



PHELIPE D'ARC


MASTER'S OF SCIENCE STUDENT
AT CBPF

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PROFESSIONAL SUMMARY

Experienced physicist with 4 years of active research utilizing statistical tools and programming languages such as Python and Wolfram Mathematica. Skilled in the use of tools such as Docker and Conda environments, as well as IPython notebooks. Adept at combining technical knowledge and analytical skills to drive successful research outcomes.

EDUCATION

UFRJ - Universidade Federal do Rio de Janeiro

Bachelor's Degree in Physics

2017-2021

CBPF - Centro Brasileiro de Pesquisas Físicas

Master's of science in Computational Astrophysics

2022 - Present

SKILLS

- **Deep Learning:**

Keras-Tensorflow, Pytorch, CNN, LSTM, GPU- Parallelism

- **Python:**

Pandas, Numpy, Regex, Matplotlib, seaborn, jupyter

- **Machine Learning:**

Sckit-Learn, Random Forest, SVM, xgboost

PROJECTS

Finding Supernovas using Random Forest Classifier

CBPF

Created a comprehensive tutorial covering the full image pre-processing pipeline, training steps, hyperparameter tuning, and generalization of a binary classification problem using a Random Forest Classifier. Demonstrated the use of the tutorial through a Jupyter Notebook example.

Search for optical Gravitational Waves candidate using CNN

CBPF + Dark Energy Survey GW collaboration

Developed a successful Convolutional Neural Network model for identifying optical GW counterparts. Trained the model using a cluster of 8 GPUs, enhancing processing speed and addressing the big data challenge. Achieved state-of-the-art results with a multi-label classifier

Kilonova and Supernovas Spectrum Classifiers using Bidirectional LSTMs

CBPF + Dark Energy Survey SPECTRO collaboration

Designed and implemented a spectrum classifier capable of distinguishing between Supernovas and Kilonovas. Utilized interpolation and standardization techniques. Incorporated one-dimensional convolutional layers for feature extraction and bidirectional LSTM for optimal results.

CERTIFICATION

Method to analyse BigData and Astrostatistics

Centro Brasileiro de Pesquisas Físicas - CBPF

Computer Vision - Course

Kaggle

Deep Learning applied to seismic data

Centro Brasileiro de Pesquisas Físicas - CBPF

Intermediate Machine Learning - Course

Kaggle

Workshop - Deep Learning

4ª O2I Science Deep Tech and Innovation

Poster - Academic meeting of computational modeling

Laboratório Nacional de Computação Científica - LNCC

More informations and Others projects are available on GitHub*

PROJECTS

Health Symptoms Classifier using Transformers

Lemobs, Prontlife and LNCC + CBPF

In the field of Natural Language Processing (NLP), I have developed an advanced algorithm that utilizes the cutting-edge BERTimbau model, which is a variant of the BERT (Bidirectional Encoder Representations from Transformers) model, which was specifically trained on a large corpus of Portuguese language data. This algorithm is designed to classify phrases that describe medical conditions, and it can accurately identify various health issues such as asthma, diabetes, cardiovascular diseases, and more. Additionally, I created a custom script that uses Google APIs and Regex library to save and process/filtering data from YouTube comments effectively.

Search for Supernovas using Deep Learning

CBPF + Southern Photometric Local Universe Survey (SPLUS) collaboration

Developed and implemented a successful Deep learning model for identifying images that contains supernovas and other astronomical transients. I designed and created a robust image processing pipeline from scratch, which included tasks such as cleaning, contrast adjustment, and normalization. The deep learning model was trained using a powerful cluster of 8 GPUs, and I leveraged transfer learning to improve the model's performance by utilizing a family of CNN models known as Mobilenet (Howard et al. 2017), which are based on depthwise separable convolutions. Which significantly enhanced the processing speed and allowed me to address the big data challenge effectively.

Supernovas type I and Supernovas type II Spectrum Classifiers using Simulation Based Inference (SBI)

CBPF + Dark Energy Survey SPECTRO collaboration

Combining statistical inference and machine learning to develop a classifier using the Simulation-Based Inference (SBI) method. This involved using computer simulations and normalizing flows to approximate the posterior distribution of a model, enabling me to estimate model parameters and uncertainties more accurately and efficiently than traditional inference methods. Specifically, I developed a classifier that can accurately identify Supernova type I from spectroscopic data, using the posterior distribution as a probability distribution. This work showcases my expertise in statistical inference, machine learning, and data analysis, and demonstrates my ability to apply these skills to solve complex problems in astrophysics.

