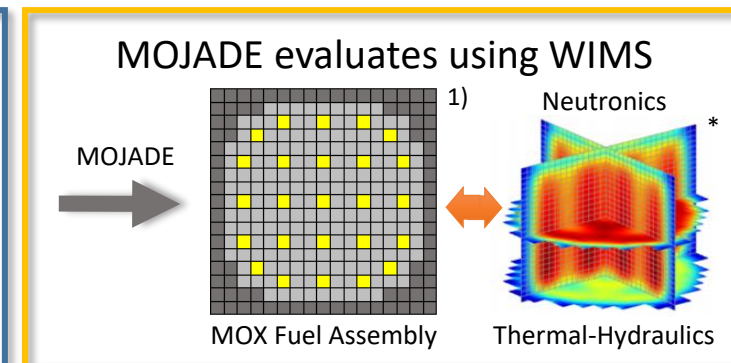
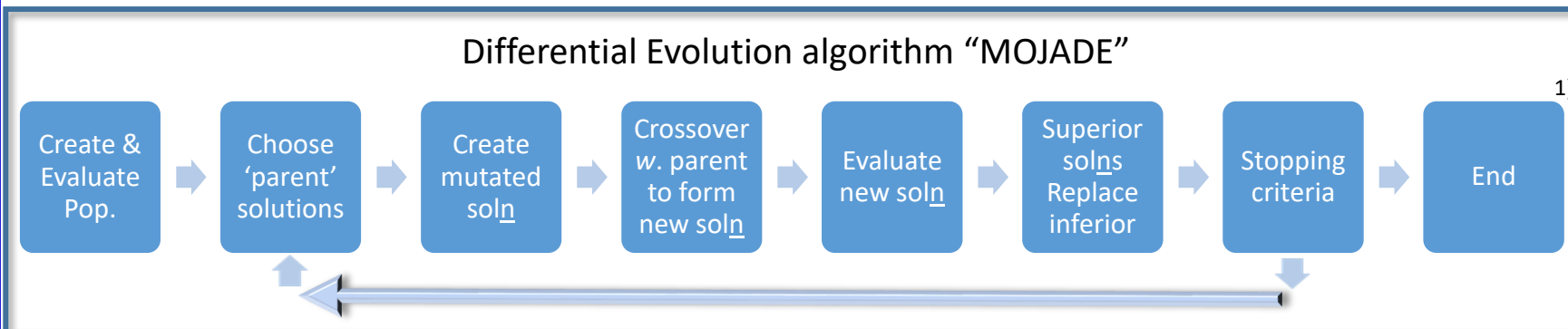


Multi-Objective Optimization of Heterogeneous Light Water Reactor Fuel Assemblies

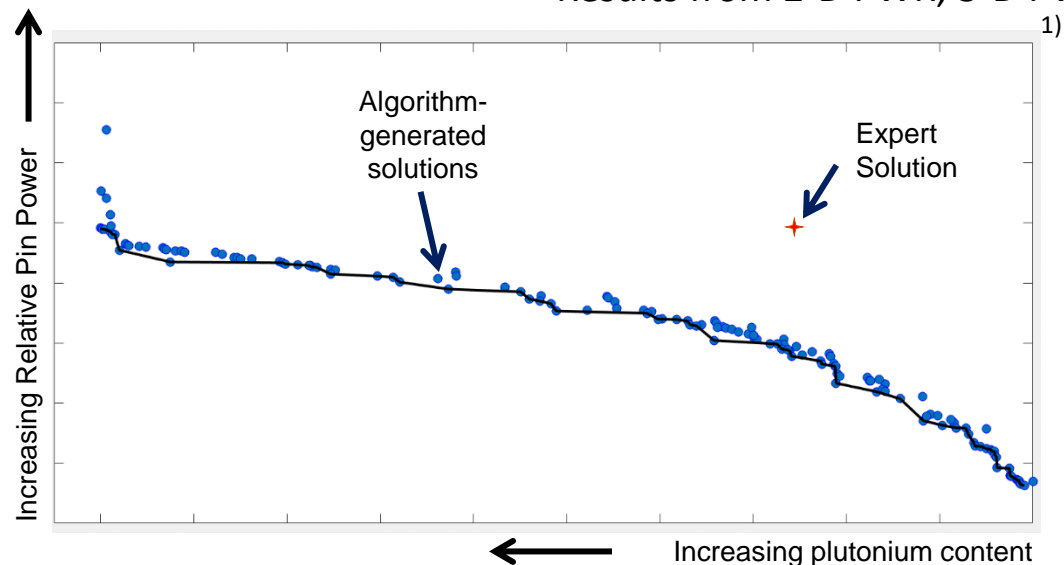
Alan Charles | Jacobs

Question: Is numerical optimization a useful tool for analysing nuclear fuel assembly designs?



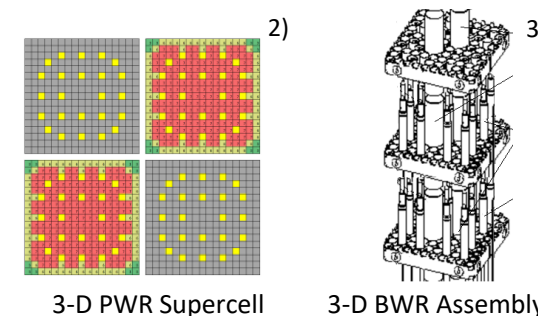
* <https://tinyurl.com/yy5erxm3>

Results from 2-D PWR, 3-D PWR, 3-D BWR fuel assembly problems, conclusions



- MOJADE can balance competing objectives (e.g. %Pu vs. PPF) to find the "Pareto-front", improving on expert solutions and outperforming other algorithms (such as genetic algorithms)
- Can be used "out-of-the-box" without requiring any tuning of parameters
- MOJADE can also tackle more complex problems, featuring poison rods, objectives for both neutronics and thermal-hydraulics, 3-D PWRs and BWRs (with partial-length rods), providing insight on the design space

Answer: YES!



References

- 1) Alan J. Charles and Geoffrey T. Parks, 2019, "Application of Differential Evolution algorithms to multi-objective optimization problems in mixed-oxide fuel assembly design", Annals of Nuclear Energy, Volume 127, Pages 165-177
- 2) Alan J. Charles and Geoffrey T. Parks, 2020, "Multi-objective, multi-physics optimization of 3D mixed-oxide LWR fuel assembly designs using the MOJADE algorithm", Annals of Nuclear Energy, Volume 145, Pages 1-14
- 3) Alan J. Charles, 2020, "Development Of A Multi-objective Optimization Capability For Heterogeneous Light Water Reactor Fuel Assemblies", PhD Thesis, University of Cambridge

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