Complément à la présentation d'Emma extrait de:

NP AI-ML PI Exchange Meeting

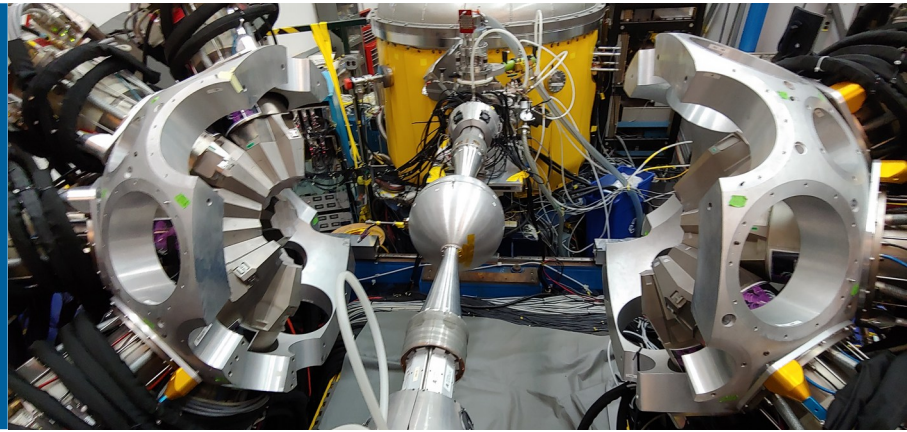
Washington DC, December 4-6, 2024

Argonne NATIONAL LABORATORY

AI/ML FOR GAMMA-RAY TRACKING

TOWARDS UNEXPLORED HIGH SENSITIVITY REGIONS

Amel Korichi



Mike Carpenter (FOA PI) **Torben Lauritsen**	**Sven Leyffer** **Thomas Lynn**	**Dominic Yang**	**Amel Korichi**
Physics Division Argonne National Laboratory	Mathematics and Computing Science Division Argonne National Laboratory	UCLA	IJCLab IN2P3/CNRS Irene Joliot Curie Laboratory

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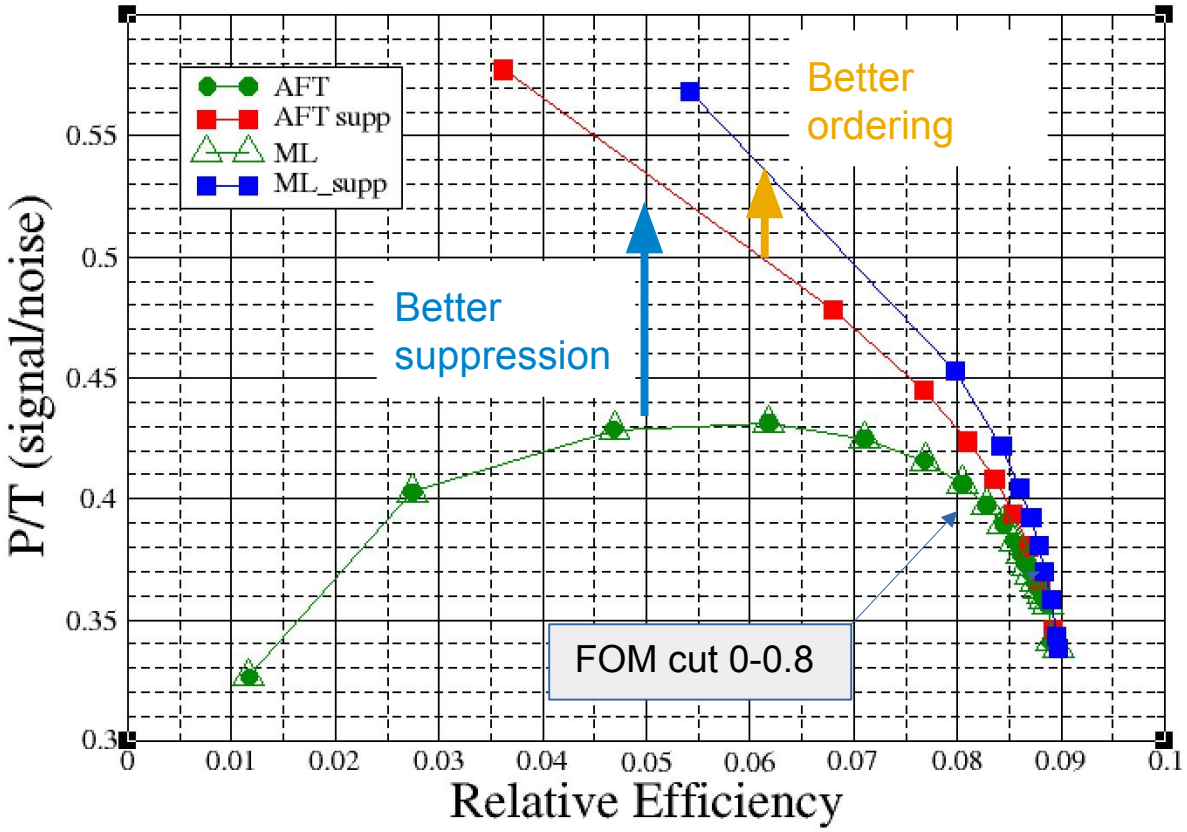
Results for ^{60}Co source data



GRETINA (AFT) FOM

$$\frac{1}{N-1}\sum_{i=1}^{N-1}\left(\theta^{\text{geo}} - \theta^{\text{theo}}(E_{i-1}, E_i)\right)^2$$

Final FOM

Check to remove background

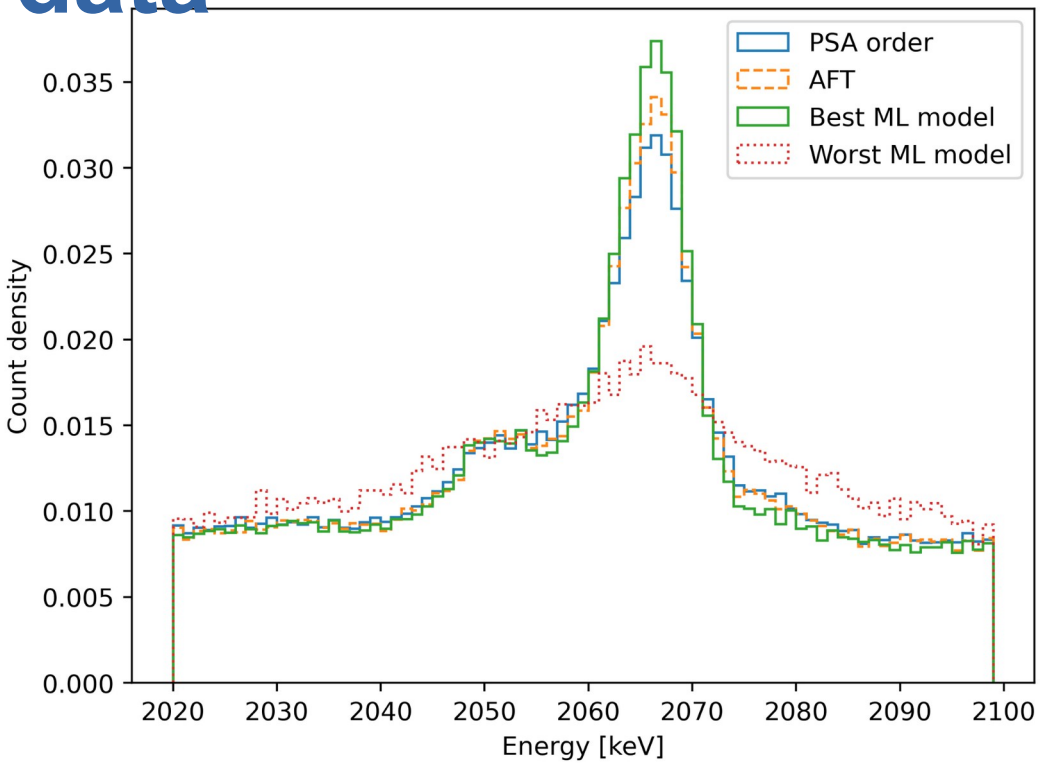
ML classification problem

Use linear model to help interpretability, protect against overfitting, help transition to experimental data

Good ordering, especially for incomplete gamma-rays, helps clean up the spectrum

Results for ^{92}Mo in-beam data

Experiment performed at ATLAS (for the evaluation of GRETINA performance)



Fusion-evaporation reaction

^{12}C(^{84}Kr,xn)

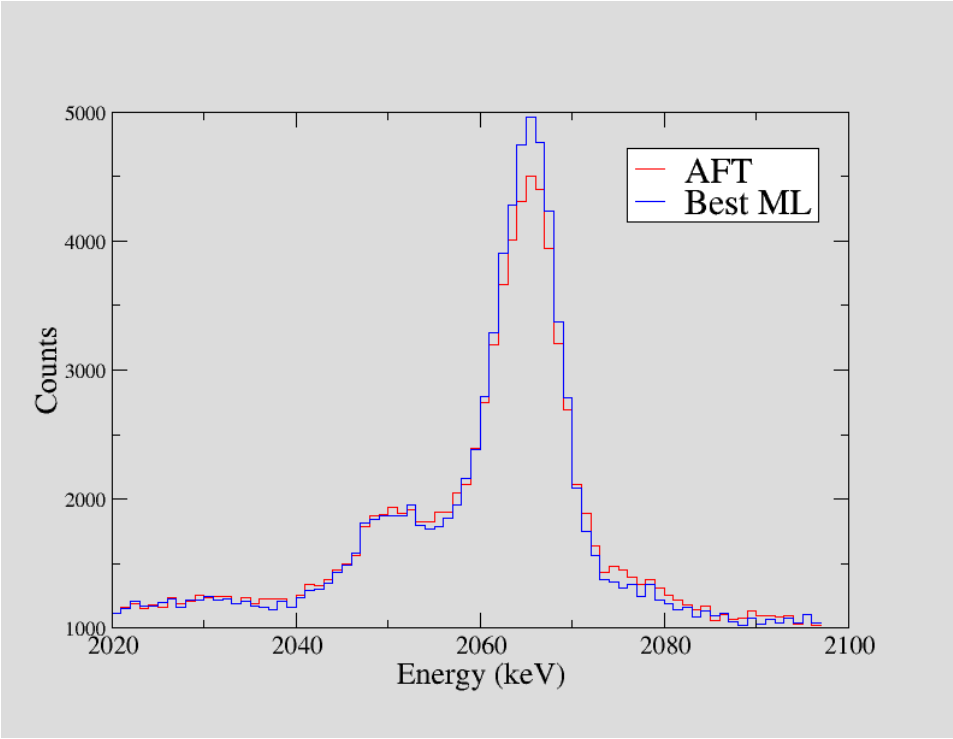
Beam Energy = 394 MeV

Recoil velocity ~8 %

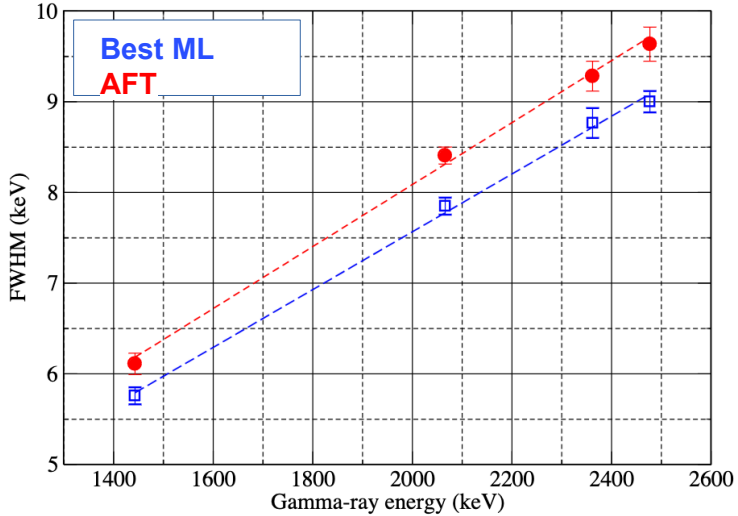
No FOM cut/supression. Only Doppler correction

Results for ^{92}Mo in-beam data

Experiment performed at ATLAS (for the evaluation of GRETINA performance)



FWHM	Peak Area	Energy
8.02(6)	31763(266)	2065.63(4)
8.75(7)	30169(277)	2065.65(5)

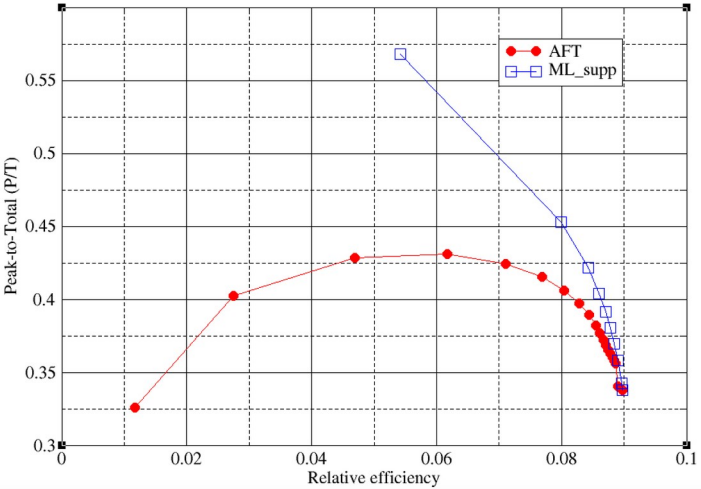


Clear improvement in the energy resolution & efficiency

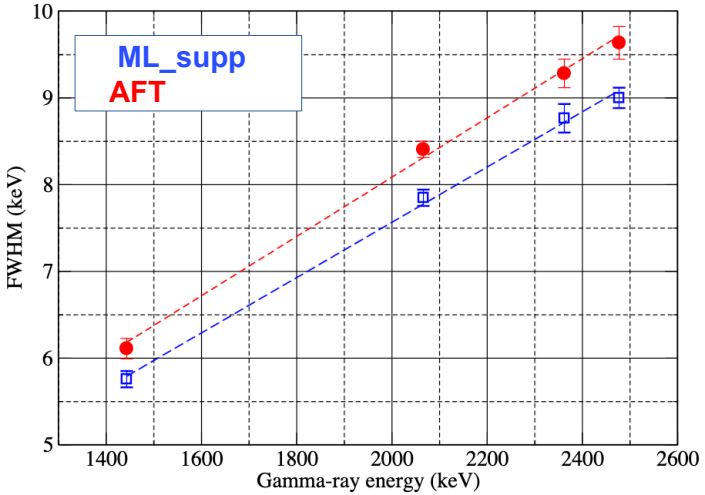
Summary

P/T improved by ~10 %

Efficiency ε ~ 6 %



FWHM improved by 9 %



These numbers look small BUT !

More than a factor 2.5 gain (fold 5) in the Resolving Power R ~ $\left(\frac{\varepsilon\ P/T}{FWHM}\right)^{Fold}$

Recent results for ^{152}Dy (multiplicity 30): impressive. Stay tuned!