Dimuon Properties for Perfect Events

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NMSU Update
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Neural Network Architecture

- We use the same neural network architechture used in single tracks to extract the dimuon properties.
  - We use classification layer and regression layer;

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* * * * * *     * * * * * * * * * * * * * * *     * * * * * * * * * * * * * * *     * * * * * *
* Input   *     * Classification Layer      *     * Regression layer          *     *         *
* Tensor  * --> * 2 Linear hidden layers    * --> * 3 Linear hidden layers    * --> * Target  *
*         *     * ReLu activation function  *     * ReLu activation function  *     * Tensor  *
* * * * * *     * CrossEntropyLoss          *     * MSELoss                   *     * * * * * *
                * Adam optimizer            *     * Adam optimizer            *
                * * * * * * * * * * * * * * *     * * * * * * * * * * * * * * *

Learning rate: 0.0001
L2 Regularization: 0.00001
```

  - We have to change the input & output tensor features;

```
For dimuons the input is;

[mu[/+, -/], station1[/x, y, z/], station3[/x, y, z/], station1[/px, py, pz], station3[/px, py, pz/]]

Target is;

[dimuon[/x, y, z, px, py, pz, m, pt, x1, x2, xf, costheta, phi/]]
```

Classification and Regression Loss

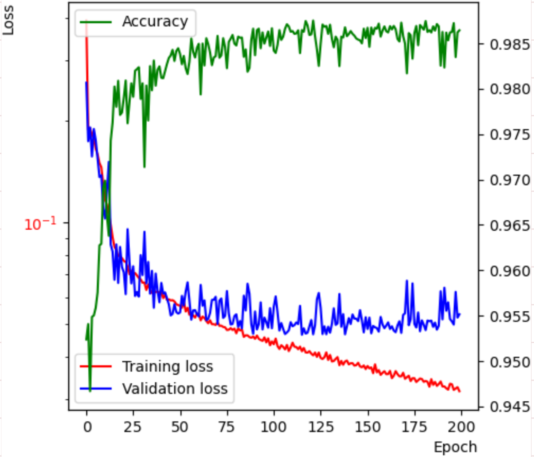

Figure 1: Train, validation classification loss and accuracy score.

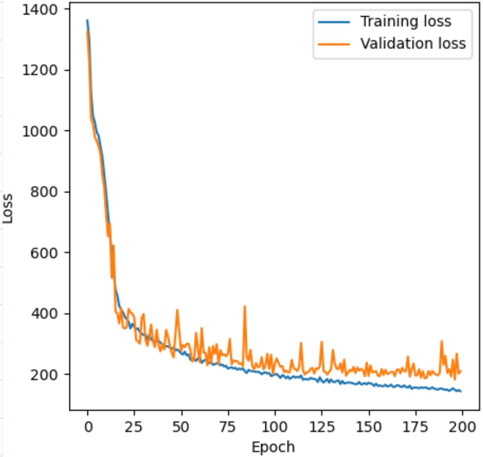

Figure 2: Train , validation regression loss.

Dimuon Properties

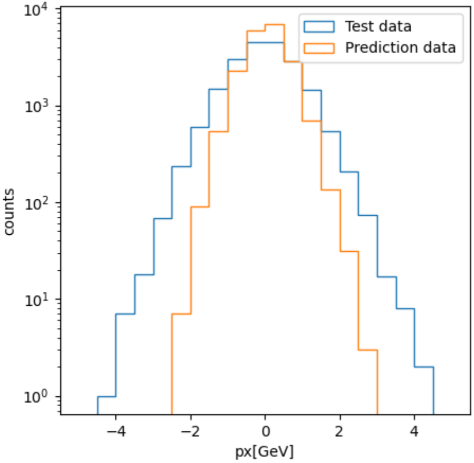

Figure 3: Dimuon px.

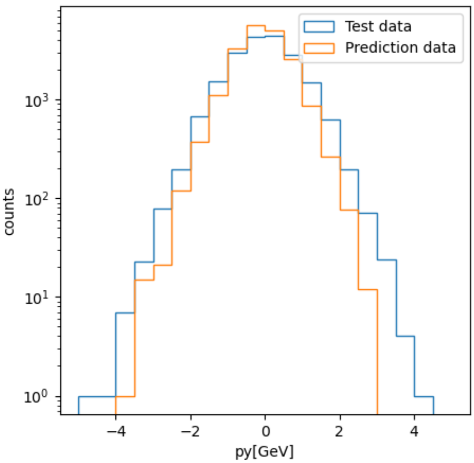

Figure 4: Dimuon py.

Dimuon Properties

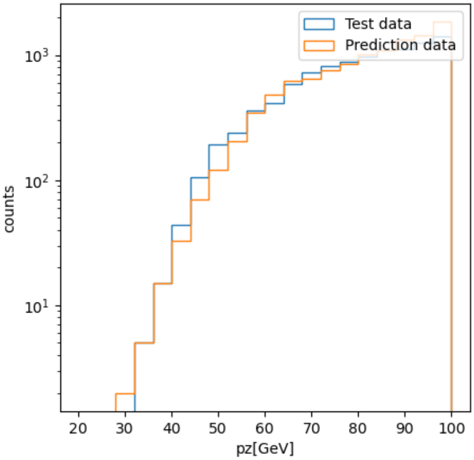

Figure 5: Dimuon pz.

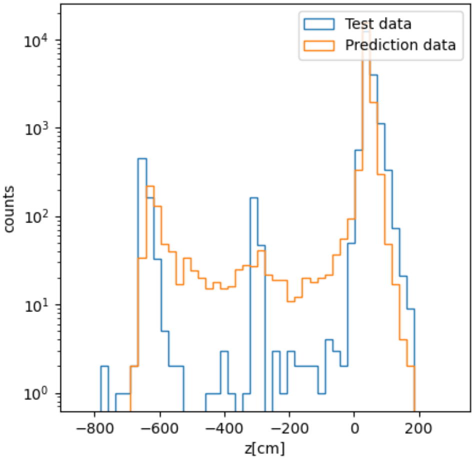

Figure 6: Dimuon z.

Dimuon Properties

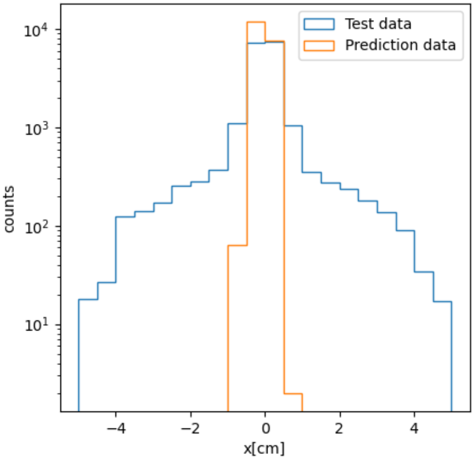

Figure 7: Dimuon x.

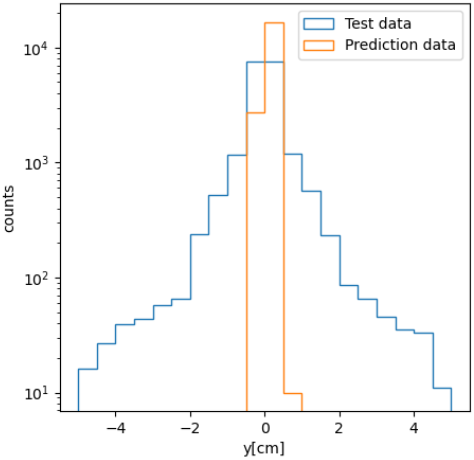

Figure 8: Dimuon y.

Dimuon Properties

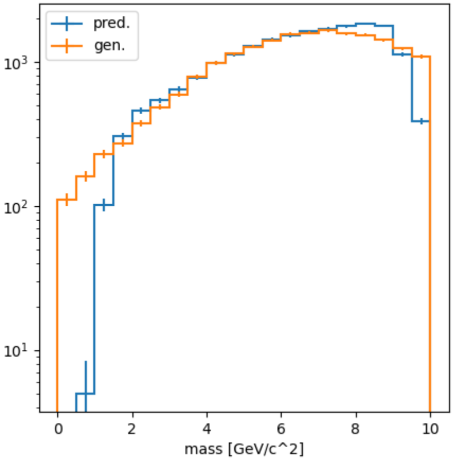

Figure 9: Dimuon mass.

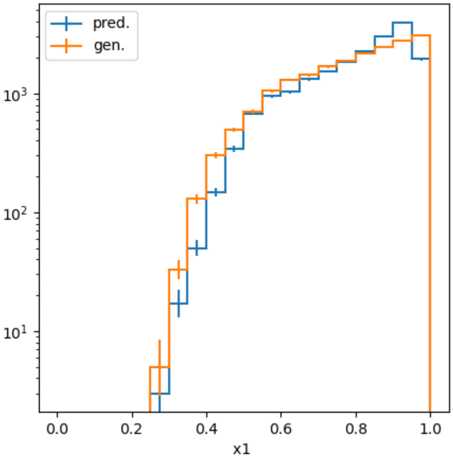

Figure 10: Dimuon x1.

Dimuon Properties

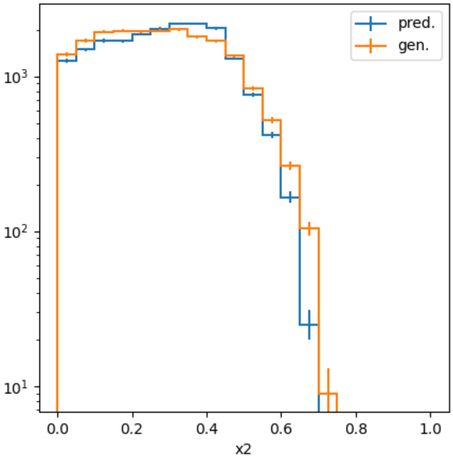

Figure 11: Dimuon x2.

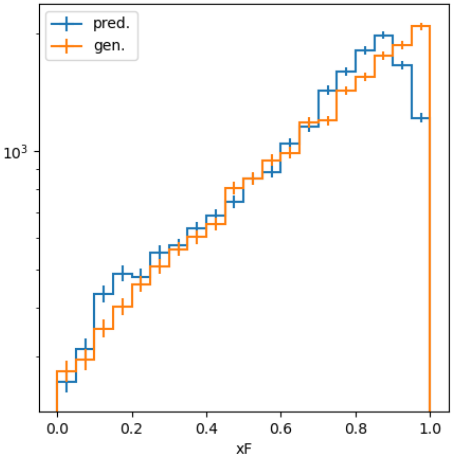

Figure 12: Dimuon xF.

Dimuon Properties

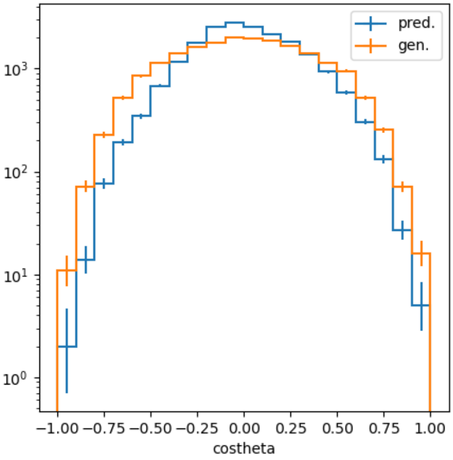

Figure 13: Dimuon costheta.

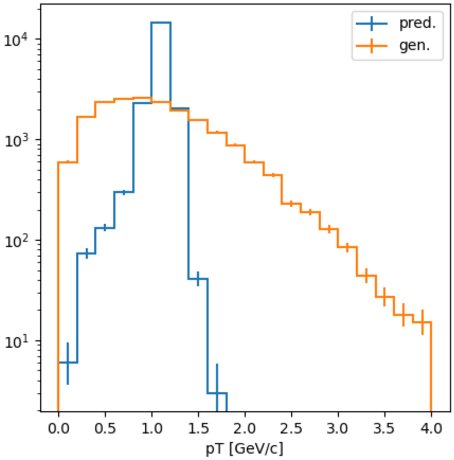

Figure 14: Dimuon pT.

Dimuon Properties

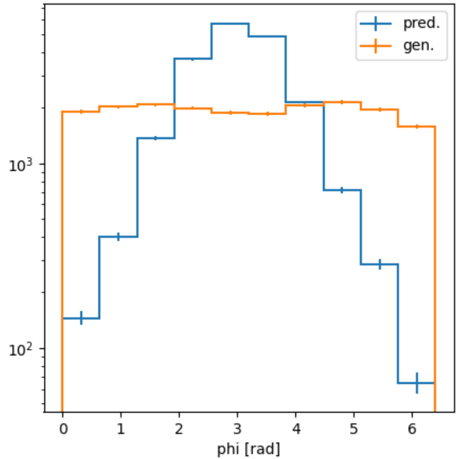

Figure 15: Dimuon phi.

- I'm still trying to figure out how to implement this method to real data. Suggestions ?