Obvious Next Step: CS 2110

- Programming in Java
  - Basic Java syntax
  - Static vs. Dynamic Types
  - Adv. Java Topics (e.g. Threads)
- OO Theory
  - More design patterns
  - Interface vs. Implementation
- Data Structures
  - Binary Trees
  - Linked Lists
  - Graphs

Java Specific

CS 2800: The Other Important Course

- CS requires a lot of math
  - Analyzing code performance
  - Analyzing data
  - Proving code correctness
- Calculus is "wrong math"
  - Data is rarely "continuous"
  - Limited to specific uses (e.g. spatial data)
- "Grab-bag" course
  - All math needed for CS
  - Includes writing proofs

Higher Level Computer Science Courses

- Programming Languages x1xx (e.g. 1110, 2110)
- Scientific Computing x2xx (e.g. 4210)
- Data Management x3xx (e.g. 3300, 4320)
- Systems x4xx (e.g. 3410, 4410)
- Computational Biology x5xx (e.g. 5555)
- Graphics and Vision x6xx (e.g. 4620)
- Artificial Intelligence x7xx (e.g. 4758, 4700)
- Theory x8xx (e.g. 4810, 4820)
- Research x9xx (e.g. 4999)

Programming Languages

- Adv. Language Topics
  - Functional languages
  - Streaming languages
  - Parallel programming
- Language Theory
  - New languages/compilers
  - Software verification
- Software Engineering
  - Design patterns
  - Architecture principles

Scientific Computing

- Calculus + Computing
  - Problems from other science domains
  - Process with computer
- Applications
  - Complex simulations
  - Physics (games!)
- Challenge: Performance
  - Programs can run for days!
  - How do we make faster?

Data Management

- Modern Web Apps
  - Storing user/session data
  - Coordinating users
- Databases
  - Query languages
  - Database optimization
  - Organizing your data
- Information Retrieval
  - Searching
  - Data analysis
Systems

- Building BIG software
  - Operating systems
  - Distributed applications (e.g. online, networked)
  - Cloud computing
- Also System Security
  - Though that is spread about
- Senior/masters level classes
  - Bulk of the 5xxx courses
  - But great project courses!

Computation Health/Biology

- No undergrad classes
  - Used at CornellTech
  - Too much to learn
- Once hoped for Ithaca
  - But hard to hire in CS
  - Faculty better fit for Bio
- Now in Comp. Bio dept.
  - Separate department
  - But part of CIS school
  - Also a graduate program
  - But has concentration in Bio

Graphics and Vision

- Not modeling/art!
- Rendering & Animation
  - Illumination/reflection
  - Cloth/hair simulation
  - Water and fluids
- Processing Images
  - Recognizing shapes
  - Assembling 3D models from 2D pictures
  - Smart cameras

Artificial Intelligence

- Not sentient computers
- Machine learning
  - Discovering patterns
  - Making predictions
- Natural Language Proc.
  - Automatic translation
  - Searching text/books
  - Voice-control interfaces
- Robotics
  - Autonomous control

Theory

- Analysis of Algorithms
  - What is possible?
  - What is feasible?
- Analysis of Structures
  - Social network theory
  - Complex data structures
- Cryptography
  - Theory side of security
  - Area responsible for founding dept. in 1965

What About Games?

- CS 3152, Spring only
  - Prereq: CS 2110
  - But CS 3110 a big help
- Build game from scratch
  - Want it to be innovative
  - You own the IP
- Interdisciplinary teams
  - 7 to 8 people on a team
  - With artists/designers
- Final: public showcase