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?