



Using computer simulations to optimize ▶ biofuel production

Lila Branchaw | Bioproducts Engineering | NREL

Mentor: Hilary Egan

Meeting communities where they are



Overview



Biofuels



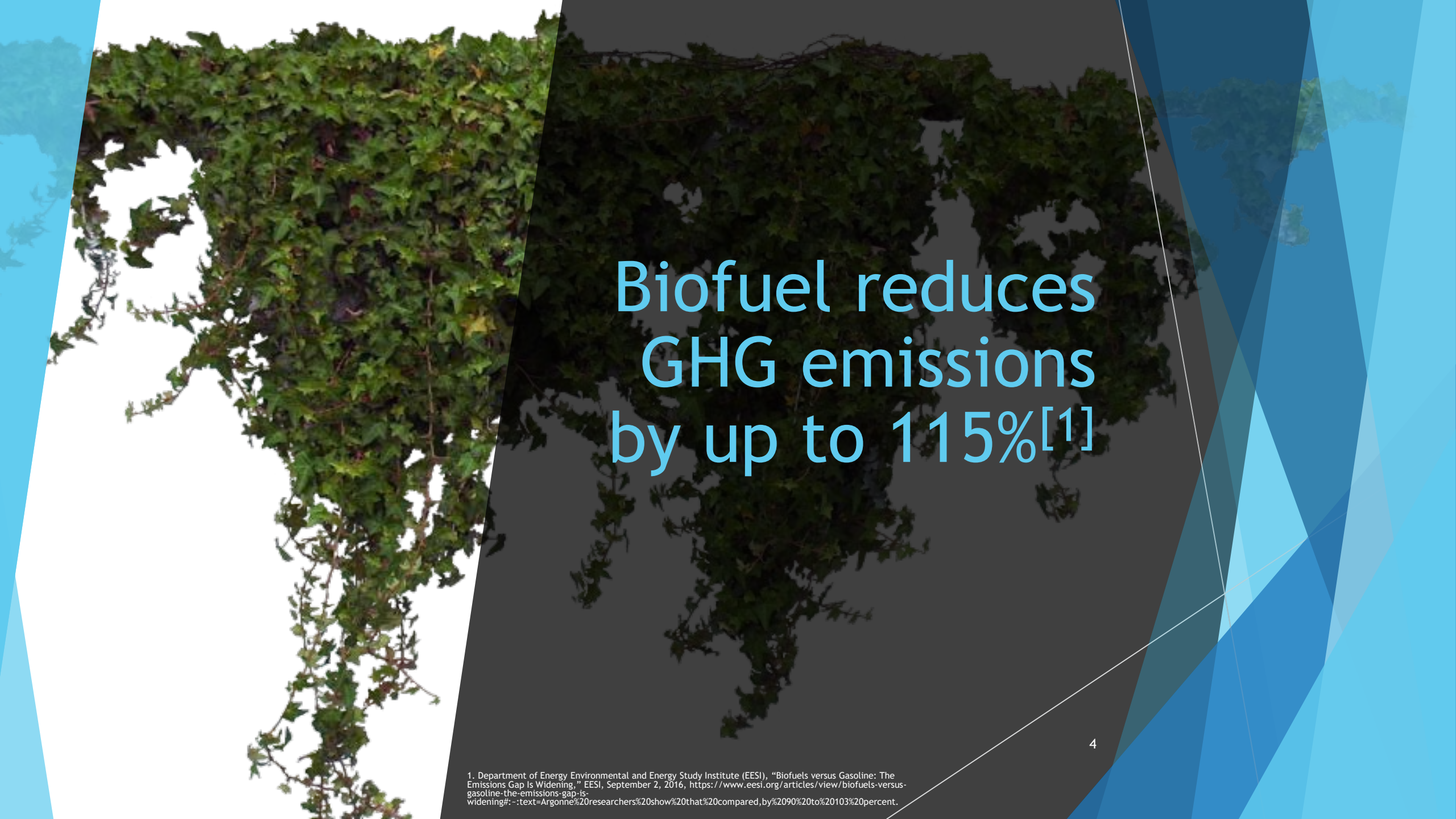
Challenges



Biofuel Production Computer Simulations



Machine Learning Enhanced Simulations

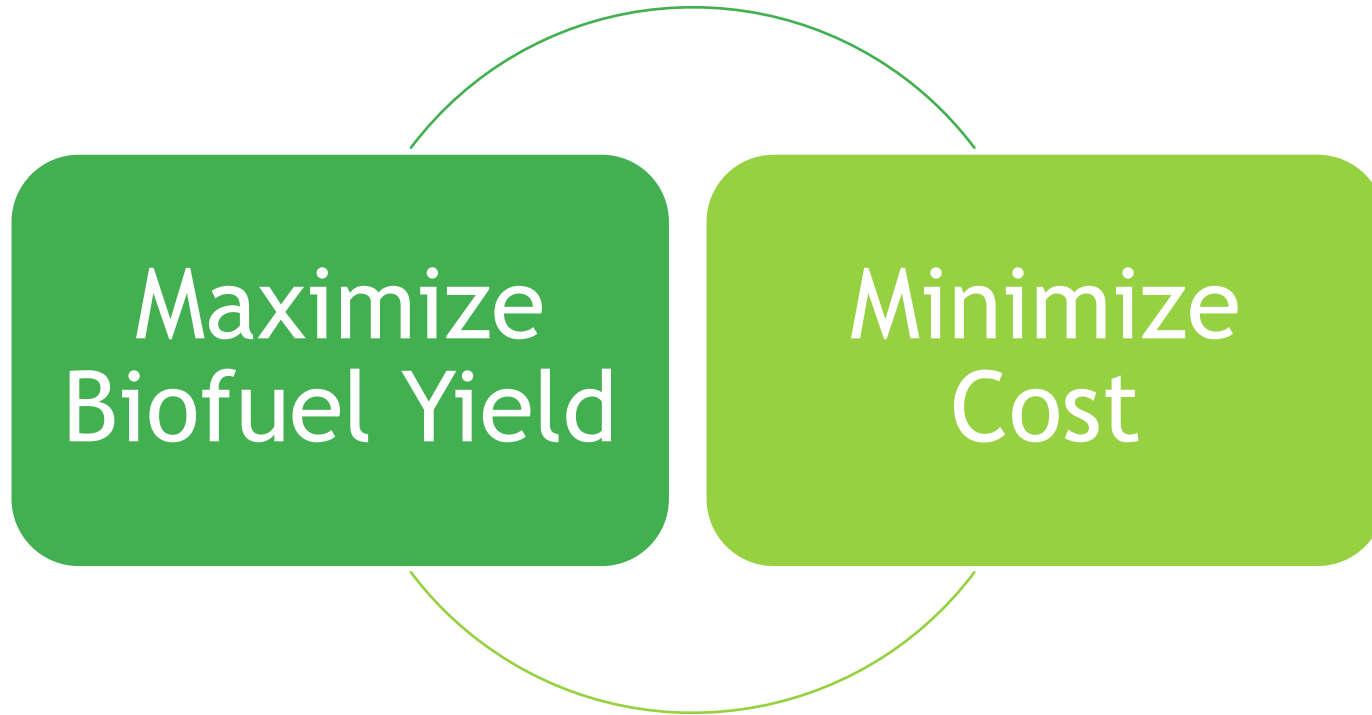


Biofuel reduces GHG emissions by up to 115%^[1]



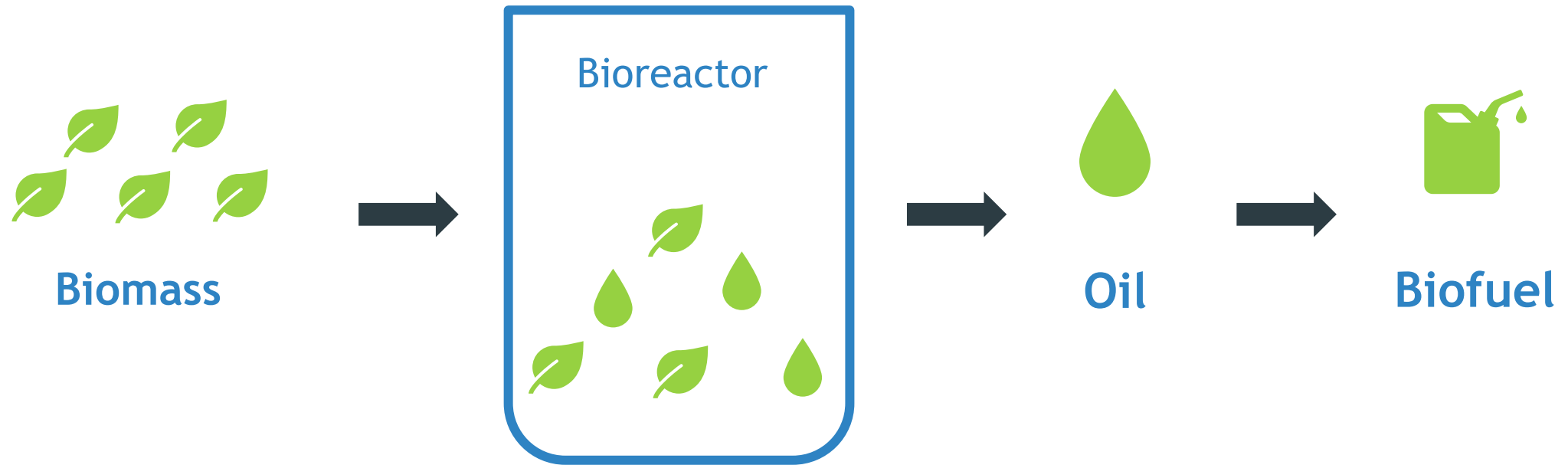


How do we
make biofuels
economically
feasible?

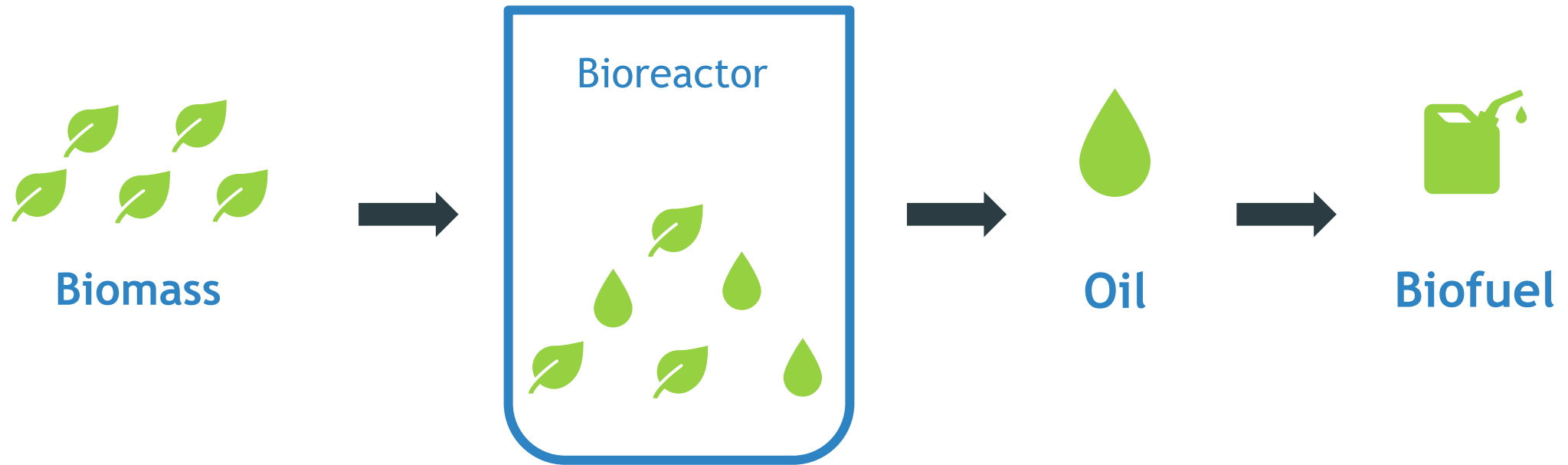


Computers are phenomenal at optimization

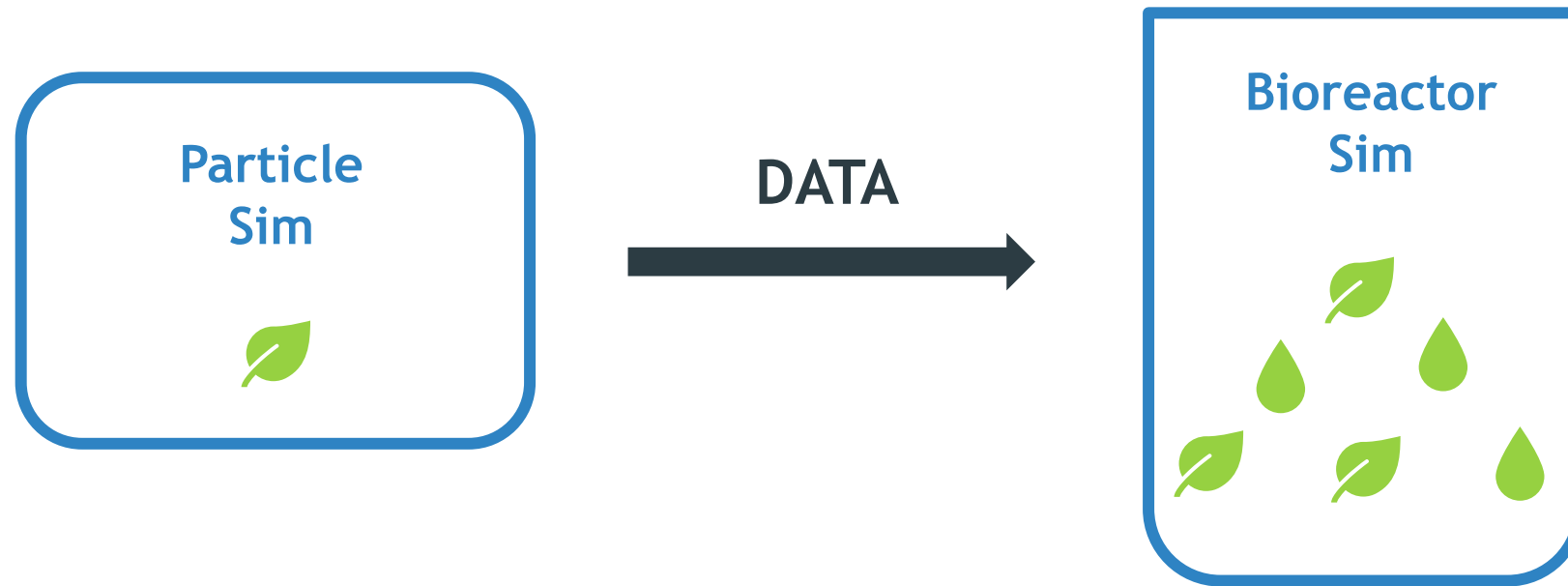
Biofuel Production Process



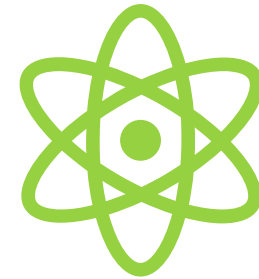
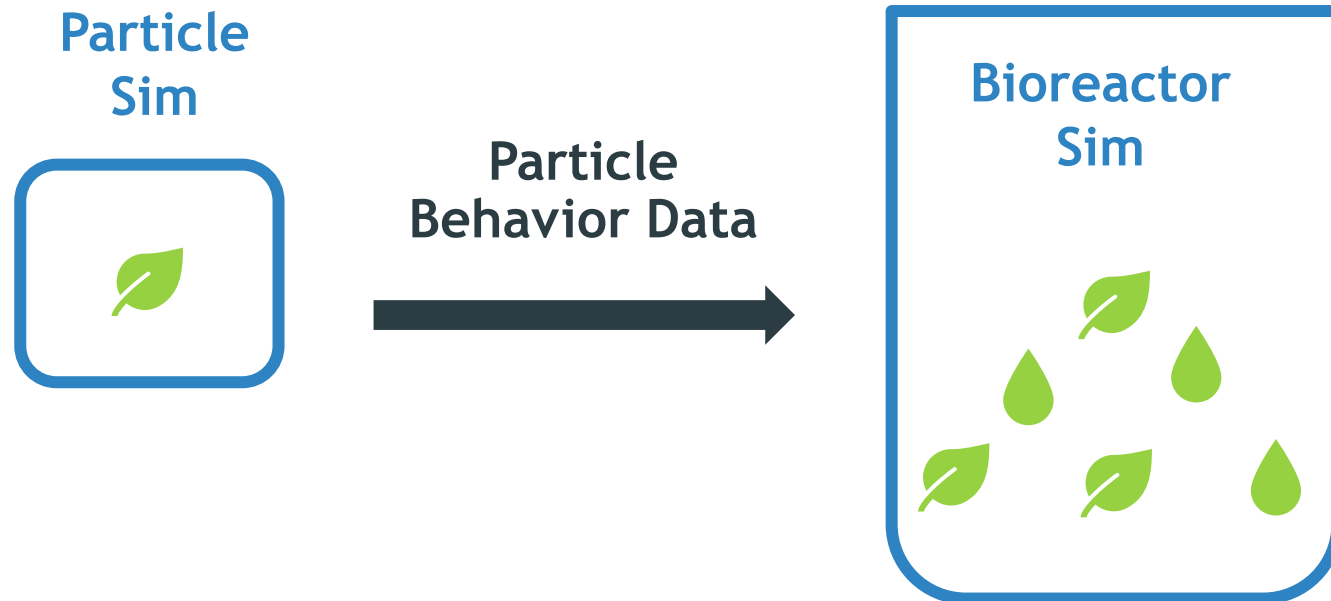
Biofuel Production Process



Bioreactor Computer Simulation



Data fed to Bioreactor Sim



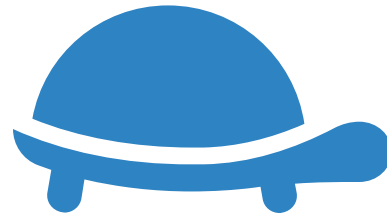
**Laws of
Thermodynamics**



“Why can’t the simulation track atoms instead of particles?”

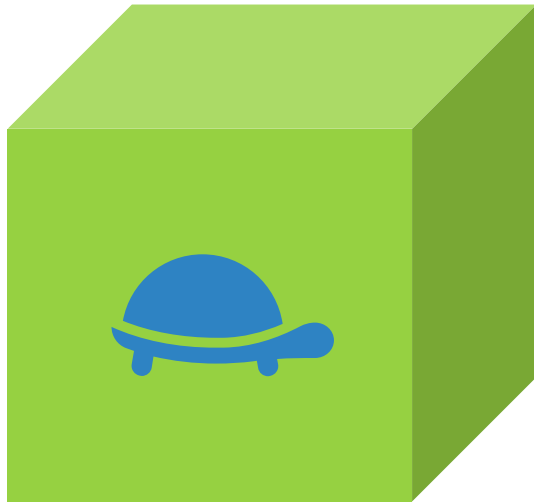


8 HOURS!!



3D and 1D Particle Simulations

**COMSOL
Biomass Particle**



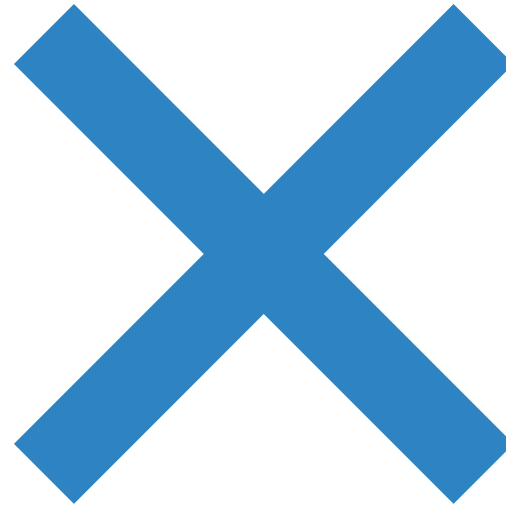
**1D
Biomass Particle**



1D Particle Simulations



Fast

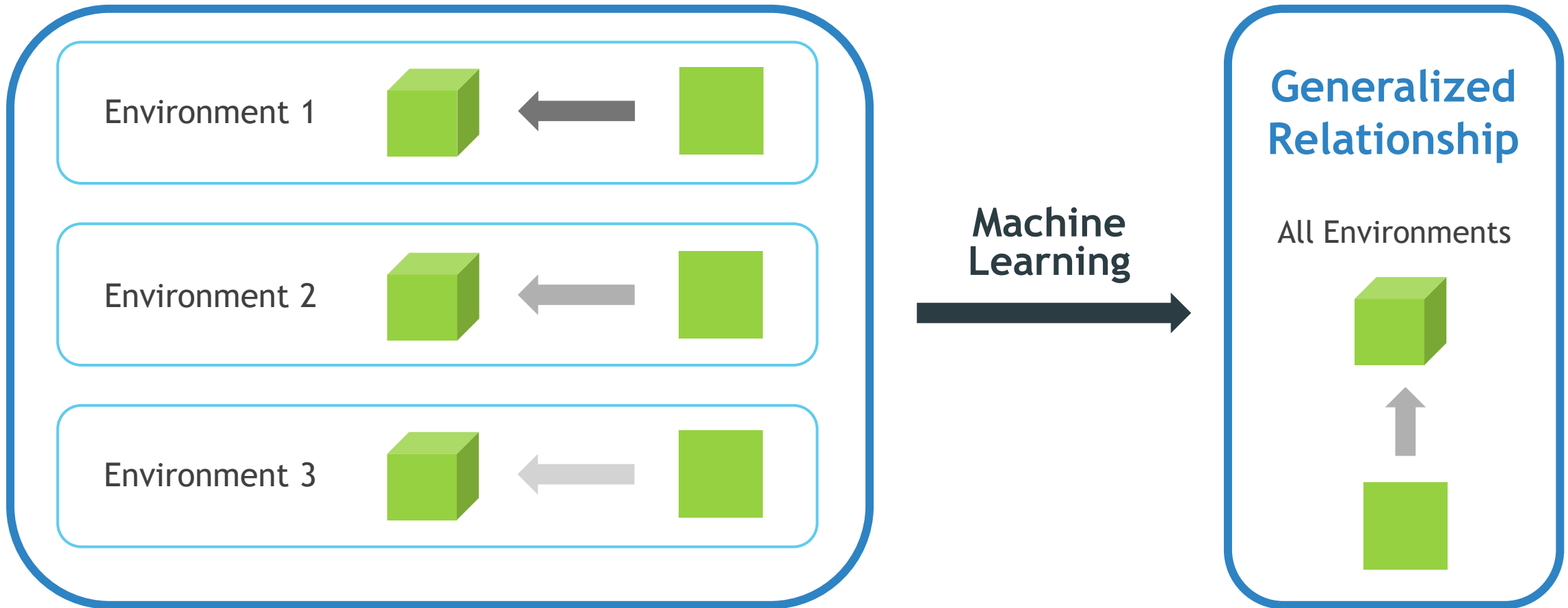


Inaccurate

Transform 1D data into 3D data



Define transformation of 1D to 3D

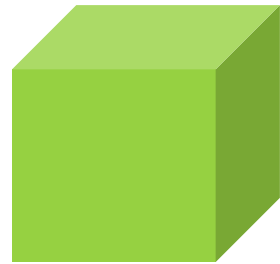


Overall Process

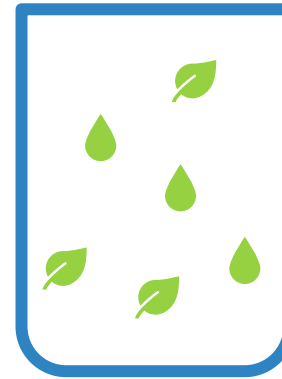
Input
Parameters



1D Sim



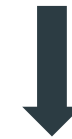
3D Data



Bioreactor Sim



Oil
Yield



Biofuel
Yield

Recap

Computer Simulation



Maximize Biofuel Yield



Minimize Cost



Economically Feasible

Thank You



Python Intro



Optimization

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