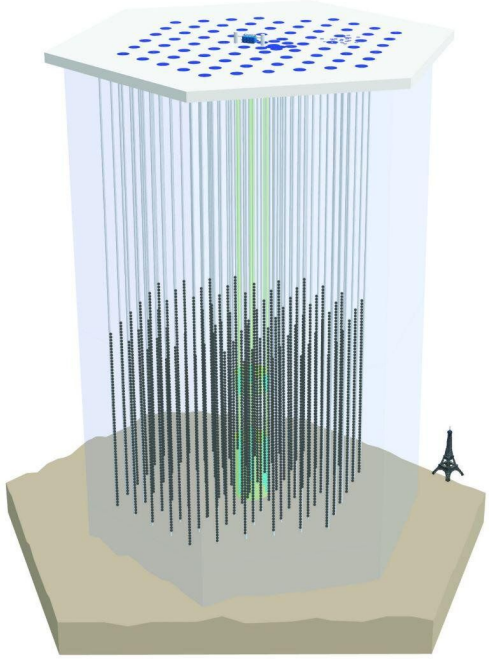
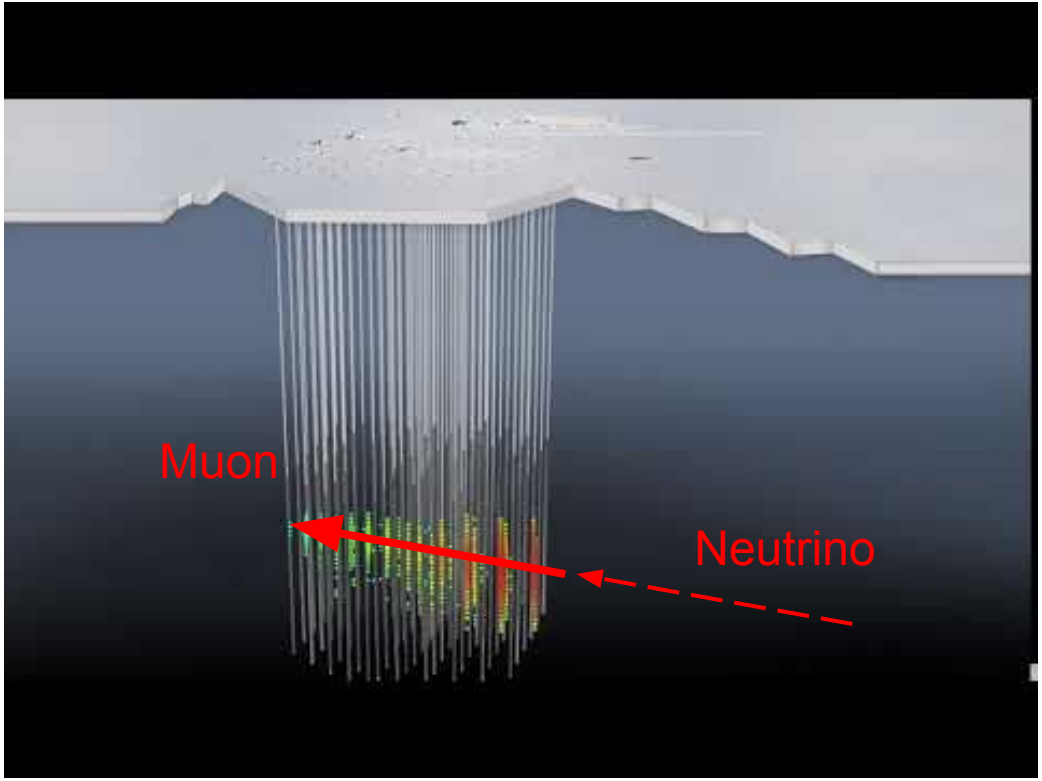
Neutrino dataset inspired by IceCube detector

Icecube: Neutrino detector

In the Antarctic



~ 5000 photo detection units in hexagonal grid



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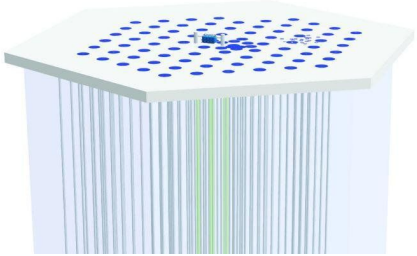
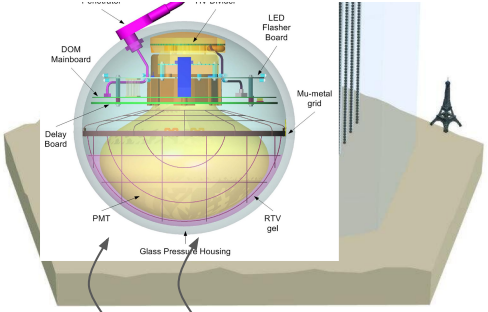
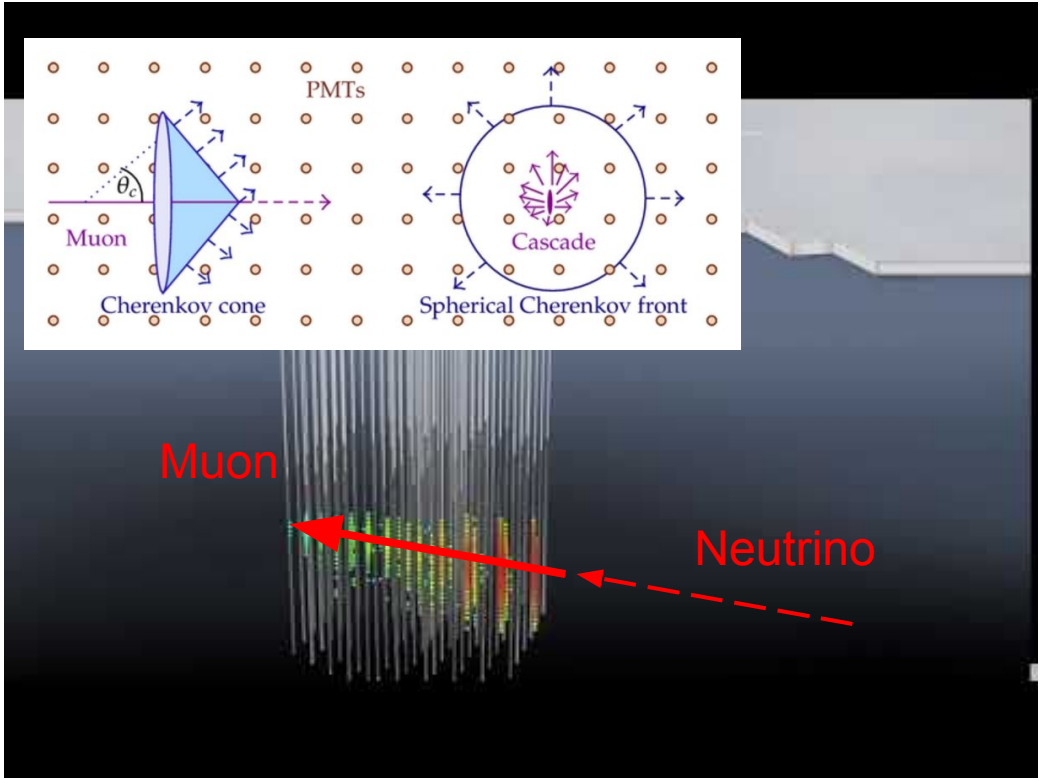


Single photon detection unit



Single photon detection unit



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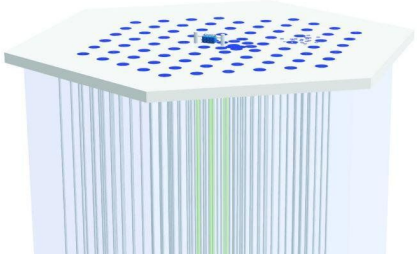
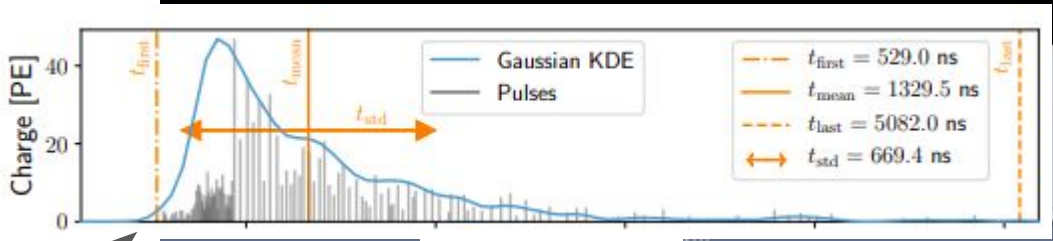
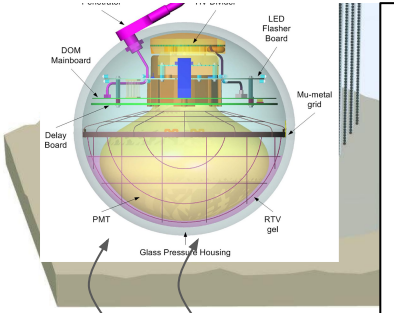


Single photon detection unit





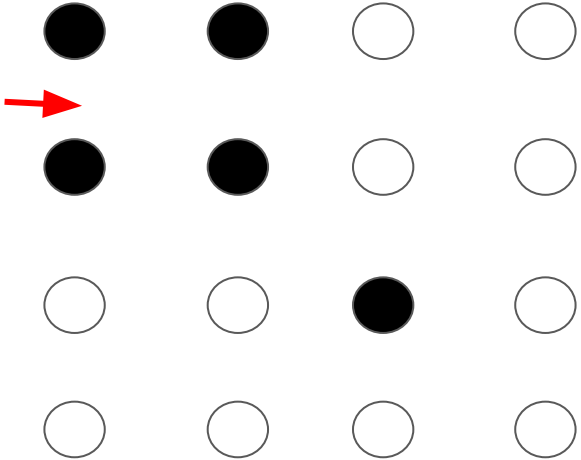
Single photon detection unit

Time distribution
Of photons
In a certain
photon detection
unit

Neutrino dataset inspired by IceCube detector

Pointlike Neutrino
Interaction + light emission

Simplified data: A “2-d” IceCube detector



This example:

5 modules hit

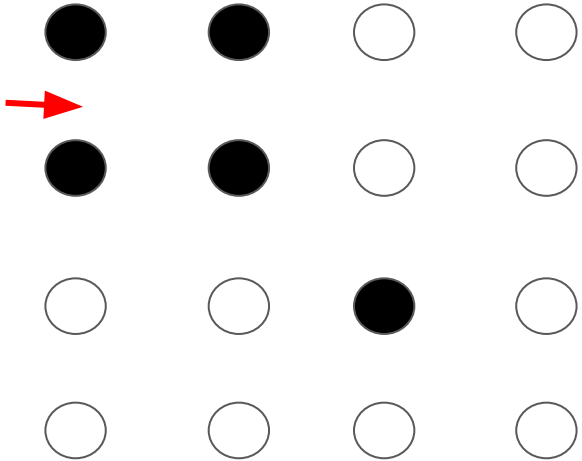
Some modules have multiple photons

Every detected photon is a tuple (t,x,y)

Neutrino dataset inspired by IceCube detector

Pointlike Neutrino
Interaction + light emission

Simplified data: A “2-d” IceCube detector



3 files:
train.pq (200k events)
test.pq (10k events)
val.pq (10k events)

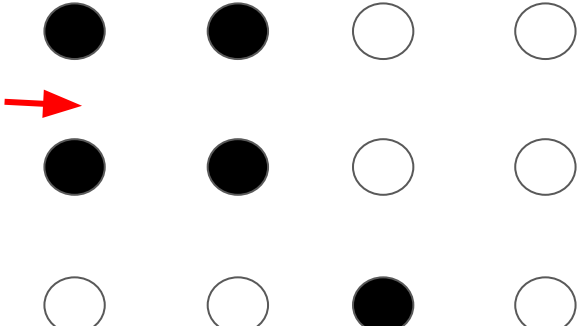
Parquet file format

Awkward arrays (variable size numpy arrays)

Neutrino dataset inspired by IceCube detector

Pointlike Neutrino
Interaction + light emission

Simplified data: A “2-d” IceCube detector



```
In [12]: import awkward

In [13]: test_data=awkward.from_parquet("./test.pq")

In [14]: test_data.fields
Out[14]: ['xpos', 'ypos', 'data', 'energy', 'xdir', 'ydir']

In [15]: test_data["data"][0].to_numpy().shape
Out[15]: (3, 26)

In [16]: test_data["data"][1].to_numpy().shape
Out[16]: (3, 11)

In [17]: test_data["data"][1].to_numpy()
Out[17]:
array([[24.40834723, 22.54650415, 13.88532266, 23.50734604, 19.90020357,
        21.66028218, 24.8793242 , 25.45982752, 18.11971604, 15.59577023,
        16.5988503 ],
       [-0.83333333,  0.83333333,  0.83333333,  0.83333333,  2.5       ,
        -2.5       , -2.5       , -2.5       ,  0.83333333,  2.5       ,
         2.5       ],
       [-2.5       , -0.83333333,  0.83333333,  0.83333333,  0.83333333,
         2.5       ,  2.5       ,  2.5       ,  2.5       ,  2.5       ,
         2.5       ]])
```

Last dimension variable size:
-> event 0 (26)
-> event 1 (11)

Per photon information is 3-d
With (time [ns], xpos [m], ypos[m])