Alex Koziol, from Wallingford, PA, plans to take a position with Glosten in Providence, RI.

Ben Hunt, from Burlington, VT, plans to take a position with Glosten in Seattle, WA.

Metaheuristic Algorithms in Concept Design: Optimization of Marine Electrical Systems

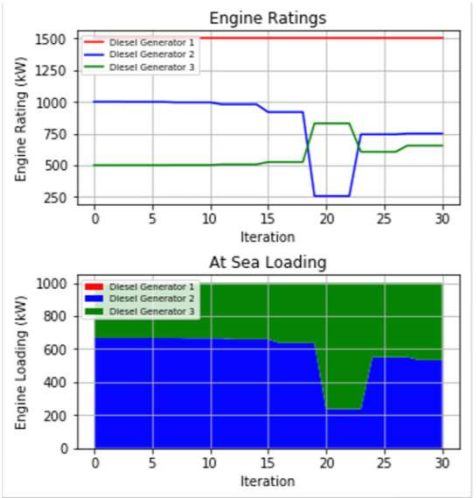
Scan this QR code to access our code!

INTRO

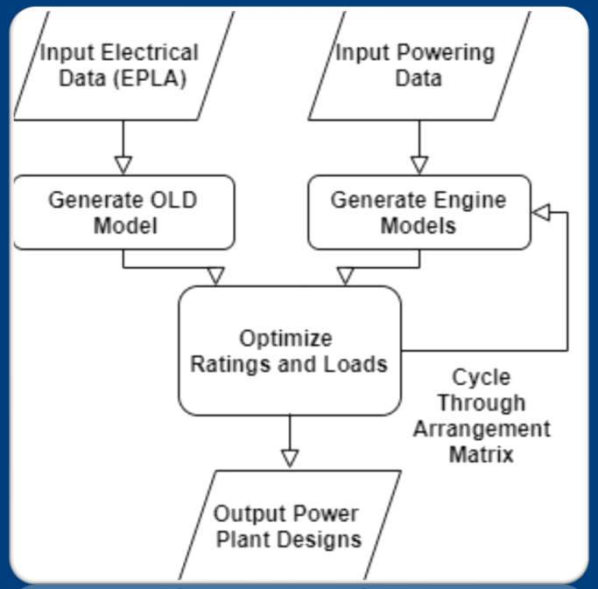
- Ship designers use **experience** and **standards** to guide solutions.
- Marine electrical systems are procedurally designed with repetitive calculations.
- Marine power plants are designed with time-intensive trade-off studies.
- Automation and optimization could **reduce repetitive tasks** and push **adoption** of **new technologies**..

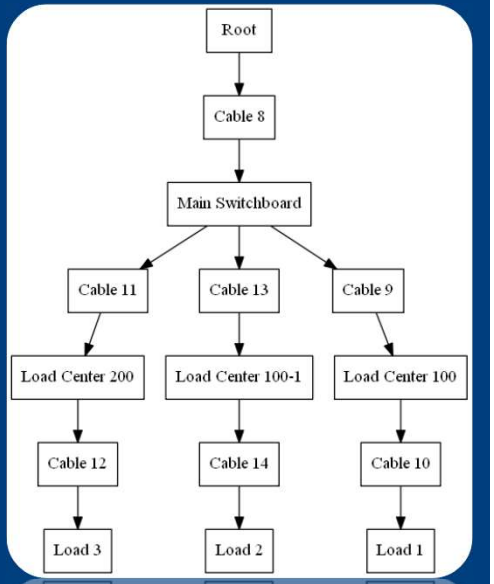
OBJECTIVES

- **Develop a tool** to:
  - Automate electrical system design.
  - Automate and optimize power plant design.
- **Demonstrate applicability** of automation and optimization to the marine industry.



We developed a **design tool** for **marine electrical systems** and **power plants.**





akoziol21@webb.edu | bhunt21@webb.edu

bit.ly/3uWMBfi

METHODS

- The tool consists of four modules: **input, modeling, optimization, and output**.
  - Input/Output is via scripting and CSV files.
  - Model the electrical system with a tree of Component objects that pass Power objects.
  - Model the power plant with a list of Source objects that pass Power objects.
  - Compare engine arrangements by fuel consumption and optimize each arrangement's rating and loading.

RESULTS

- **EPLA** -> flowchart **OLD** with panel connections and cable sizing.
- Set of **optimized power plant arrangements** by **fuel consumption** and **GHG emissions.**

Rating Optimization Algorithm Comparison

Name	SSDG #1 Rating (kW)	SSDG #2 Rating (kW)	SSDG #3 Rating (kW)	Time (s)
BFGS	1500	941	518	303
CG	1500	707	707	820
COBYLA	1499	998	498	1661
L-BFGS-B	1500	750	654	485
N-M	1533	708	679	1133
Powell	1511	709	681	1370
SLSQP	1500	1000	500	103