU function. The last hidden layer is fully connected to a single-neuron output layer with sigmoid activation. In addition, a layer connected directly to the input layer returns the dilepton mass as part of the output.
- The combined network is trained adversarially for 40,000 epochs.
- All networks were implemented in KERAS, using `TensorFlow` as a back-end, The training was performed using Google TPU type (v2).

Research Interests & Experience : My Master Project

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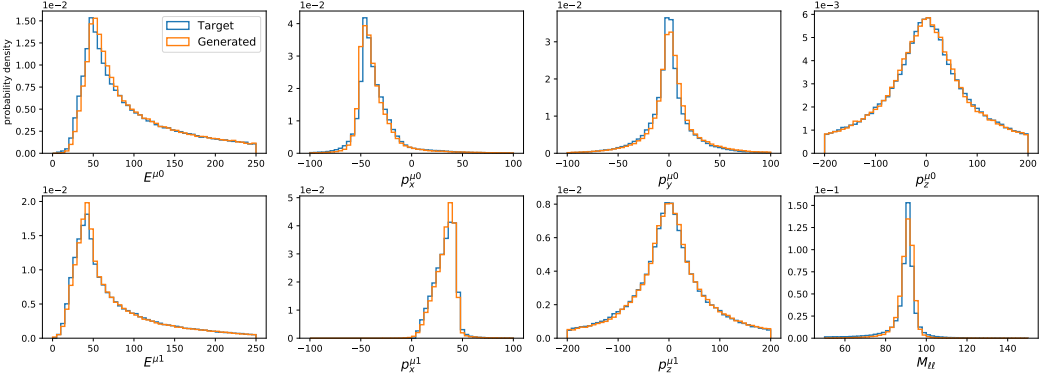

Results

- Results show that GANs can learn the multi-dimensional pdf of $\mathcal{O}(7)$ features
- The GAN shows problems in learning distributions with sharp features such as edges
- The Gan indicate a good performance but the reached precision is still insufficient to meet the precision requirements of an LHC data analysis.

Solutions

- Auxiliary GAN
- reinforcement learning
- Conditional Hybrid GAN

Why this thesis

why doing a phd why this field what set you apart from other candidates experience related to this thesis why this University : i love rural cities future projects your qustions
Scientific background and achievements/goals of Honours/Masters project that is being or has been completed. Explanation of techniques used and skills gained Understanding of the project applied for in terms of scientific background, the challenges it may pose
Why does the student want to do a PhD ? Why this specific PhD - appreciation of the research project objectives Careers plans for 5-10 years time ? View of the DTP cohort identity of students, cross-partnership events and PIPS placement* *CASE students are required to spend time with the CASE partner. This obviates the need to arrange a separate PIPS placement

- basics about detector
- i love computer science physics
- i worked in many open source projects with large team

Why this thesis

- I’ve enjoyed my academic work so far, but I really feel I’ve got more to offer as an independent researcher. I’m also passionate about this subject and don’t feel enough attention has been paid to the questions I’m looking to address (appling deep learning to data analysis in lhc big data) .
- This thesis combine two of my favorite field : experimental particle physics & computational physics,
- I think CEA can help me with these ambitions since it has a strong ATLAS group with access to formidable computational resources.

after complete the PhD I plan to pursue a postdoc likely in the area of unsupervised machine learning in data analysis of the ATLAS experiment.

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