Charge PDF generator network

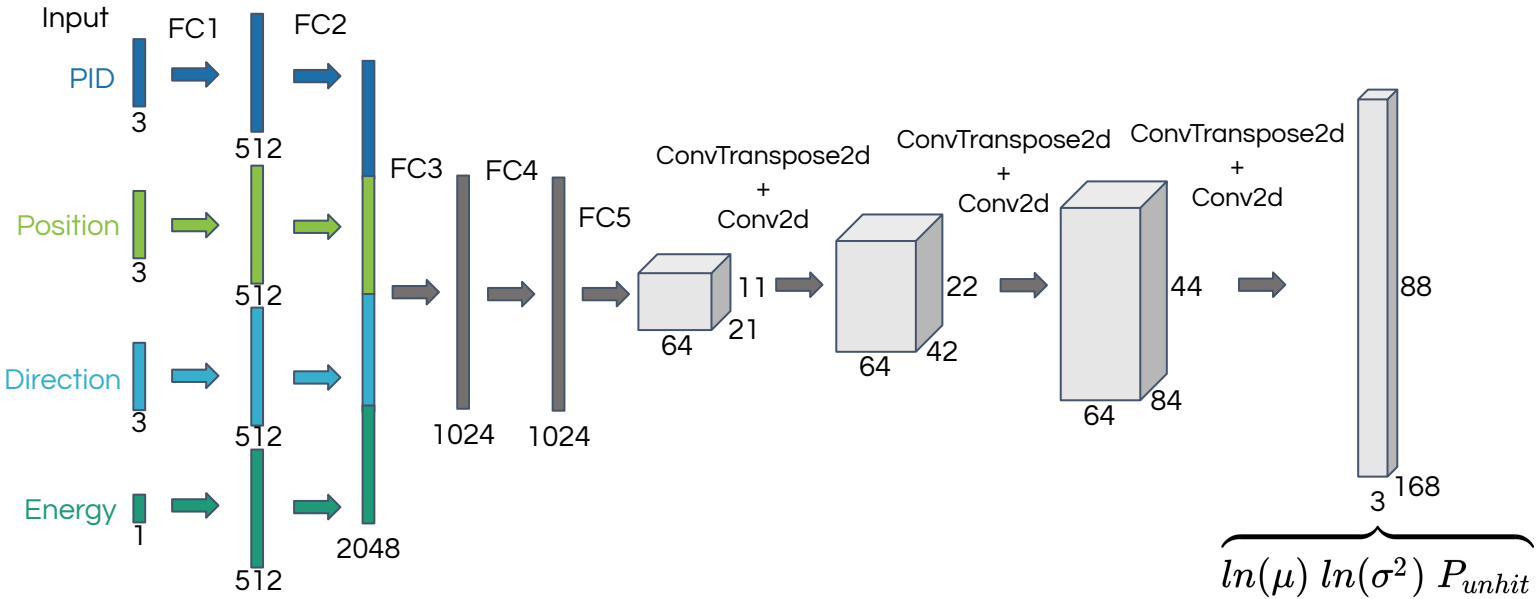
Likelihood functions

SBU water Cherenkov

August 23 2019

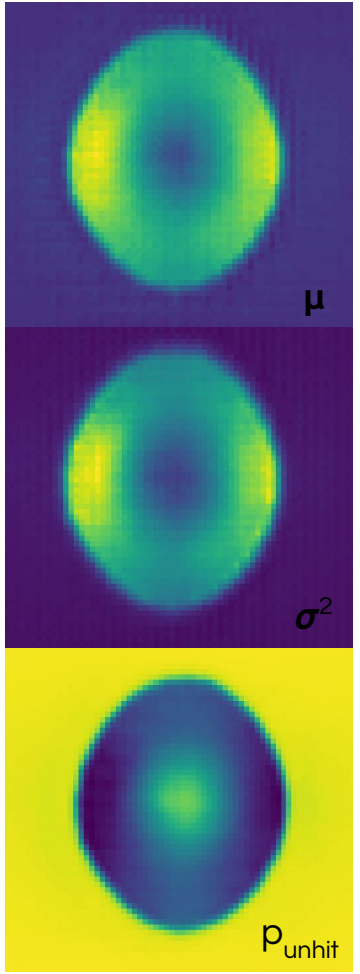
Cristóvão Vilela

Predicting pdfs



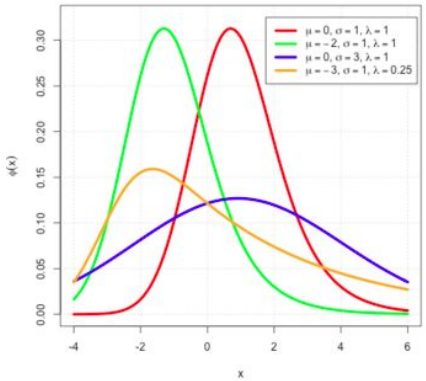
$$\text{Loss} = -ln(\mathcal{L}) = -\sum_{unhit} ln(P_{unhit}) - \sum_{hit} ln(1 - P_{unhit}) - \sum_{hit} \frac{1}{2}\left[ln(2\pi\sigma^2) + \frac{(q_{obs}-\mu)^2}{\sigma^2}\right]$$

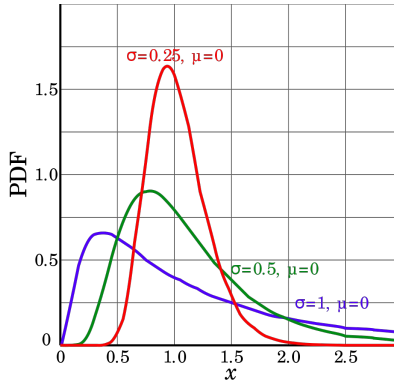
- Prediction is a (Gaussian) charge pdf and hit probability for each PMT.
- Basic building block for FiTQun-like MLE reconstruction!

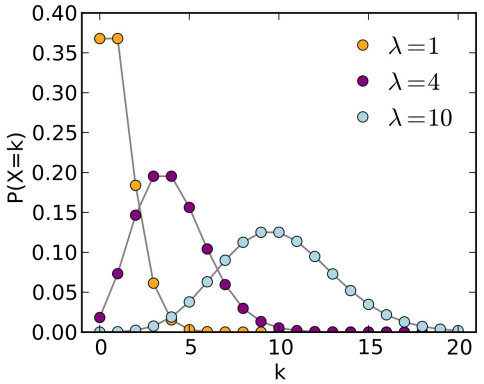


Functional forms

- Gaussian distribution doesn't seem to capture the charge distribution particularly well.
- Try:
  - Exponentially modified gaussian
    - Use approximation for error function
  - Log-normal
  - "Poisson", replace factorial with gamma function for a continuous version
    - Use approximation for gamma function







Function comparison