

h TopDileptonReconstruction.h 8.85 KiB

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1  #ifndef TopDileptonReconstruction_h
2  #define TopDileptonReconstruction_h
3  #include <iostream>
4
5  #include "TObject.h"
6  #include "TRandom3.h"
7  #include "TLorentzVector.h"
8  #include <assert.h>
9  #include "Math/VectorUtil.h"
10 #include <Math/Polynomial.h>
11 #include <TMatrix.h>
12 #include <TMatrixD.h>
13 #include <TArrayD.h>
14 #include <TMatrixDEigen.h>
15 #include <TMath.h>
16 #include <TLorentzVector.h>
17 #include <TVector3.h>
18 #include <stdio.h>
19 #include <stdlib.h>
20 #include <TVector3.h>
21 #include "TH1F.h"
22
23 //namespace top{
24
25 class TopDileptonReconstruction {
26     //ClassDef(top::TopDileptonReconstruction,1);
27 private:
28
29     std::vector<TLorentzVector> m_NW_tops;
30     std::vector<TLorentzVector> m_EM_tops;
31     std::vector<TLorentzVector> m_SN_tops;
32     std::vector<TLorentzVector> m_NW_tbars;
33     std::vector<TLorentzVector> m_EM_tbars;
34     std::vector<TLorentzVector> m_SN_tbars;
35     std::vector<TLorentzVector> m_NW_nus;
36     std::vector<TLorentzVector> m_EM_nus;
37     std::vector<TLorentzVector> m_SN_nus;
38     std::vector<TLorentzVector> m_NW_nubars;
39     std::vector<TLorentzVector> m_EM_nubars;
40     std::vector<TLorentzVector> m_SN_nubars;
41     std::vector<TLorentzVector> m_NW_Wpos;
42     std::vector<TLorentzVector> m_EM_Wpos;
43     std::vector<TLorentzVector> m_SN_Wpos;
44     std::vector<TLorentzVector> m_NW_Wneg;
45     std::vector<TLorentzVector> m_EM_Wneg;
46     std::vector<TLorentzVector> m_SN_Wneg;
47
48     std::vector<double> m_NW_weights;
49
50     TLorentzVector m_NW_highestWeightTop;
51     TLorentzVector m_NW_highestWeightTbar;
52     TLorentzVector m_EM_averageTop;
53     TLorentzVector m_EM_averageTbar;
54     TLorentzVector m_EM_lowestMassTop;
55     TLorentzVector m_EM_lowestMassTbar;
56     TLorentzVector m_SN_averageTop;
57     TLorentzVector m_SN_averageTbar;
58     TLorentzVector m_SN_lowestMassTop;
59     TLorentzVector m_SN_lowestMassTbar;
60
61     TLorentzVector m_NW_highestWeightNu;
62     TLorentzVector m_NW_highestWeightNubar;
63     TLorentzVector m_EM_averageNu;
64     TLorentzVector m_EM_averageNubar;
65     TLorentzVector m_EM_lowestMassNu;
66     TLorentzVector m_EM_lowestMassNubar;
67     TLorentzVector m_SN_averageNu;
68     TLorentzVector m_SN_averageNubar;
69     TLorentzVector m_SN_lowestMassNu;
70     TLorentzVector m_SN_lowestMassNubar;
71
72     TLorentzVector m_NW_highestWeightWpos;
73     TLorentzVector m_NW_highestWeightWneg;
74     TLorentzVector m_EM_averageWpos;
75     TLorentzVector m_EM_averageWneg;
76     TLorentzVector m_EM_lowestMassWpos;
77     TLorentzVector m_EM_lowestMassWneg;

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78 TLorentzVector m_SN_averageWpos;
79 TLorentzVector m_SN_averageWneg;
80 TLorentzVector m_SN_lowestMassWpos;
81 TLorentzVector m_SN_lowestMassWneg;
82
83 TRandom3 m_random;
84 bool doNW;
85 bool doNWfull;
86 bool doEM;
87 bool doSN;
88
89 double m_highestWeight;
90 double m_lowestMass;
91 double m_lowestMass;
92
93 public:
94
95 virtual ~TopDileptonReconstruction();
96 TopDileptonReconstruction();
97
98 void Reconstruct(TLorentzVector lepton_pos,
99                 TLorentzVector lepton_neg,
100                 TLorentzVector b,
101                 TLorentzVector bbar,
102                 double met_ex,
103                 double met_ey,
104                 double mtop,
105                 double mtbar,
106                 double mWpos,
107                 double mWneg);
108
109 void ReconstructNW(TLorentzVector lepton_pos,
110                   TLorentzVector lepton_neg,
111                   TLorentzVector b,
112                   TLorentzVector bbar,
113                   double met_ex,
114                   double met_ey,
115                   double mtop,
116                   double mtbar,
117                   double mWpos,
118                   double mWneg);
119
120 void ReconstructEM(TLorentzVector lepton_pos,
121                   TLorentzVector lepton_neg,
122                   TLorentzVector b,
123                   TLorentzVector bbar,
124                   double met_ex,
125                   double met_ey,
126                   double mtop,
127                   double mtbar,
128                   double mWpos,
129                   double mWneg);
130
131 void ReconstructSN(TLorentzVector lepton_pos,
132                   TLorentzVector lepton_neg,
133                   TLorentzVector b,
134                   TLorentzVector bbar,
135                   double met_ex,
136                   double met_ey,
137                   double mtop,
138                   double mtbar,
139                   double mWpos,
140                   double mWneg);
141
142 double mW_get_weight(TLorentzVector nu1,
143                     TLorentzVector nu2,
144                     double met_ex,
145                     double met_ey);
146
147 void Reset();
148
149 std::vector<TLorentzVector> mW_solveForNeutrinoEta(TLorentzVector* lepton,
150                                                    TLorentzVector* bJet,
151                                                    double nu_eta,
152                                                    double mtop,
153                                                    double mW);
154
155 std::vector<TMatrixD> mW_getNeutrinoEllipse(TLorentzVector& bjet,
156                                              TLorentzVector& lepton,
157                                              double& mtop,

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158         double& mW,
159         double& mNu);
160
161     bool EM_cmp(std::pair<Double_t,TVectorD> kv1,
162               std::pair<Double_t,TVectorD> kv2);
163
164     std::vector<TVectorD> EM_intersect_ell_ell(TMatrixD A, TMatrixD B);
165     std::vector<TVectorD> EM_intersect_ell_line(TMatrixD E, TVectorD L, std::vector<Double_t> &kv);
166     Double_t EM_cofactor(TMatrixD A, int row, int col);
167     TMatrixD EM_rotationMatrix(int axis, double angle);
168     std::vector<TVectorD> EM_factor_degenerate(TMatrixD G);
169
170
171     std::vector<TLorentzVector> GetNW Tops(){ return m_NW_tops;};
172     std::vector<TLorentzVector> GetNMTbars(){return m_NW_tbars;};
173     std::vector<TLorentzVector> GetEMTops(){ return m_EM_tops;};
174     std::vector<TLorentzVector> GetEMTbars(){return m_EM_tbars;};
175     std::vector<TLorentzVector> GetSNTops(){ return m_SN_tops;};
176     std::vector<TLorentzVector> GetSNTbars(){return m_SN_tbars;};
177
178     std::vector<TLorentzVector> GetNNuNu(){ return m_NW_nus;};
179     std::vector<TLorentzVector> GetNNuNubars(){return m_NW_nubars;};
180     std::vector<TLorentzVector> GetEMNuNu(){ return m_EM_nus;};
181     std::vector<TLorentzVector> GetEMNuNubars(){return m_EM_nubars;};
182     std::vector<TLorentzVector> GetSNNuNu(){ return m_SN_nus;};
183     std::vector<TLorentzVector> GetSNNuNubars(){return m_SN_nubars;};
184
185     std::vector<TLorentzVector> GetNWWposs(){return m_NW_Wposs;};
186     std::vector<TLorentzVector> GetNWWnegs(){return m_NW_Wnegs;};
187     std::vector<TLorentzVector> GetEMWposs(){return m_EM_Wposs;};
188     std::vector<TLorentzVector> GetEMWnegs(){return m_EM_Wnegs;};
189     std::vector<TLorentzVector> GetSNWposs(){return m_SN_Wposs;};
190     std::vector<TLorentzVector> GetSNWnegs(){return m_SN_Wnegs;};
191
192     std::vector<double> GetNWWeights(){return m_NW_weights;};
193     double GetNWWeight(){return m_NW_highestWeight;};
194
195     TLorentzVector GetNWTop(){ return m_NW_highestWeightTop;};
196     TLorentzVector GetNWTbar(){ return m_NW_highestWeightTbar;};
197     /*TLorentzVector GetEMTop(){ return m_EM_averageTop;};
198     TLorentzVector GetEMTbar(){ return m_EM_averageTbar;};
199     TLorentzVector GetSNTop(){ return m_SN_averageTop;};
200     TLorentzVector GetSNTbar(){ return m_SN_averageTbar;};*/
201     TLorentzVector GetEMTop(){ return m_EM_lowestMassTop;};
202     TLorentzVector GetEMTbar(){ return m_EM_lowestMassTbar;};
203     TLorentzVector GetSNTop(){ return m_SN_lowestMassTop;};
204     TLorentzVector GetSNTbar(){ return m_SN_lowestMassTbar;};
205
206
207     TLorentzVector GetNNuNu(){ return m_NW_highestWeightNu;};
208     TLorentzVector GetNNuNubar(){ return m_NW_highestWeightNubar;};
209     /*TLorentzVector GetEMNuNu(){ return m_EM_averageNu;};
210     TLorentzVector GetEMNuNubar(){ return m_EM_averageNubar;};

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