h TopDileptonReconstruction.h 7.59 KiB

```
#ifndef TopDileptonReconstruction_h
#define TopDileptonReconstruction_h
#include <iostream>

#include "TObject.h"
#include "TRandom3.h"
#include "TLorentzVector.h"
#include <assert.h>
#include "Math/VectorUtil.h"
#include <Math/Polynomial.h>
#include <TMatrix.h>
#include <TMatrixD.h>
#include <TArrayD.h>
#include <TMatrixDEigen.h>
#include <TMath.h>
#include <TLorentzVector.h>
#include <TVector3.h>
#include <stdio.h>
#include <stdlib.h>
#include <TVector3.h>

//namespace top{

class TopDileptonReconstruction {
  //ClassDef(top::TopDileptonReconstruction,1);
private:

  std::vector<TLorentzVector> m_NW_tops;
  std::vector<TLorentzVector> m_EM_tops;
  std::vector<TLorentzVector> m_SN_tops;
  std::vector<TLorentzVector> m_NW_tbars;
  std::vector<TLorentzVector> m_EM_tbars;
  std::vector<TLorentzVector> m_SN_tbars;
  std::vector<TLorentzVector> m_NW_nus;
  std::vector<TLorentzVector> m_EM_nus;
  std::vector<TLorentzVector> m_SN_nus;
  std::vector<TLorentzVector> m_NW_nubars;
  std::vector<TLorentzVector> m_EM_nubars;
  std::vector<TLorentzVector> m_SN_nubars;
  std::vector<TLorentzVector> m_NW_Wposs;
  std::vector<TLorentzVector> m_EM_Wposs;
  std::vector<TLorentzVector> m_SN_Wposs;
  std::vector<TLorentzVector> m_NW_Wnegs;
  std::vector<TLorentzVector> m_EM_Wnegs;
  std::vector<TLorentzVector> m_SN_Wnegs;

  std::vector<double> m_NW_weights;

  TLorentzVector m_NW_highestWeightTop;
  TLorentzVector m_NW_highestWeightTbar;
  TLorentzVector m_EM_averageTop;
  TLorentzVector m_EM_averageTbar;
  TLorentzVector m_SN_averageTop;
  TLorentzVector m_SN_averageTbar;

  TLorentzVector m_NW_highestWeightNu;
  TLorentzVector m_NW_highestWeightNubar;
  TLorentzVector m_EM_averageNu;
  TLorentzVector m_EM_averageNubar;
  TLorentzVector m_SN_averageNu;
  TLorentzVector m_SN_averageNubar;

  TLorentzVector m_NW_highestWeightWpos;
  TLorentzVector m_NW_highestWeightWneg;
  TLorentzVector m_EM_averageWpos;
  TLorentzVector m_EM_averageWneg;
  TLorentzVector m_SN_averageWpos;
  TLorentzVector m_SN_averageWneg;

  TRandom3 m_random;
  bool doNW;
  bool doNWfull;
  bool doEM;
  bool doSN;

  double NWhighestWeight;

```



```
public:

  virtual ~TopDileptonReconstruction();
  TopDileptonReconstruction();

  void Reconstruct(TLorentzVector lepton_pos,
                   TLorentzVector lepton_neg,
                   TLorentzVector b,
                   TLorentzVector bbar,
                   double met_ex,
                   double met_ey,
                   double mtop,
                   double mtbar,
                   double mWpos,
                   double mWneg);

  void ReconstructNW(TLorentzVector lepton_pos,
                     TLorentzVector lepton_neg,
                     TLorentzVector b,
                     TLorentzVector bbar,
                     double met_ex,
                     double met_ey,
                     double mtop,
                     double mtbar,
                     double mWpos,
                     double mWneg);

  void ReconstructEM(TLorentzVector lepton_pos,
                     TLorentzVector lepton_neg,
                     TLorentzVector b,
                     TLorentzVector bbar,
                     double met_ex,
                     double met_ey,
                     double mtop,
                     double mtbar,
                     double mWpos,
                     double mWneg);

  void ReconstructSN(TLorentzVector lepton_pos,
                     TLorentzVector lepton_neg,
                     TLorentzVector b,
                     TLorentzVector bbar,
                     double met_ex,
                     double met_ey,
                     double mtop,
                     double mtbar,
                     double mWpos,
                     double mWneg);

  double NW_get_weight(TLorentzVector nu1,
                       TLorentzVector nu2,
                       double met_ex,
                       double met_ey);

  std::vector<TLorentzVector> NW_solveForNeutrinoEta(TLorentzVector* lepton,
                                                     TLorentzVector* bJet,
                                                     double nu_eta,
                                                     double mtop,
                                                     double mW);

  std::vector<TMatrixD> EM_getNeutrinoEllipse(TLorentzVector& bjet,
                                              TLorentzVector& lepton,
                                              double& mW,
                                              double& mNu);

  bool EM_cmp(std::pair<Double_t,TVectorD> kv1,
              std::pair<Double_t,TVectorD> kv2);

  std::vector<TVectorD> EM_intersect_ell_ell(TMatrixD A, TMatrixD B);
  std::vector<TVectorD> EM_intersect_ell_line(TMatrixD E, TVectorD L, std::vector<Double_t> &kv);
  Double_t EM_cofactor(TMatrixD A, int row, int col);
  TMatrixD EM_rotationMatrix(int axis, double angle);
  std::vector<TVectorD> EM_factor_degenerate(TMatrixD G);


  std::vector<TLorentzVector> GetNWTops(){ return m_NW_tops;};
  std::vector<TLorentzVector> GetNWTbars(){return m_NW_tbars;};
  std::vector<TLorentzVector> GetEMTops(){ return m_EM_tops;};
  std::vector<TLorentzVector> GetEMTbars(){return m_EM_tbars;};
```

```
158   std::vector<TLorentzVector> GetSNTops(){ return m_SN_tops;};
159   std::vector<TLorentzVector> GetSNTbars(){return m_SN_tbars;};
160
161   std::vector<TLorentzVector> GetNWNus(){   return m_NW_nus;};
162   std::vector<TLorentzVector> GetNWNubars(){return m_NW_nubars;};
163   std::vector<TLorentzVector> GetEMNus(){   return m_EM_nus;};
164   std::vector<TLorentzVector> GetEMNubars(){return m_EM_nubars;};
165   std::vector<TLorentzVector> GetSNNus(){   return m_SN_nus;};
166   std::vector<TLorentzVector> GetSNNubars(){return m_SN_nubars;};
167
168   std::vector<TLorentzVector> GetNWWposs(){return m_NW_Wposs;};
169   std::vector<TLorentzVector> GetNWWnegs(){return m_NW_Wnegs;};
170   std::vector<TLorentzVector> GetEMWposs(){return m_EM_Wposs;};
171   std::vector<TLorentzVector> GetEMWnegs(){return m_EM_Wnegs;};
172   std::vector<TLorentzVector> GetSNWposs(){return m_SN_Wposs;};
173   std::vector<TLorentzVector> GetSNWnegs(){return m_SN_Wnegs;};
174
175   std::vector<double> GetNWweights(){return m_NW_weights;};
176   double GetNWweight(){return NWhighestWeight;};
177
178   TLorentzVector GetNWTop(){   return m_NW_highestWeightTop;};
179   TLorentzVector GetNWTbar(){  return m_NW_highestWeightTbar;};
180   TLorentzVector GetEMTop(){   return m_EM_averageTop;};
181   TLorentzVector GetEMTbar(){  return m_EM_averageTbar;};
182   TLorentzVector GetSNTop(){   return m_SN_averageTop;};
183   TLorentzVector GetSNTbar(){  return m_SN_averageTbar;};
184
185   TLorentzVector GetNWNu(){    return m_NW_highestWeightNu;};
186   TLorentzVector GetNWNubar(){ return m_NW_highestWeightNubar;};
187   TLorentzVector GetEMNu(){    return m_EM_averageNu;};
188   TLorentzVector GetEMNubar(){ return m_EM_averageNubar;};
189   TLorentzVector GetSNNu(){    return m_SN_averageNu;};
190   TLorentzVector GetSNNubar(){ return m_SN_averageNubar;};
191
192   TLorentzVector GetNWWpos(){  return m_NW_highestWeightWpos;};
193   TLorentzVector GetNWWneg(){  return m_NW_highestWeightWneg;};
194   TLorentzVector GetEMWpos(){  return m_EM_averageWpos;};
195   TLorentzVector GetEMWneg(){  return m_EM_averageWneg;};
196   TLorentzVector GetSNWpos(){  return m_SN_averageWpos;};
197   TLorentzVector GetSNWneg(){  return m_SN_averageWneg;};
198
199   void RunNW(){doNW = true;};
200   void RunEM(){doEM = true;};
201   void RunSN(){doSN = true;};
202
203   TLorentzVector Average(std::vector<TLorentzVector> vecs);
204
205   //virtual ~NeutrinoWeighter()=0;
206 };
207
208 bool EM_cmp(std::pair<Double_t,TVectorD> kv1, std::pair<Double_t,TVectorD> kv2);
209
210
211
212 #endif
213
214
215
```