

# **CIDER Workshop report**

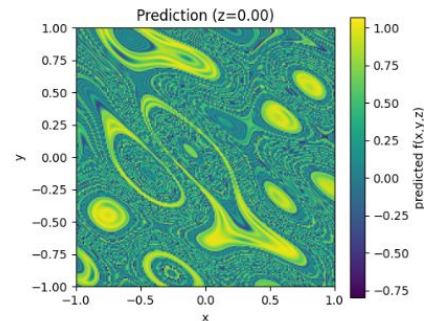
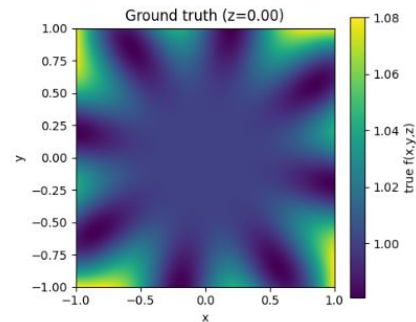
# Getting familiar with SIREN

- Goal during the workshop : getting familiar and use SIREN to include more complicated processes into LUCiD (position dependant water absorption)
- First couple of days : getting familiar with SIREN using the function  $f$  to model a correction of the water absorption length.

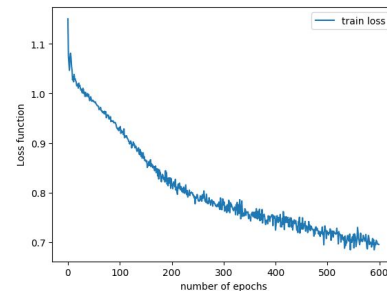
$$f(r, \theta, z) \propto (1 + a \cdot \max(-11, z))(1 + b \cdot r^{\frac{c}{2}})(1 + d \cdot \sin(e \cdot \theta))$$

- Then move on to another another function: PMT acceptance depending on PMT coordinates and angle of incidence.

Horizontal slice of  $f$ .



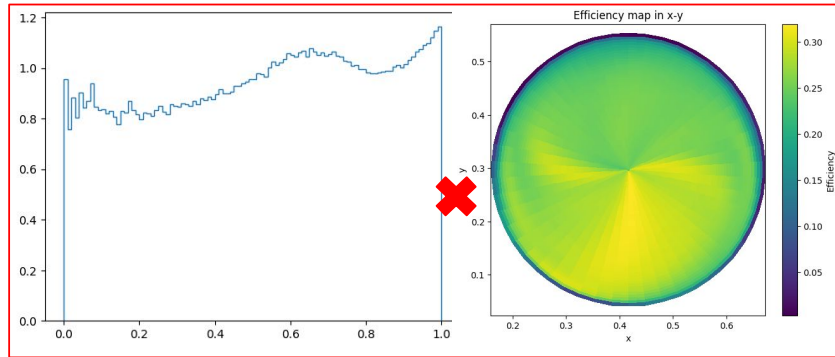
Training loss



# SIREN for PMT acceptance correction : histograms and LUT

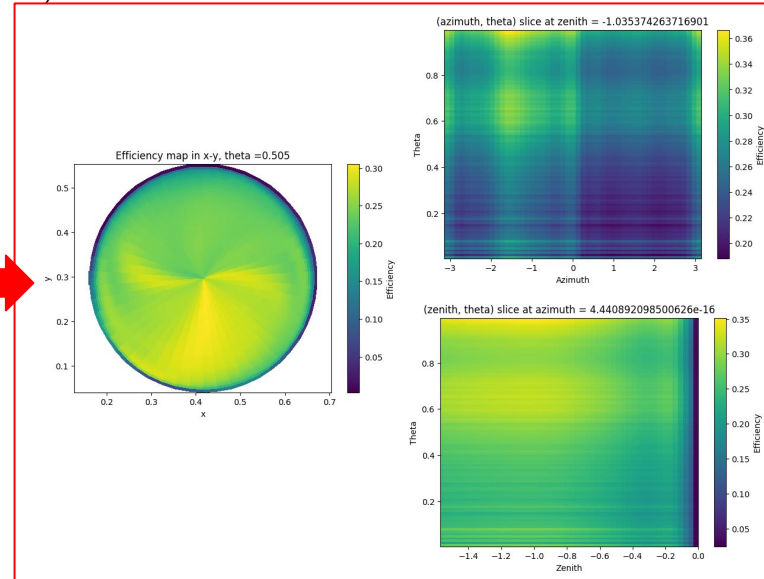
Similar problem in practice but different kind of data : only have access to histograms representing unknown functions instead of a random points from a known function.

$$C_{tot} = C_m(\alpha, \varphi) \times C_{inc}(\cos\theta)$$



1D hist : incidence angle  
dependant C (100  
datapoints)

2D hist : magnetic field  
dependant C(2500  
datapoints)

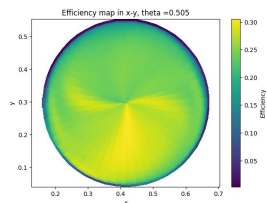


Slices of the 3D LUT

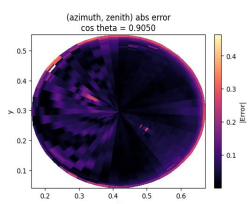
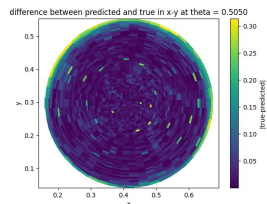
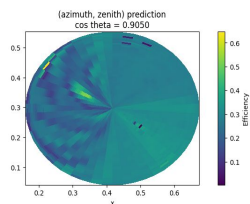
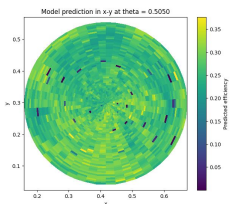
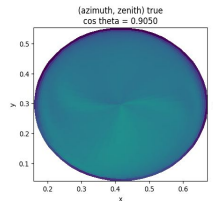
# SIREN for PMT acceptance correction : unsuccessful attempts

## First attempts

Trained on 80% of the data and validating with the 20% remaining.

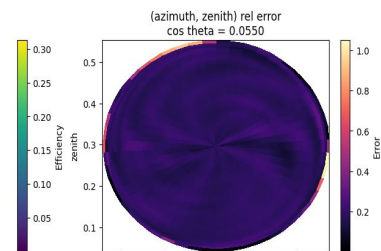
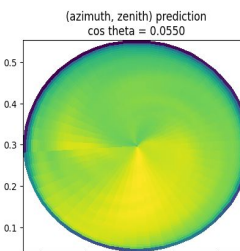
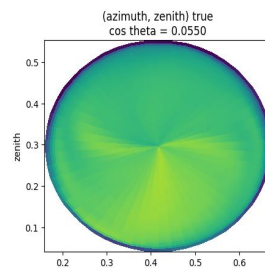


Trained on different random subsets of the table at each epoch



## After fixes

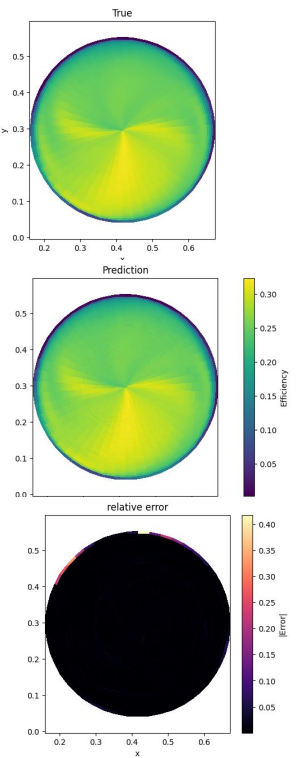
Trained on the whole LUT with corrected normalization



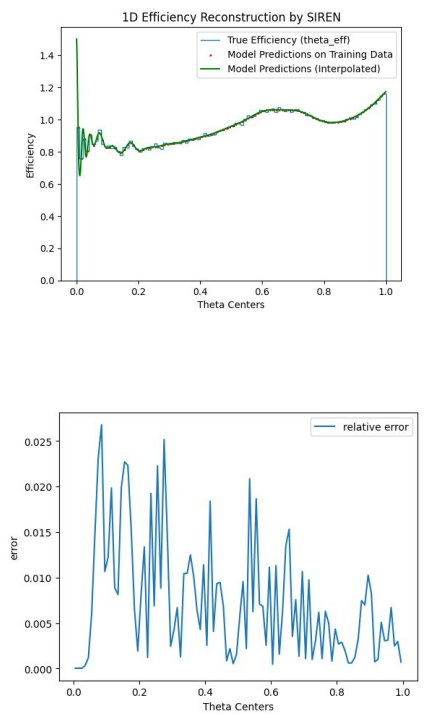
- Now : better results but error still large
- In parallele to that, verify how SIREN works on individual histograms

# SIREN for PMT acceptance correction : Training on the histograms

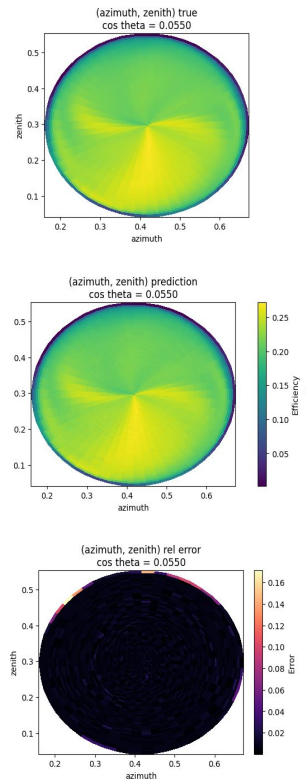
2D histogram prediction, w = 15



1D histogram prediction, w = 7



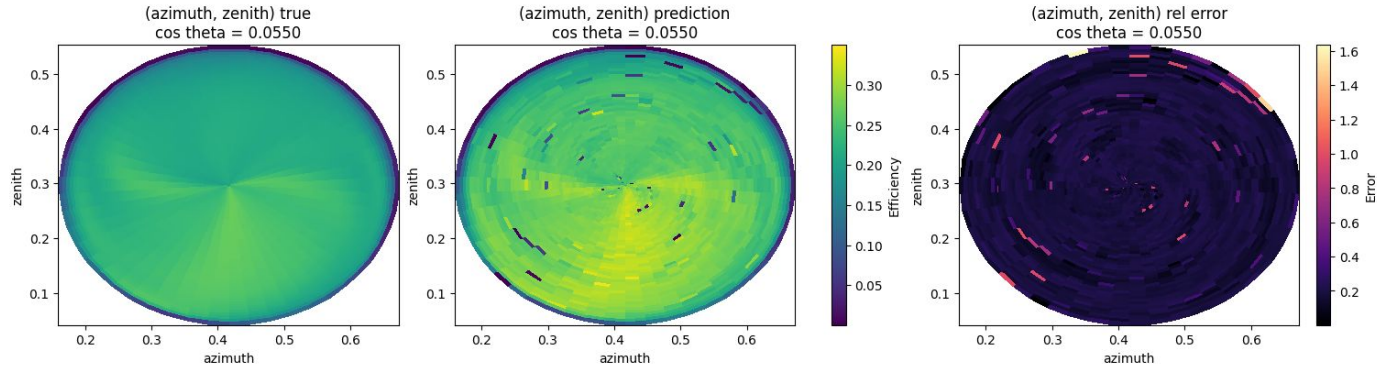
Resulting predicted LUT



- Outputs combined in a predicted LUT to compare with the training on the full LUT.
- Difference with the past attempts : each model was trained with different omega.

# SIREN for PMT acceptance correction : Last attempts

Last try of the workshop : larger model (256 features per layer → 512 features per layer)



Results for larger model trained on the full LUT

- Very high error for now, requires more parameter tuning, and longer training.
- Next : try to use the xy coordinates instead of zenith/azimuth for training