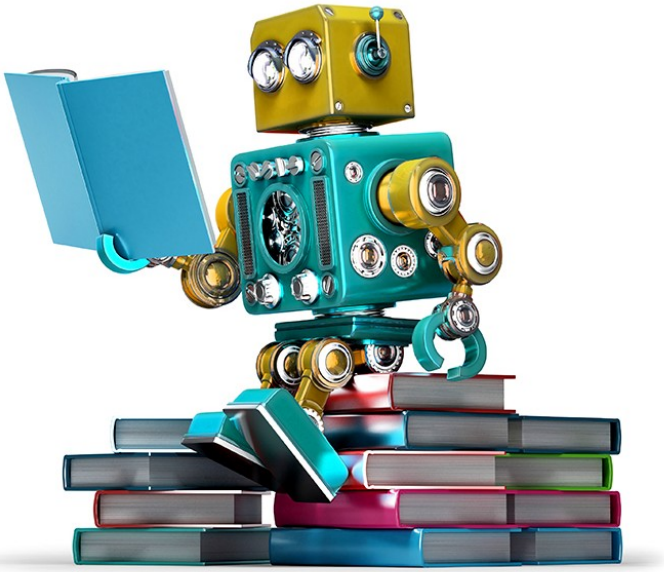
Doktoratskolleg Particles and Interactions

Summer school challenge – classify CRESST pulse shapes

Wolfgang Waltenberger

DKPI Summer School,
Sept 16 - 21, 2018



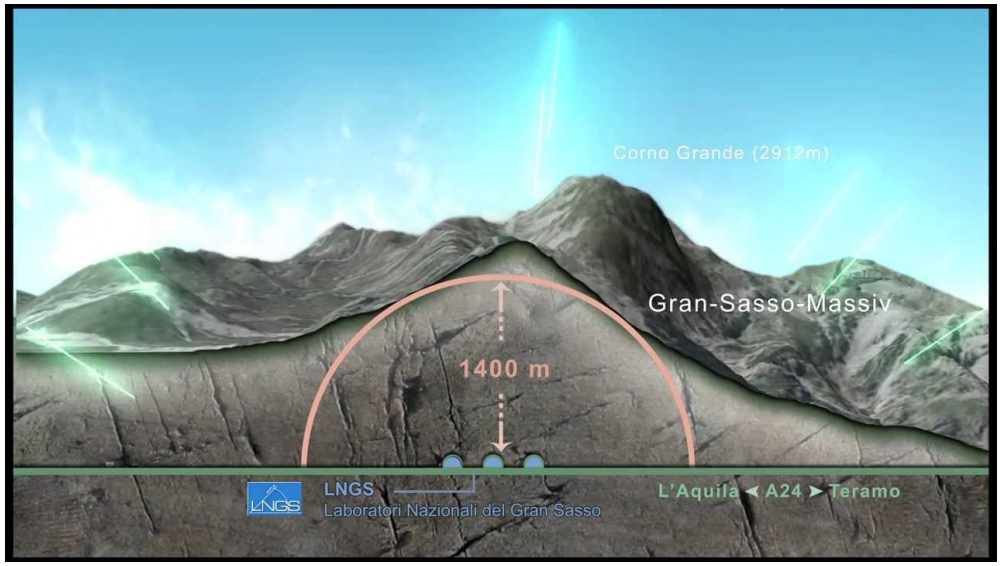
HEPHY
INSTITUT FÜR HOCHENERGIEPHYSIK

Wait – CRESST?

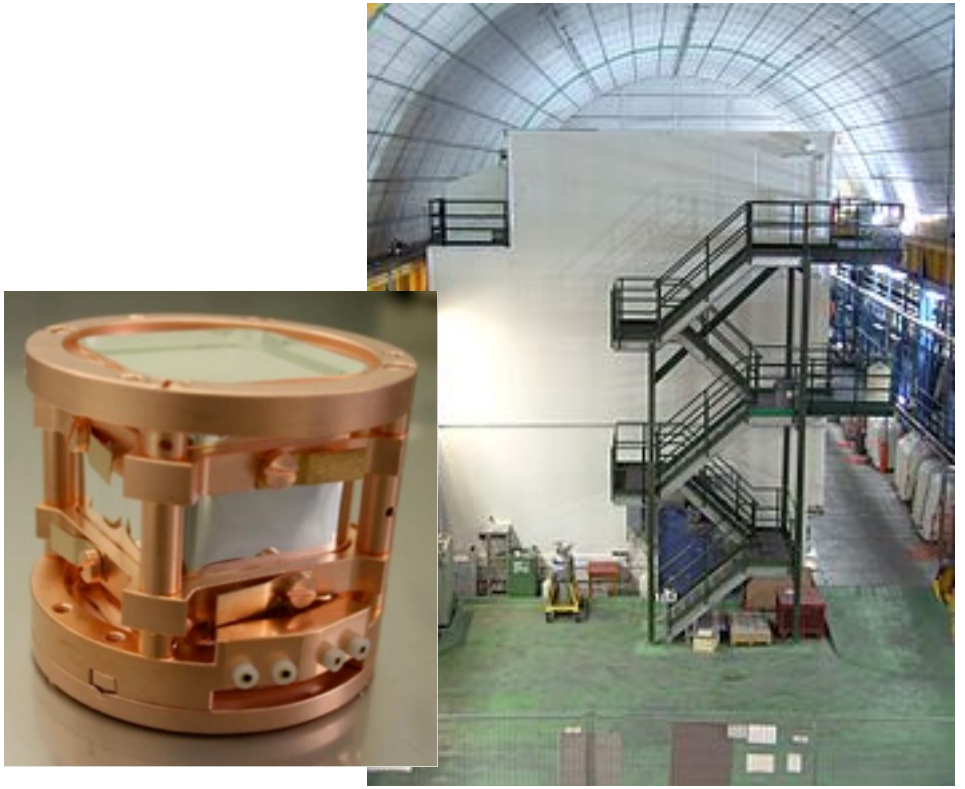
What is CRESST?

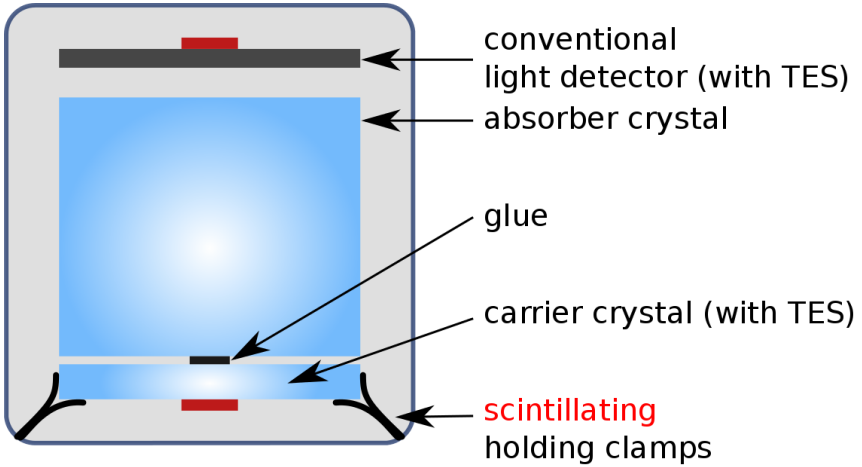
CRESST –

Cryogenic Rare Event Search with Superconducting Thermometers

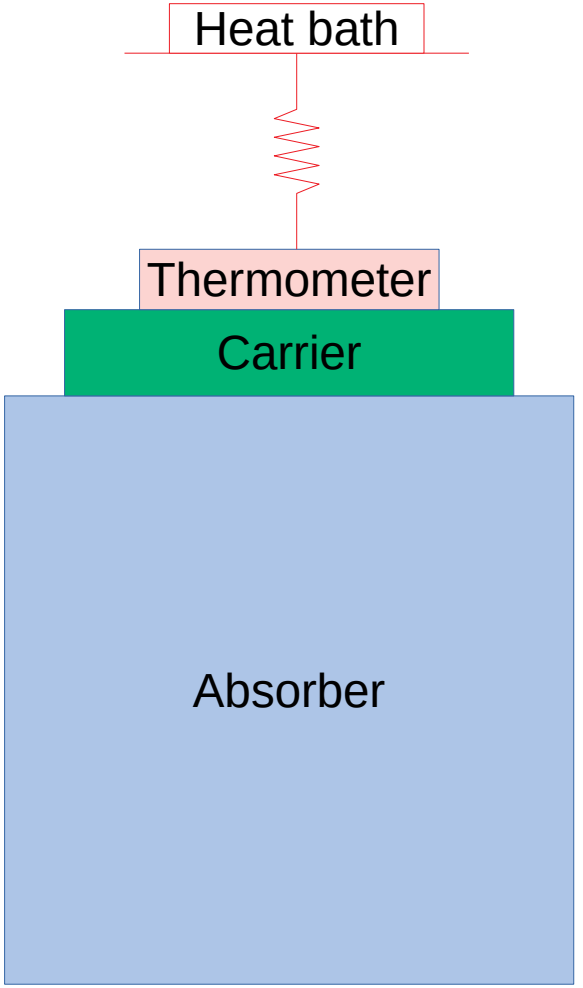


Direct detection dark matter experiment beneath Gran Sasso in italy

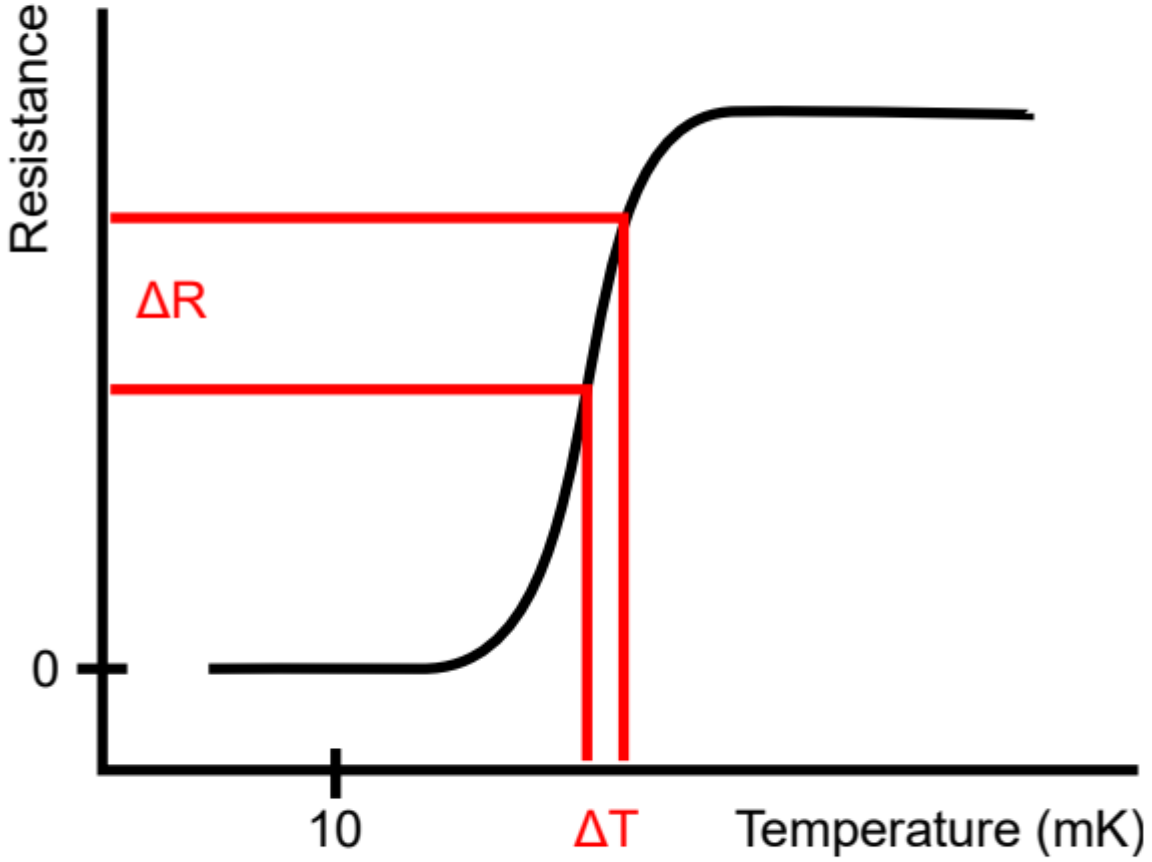




TUM40 detector design

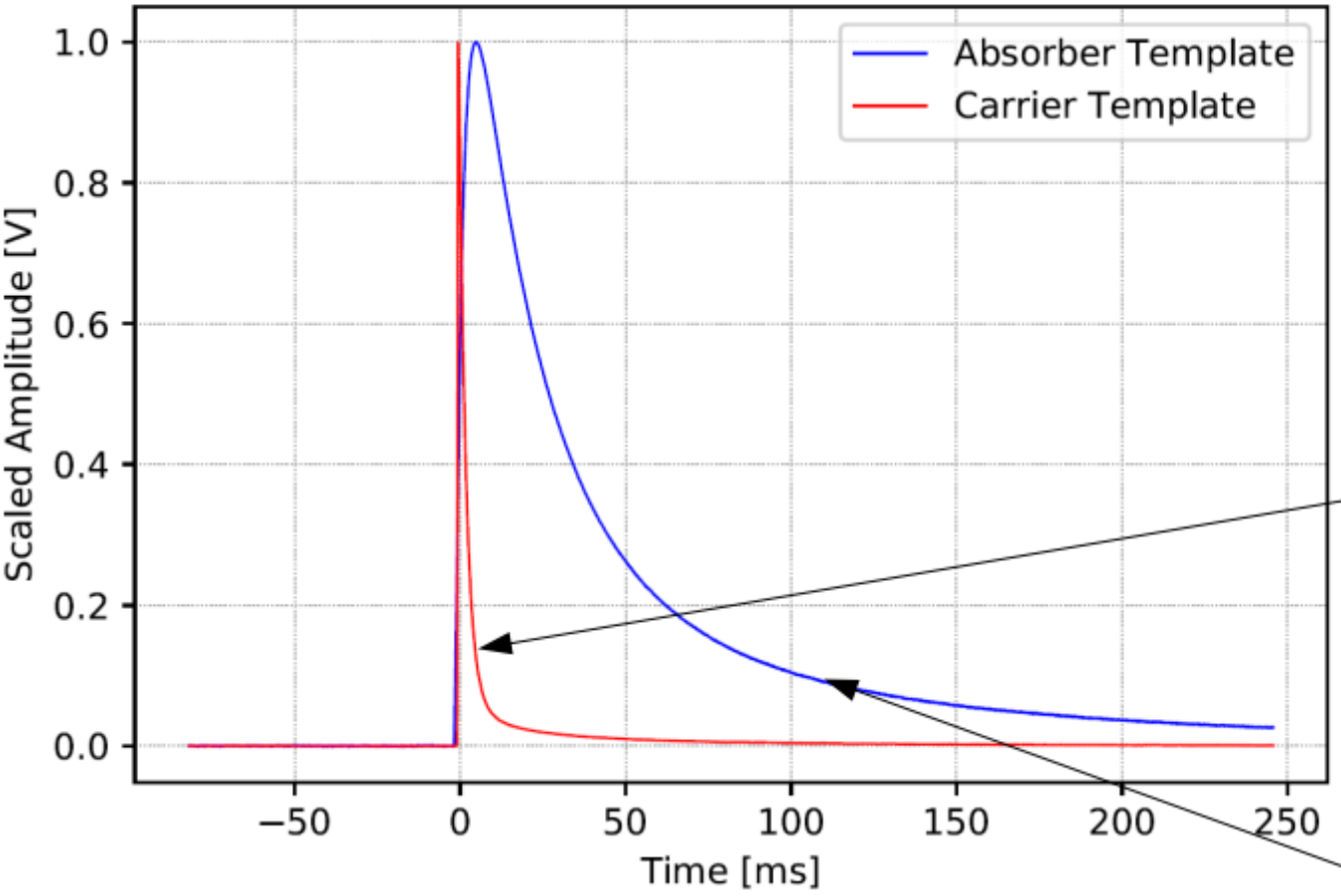


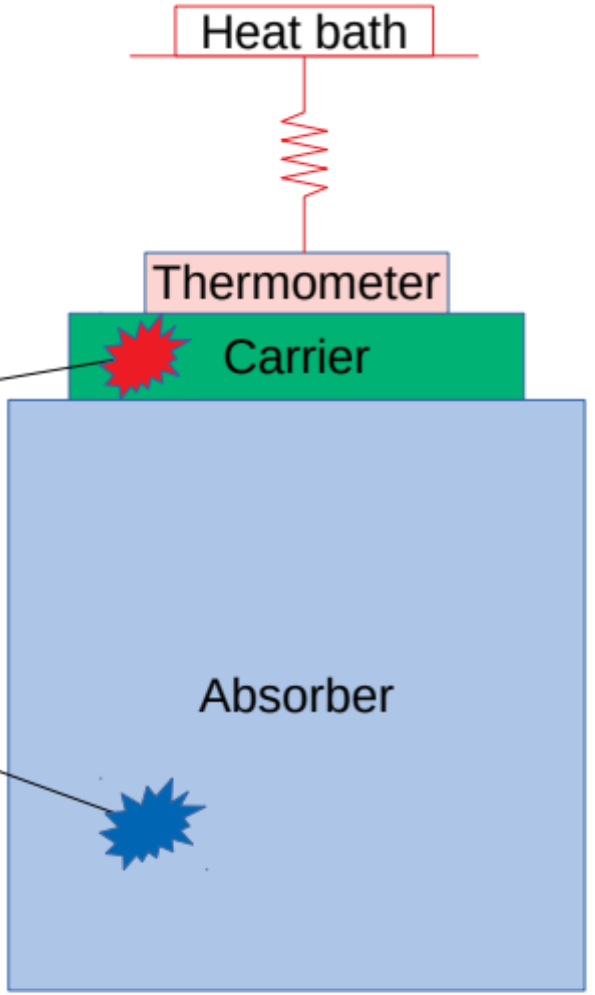
Transition Edge Sensor (TES)



Energy deposition
~ keV
↓
Temperature rise
~μK
↓
Resistance change
~mΩ

TUM40 detector design





Classification problem

THE CHALLENGE

- You are given a training sample of 10,000 pulse shapes, around 5,000 of which are absorber events, the others are carrier events. And a similar validation sample.
  Many thanks to the HEPHY CRESST team for providing the data!
- The skeleton.py in the “challenge” folder is code that runs but exhibits sub-optimal performance (around 80% accuracy). Get the data from http://smodels.hephy.at/dkpi/CRESST.zip or via ./fetch_data.sh or from me (USB stick).
- Improve the algorithm. Work in pairs of two. Be creative. Everything based on pytorch and neural networks that I can reproduce (see below) is allowed. You are allowed to train on any machine.
- Whoever has the lowest misclassification rate (on a third undisclosed *holdout* data sample!) by thursday, sept 20, 20:59, wins the workshop challenge!
  In case of a tie, the smaller network wins (Occam’s razor).
- Send code **and** the trained weights (e.g. skeleton.ckpt) to me:
  wolfgang.waltenberger@gmail.com
  Multiple submissions (<= 3) are allowed. The best submission counts.
- The winners will be announced by Andi in the wrap-up session.