h TopDileptonReconstruction.h 8.85 KiB

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#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>
#include "TH1F.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_EM_lowestMassTop;
  TLorentzVector m_EM_lowestMassTbar;
  TLorentzVector m_SN_averageTop;
  TLorentzVector m_SN_averageTbar;
  TLorentzVector m_SN_lowestMassTop;
  TLorentzVector m_SN_lowestMassTbar;

  TLorentzVector m_NW_highestWeightNu;
  TLorentzVector m_NW_highestWeightNubar;
  TLorentzVector m_EM_averageNu;
  TLorentzVector m_EM_averageNubar;
  TLorentzVector m_EM_lowestMassNu;
  TLorentzVector m_EM_lowestMassNubar;
  TLorentzVector m_SN_averageNu;
  TLorentzVector m_SN_averageNubar;
  TLorentzVector m_SN_lowestMassNu;
  TLorentzVector m_SN_lowestMassNubar;

  TLorentzVector m_NW_highestWeightWpos;
  TLorentzVector m_NW_highestWeightWneg;
  TLorentzVector m_EM_averageWpos;
  TLorentzVector m_EM_averageWneg;
  TLorentzVector m_EM_lowestMassWpos;
  TLorentzVector m_EM_lowestMassWneg;
  TLorentzVector m_SN_averageWpos;
  TLorentzVector m_SN_averageWneg;
  TLorentzVector m_SN_lowestMassWpos;
  TLorentzVector m_SN_lowestMassWneg;

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

  double NWhighestWeight;
  double EMlowestMass;
  double SNlowestMass;

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);

  void Reset();

  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& mtop,
```


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https://gitlab.cern.ch/atlasphys-top/reco/topcommondilepton/-/blob/master/TopCommonDilepton/TopDileptonReconstruction.h 3/5

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                                        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;};
std::vector<TLorentzVector> GetSNTops(){ return m_SN_tops;};
std::vector<TLorentzVector> GetSNTbars(){return m_SN_tbars;};

std::vector<TLorentzVector> GetNWNus(){   return m_NW_nus;};
std::vector<TLorentzVector> GetNWNubars(){return m_NW_nubars;};
std::vector<TLorentzVector> GetEMNus(){   return m_EM_nus;};
std::vector<TLorentzVector> GetEMNubars(){return m_EM_nubars;};
std::vector<TLorentzVector> GetSNNus(){   return m_SN_nus;};
std::vector<TLorentzVector> GetSNNubars(){return m_SN_nubars;};

std::vector<TLorentzVector> GetNWWposs(){return m_NW_Wposs;};
std::vector<TLorentzVector> GetNWWnegs(){return m_NW_Wnegs;};
std::vector<TLorentzVector> GetEMWposs(){return m_EM_Wposs;};
std::vector<TLorentzVector> GetEMWnegs(){return m_EM_Wnegs;};
std::vector<TLorentzVector> GetSNWposs(){return m_SN_Wposs;};
std::vector<TLorentzVector> GetSNWnegs(){return m_SN_Wnegs;};

std::vector<double> GetNWweights(){return m_NW_weights;};
double GetNWweight(){return NWhighestWeight;};

TLorentzVector GetNWTop(){   return m_NW_highestWeightTop;};
TLorentzVector GetNWTbar(){  return m_NW_highestWeightTbar;};
/*TLorentzVector GetEMTop(){   return m_EM_averageTop;};
TLorentzVector GetEMTbar(){  return m_EM_averageTbar;};
TLorentzVector GetSNTop(){   return m_SN_averageTop;};
TLorentzVector GetSNTbar(){  return m_SN_averageTbar;};*/
TLorentzVector GetEMTop(){   return m_EM_lowestMassTop;};
TLorentzVector GetEMTbar(){  return m_EM_lowestMassTbar;};
TLorentzVector GetSNTop(){   return m_SN_lowestMassTop;};
TLorentzVector GetSNTbar(){  return m_SN_lowestMassTbar;};


TLorentzVector GetNWNu(){    return m_NW_highestWeightNu;};
TLorentzVector GetNWNubar(){ return m_NW_highestWeightNubar;};
/*TLorentzVector GetEMNu(){    return m_EM_averageNu;};
TLorentzVector GetEMNubar(){ return m_EM_averageNubar;};
```