
Subject: RhoError class in pandaroot

Posted by [Elisabetta Prencipe \(2\)](#) on Tue, 03 Jun 2014 09:52:08 GMT

[View Forum Message](#) <> [Reply to Message](#)

Dear Ralf, dear rho-developers,

I have a question how to evaluate the error of the momentum, position, theta, phi, distributions using rho candidates and rho lists, and I am wondering if below is the best way how to proceed. For example, if I want to evaluate the pull of quantities like momentum, or theta and phi, I need information about the reco variables (easy), the true value (easy) and the error distributions. I see that in RhoMath/ the information about the covariance error matrix is accessible. So I could write:

```
while (theAnalysis->GetEvent() && i++<nevt)
{
    theAnalysis->FillList(muminus, "MuonAllMinus");

    for (j=0;j<muminus.GetLength();++j)
    {
        // reco variables
        hmomtrk->Fill(muminus[j]->P());
        hthtrk->Fill(muminus[j]->P4().Theta());
        hphitrk->Fill(muminus[j]->P4().Phi());

        // error matrix : variance
        RhoError tempvar = muminus[j]->Cov7(); //variance of 7 parameters: x,y,z,px,py,pz,E
        double var_px = tempvar(3,3);
        double var_py = tempvar(4,4);
        double var_pz = tempvar(5,5);
        double var_energy = tempvar(6,6);
    }
}
```

This should give me access to the variance of px, py, pz, energy. Am I correct? Sqrt() of what I get from here should deliver the error distribution of px, py, pz, E. Now my question is: is this the way to proceed to get the error distributions? and what about Theta() and Phi()? Should I combine, then, the information which I obtain, and get the error distribution for the angular variables? or is there a smarter way/function implemented to obtain the error distribution of kinematic variables, in pandaroot?

Thank you for your help,

Elisabetta

Subject: Re: RhoError class in pandaroot

Posted by [Ralf Kliemt](#) on Tue, 03 Jun 2014 09:57:16 GMT

[View Forum Message](#) <> [Reply to Message](#)

Hi Elisabetta,

The RhoCandidate stores the 4-momentum and its covariance matrix in the coordinates of (px, py, pz, e). The covariance is a "RhoError" type, which inherits from TMatrixD. The diagonal elements contain σ^2 of the corresponding coordinate. If you want to get some error and pull distributions, you can do something like that:

```
for (j=0;j<muplus.GetLength();++j)
{
    TLorentzVector lv=muplus[j]->P4();
    RhoError lvCov=muplus[j]->P4Cov();
    hpullpx->Fill( ( lv.Px() - lvmc.Px() ) / sqrt( lvCov[0][0] ) );
    hpullpy->Fill( ( lv.Py() - lvmc.Py() ) / sqrt( lvCov[1][1] ) );
    hpullpz->Fill( ( lv.Pz() - lvmc.Pz() ) / sqrt( lvCov[2][2] ) );
    hpulle->Fill( ( lv.E() - lvmc.E() ) / sqrt( lvCov[3][3] ) );
}
```

If you need the other coordinates, you would have to convert that error matrix to those coordinates.

Cheers
Ralf

Subject: Re: RhoError class in pandaroot

Posted by [Elisabetta Prencipe \(2\)](#) on Tue, 03 Jun 2014 11:12:08 GMT

[View Forum Message](#) <> [Reply to Message](#)

Hi Ralf,

thank you for your reply. So you confirm that for additional (basic) kinematic variables nothing is already implemented. Then, I will do myself. no problem!

So, instead of Cov7(), you suggest the use of P4Cov(), where:

cov[0][0] is the variance for px
cov[1][1] is the variance for py
cov[2][2] is the variance for pz
cov[3][3] is the variance for E

Actually I checked, and I found that if I use Cov7(), and I evaluate cov[3][3], cov[4][4], cov[5][5] and cov[6][6],

or

if I use P4Cov(), as you suggested, to evaluate the variance of px,py,pz,E respectively, as

indicated in my previous posting, results are identical, as expected. This is the output for the px variance, if I run in my macro Cov7(3,3) left side, or P4Cov(0,0) right side.

4.7454e-05, 4.7454e-05
7.9324e-05, 7.9324e-05
0.00021817, 0.00021817
0.000140595, 0.000140595
1.7677e-05, 1.7677e-05
0.000121126, 0.000121126
0.000230273, 0.000230273
0.000486443, 0.000486443
2.26079e-05, 2.26079e-05
1.85428e-05, 1.85428e-05
0.000152567, 0.000152567

cheers, Elisabetta
