MSU status report for FY25

Jun Chen

2025 USNDP annual meeting, 28-31 October 2025

@ZOOM, BNL

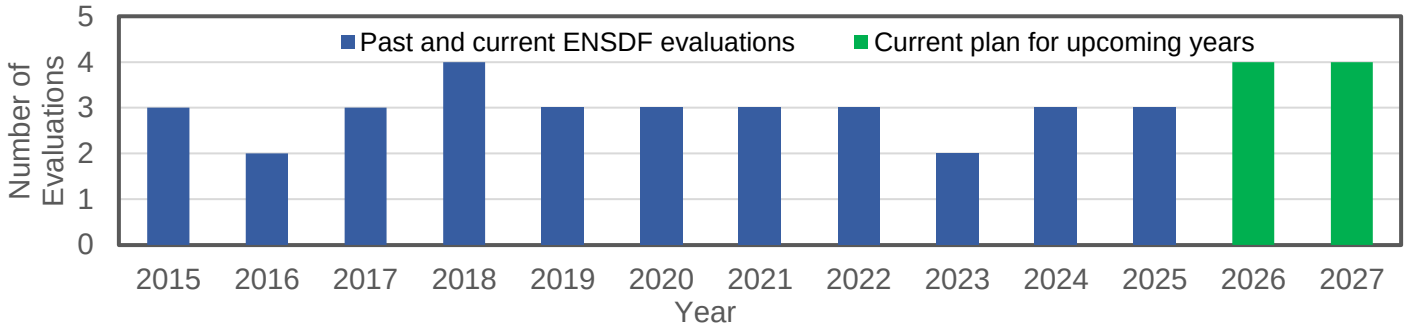
This material is based upon work supported by the U.S. Department of Energy, Office of Science, Office of Nuclear Physics under Award Number DE-SC0016948.

Overview

- Grant status: funded by DOE since 2017 (supplemental awarded in 2024)
- Data personnel (2.0 FTE)
  - Lijie Sun (staff, 1.0 FTE since 02/2025), Jun Chen (1.0 FTE)
  - Two undergraduate students for XUNDL compilation and ENSDF codes (supported by MSU and course credit)
- Major Responsibilities:
  - ENSDF evaluation: A=31-44, 60-80 (except 62,67-70); currently 30 mass chains in total
  - Data review and XUNDL compilation for PRC and EPJA manuscripts
  - Development and Maintenance of ENSDF codes
  - Development of AI/ML assisted workflow for ENSDF evaluation
  - Data support to FRIB users via the FRIENDS (**FR**IB **I**ntegral **E**xperimental **N**uclear **D**ata **S**ervices) project

ENSDF evaluation at FRIB

- Current MSU/FRIB responsibilities (30 mass chains): A=31-44, 60-80 except 62,67-70
  - Completed for FY25: A=35, 74, 151
  - Planed for FY26 (2 evaluators): A=34, 36, 78, (and 37 if time allows)
- Also work on other mass chains in the past (mostly in collaboration with Balraj Singh)
  - Completed: A=48, 50, 85, 98, 100, 123, 138, 149, 151, 165, 167, 190, 194, since 2014, (also 64, 71, 73 with Balraj)
- Current goal settings starting FY26: 3-4 mass-chains per year (2 evaluators)



Number of ENSDF evaluations each year at MSU, including collaboration work (1-2 per year) with Balraj Singh till 2024

Total 3-4 mass chains/year after additional evaluator (1.0 FTE) is hired starting from FY25

- Completed in FY25 (full-evaluation of all available data "from scratch")

Mass	#Nuclides	#Datasets	#Lines	#Levels	#Gammas	Evaluators	*status*
A=35	*11*	*98*	*15,248* *(old 11,324)*	*671*	*1,313*	L.J. Sun and J. Chen	*Submitted*
A=74	*13*	*109*	*23,875* *(old 12,099)*	*890*	*1,628*	J. Chen	*Submitted*
A=151	*18*	*119*	*39,114* *(old 24,932)*	*1,695*	*3,183*	B. Singh, J. Chen	*In-review*

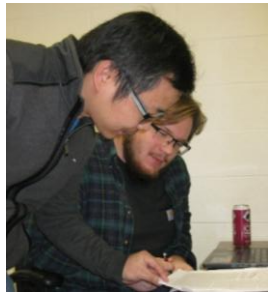
Other: reviewed 1 mass-chain evaluation

Data Review and XUNDL Compilation at FRIB

- Completed in FY25:
  - » XUNDL compilations (including data reviews): 45 datasets from 30 papers
    - including compilation of 7 papers by two undergraduate students
  - » Data reviews (by L.J. Sun and J. Chen): 23 PRC manuscripts (total 38 datasets)
- Training MSU students for XUNDL compilation (since 2018)
  - » Since 2018, 1-2 top undergraduates from Honors College of MSU have been recruited and trained each year (except 2021)
  - » A total of **72** datasets from **51** papers have been compiled by 8 students so far
  - » Beginning 10/2025, one new student from MSU Honors College: Mathew Borlace joined in this activity, supported by course credits of MSU/FRIB Honors Research Seminars.

Amani Ahnuar
2018-2019

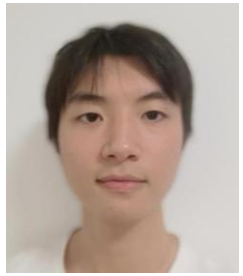
Pranjal Dangwal
2019-2020



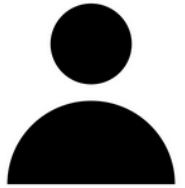
Dave Lempke
2019-2020
Current PhD student at FRIB

Luke Hixson
2022-2023
B.S. degree in <3y
Compiled 11 papers

Rylie DuBois
2023-2024
Compiled 10 papers

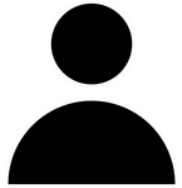


Hang Su
2023-2024
Compiled 8 papers



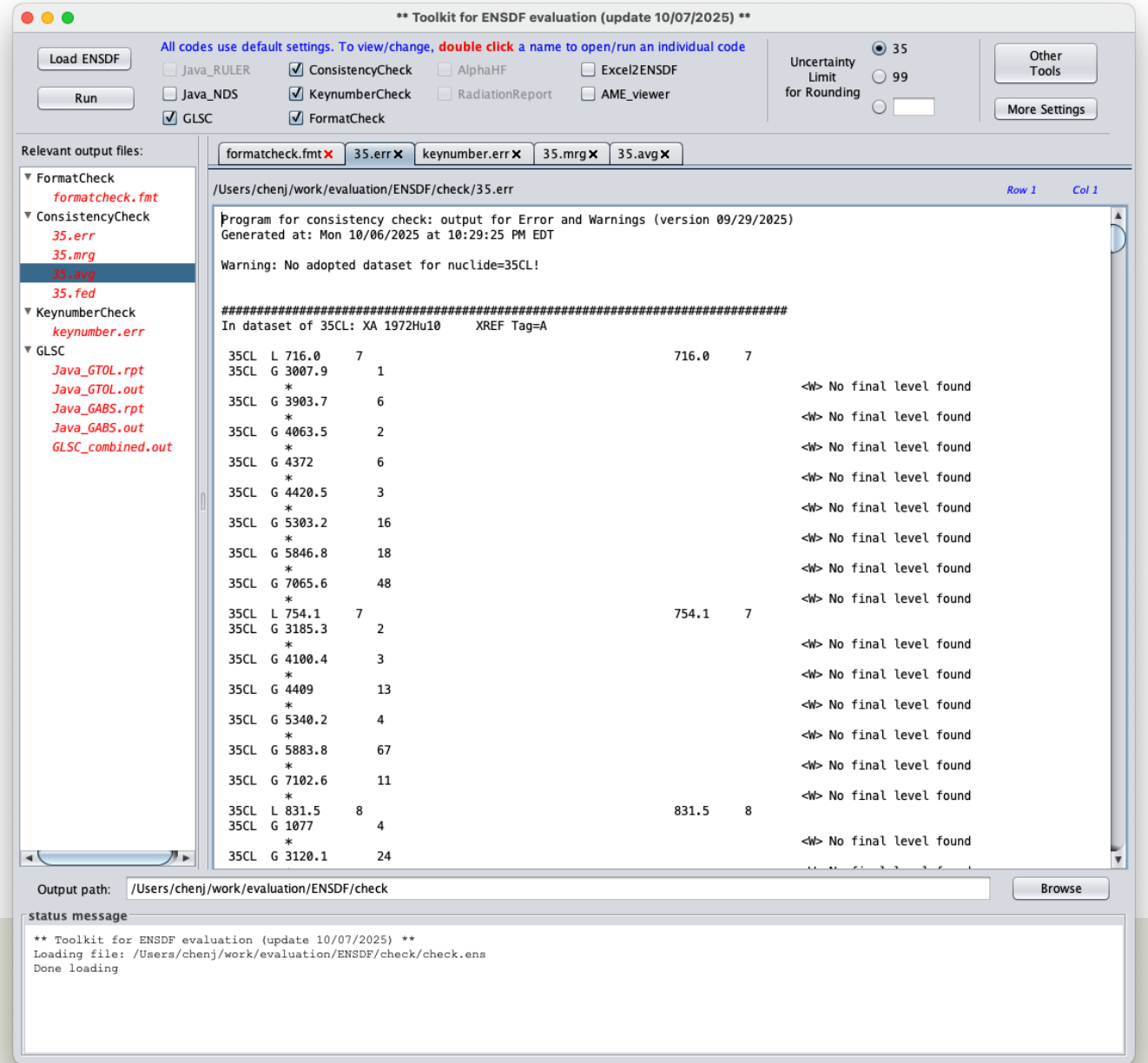
Parameswar Rejesh
2024-2025

Evan Sternberg
2024-2026
Continue on ENSDF codes



Mathew Borlace
10/2025-2026
new student

ENSDF code development and maintenance at FRIB



EvaluationToolkit is a Java toolkit combining all ENSDF Java codes to streamline ENSDF evaluation procedure

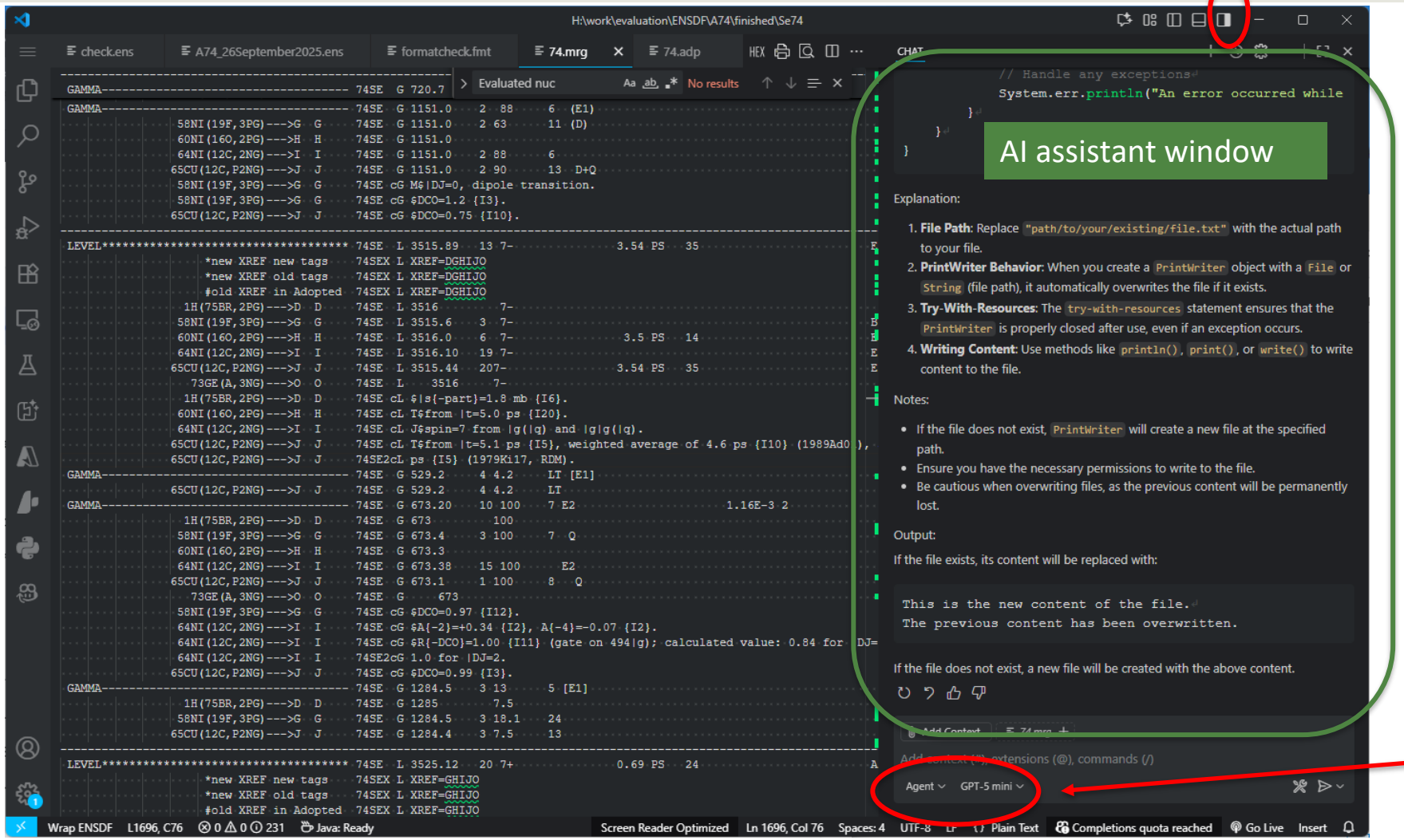
- ❑ Provides easy access to all codes in a single app
- ❑ Automatically determines which codes to run based on the type and data of the input dataset
- ❑ Runs all applicable codes in one single click
- ❑ Lists generated output files in one place
- ❑ In-app tabbed viewer for quick view of all generated output files

Eliminate the hassle of figuring out what codes to run for each dataset, executing them one-by-one, and tracking down their buried outputs.

Note: all codes are run with default settings. If customized settings are needed, double click the name of a code to change the settings and run it individually

AI-assisted workflow for ENSDF evaluation: initial stage

Toggle AI assistant window



An AI-assisted ENSDF formatting tool with VS Code has been developed and been used in an early stage in ENSDF evaluation. It is actively under continuous development and improvement.

VS code seamlessly integrates with all popular AI assistants (free and paid versions)

Selection of AI mode and model

See L.J. Sun's talk for more details

Facility for Rare Isotope Beams
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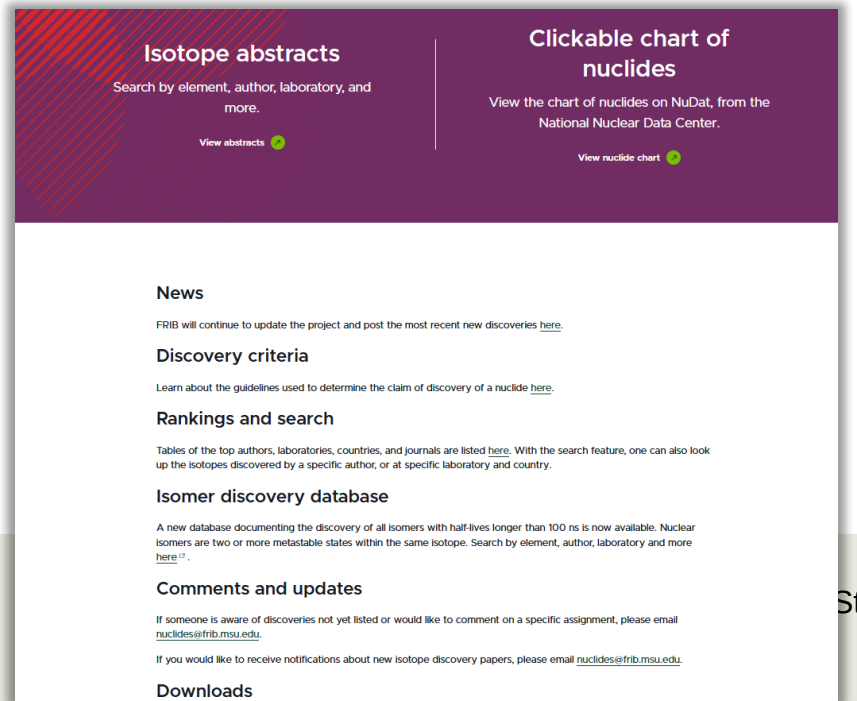
frib.msu.edu

Other Data Activities at FRIB

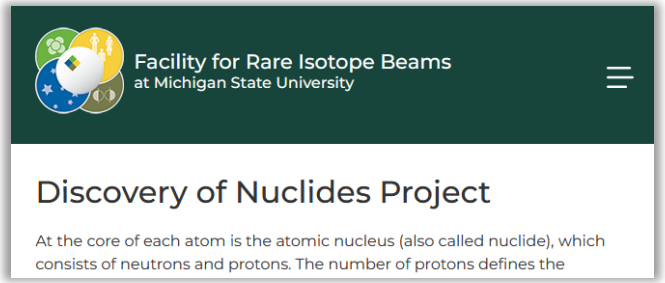
- Data support to FRIB users and researchers in the FRIENDS framework since 2021
- The lifetimes and branching ratios apparatus (LIBRA) (led by Lijie in his previous role at FRIB)
  https://journals.aps.org/prc/abstract/10.1103/PhysRevC.111.055806
- FRIB Nuclide and Isomer Discovery Data project since 2023 (with Michael Thoennessen)
  - » *New (in addition to isotope discovery):* Convert all isomer discovery data including abstracts into a single JSON file
  - » Develop a viewer/editor Java program to view and add/edit isomer discovery data
  - » Build webpages to host and display the isomer discovery data (tables) and to provide customized search to users

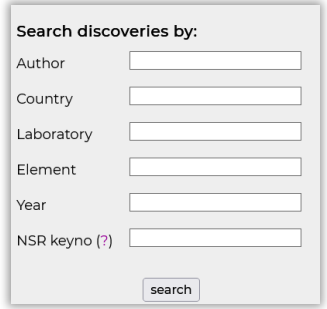


The new FRIB webpages of the nuclide discovery project are officially online in March 2024: https://frib.msu.edu/public/nuclides

For isotope discovery: data file, retrieval and search pages are at https://people.frib.msu.edu/~chenj/isotope-discovery/search.html

For isomer discovery: data file, retrieval and search pages are at https://people.frib.msu.edu/~chenj/isotope-discovery/isomers/search.html





Discovery of nuclear isomers, M. Thoennessen, J. Chen, At Data Nucl Data Tables 2025, in press
Nuclear Isomer Discovery Database Released, M. Thoennessen, J. Chen, Nature Comm 2025, in press