Karlsruhe Institute of Technology

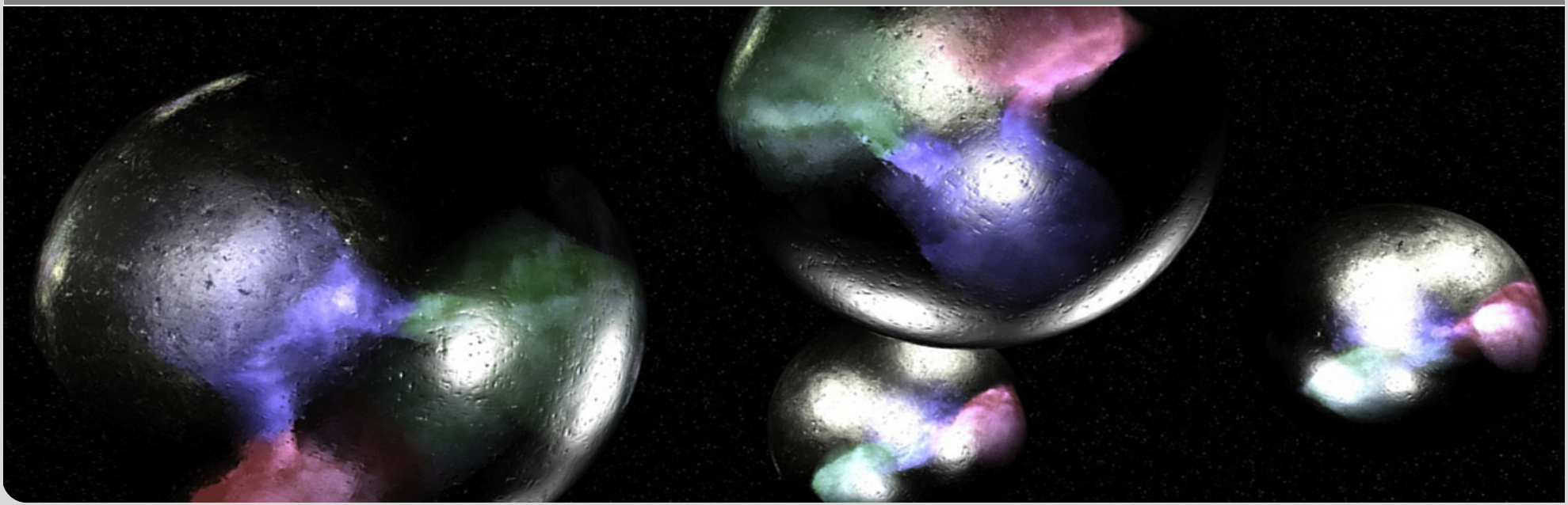
Belle II

Track Quality Indicator

29th B2GM

Felix Metzner | 6th February 2018

INSTITUT FÜR EXPERIMENTELLE TEILCHENPHYSIK (ETP)



Track Finding Efficiency vs. Purity

Current performance of the track reconstruction chain:

Finding Efficiency	**95.1 %**
Fake Rate	**3.8 %**
Clone Rate	**10.9 %**

These figures of merit have been improved significantly.
We still have some aces in our sleeves to improve them further.

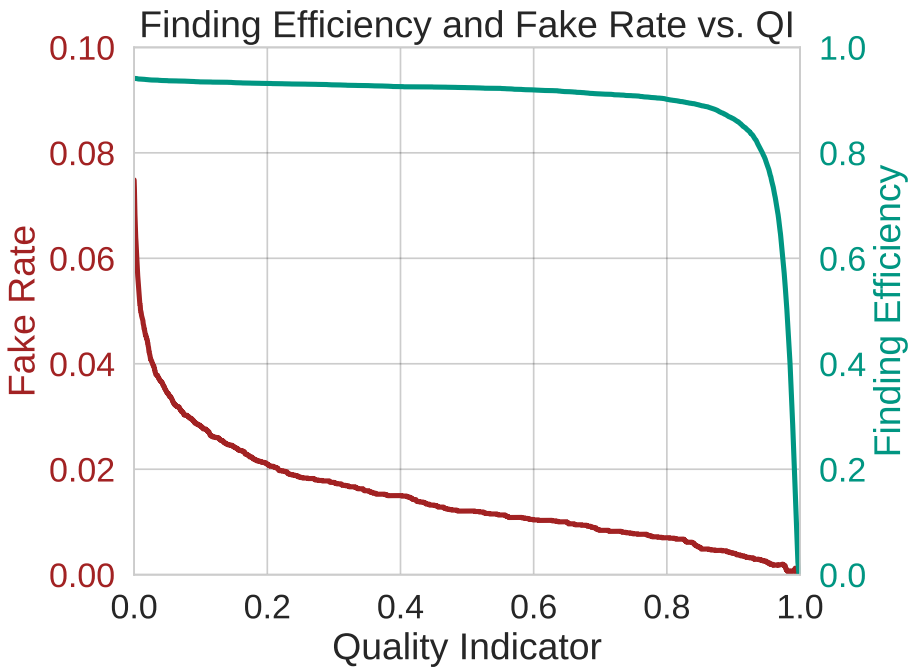
However, in the end it will come down to a trade-off between efficiency and purity!

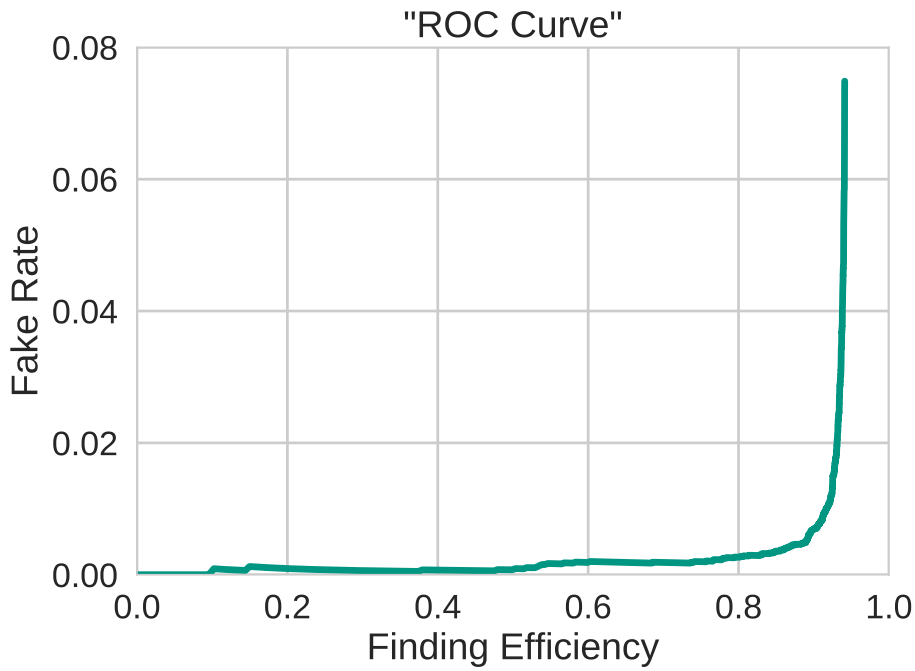
$\Rightarrow$ **Analysts should be able to decide based on their needs.**

Track Quality Indicator (QI)

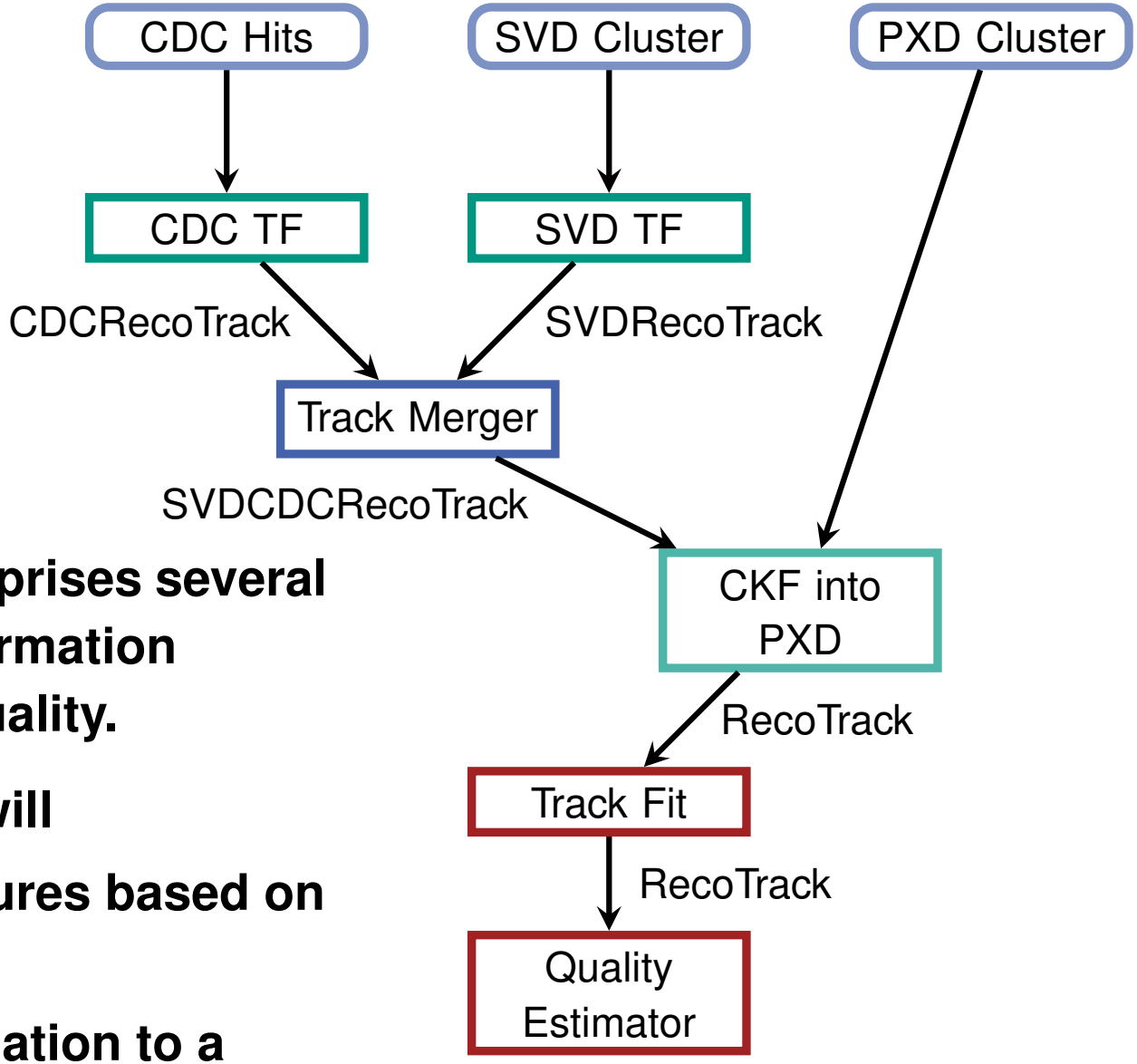
- Use **all information** available during the reconstruction.
- Condense these down to a single **Quality Indicator**.
- Attach this value to the stored track object **available for analyses**.

VXDTF2 MVA Quality Indicator performance





Calculation of the QI



The tracking chain comprises several steps which create information relevant for the track quality.

The Quality Estimator will

- **Calculate new features based on the whole picture;**
- **Combine all information to a strong discriminator.**

Calculation of the QI

Features to be used for the Track Quality Estimation:

- Quality estimations from individual track finders
- Hit pattern and hit weights from the track fit
- Momentum and positional information
- Merger Information
- ...

A FastBDT will be trained

- with the Monte Carlo truth as target
- utilizing the provided features
- to generate a probability-like output

to discriminate fake and cloned track candidates.

Current Status

- **The VXDTF2 already provides a working QI.**

  (Jonas Wagner, Sebastian Racs, Felix Metzner)

- **A CDC Quality Indicator is in the making.**

  (Michael Eliachevitch)

- **The CKF Modules will also provide a Quality Indicator.**

  (Nils Braun)

- **The work on the final Quality Estimator is already ongoing.**

  (Sebastian Racs, Felix Metzner)