Anming Gu
Transcript of Select Coursework

Boston University

Computer Science – Theory

CS330: *Analysis of Algorithms*, Spring 2021, Dora Erdos and Steven Homer
Introductory algorithms class. Space and time complexity analysis. Stable matching algorithm. Graph algorithms. Greedy algorithms. Dynamic programming. Divide and conquer. Network flow. NP-hard and NP-complete problems.
Textbook: *Algorithm Design*, Klein and Tardos

CS332: *Theory of Computation*, Fall 2021, Mark Bun
Introductory theory of computation class. Finite automata and Turing machines. Decidablility and recognizability. Complexity classes P, NP, PSPACE, NPSPACE. Complete problems. Reductions and mapping reductions.
Textbook: *Introduction to the Theory of Computation*, Sipser

CS599: *An Algorithmist's Toolbox*, Spring 2022, Mark Bun
Graduate class for PhD depth requirement in theoretical computer science. Fourier analysis of Boolean functions. Pseudorandomness. Spectral graph theory. Coding theory. LP and SDP relaxation and approximation.
Textbooks: *Analysis of Boolean Functions*, O'Donnell; *Psuedorandomness*, Vadhan; *Spectral and Algebraic Graph Theory*, Spielman; *Essential Coding Theory*, Guruswami, Rudra, and Sudan

Computer Science – ML/AI

CS523: *Deep Learning*, Fall 2022, Iddo Drori
Graduate deep learning class. Architectures. Reinforcement learning. Generative models. Meta learning.
Textbook: *The Science of Deep Learning*, Drori

CS542: *Machine Learning*, Spring 2022, Sarah Bargal
Graduate introductory machine learning class. Regression. Feature selection. CNNs. Supervised, unsupervised, and semi-supervised paradigms. SVMs. Bayesian networks.
Textbook: *Pattern Recognition and Machine Learning*, Bishop

CS640: *Artificial Intelligence*, Fall 2022, Iddo Drori
Graduate artificial intelligence class. Reinforcement learning. Games and search. Computer vision and robotic systems.
Textbook: *The Science of Deep Learning*, Drori

Computer Science – Software

CS320: *Concepts of Programming Languages*, Fall 2021, Abbas Attarwala and Marco Gaboardi
Introductory programming language theory class. Functional programming in OCaml. Formal

language theory. Context-free grammars and languages. Lexing and parsing. Interpreting a PDA-based language. Introduction to compilers.
Textbook: None

CS525: *Compiler Theory and Implementation*, Fall 2022, Hongwei Xi
Graduate functional compilers class. Functional programming in ATS. Typed and untyped λ-calculus. Interpreters. Type checking. Hindley-Milner type inference. Intermediate representation and A-normal form. Lambda lifting and closure conversion. Streams and lazy evaluation. Register allocation. Garbage collection. Compilation of λ-calculus-based language to C.
Textbook: N/A, Reference text: *Modern Compiler Implementation in ML*, Appel

Computer Science – Applications

CS599: *Geometry Processing*, Spring 2022, Edward Chien
Graduate seminar in computational geometry and graphics. Geometry representations. Discrete differential geometry. Voronoi diagrams. Mesh techniques: smoothing, parameterization, fairing, deformation. Discussion, presentation, and implementation of recent papers in the field.
Textbook: None

Mathematics – Pure

MA717: *Functional Analysis*, Spring 2023, Mark Kon
Graduate class on functional analysis. Theory of Hilbert and Banach spaces. Fourier analysis. Wavelet theory and multiresolution analysis. Ergodic theory. Topological vector spaces. Spaces of bounded operators. Spectral theory for bounded and self-adjoint operators. Applications in quantum mechanics, probability, and neural networks.
Textbook: *Functional Analysis*, Reed and Simon

Mathematics – Applied

MA569: *Optimization Methods in Operations Research*, Fall 2021, Steven Krigman
Introductory linear programming class. Simplex method. Interior point methods. Primal-dual theory.
Textbook: *Introduction to Operations Research*, Hillier and Lieberman

Mathematics – Statistics

MA581: *Introduction to Probability*, Spring 2021, Mickey Salins
Introductory probability class. Basic probability. Probability distributions and random variables. Expectation and variance. Moment generating functions. Law of large numbers. Central limit theorem.
Textbook: *A Course in Probability*, Weiss

MA570: *Stochastic Methods in Operations Research*, Spring 2022, Steven Krigman
Introductory stochastic processes class. Decision trees and utility theory. Poisson processes. Markov chains. Steady-state and transient distributions. Queueing theory.
Textbook: *Introduction to Operations Research*, Hillier and Lieberman

Economics and Finance

PY538: *Interdisciplinary Methods for Quantitative Finance*, Spring 2022, Alex Becker

Introductory computational finance class using Python. Financial time series. Autoregressive models. Markowitz portfolio optimization. CAPM model. Factor models. Options pricing and the Black-Scholes model. Binomial options pricing.

Textbook: None

EC794: *Financial Econometrics*, Spring 2023, Zhongjun Qu

Advanced graduate financial econometrics class. Time series and cross-sectional properties of asset returns (high- and low-frequency). Arbitrage pricing theory and factor models. Econometric analysis of the stochastic discount factor. Continuous-time models, including options pricing and parameter estimation. Volatility dynamics. Discussion and presentation of recent papers in the field.

Textbook: Econometric papers. Loosely follows *Financial Decisions and Markets*, Campbell; *Handbook of Financial Econometrics*, Ait-Sahalia and Hansen; *The Econometrics of Financial Markets*, Campbell, Lo, and Mackinlay.

Other

Computer Science

Self Study: *Discrete Math for Computer Science*, Fall 2020

Study of discrete mathematics in preparation for higher-level computer science courses. Proofs. Mathematical structures. Graph theory. Counting. Probability theory. Recurrences.

Textbook: *Mathematics for Computer Science*, Lehman, Leighton, and Meyer

Mathematics

Self Study: *Introduction to Analysis*, Fall 2022

Study of introductory analysis in preparation for functional analysis. Real and complex number systems. Point-set topology. Sequences and series. Continuity. Differentiation. Riemann-Stieltjes integration. Convergence. Basic functions and functions of several variables.

Textbook: *Principles of Mathematical Analysis*, Rudin

Self Study: *Real Analysis*, Fall 2022

Study of measure theory in preparation for functional analysis. Abstract measure theory. Integration. Introduction to functional analysis. L^p spaces.

Textbook: *Real Analysis*, Folland

Self Study: *Probability Theory*, Summer 2023

Study of measure-theoretic probability theory in preparation for stochastic calculus. Random variables and distributions. Law of large numbers. Central limit theorems.

Textbook: *Probability: Theory and Examples*, Durrett

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