

Studio dell'efficienza di associazione tracce in jets b

Link all repository pubblica su GitHub → https://github.com/martinosal/root_selector

Tracce ricostruite nei rivelatori e associate ai jet con un criterio di "prossimità": Shrinking Cone Association.

Da verità MC: prodotti del decadimento dell'adrone b del jet → "childs".

L'obiettivo è associare a ogni traccia ricostruita il rispettivo child così da valutare l'efficienza di associazione delle tracce nei jets b.

L'algoritmo:

- 1 selezioniamo i jet taggati b su base MonteCarlo,
- 2 cerchiamo corrispondenze sulla base del pdg_Id di tracks e childs con la condizione che i parent (quindi i "genitori" delle tracks/childs) abbiano anch'essi stesso pdg_Id , ovvero, per ogni track e per ogni child:

$$pdg_Id(track) = pdg_Id(child) \quad (1)$$

$$pdg_Id(parent_track) = pdg_Id(parent_child) \quad (2)$$

- 3 nel caso di più di una corrispondenza per un child o una traccia (due o più tracce associate allo stesso child o viceversa), si considera giusta la corrispondenza migliore in termini di:

$$\Delta p_T \equiv p_{T,child} - p_{T,track} \quad (3)$$

$$\Delta R \equiv \sqrt{(\Delta \phi_{track,child})^2 + (\Delta \eta_{track,child})^2} \quad (4)$$

Risultati

number of childs: 804481

matches: 661624

no matches: 142857

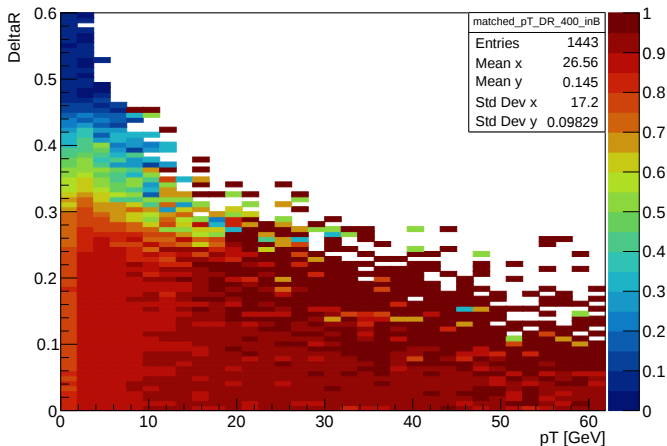
average efficiency: 0.82242

single matches: 373042, fraction: 0.56383

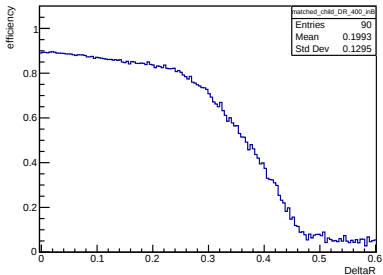
double matches: 243837, fraction: 0.36854

triple matches: 31532, fraction: 0.04766

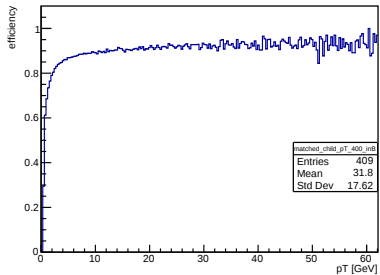
heat map efficiency



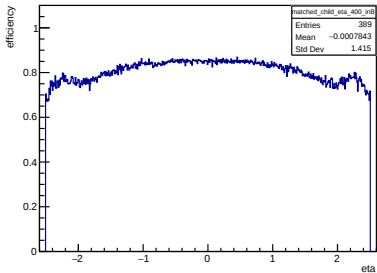
efficiency_vs_DR



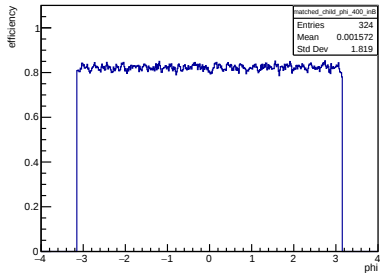
efficiency_vs_pT



efficiency_vs_eta



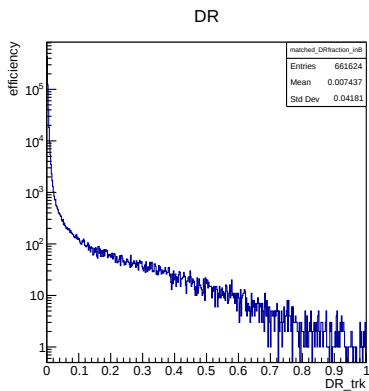
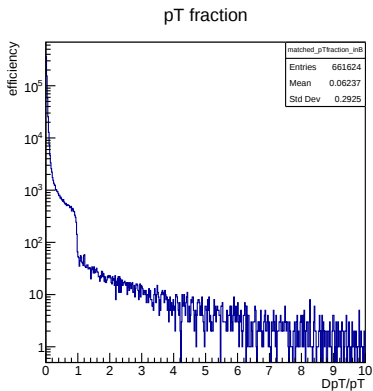
efficiency_vs_phi



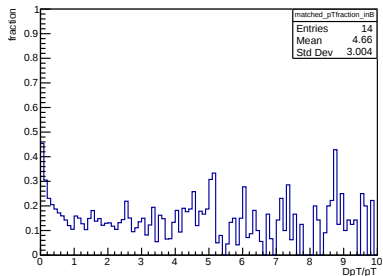
I risultati mostrano la presenza di cattivi matching, cioè corrispondenze non buone:

$$\frac{|\Delta p_T|}{p_{T,child}} > 1$$

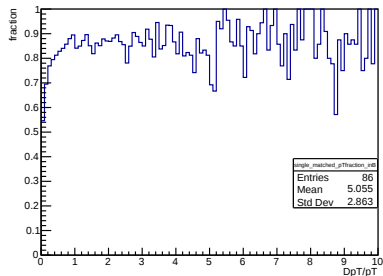
$$\Delta R_{child,jet} > 0.5$$



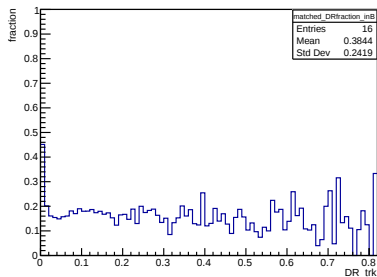
(matched-singlematched)/matched_vs_DpT/pT



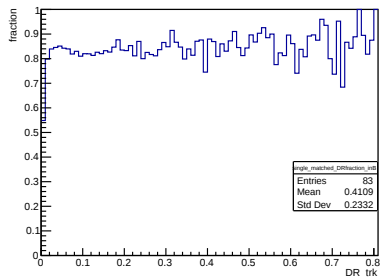
singlematched/matched_vs_DpT/pT



(matched-singlematched)/matched_vs_DR_trk



singlematched/matched_vs_DR_trk



Un buon 85% di cattivi matching viene dai match singoli, *i.e.* singole corrispondenze child-track, le quali non hanno nessun controllo in ingresso su $|\Delta p_T|/p_{T,child}$ e ΔR .

Proposta:

controllo con taglio in ingresso su $|\Delta p_T|/p_{T,child}$ e ΔR :

$$\frac{|\Delta p_T|}{p_{T,child}} < 1 \quad (5)$$

$$\Delta R < 0.1 \quad (6)$$

Risultati:

number of childs: 804481

matches: 653602

no matches: 150879

average efficiency: 0.81245

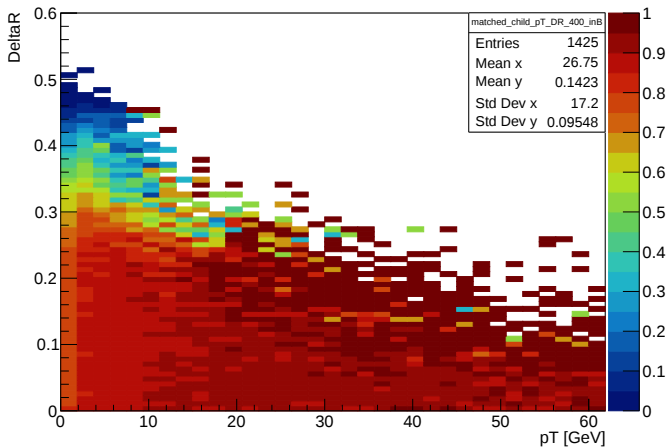
single matches: 366818, fraction: 0.56123

double matches: 241245, fraction: 0.36910

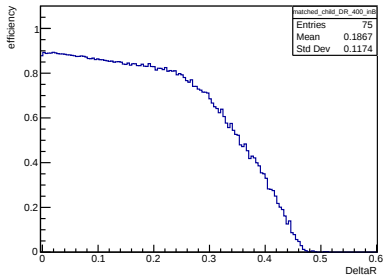
triple matches: 32156, fraction: 0.04920

L'efficienza media è rimasta pressochè invariata: ~ 0.81 contro ~ 0.82 .

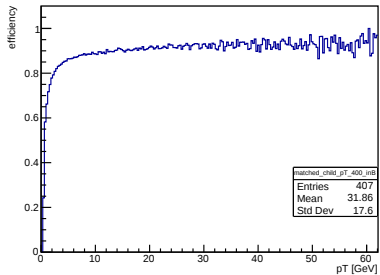
heat map efficiency



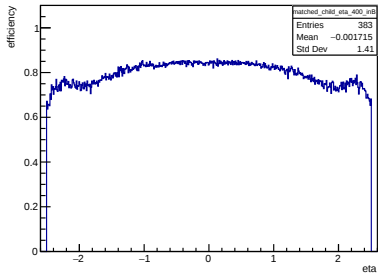
efficiency_vs_DR



efficiency_vs_pT



efficiency_vs_eta



efficiency_vs_phi

