L14: March 9, 2017.

Housekeeping: Falling-with-friction report due today

No homework during break — but think about potential modelling projects!

(Find project descrip'n online Monday.)

Last time: Falling w/ friction.

Questions?

Today: SPACE MAPPING

Mathematical / Numerical Optimization

- Given a function that maps inputs to outputs, determine the inputs that yield a desired output.

For example...

- Minimize the production cost of a manufactured good; the function takes input parameters, like specific raw-goods supplier, design of the product, strategy of assembly, and maps to the output: Cost of production.

- Radar + sonar: you know the value of the scattered field — what physical characteristics (e.g., size/shape/location of a plane or submarine) produce that particular far-field pattern?

- What shape should my microwave cavity have in order to produce a / the desired heating pattern?

For some optimization problems, you know an appropriate technique — e.g. :

- Calc I : if the function is smooth / differentiable, the extrema are located at zeros of the derivative, or at endpts. of parameter intervals.

- Calc IV : gradient descent — same idea, multiple input parameters

- Newton's method for root finding

- Simulated annealing (? other stochastic local search algorithms)

MANY OTHERS !!

A technique commonly used in engineering :

SPACE MAPPING.