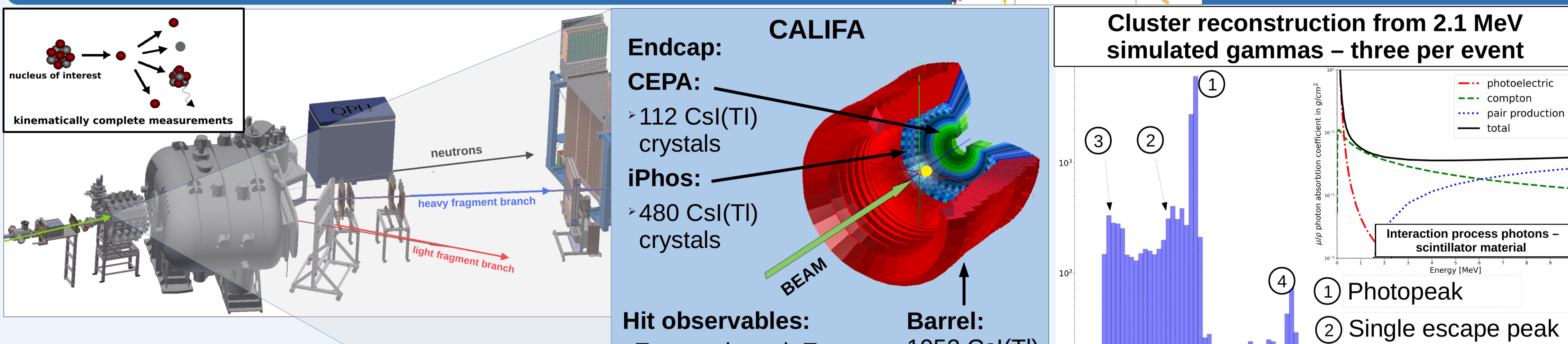


T. Jenegger, R. Gernhäuser for the R³B Collaboration,
N. Hartman, L. Heinrich for the ORIGINS Data Science Laboratory - ODSL

TUM School of Natural Sciences, Technical University of Munich, Germany

CALIFA – Detection of gammas and light charged particles @ R³B

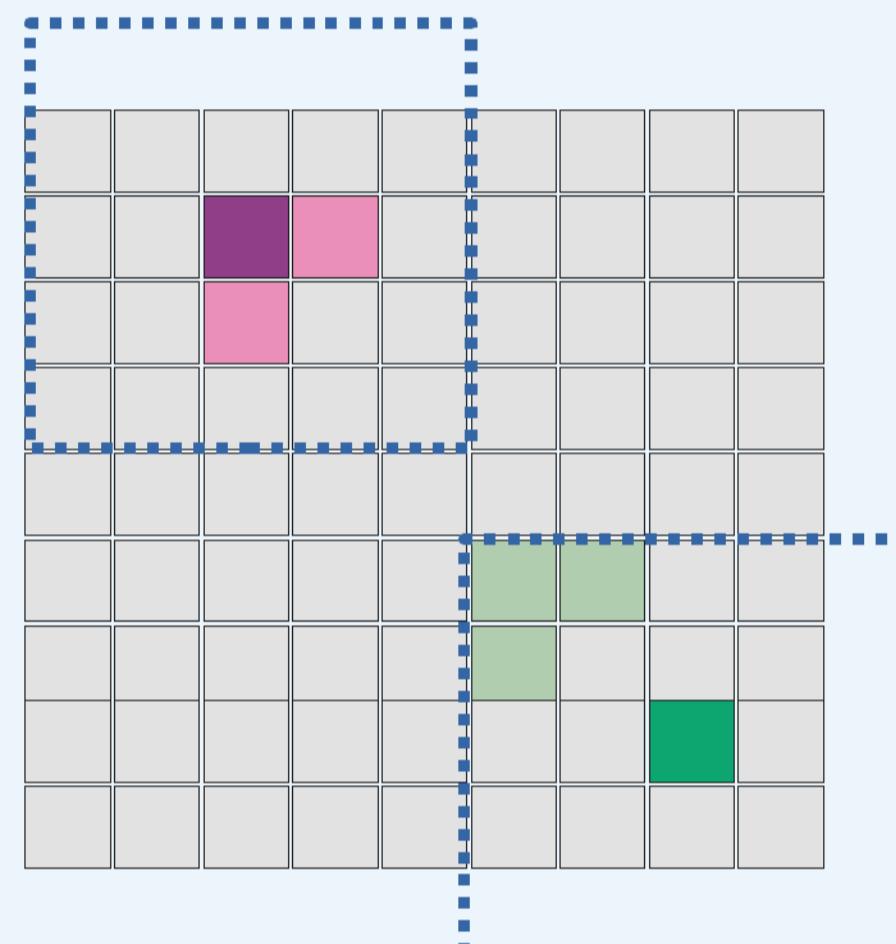


R³B - Reactions with Relativistic Radioactive Beams

- Studies of exotic nuclei far from stability
- Focus: nuclear structure and reaction dynamics

Constant Geometry Method (CGM)

User defines shape and size of cluster:

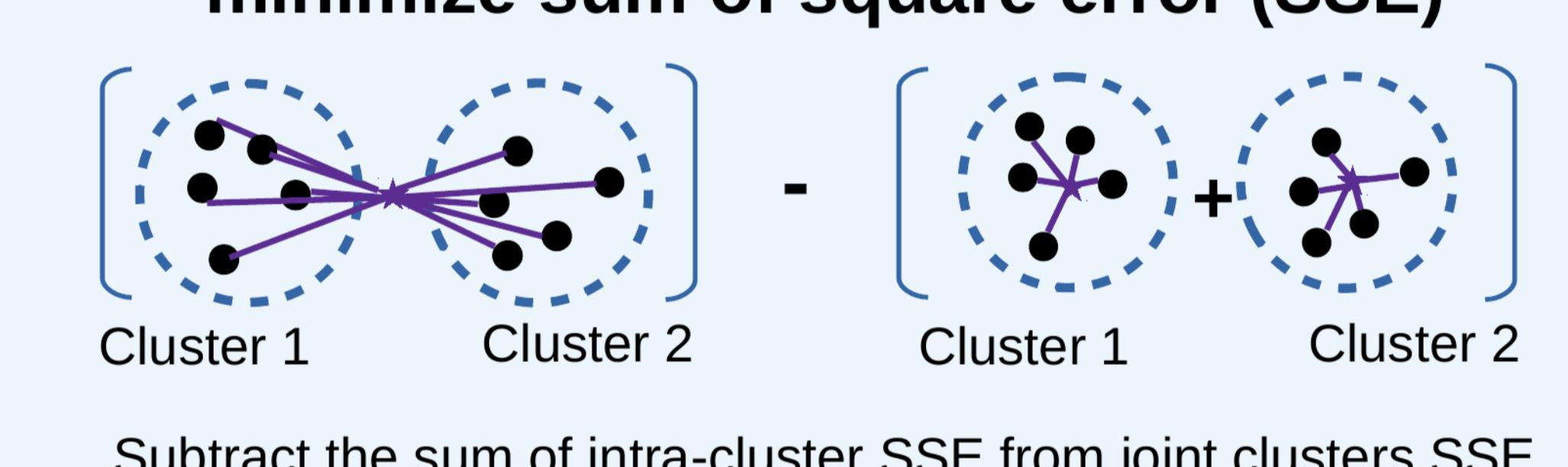
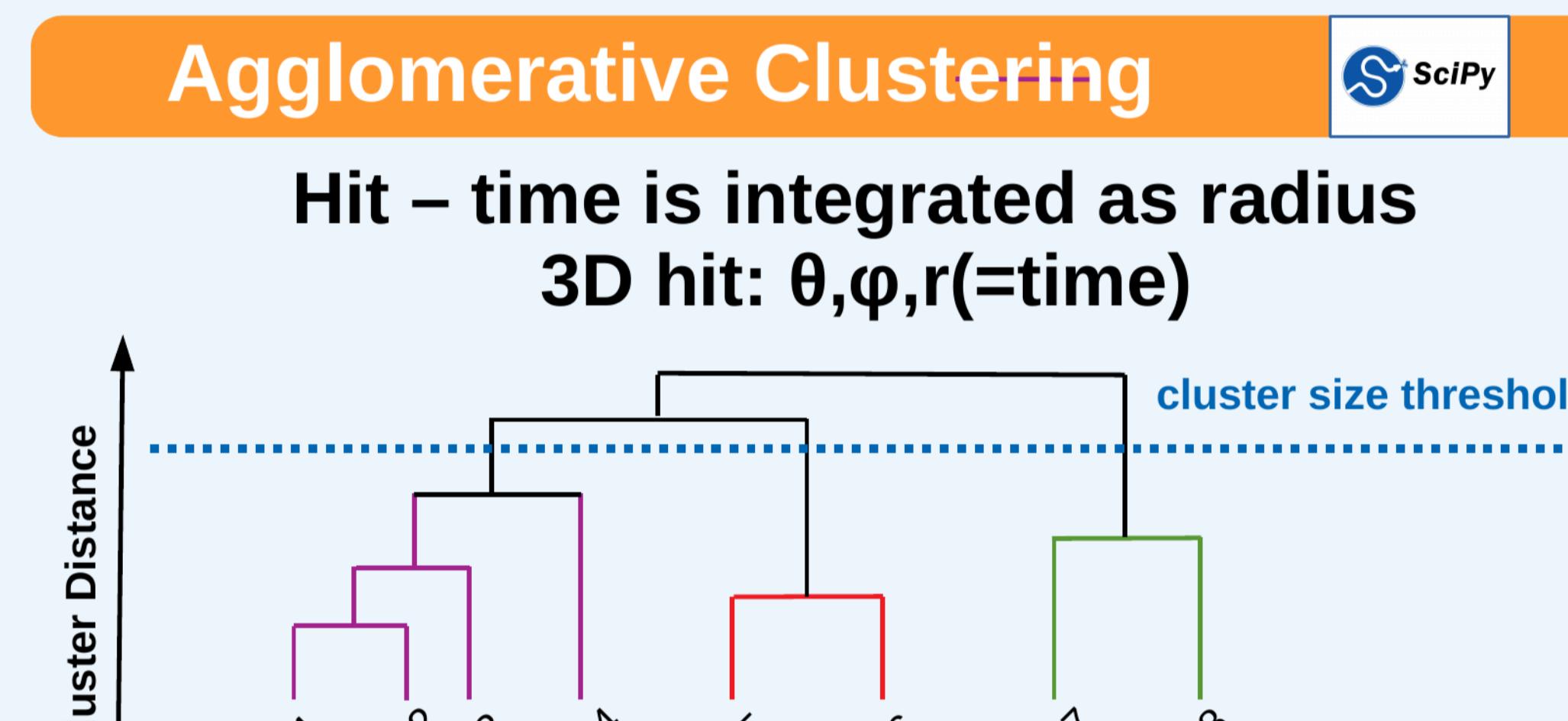
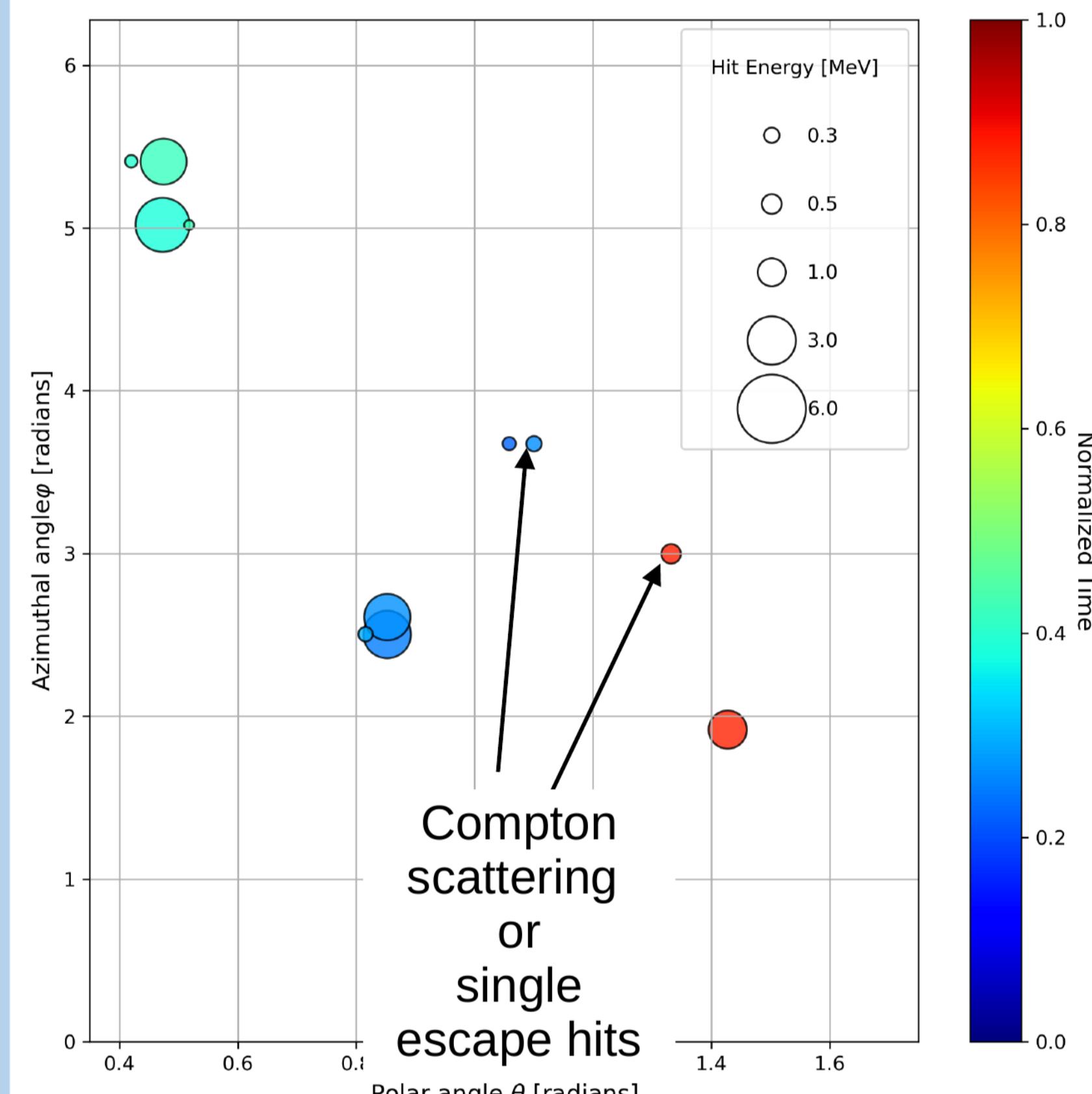


and set energy threshold for single crystals

Sort the hit list by energy:

- Create cluster centered around first hit
- Loop over all hits in list
- >if hit inside cluster add it and remove it from the list
- Do this procedure until list is empty

Simulated CALIFA event with three true clusters



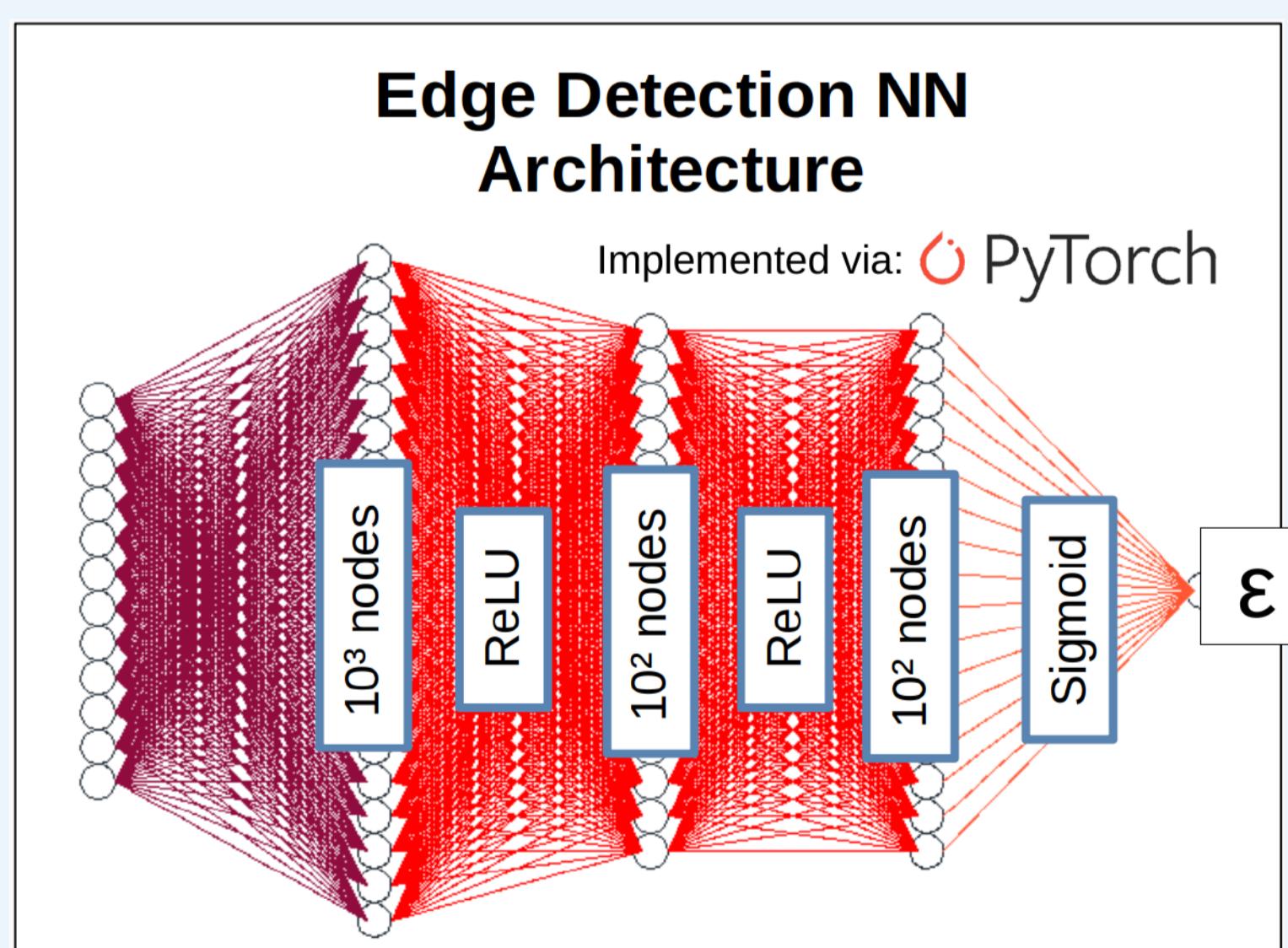
Edge Detection Neural Network

Pairwise hit comparison (i, j)

12 input features:

$$E_{ij}, \theta_{ij}, \phi_{ij}, t_{ij}, \Delta E_{ij}, \Delta \theta_{ij}, \Delta \phi_{ij}, \Delta t_{ij}$$

Single node output layer with score ϵ within [0, 1]



If $\epsilon <$ merge cut

independent hits

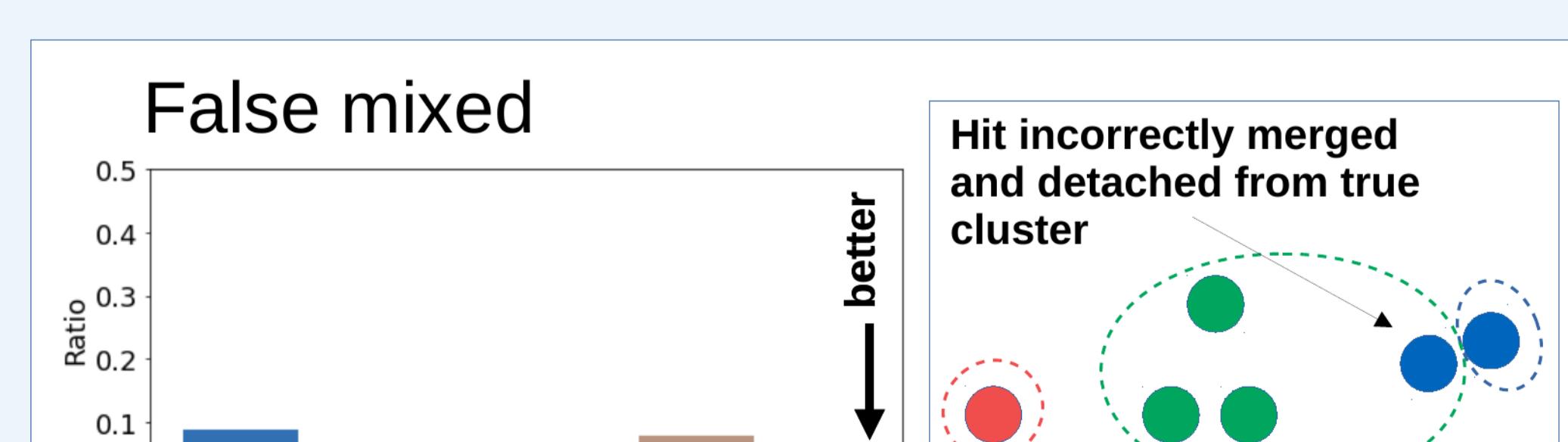
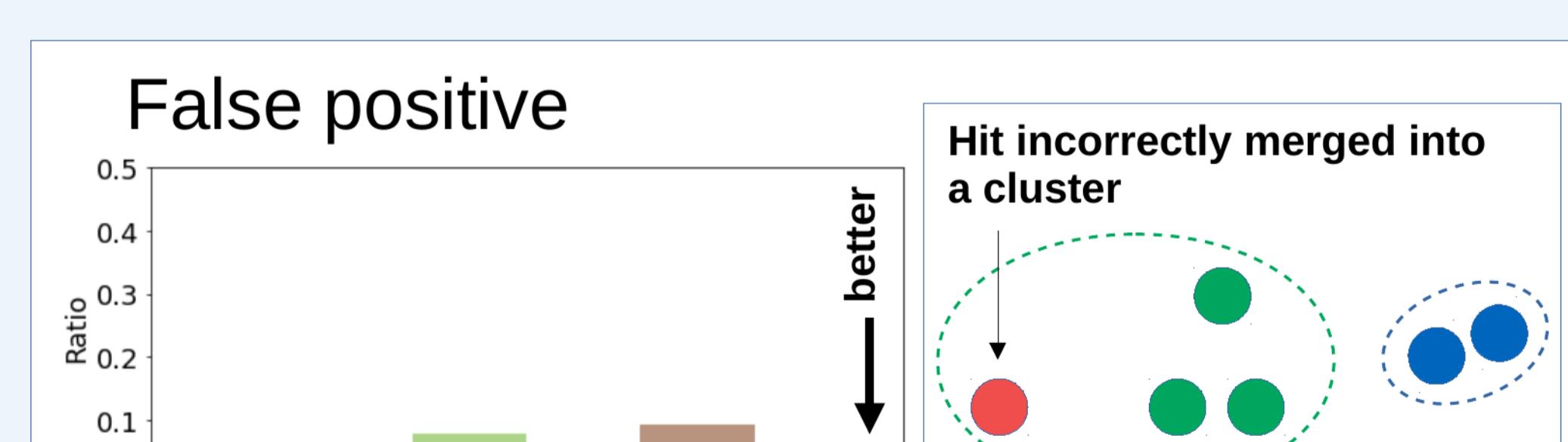
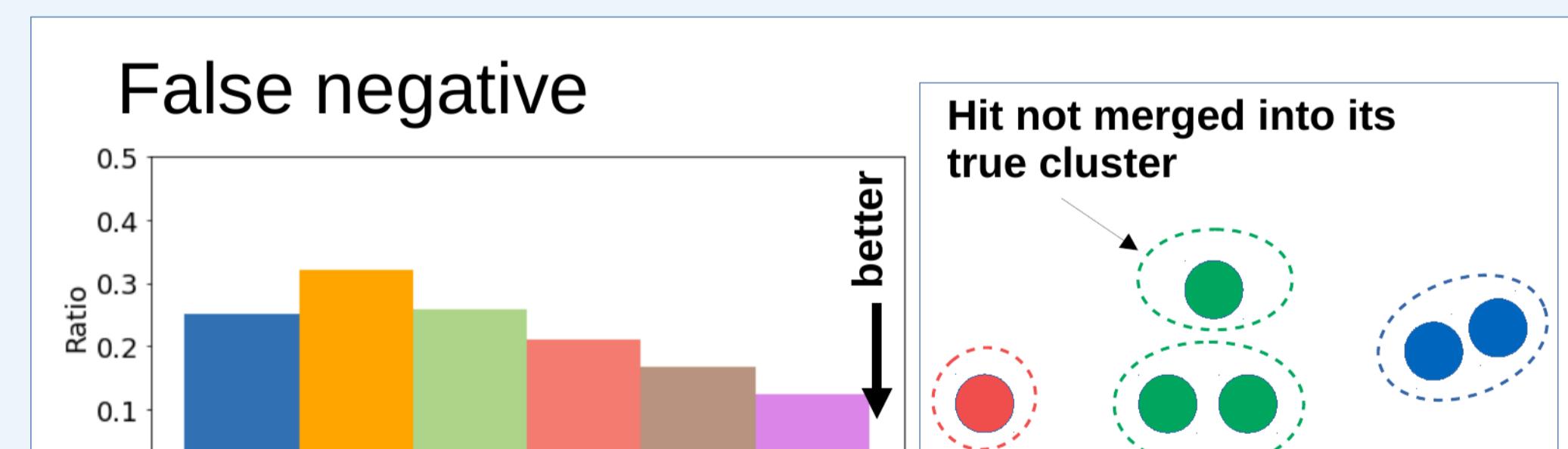
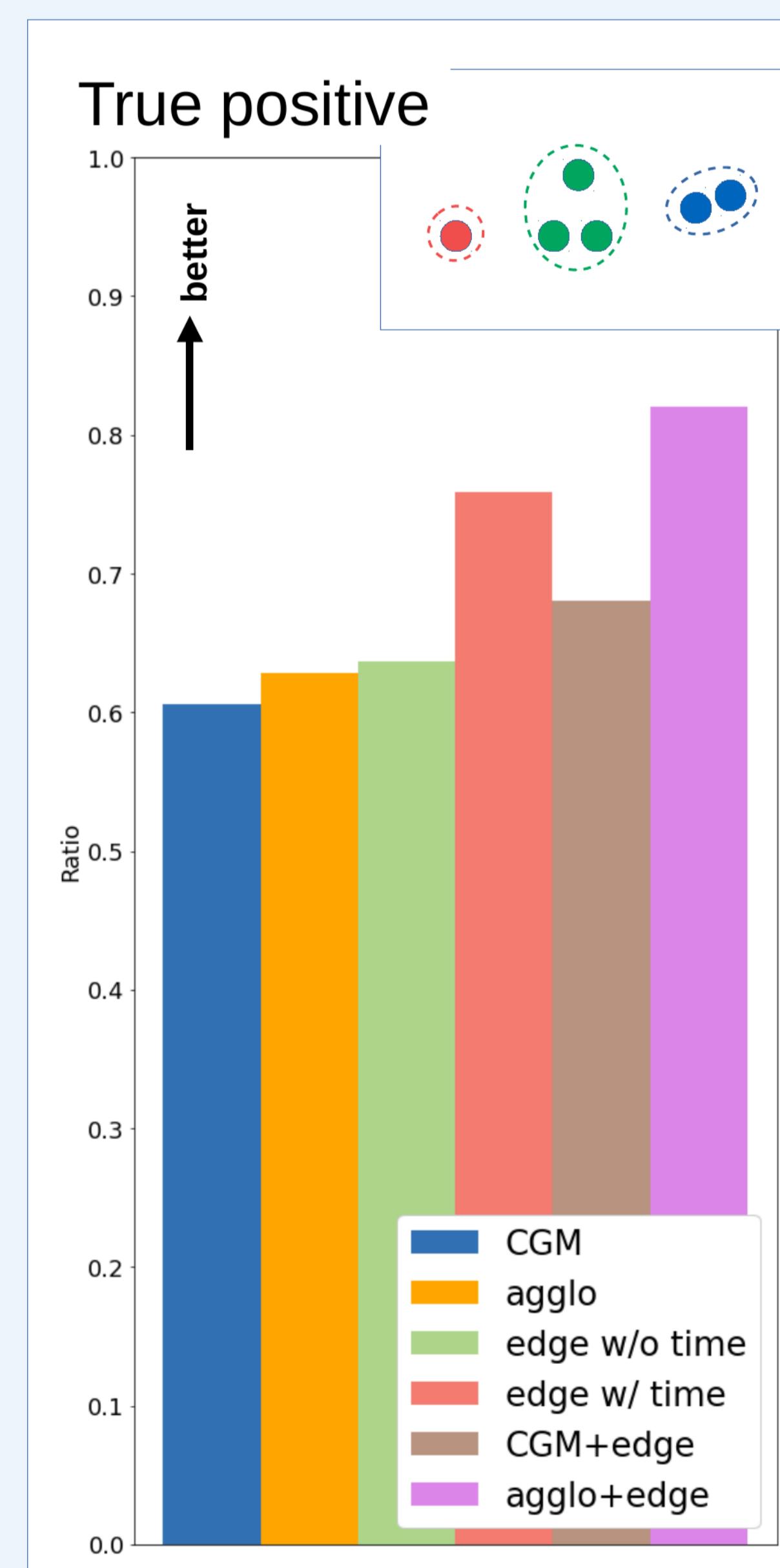
elif $\epsilon >$ merge cut

merge hits

Various Edge Detection NN models analyzed:

- Edge model without time information
- Edge Model with time information
- R3B + Edge (without time)
Data preclustered via Standard R3B Clustering → input into the Edge model
- Aggro + Edge (with time)
Data preclustered via Agglomerative Clustering → input into the Edge model

RESULTS



Contact: Tobias Jenegger
tobias.jenegger@tum.de



Bundesministerium
für Bildung
und Forschung

Supported by
BMBF: 05P24WO2,
Excellence Cluster ORIGINS from the DFG
(Excellence Strategy EXC-2094-390783311)