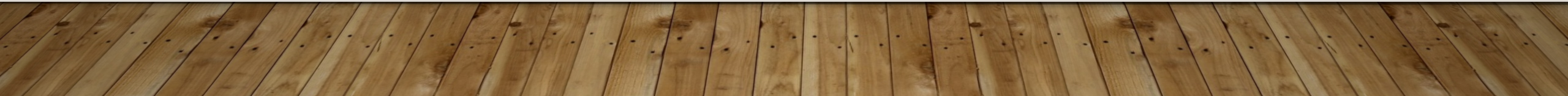


PCOE LECTURE SERIES

PYTHON PROGNOSTICS PACKAGES TUTORIAL

JANUARY 2021



GOALS

- Encourage new researchers into the prognostics research community by reducing effort required to begin new Prognostics Research – framework that they can use as a starting point
- Accelerate prognostics research through a set of extendable and robust prognostics tools
- Support collaboration on Prognostics Tools – Using Github Repository
- Optimize tool performance
- Failure modeling
- Prognostic modeling
- Model analysis
- State estimation
- Prediction
- Future load estimation
- Benchmarking and performance analysis
- Verification and Validation

STRUCTURE

Prognostics Models Package

- Flexible tools for building models
- Distribute example models
- Tools for simulation of modeled systems
- Tools for analysis and visualization of models and simulation results

Prognostics Algorithms Package

- Algorithms for performing state estimation and prediction using models (See Prognostics Models Package)
- Tools for developing new state estimation and prediction algorithms (i.e., extending)
- Tools for analysis and visualization of prognostics results

PROGNOSTICS MODELS PACKAGE TUTORIAL

MODELS – IDEAS/NEXT STEPS

- Motor model
- ESC model
- System of system support (composite design structure)
- Simulation – dynamic step size support
- Other battery models
 - Adding thermal runaway
- Surrogate model generation
- Using data-driven models
- Explore hybrid models (e.g., using *pml-pinn*)
- GPU support for sim parallelization
- Additional model testing/verification tools

Note: Some of these might be more appropriate as separate package

PROGNOSTICS ALGORITHMS PACKAGE TUTORIAL

ALGS – IDEAS/NEXT STEPS

- Diagnostic Tools
- Additional Prognostics Algorithms
- Sample Shedding (See research of Katy Jarvis)
- Additional Metrics/Visualization Tools

Note: Some of these might be more appropriate as separate package

SOCIALIZATION OUTREACH

- NASA-Internal Lectures (for example, this one)
- Tutorial at PHM Conference
- Socialize with partners
 - Invite participants from academia and industry

PROGNOSTICS PYTHON PACKAGES

Prognostics Models Package

- Flexible tools for building models
- Distribute example models
- Tools for simulation of modeled systems
- Tools for analysis and visualization of models and simulation results

Prognostics Algorithms Package

- Algorithms for performing state estimation and prediction using models (See Models Package)
- Tools for developing new state estimation and prediction algorithms (i.e., extending)
- Tools for analysis and visualization of prognostics results
- Algorithm Performance – verification and validation