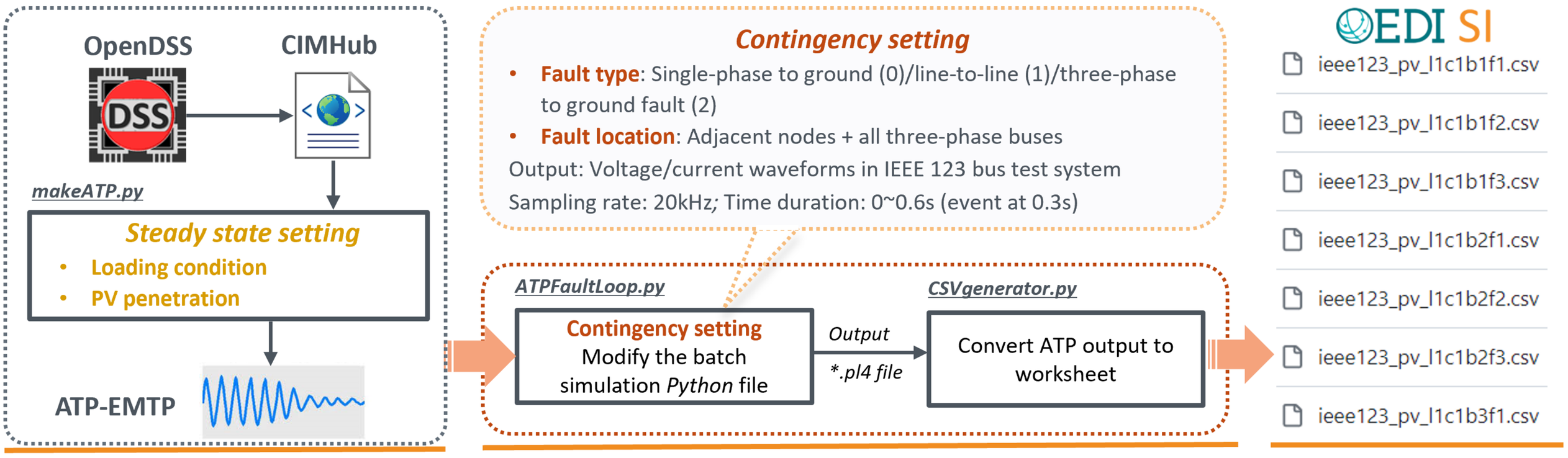
A Use-case Example: Transient Event Detection and Identification Demo on IEEE 123 Bus System

Yuqing Dong[1], Jin Dong[2], Boming Liu[2], Yilu Liu[1,2]
1 The University of Tennessee, Knoxville 2 Oak Ridge National Laboratory

INTRODUCTION

- Objective: Develop algorithms for event detection and identification based on the OEDI Solar Systems Integration Data and Modeling (OEDI SI) library
- Methodology
  - Data generation: multi-scenario POW data in ATP-EMTP (free license)
  - Data preprocessing: remove the initialization of EMT simulation
  - Event detection: periodic waveform detector
  - Event identification: (1) extract feature based on discrete wavelet transform
    (2) classify the events by multiple machine learning algorithms

Data Generation

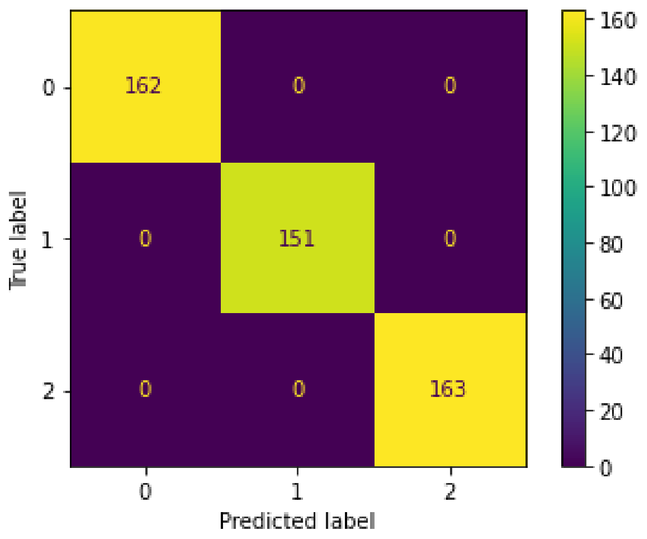


https://github.com/openEDI/oedisi-transient/tree/main/input

Transient Analysis Algorithms

Algorithm	Input		Output
Detection	Data	Preprocessed feeder head voltage/current waveforms	Detected event data period
	Algorithm parameter	Pre-selected detection threshold	
Identification	Detected event data period		Event type (0/1/2)

Confusion matrix of SVM algorithm



https://openei.org/wiki/OEDI-SI/Scenarios/AI_Based_Event_Identification

Conclusion

- Use case 1 (transient data generation) provides a simple way to simulate large amounts of POW data by modifying multiple
  - Steady states: loading condition/PV penetration
  - Dynamic states: fault type/fault location
- Use case 2 (transient analysis algorithms) provides a benchmarking solution for
  - Event detection: can detect all fault events
  - Event identification: each algorithm can reach a high accuracy