# From Data to Models

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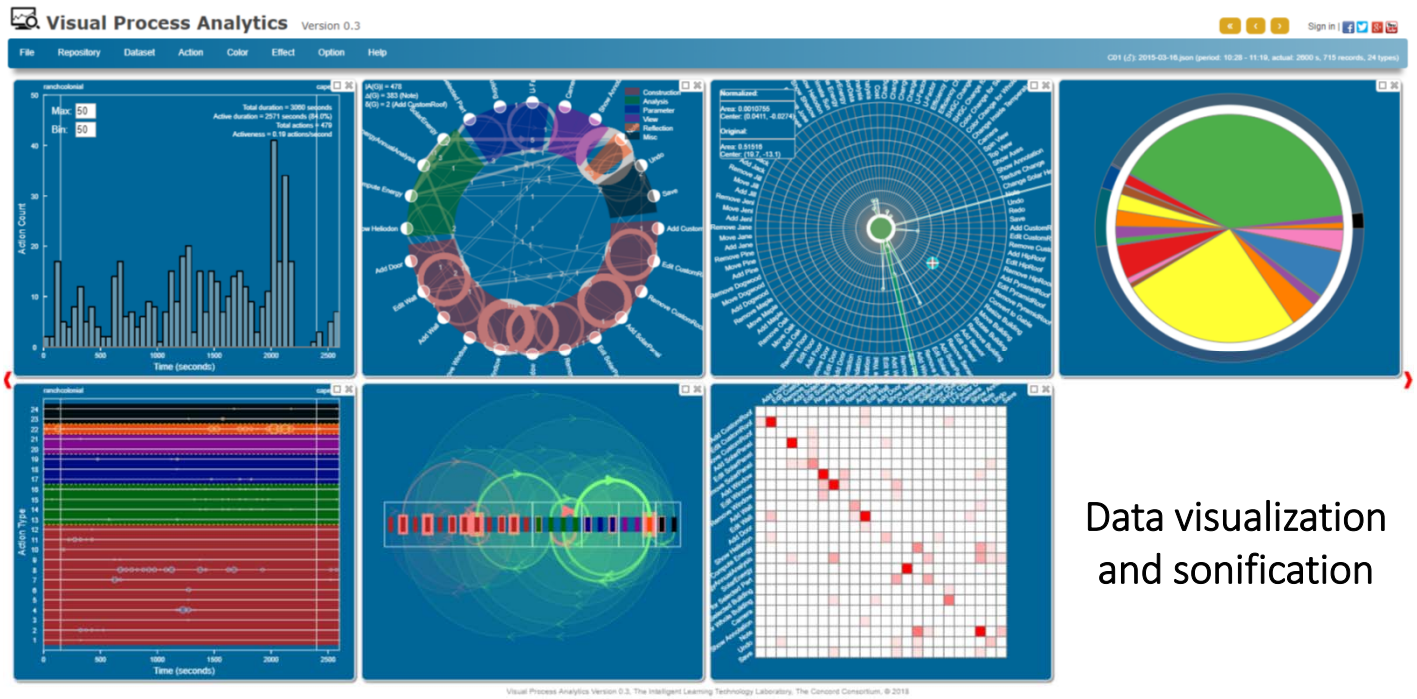
# Why designer modeling?

Data = Observation

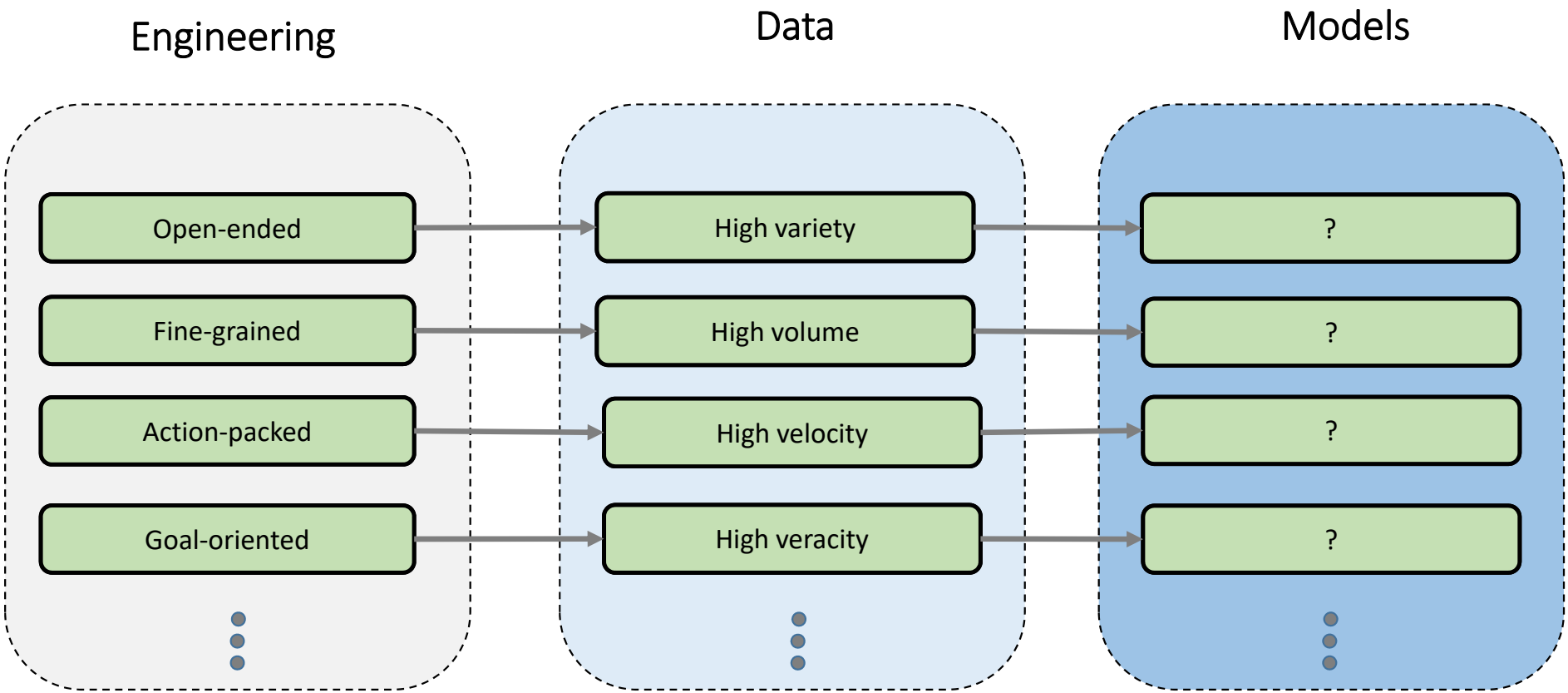
Model = Explanation (& Prediction…)

# Visual Process Analytics: What do our data look like?




Data visualization and sonification

# The complexity of design calls for complex models




IBM's 4V definition of big data

Just how complex is the design in question?
(Problem scoping)

# Examples: Architectural Design

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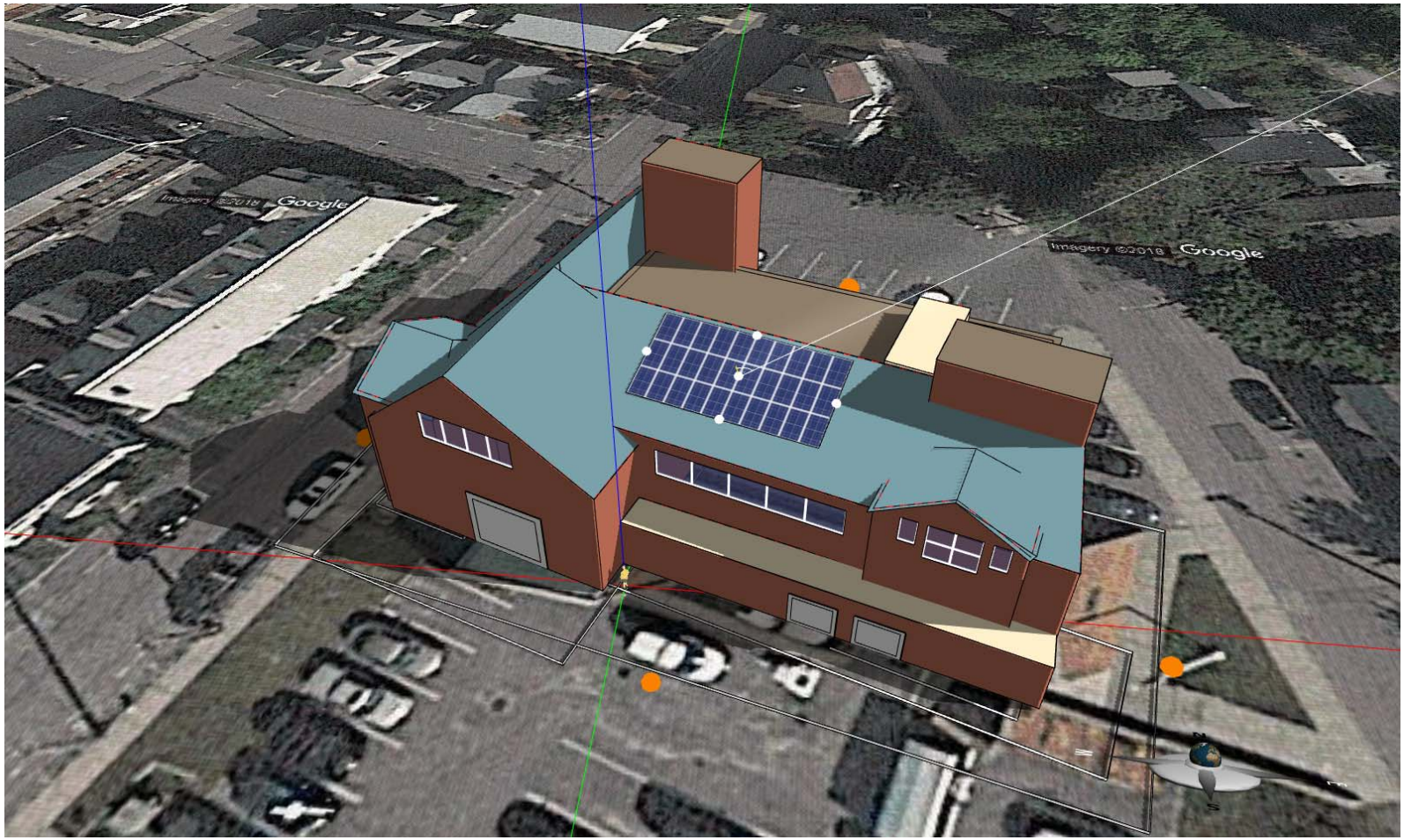
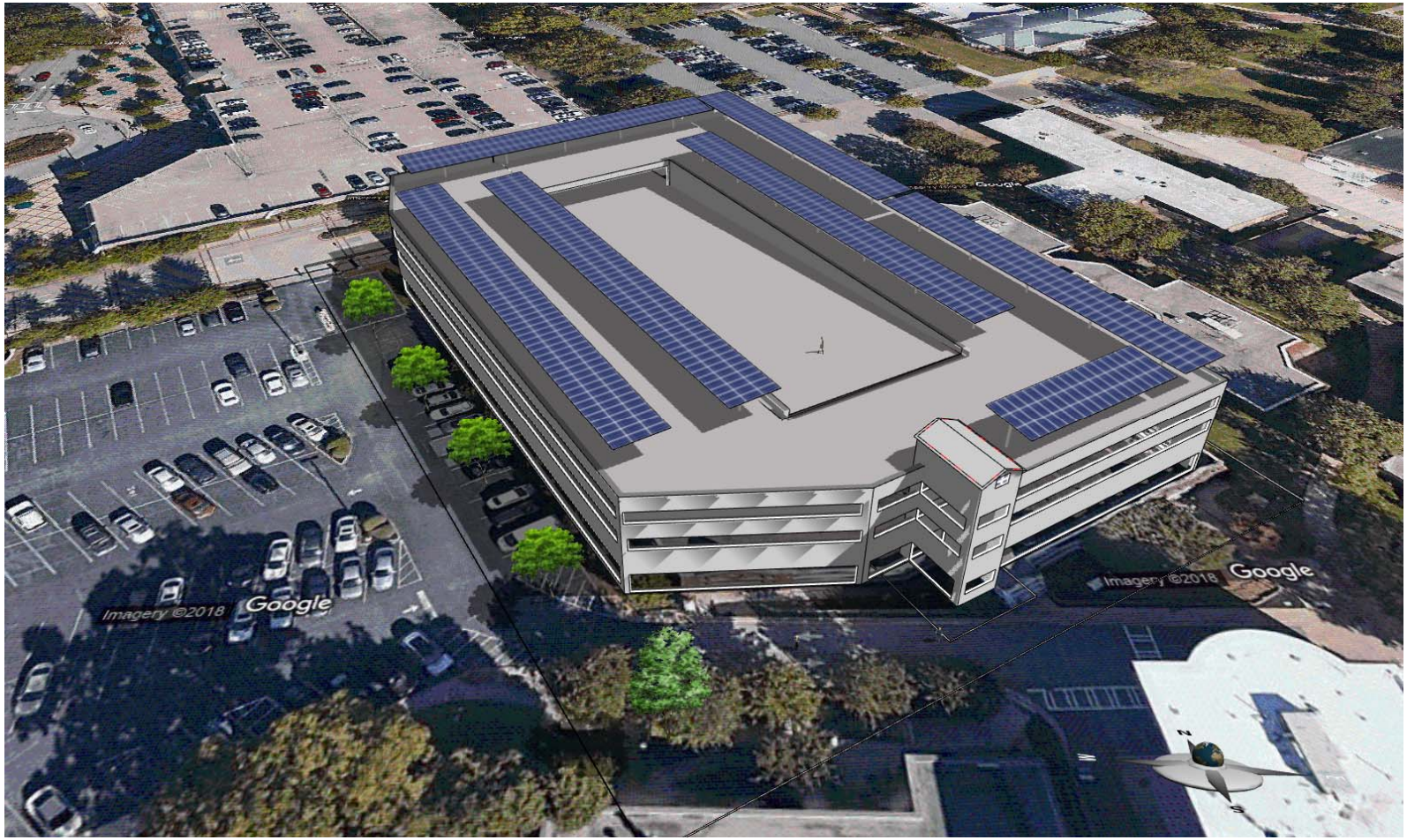
# Examples: Solarize Your Home (Braintree, MA)

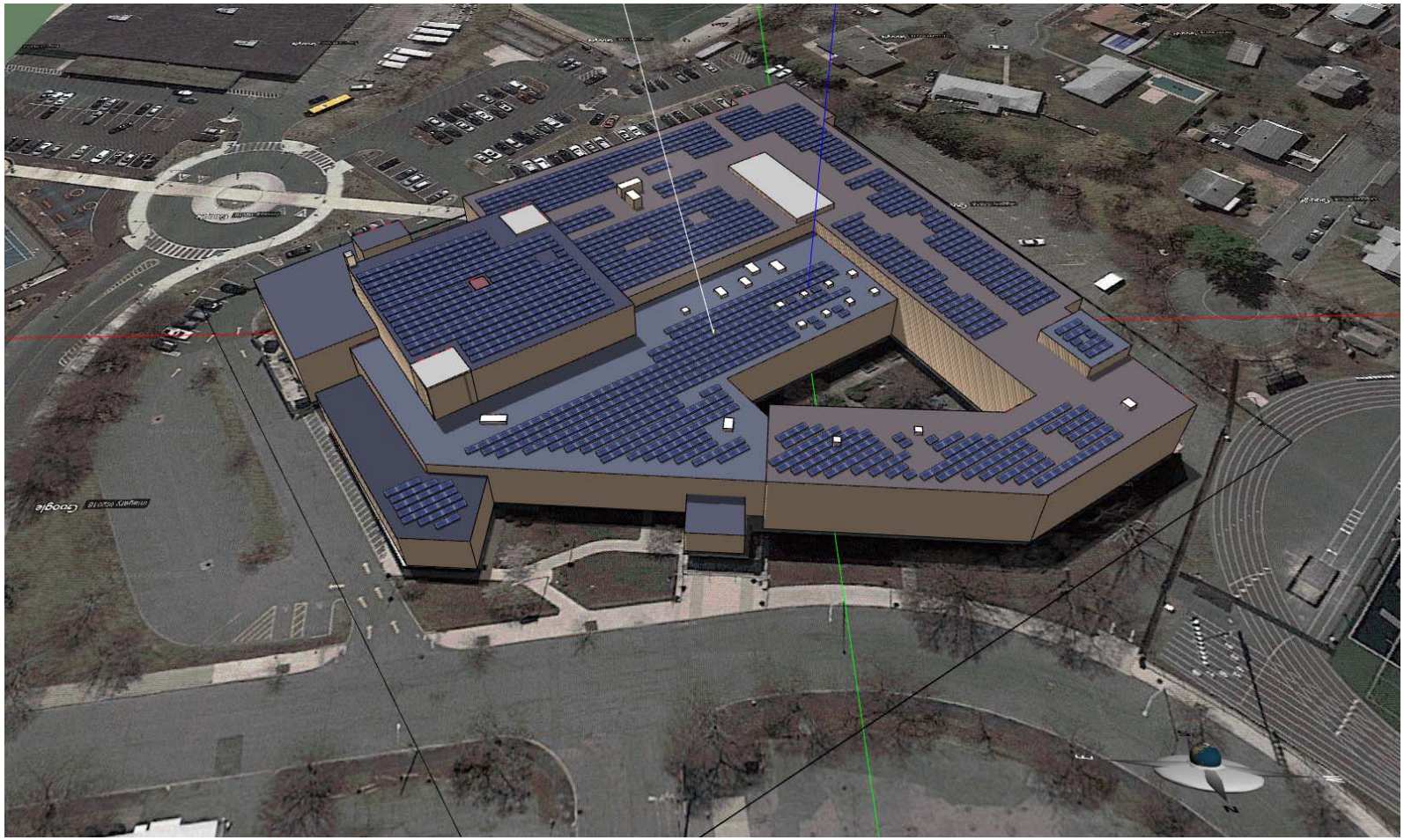
# Examples: Solarize a Public Building (Fitchburg Police Department, MA)



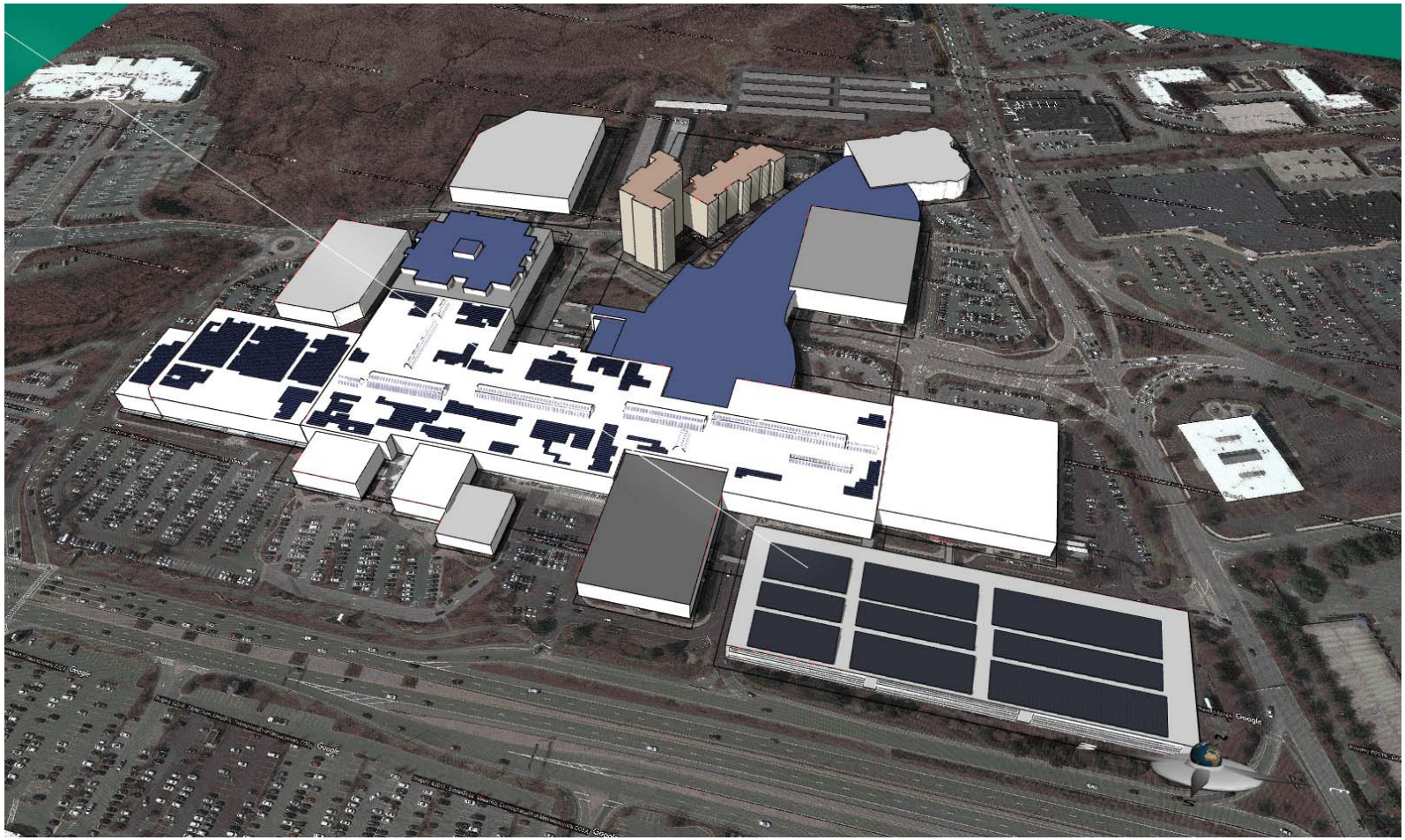
# Examples: Solarize a Parking Garage (Spelman College, GA)



# Examples: Solarize Your School (Malden Catholic High School, MA)

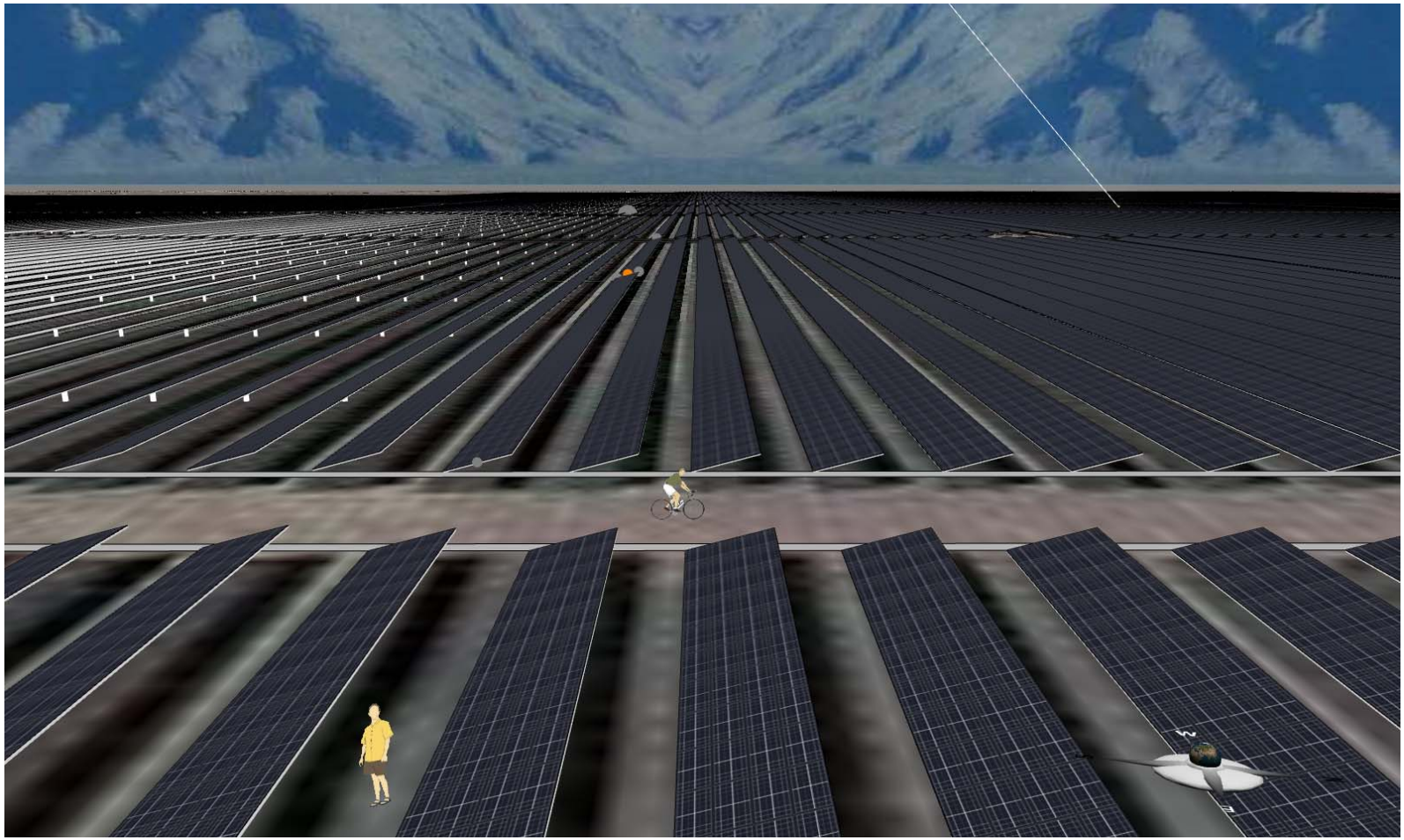


# Examples: Solarize Your Stores (Natick Mall, MA)

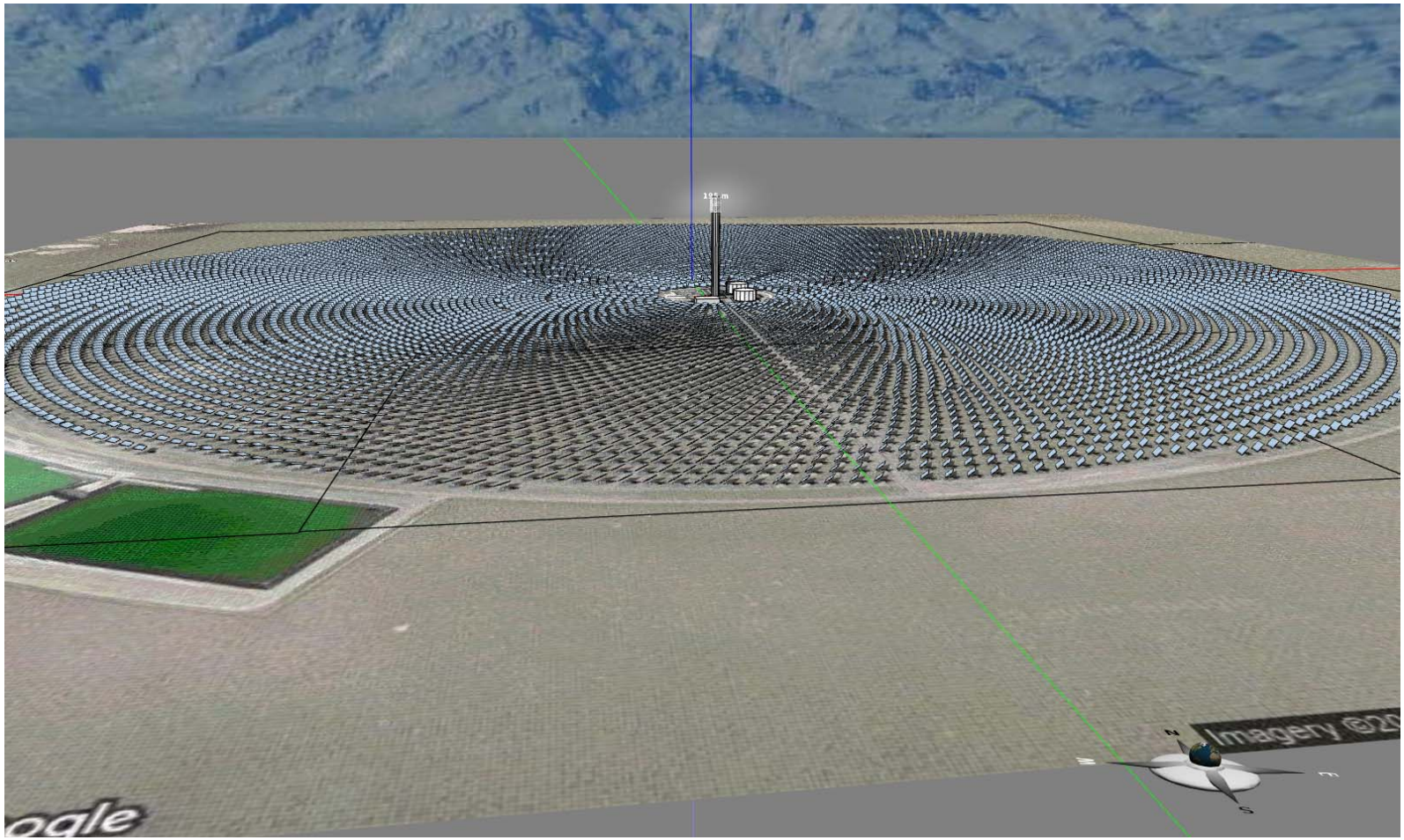


# Examples: Advertisement-Integrated Photovoltaics (Orlando, FL)

# Examples: Topaz Solar Farm, California



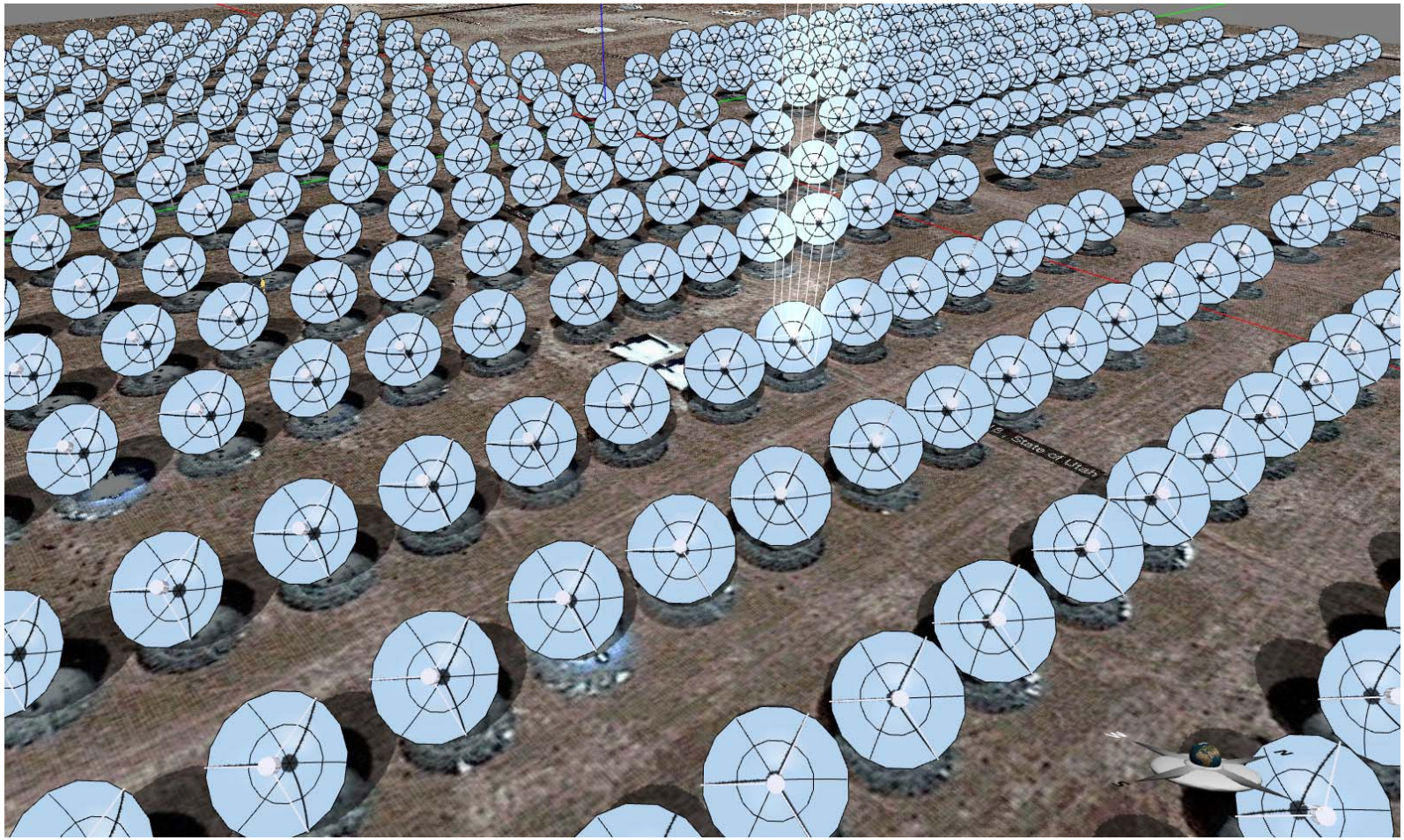
# Examples: Crescent Dunes Solar Tower, Nevada



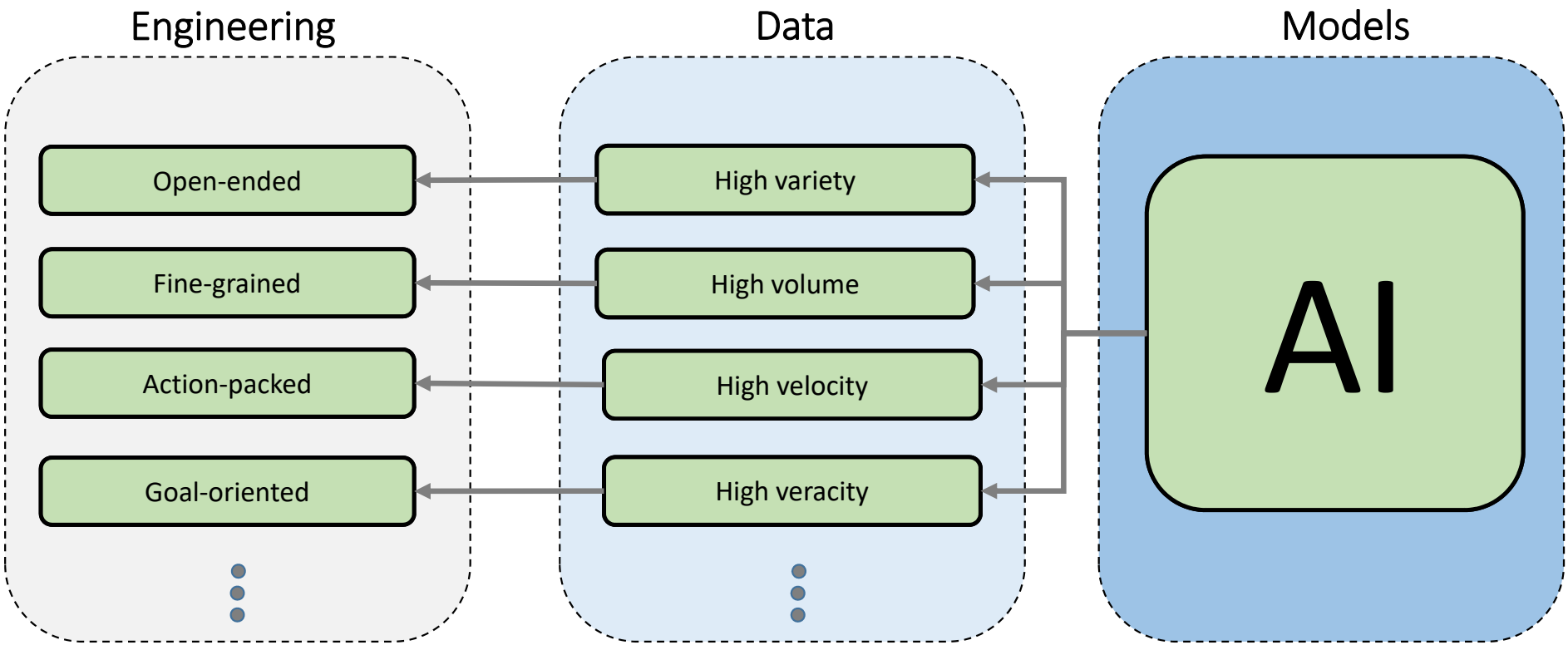
# Examples: Solar Energy Generating Systems VIII, California

# Examples: Puerto Errado Thermosolar Power Plant, Spain

# Examples: Tooele Army Depot, UT



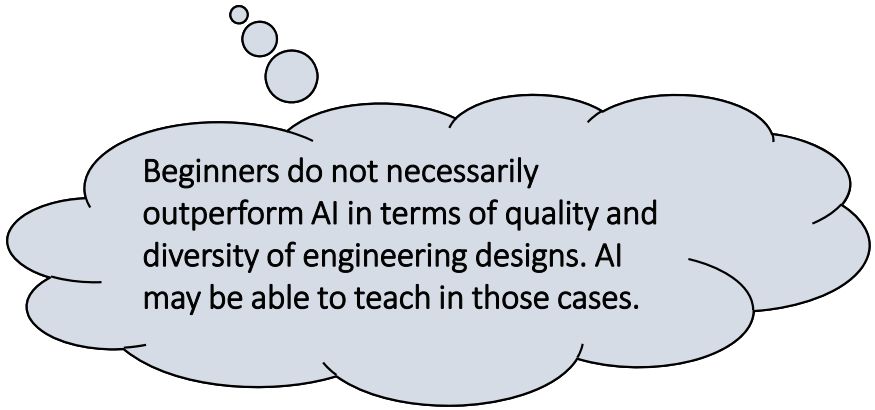
# Fitting data with models:
# Simulate complex design processes with AI models?




Note that the arrows are reversed!

# A different perspective

Instead of asking what data analyses reveal of students, we ask what levels and traits (parameters) of AI student performances correspond to.



# Genetic algorithms (GA) as examples

Typical use of GA

GA models the work of a diligent and careful designer able to systematically improve his design through iterations.

Atypical use of GA

GA can be used to model a wide variety of design behaviors, even erratic ones, by choosing different evolutionary parameters and fitness functions.

For example, GA can simulate aimless design if the fitness function returns the same value or some random value irrespective of the design, or simulate biased design if a certain variable is given extra weight (deserved or not) in the fitness function.

# Energy3D Demo

# Questions

1. How many different types of design behaviors can GA generate with various combinations of genetic parameters and fitness functions (that can be verified in classroom tests with students)?
2. How realistically can GA's computational evolution represent design iteration among students (e.g., the process of zeroing in towards an optimal solution)?
3. To what extent can the rate of genetic mutation represent the degree of design space exploration (e.g., trying alternative ideas rather than being trapped in one, or in GA's terms, exploring other local minima)?
4. ……

Thank you
for your attention!