1 January 20, 2021

Dynamic Optimization
Theory Course
Preliminary Notes posted, but will be weekly updated
CS is about discrete optimization
Finite Dimensional optimization is about a unknown point in R_n
Dynamic Optimization is about a unknown function
Part 1: Calculus of Variations
(1) First Variation: Derive Euler-Lagrange Equations (greatest things in math, evans learned it himself in physics courses)
(2) Second Variation: Weak and strong minima
(3) ODE to Many Variables: Selected applications (e.g. More advanced topics taught in graduate differential equations)
Part 2: Optimal Control Theory
(1) Mechanic or Economic Model: Find best way to modify model to maximize payoff and minize cost
(1a)(4) Solve with Pontryagin Maximum Principle: (Blind Russian that Evans saw him in UCLA)
(1b)(5) Dynamic Programmins: If you can solve a certain partial differential equation you can solve the problem
Function of time gives the name "dynamic" optimization
Books: Dynamic Optimization by Common and Schwartz by Dobber Press
Student Math Library by American Mathematical Society
Prequisite: Multivariable Calculus and Linear Algebra (54 not used much)
Goal: We want to have more applied math courses for non-math majors
Math 123: Differential Equations
Math 126: Partial Differentials
Interesting problems with general theoretic points of view:
(1) Set up Euler-Langrange equations
(2) Pontryagin Maximum Principle
(e.g. Need to know trig identities or other random misc. knowledge)
Professor Evans plans on retiring, but still has sympathy for undergrads like himself who didn't remember things too well
Course Logistics: 9:10-10:00pm
Homework: Each homework is due the subsequent week
Exams: Midterm 25, Final 25

Amusing Childhood Stories:

Task: Go ahead and read the notes

Q1: What is the graduate diff class about?
Finite dimensional optimization: Bolzano-Weierstrass Theorem and Extreme Value Theorem, once you find a bounded sequence
Infinite dimensional optimization: More complicated

Existence of minimizer: Found in math 222

Q2: Funding?

Q3: Employability?

Engineering Ideas: Make a centralized script that copies the files needed to github repository all at once? Take notes within github file as well?