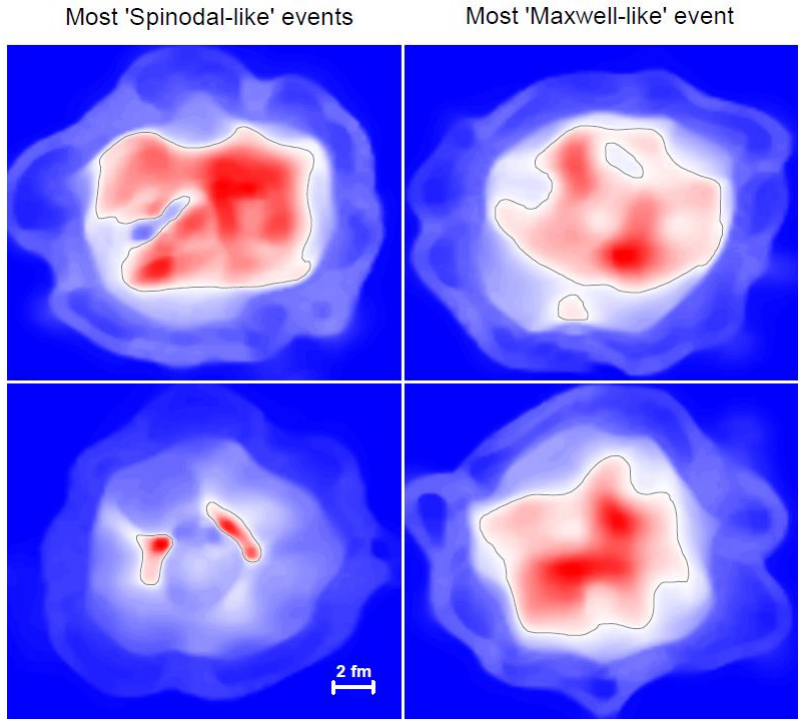
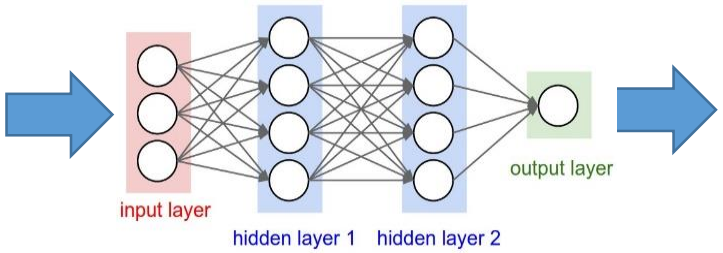
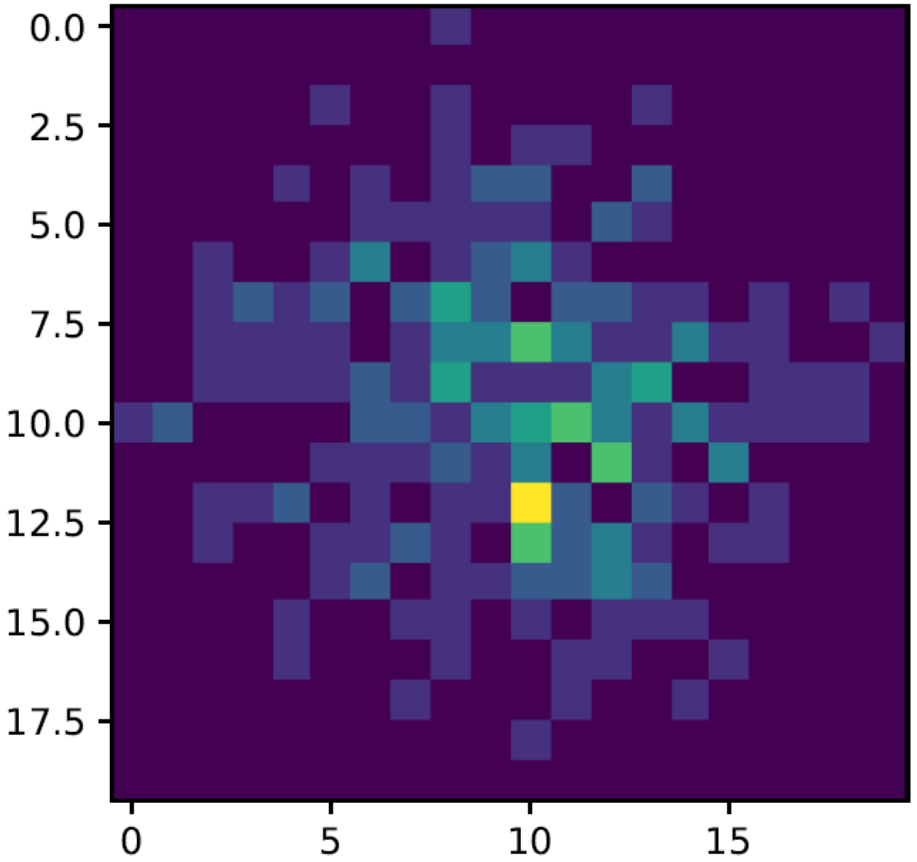
Spinodal or not? - Classification

- Spinodal clumping is a physical effect known to occur in fast non-equilibrium phase transitions.
- If such a phase transition happens in HIC, then they can be easily observed in coordinate space.
- A fluid dynamical model is used to create 2D-spectra in phase space.





The example Data



The dataset consists of three files in ASCII format:

- `train_mom_ms_TP1.dat` The training Data, 160,000 events
- `val_mom_ms_TP1.dat` The validation Data, 20,000 events
- `test_mom_ms_TP1.dat` The testing Data, 20,000 events

In either file each line represents a single event. The first column gives the event label: 0 for a Maxwell event and 1 for a Spinodal event.

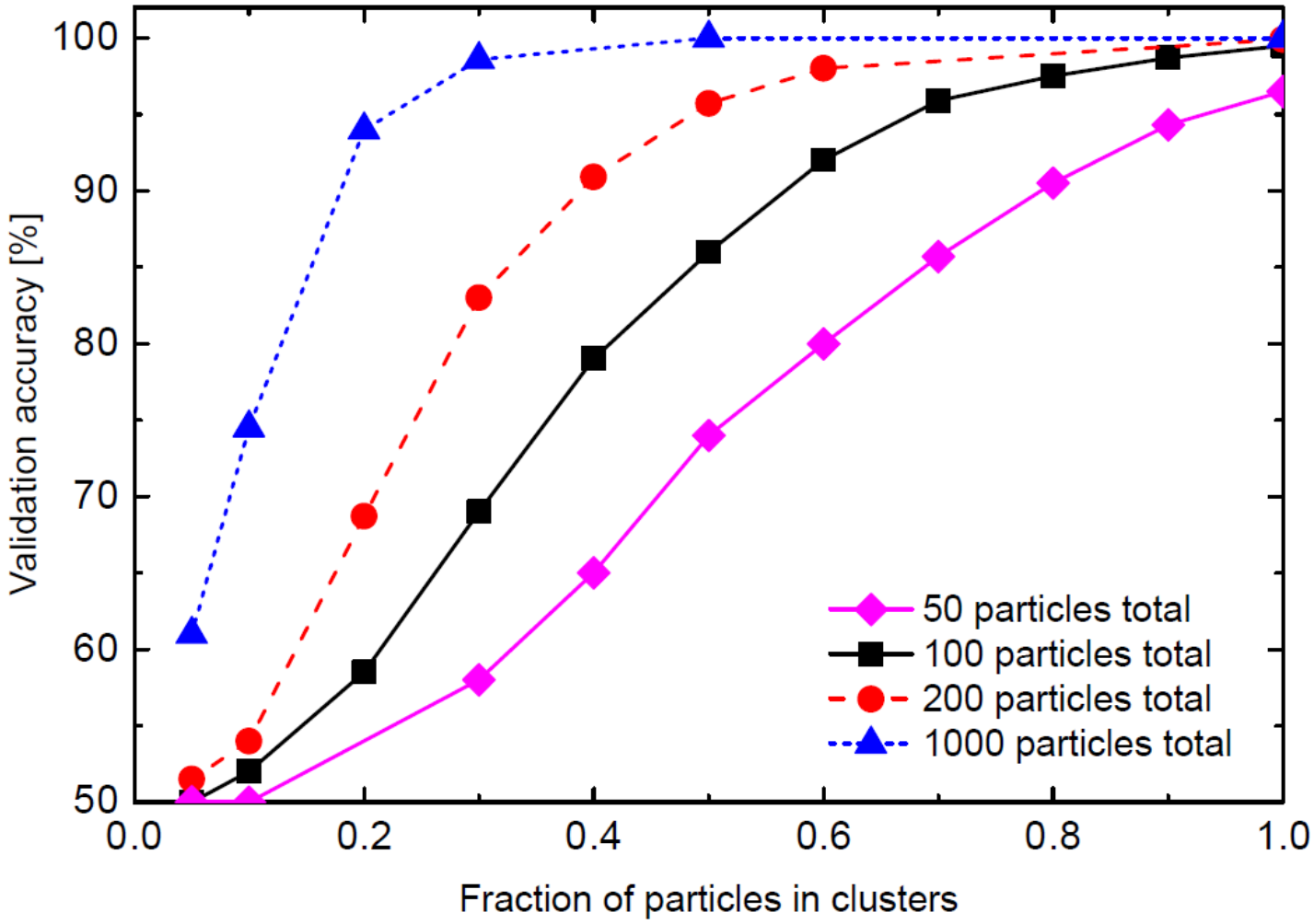
The remaining 400 columns are a flattened 20×20 2D histogram of particle momenta.

[1] J. Steinheimer, L. Pang, K. Zhou, V. Koch, J. Randrup and H. Stoecker, JHEP **1912**, 122 (2019) doi:10.1007/JHEP12(2019)122 [arXiv:1906.06562 [nucl-th]].

Currently ongoing

With group in Berkeley (LBNL)

- Can we quantify when and how well a classification model should work with cluster?
- Use a cluster generator and vary the parameters (particle number, cluster number, cluster size etc.)
- In the future such datasets can also be made available.



Outlook for Data ‚Analysis‘ Project

by PhD student Manjunath Omana Kuttan
with help of Andreas Redelbach

- Using a PointNet on Simulated CBM data:
  - Use Event Generator
  - Run events through the CBM-detector Simulation to generate Hits
  - Run the CBM track reconstruction
  - Use Information of tracks in the silicon detector
  - Use information of hits in the MVD
- Estimate the centrality/impact parameter.
- Results are at least as good as conventional off-line analysis
- Impact parameter can be exchanged for any observable