A Framework for Data Simulation and Analysis of the BabyCal Electromagnetic Calorimeter

Daniel Hebel Lobos (UTFSM)
Raquel Pezoa (UTFSM)
Claudio Torres (UTFSM)

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CCTVal ANID PIA/APOYO AFB220004 - FONDECYT Postdoc Nº 3190740

ABOUT ME

- **26 years old**
- **I am from Chile (Not this one 🌶, but this one)**
- **Computer Science Engineer at UTFSM**
- **PyHEP *first-timer***

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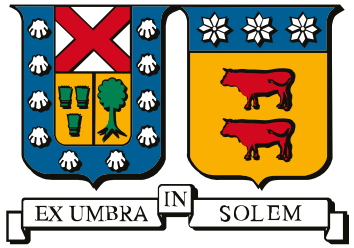
Source:
ESO

CONTEXT OF APPLICATION

Thesis Work – Computer Clusters



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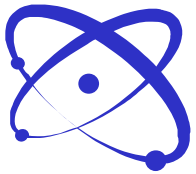

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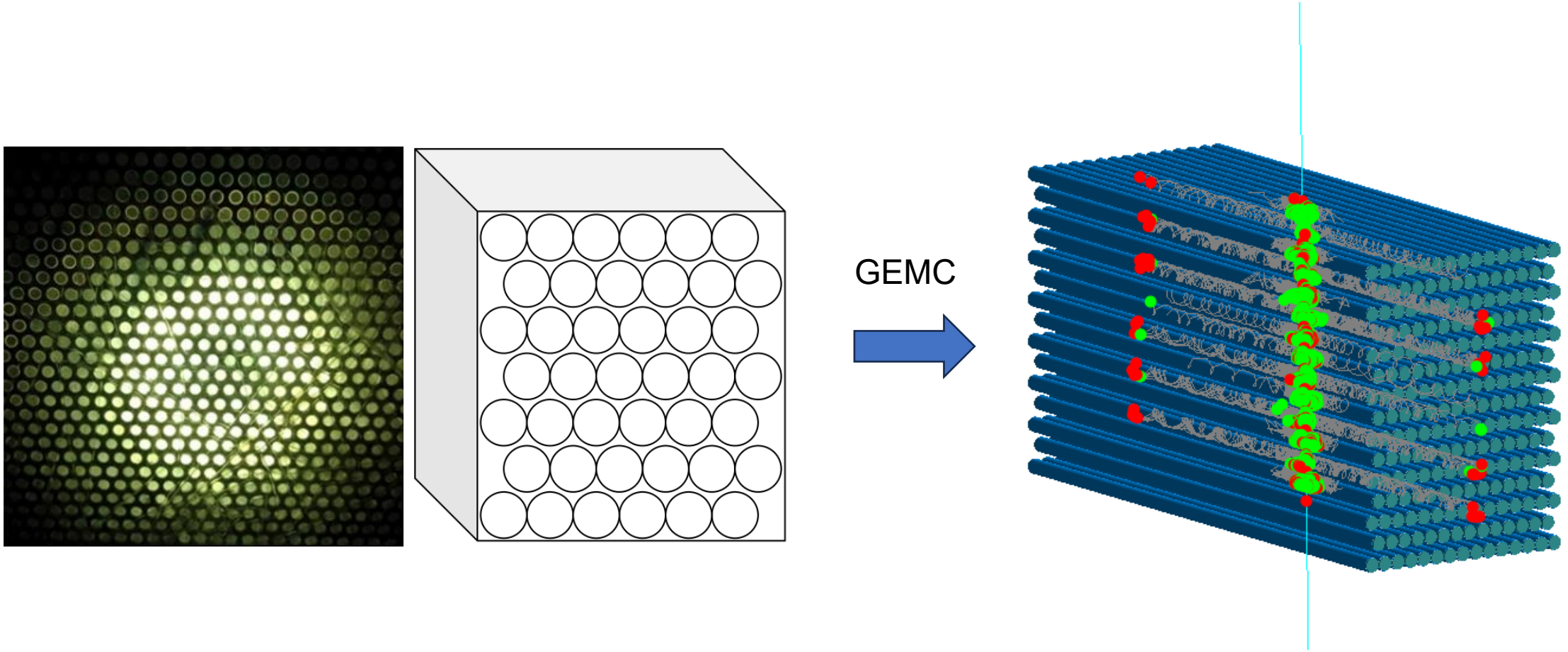
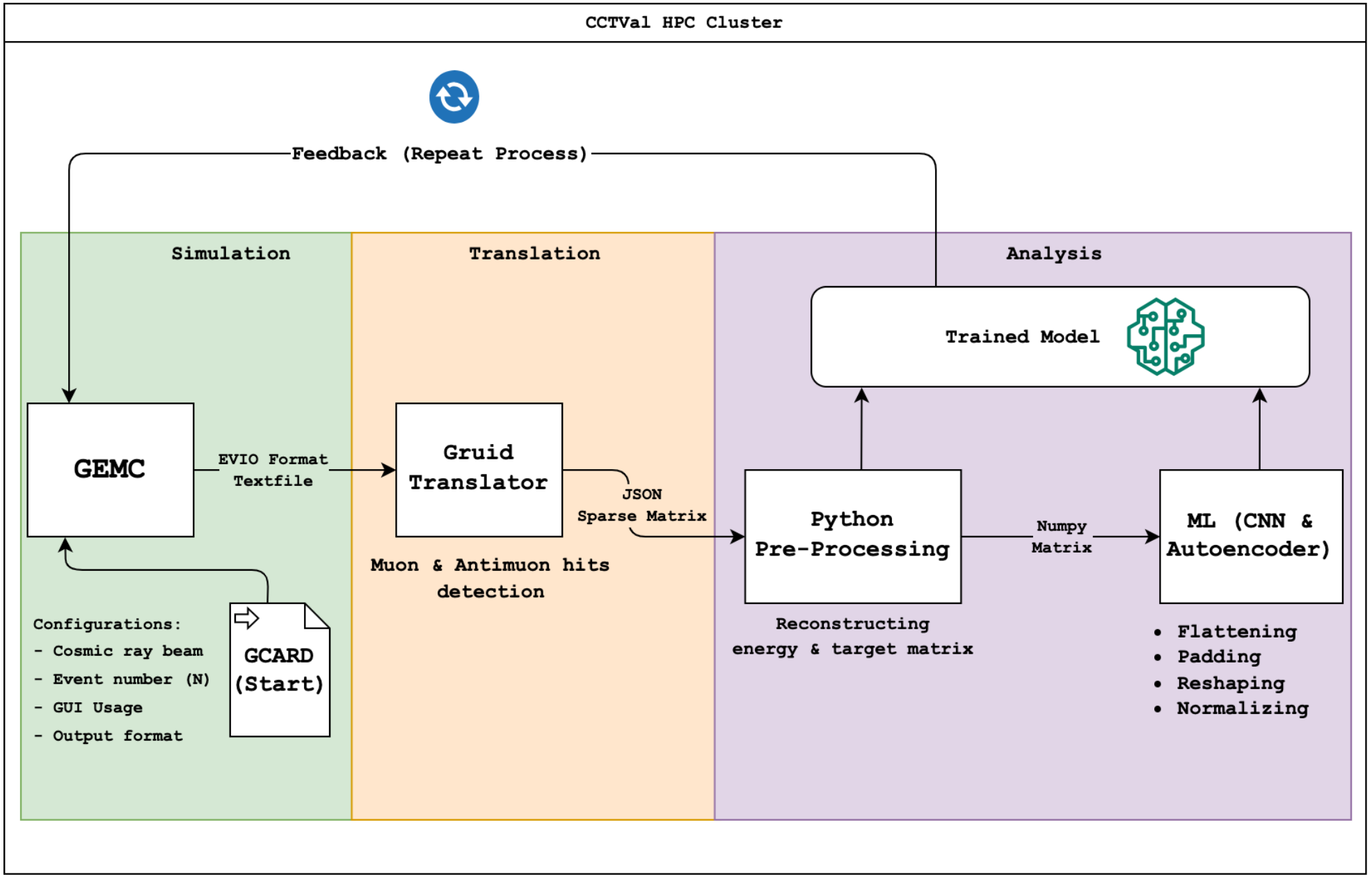
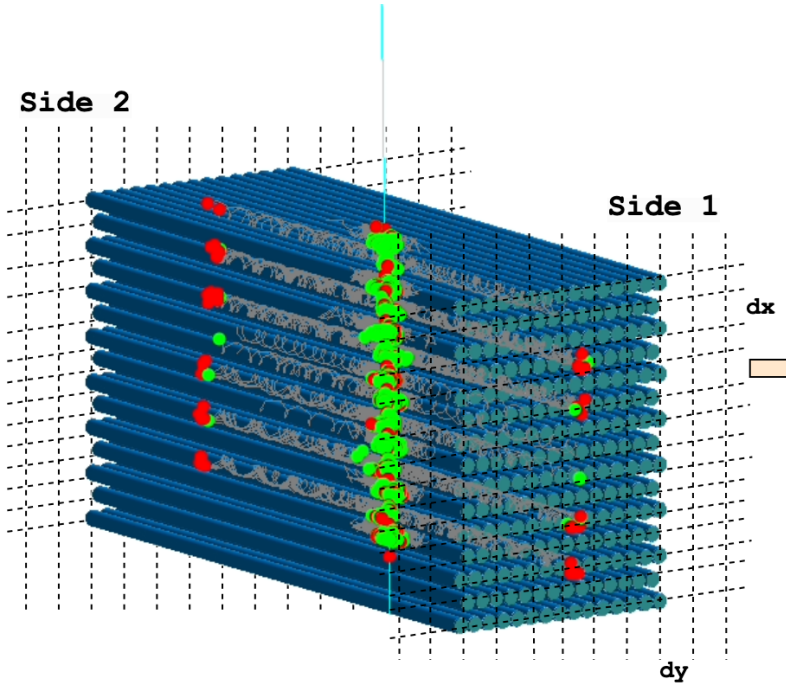
DE VALPARAÍSO

THE BABYCAL - GEMC




CCTVal HPC Cluster
Feedback (Repeat Process)
Simulation
Translation
Analysis
Trained Model
GEMC
EVIO Format
Textfile
Gruid
Translator
JSON
Sparse Matrix
Python
Pre-Processing
Numpy
Matrix
ML (CNN &
Autoencoder)
Muon & Antimuon hits
detection
Reconstructing
energy & target matrix
Configurations:
- Cosmic ray beam
- Event number (N)
- GUI Usage
- Output format
GCARD
(Start)
Flattening
Padding
Reshaping
Normalizing

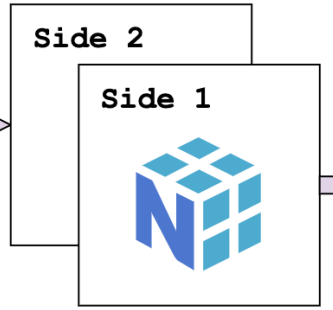
Data Flow Diagram



Simulated BabyCal in GEMC + Gruid Translator Grid

JSON Sparse Matrix

Matrix Reconstruction with Python



Bi-Channel Numpy Matrix (Tensor)

ML

MACHINE LEARNING FOR DATA ANALYSIS

Tasks performed to test the Framework were the following:

Supervised Learning

↓

Particle classification using CNN's for Muons / Antimuons (failed experiment)

Unsupervised Learning

↓

Data reconstruction using Autoencoders for Muons

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