2020 REU Program

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Research Goals

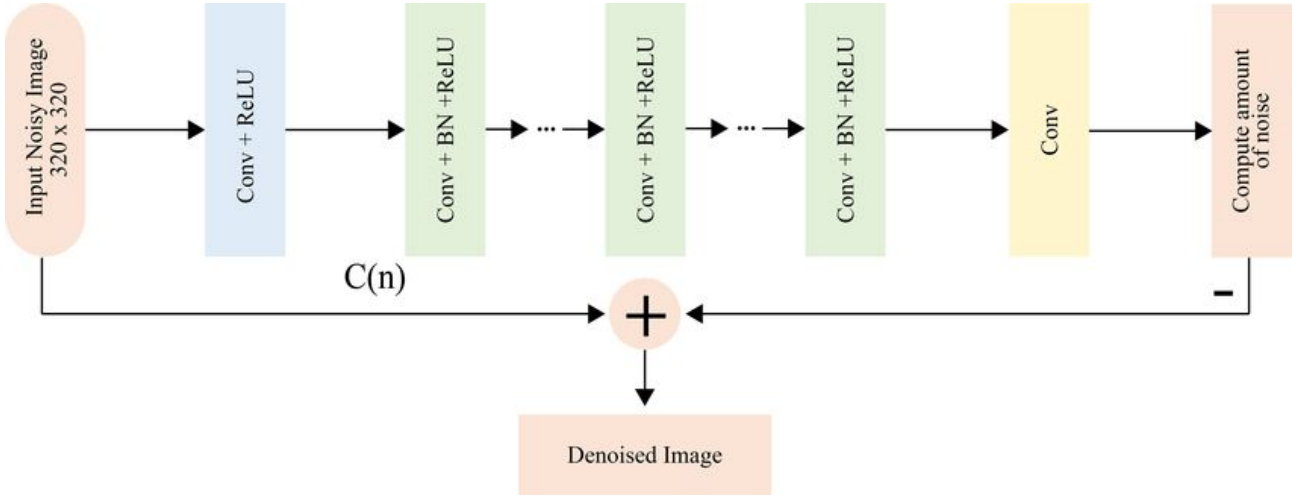
- Improve Energy Resolution of HPGe Detectors

  -Denoising CNN

- Applications

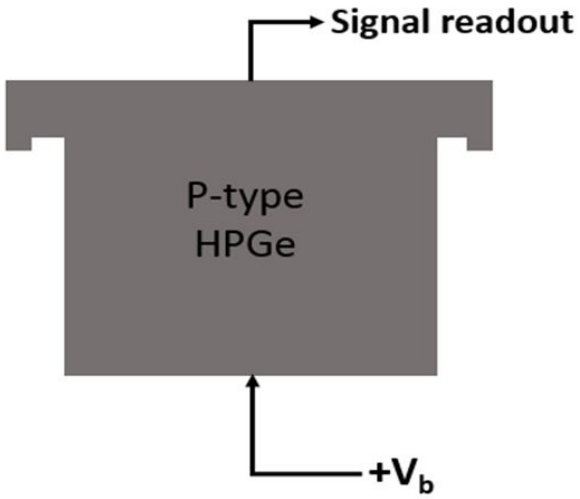
  -Dark Matter Searches

  - 0νββ

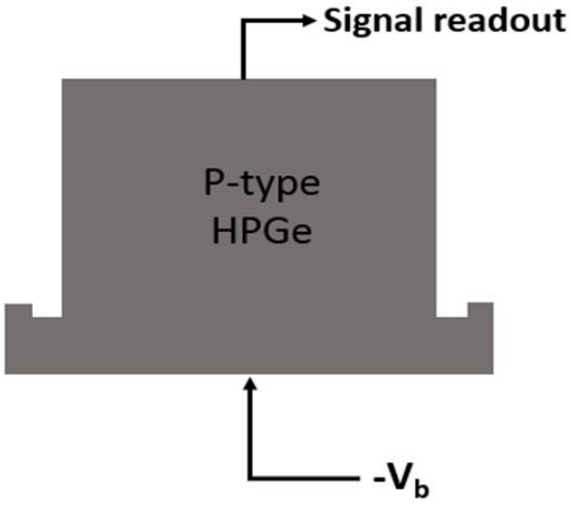


High Purity Germanium Detectors

Planar Detector Diagram

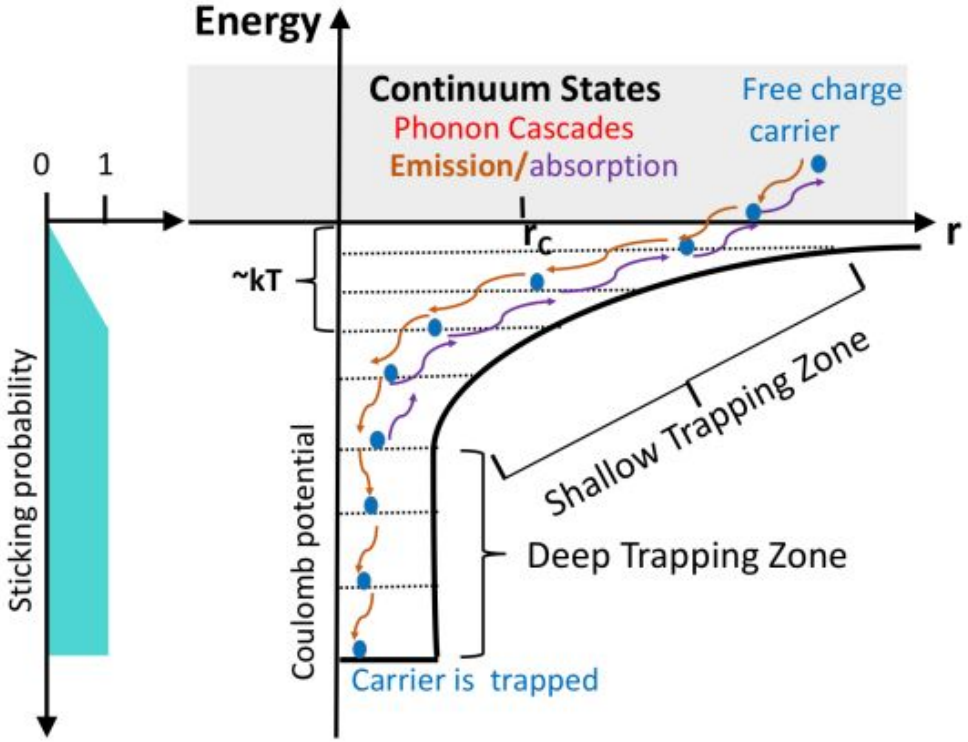


Hole Collection

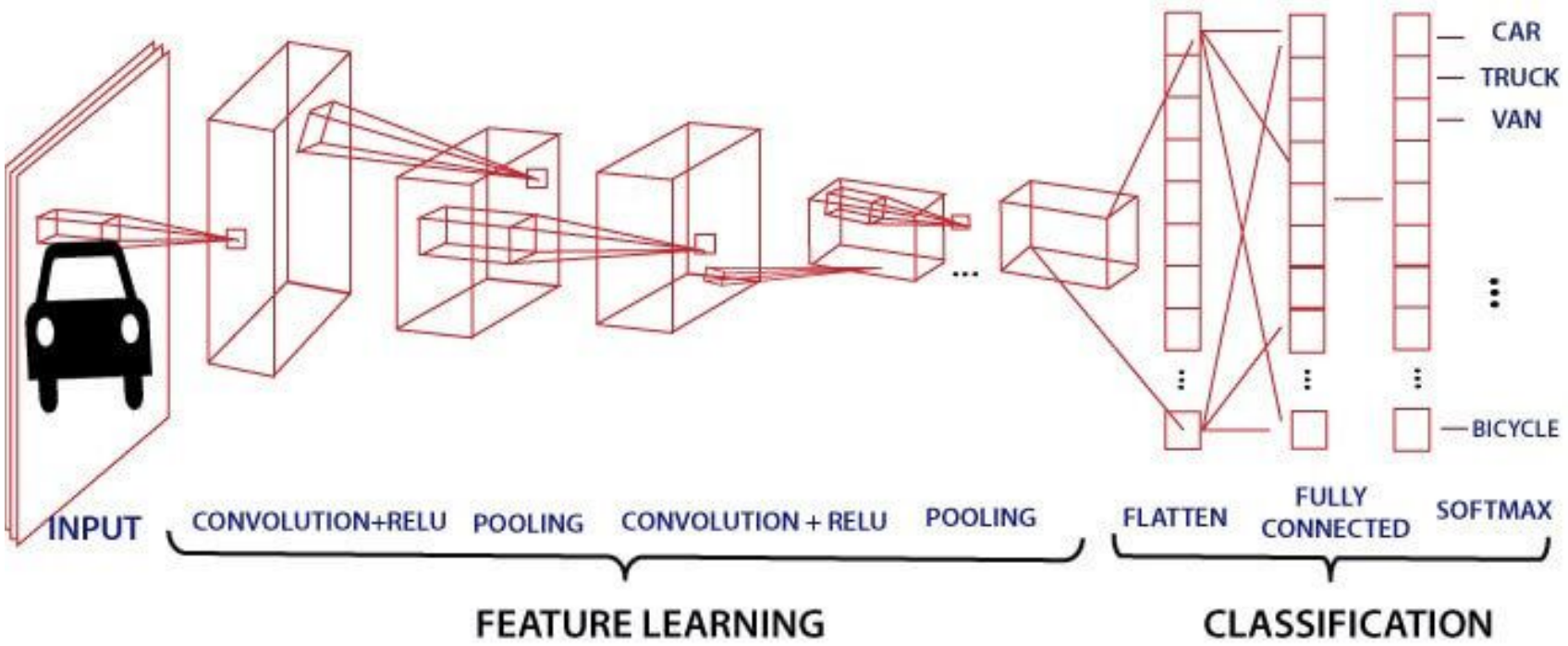


Electron Collection

Lax Model



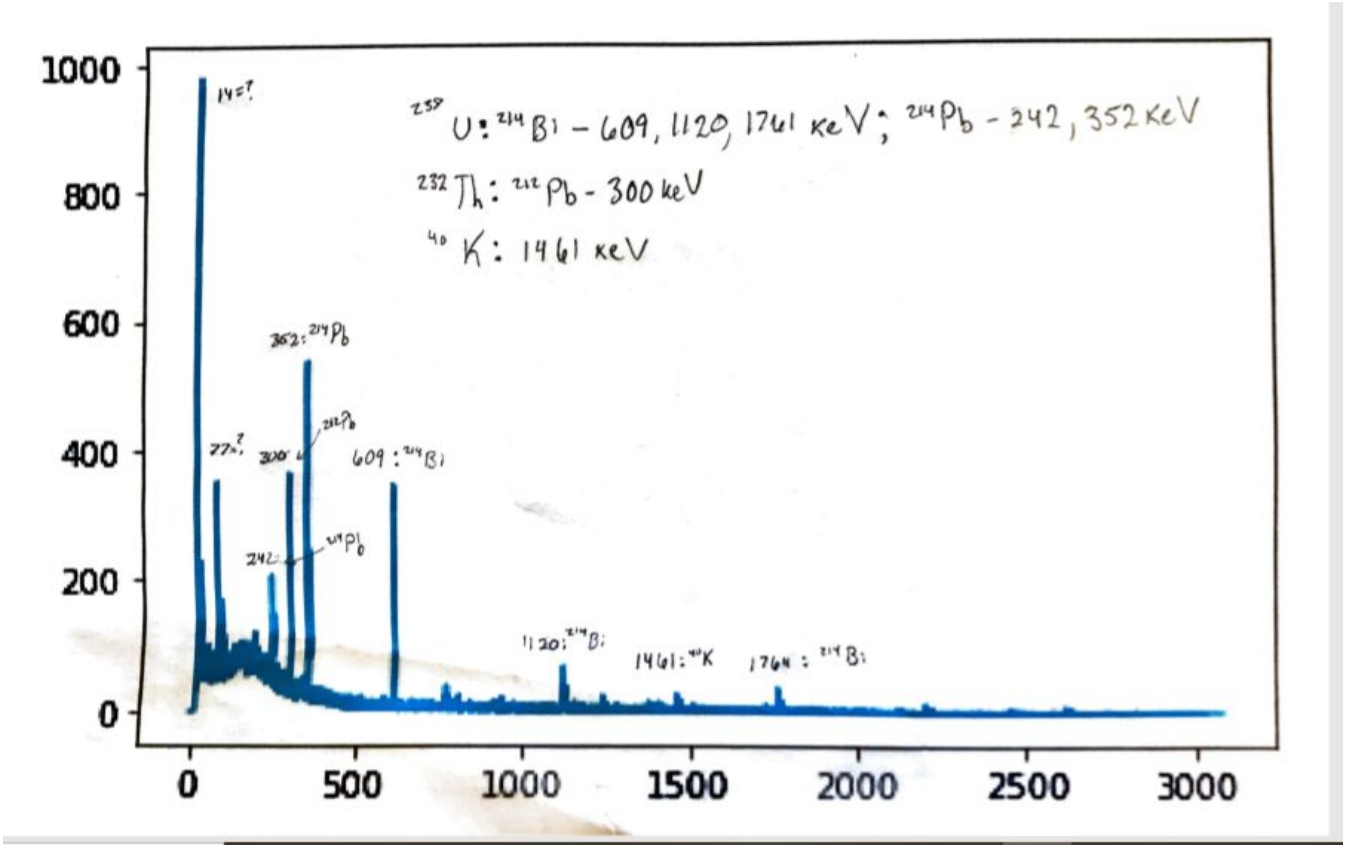
Convolutional Neural Network



Labeled Energy Spectrum

Radioisotopes

- U-238
- Th-232
- K-40



Fitting Algorithm

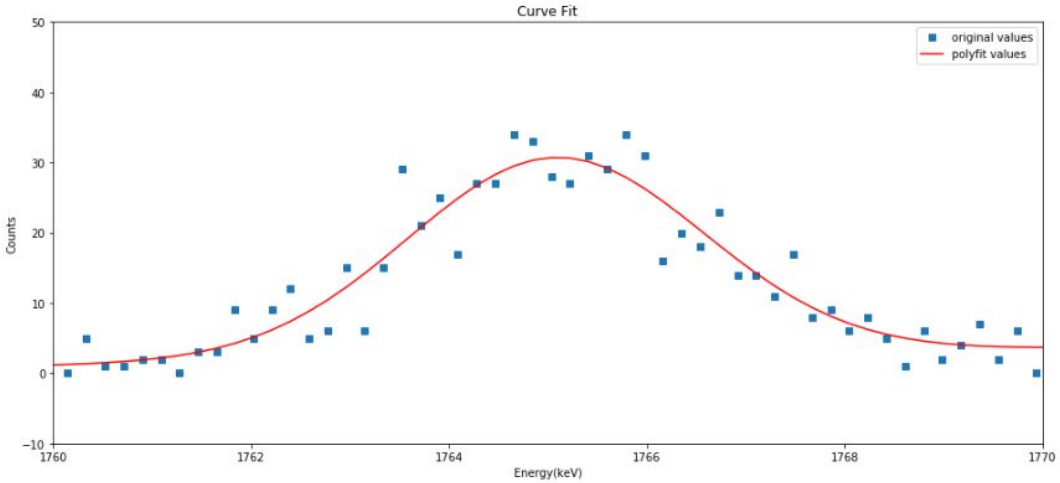
Gaussian Equation

$$f(x) = ae^{-\frac{(x-b)^2}{2c^2}}$$

Parameters

Gaussian Function
- -amplitude
- -energy
- -standard deviation

Background Function
- -slope
- -y-intercept



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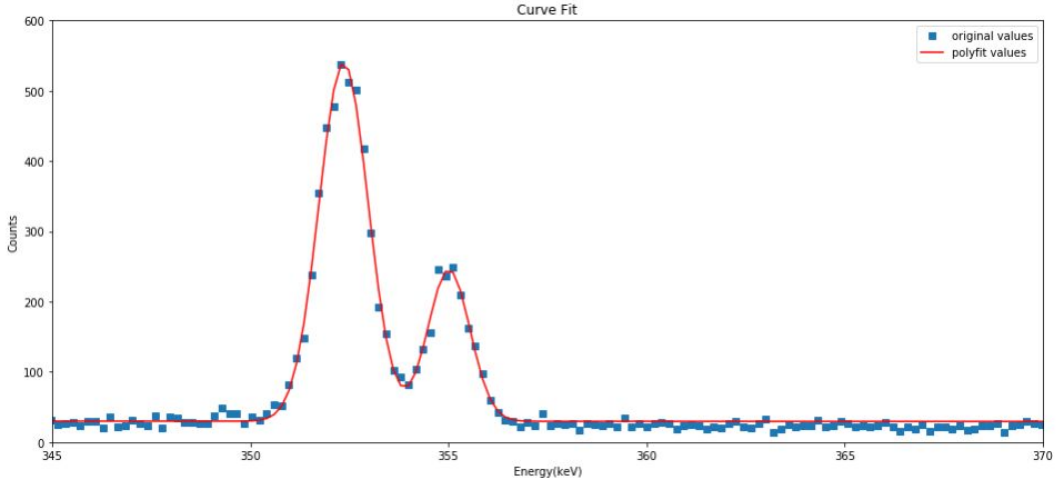
mu: 1765.0804494533509
sigma: 1.0583821879176403
m: 0.24794448190516272
b: -435.2949694095547
FWHM: 2.4924900525460427



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mu: 352.35409759997594
sigma: 0.4398507587241479
amp2: 215.9367461060639
mu2: 355.0113046359733
sigma2: 0.37642753432180276
m: -0.01584426335043425
b: 35.222914357680736
FWHM: 1.0358485367953683
FWHM2: 0.8864868433278454

Current Objectives

- Refining Energy Resolution

  -background subtraction from gaussian peak

  -convolutional neural networks