Life after CS 1110

CS 1110
Introduction to Computing Using Python

[E. Andersen, A. Bracy, D. Fan, D. Gries, L. Lee,
S. Marschner, C. Van Loan, W. White]

Obvious Next Step: CS 2110

- **Programming in Java**
  - Basic Java syntax
  - Static vs. Dynamic Types
  - Adv. Java Topics (e.g. Threads)

  Java Specific

- **OO Theory**
  - More design patterns
  - Interface vs. Implementation

- **Data Structures**
  - Binary Trees
  - Linked Lists
  - Graphs

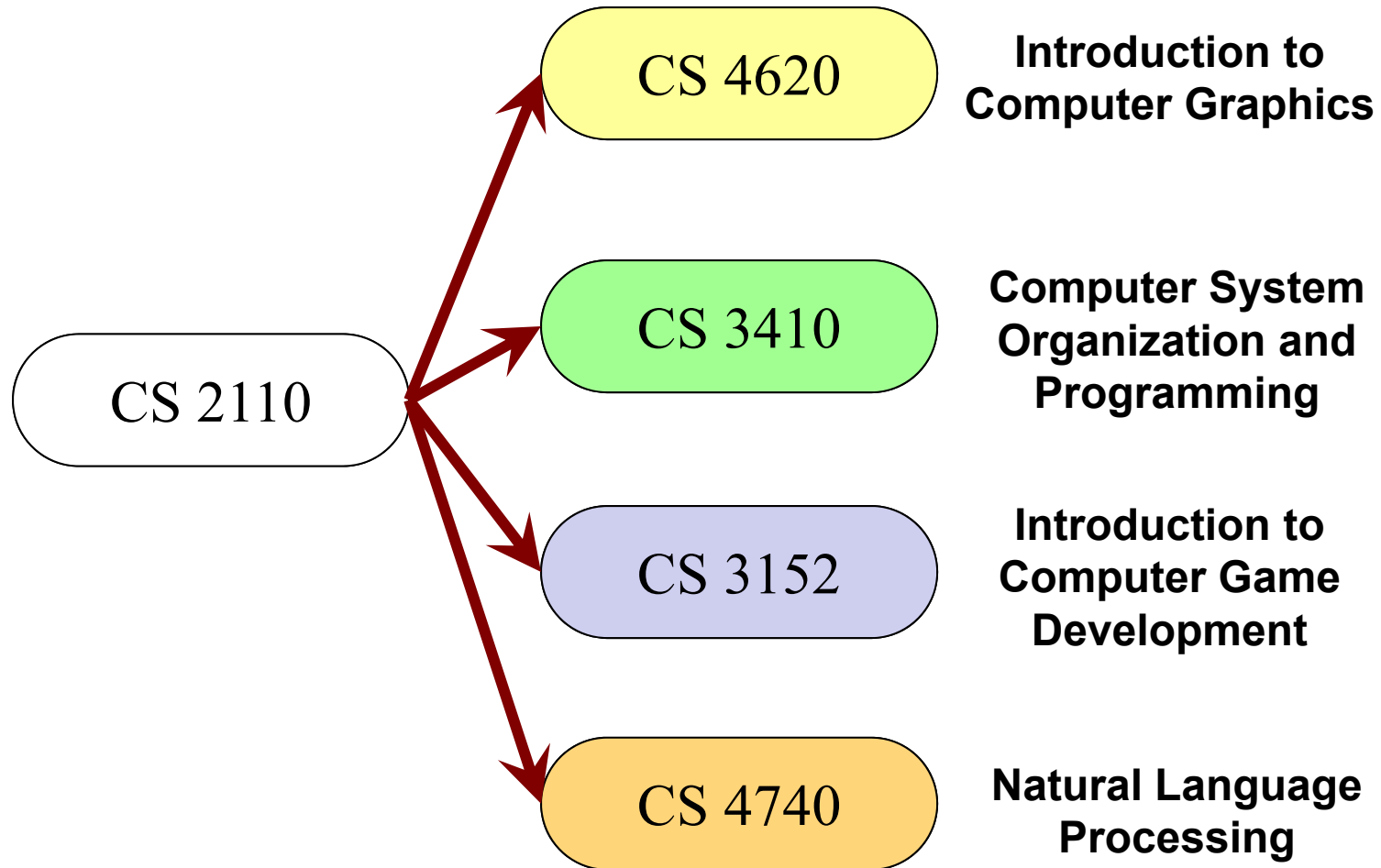 Major CS Topic

  Language Independent
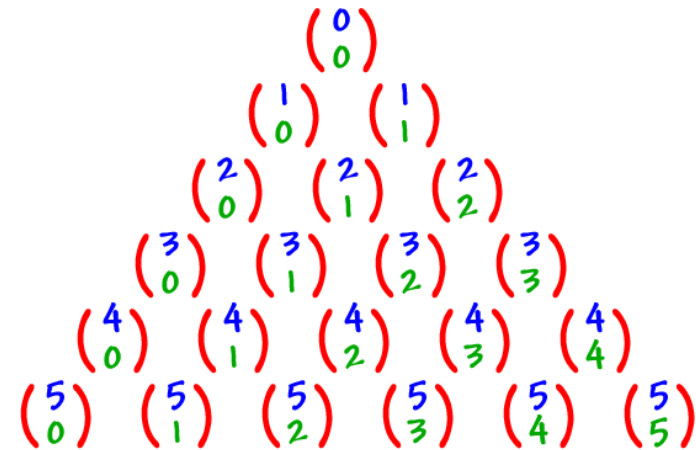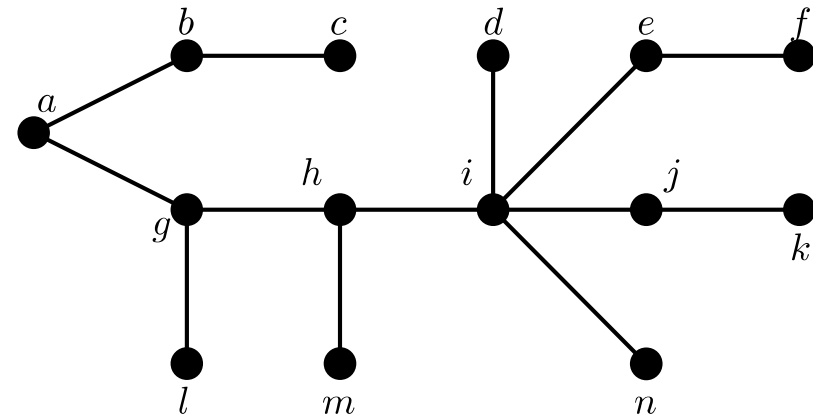
CS 2110 Immediately Opens your Options

CS 2110

CS 4620 — **Introduction to Computer Graphics**

CS 3410 — **Computer System Organization and Programming**

CS 3152 — **Introduction to Computer Game Development**

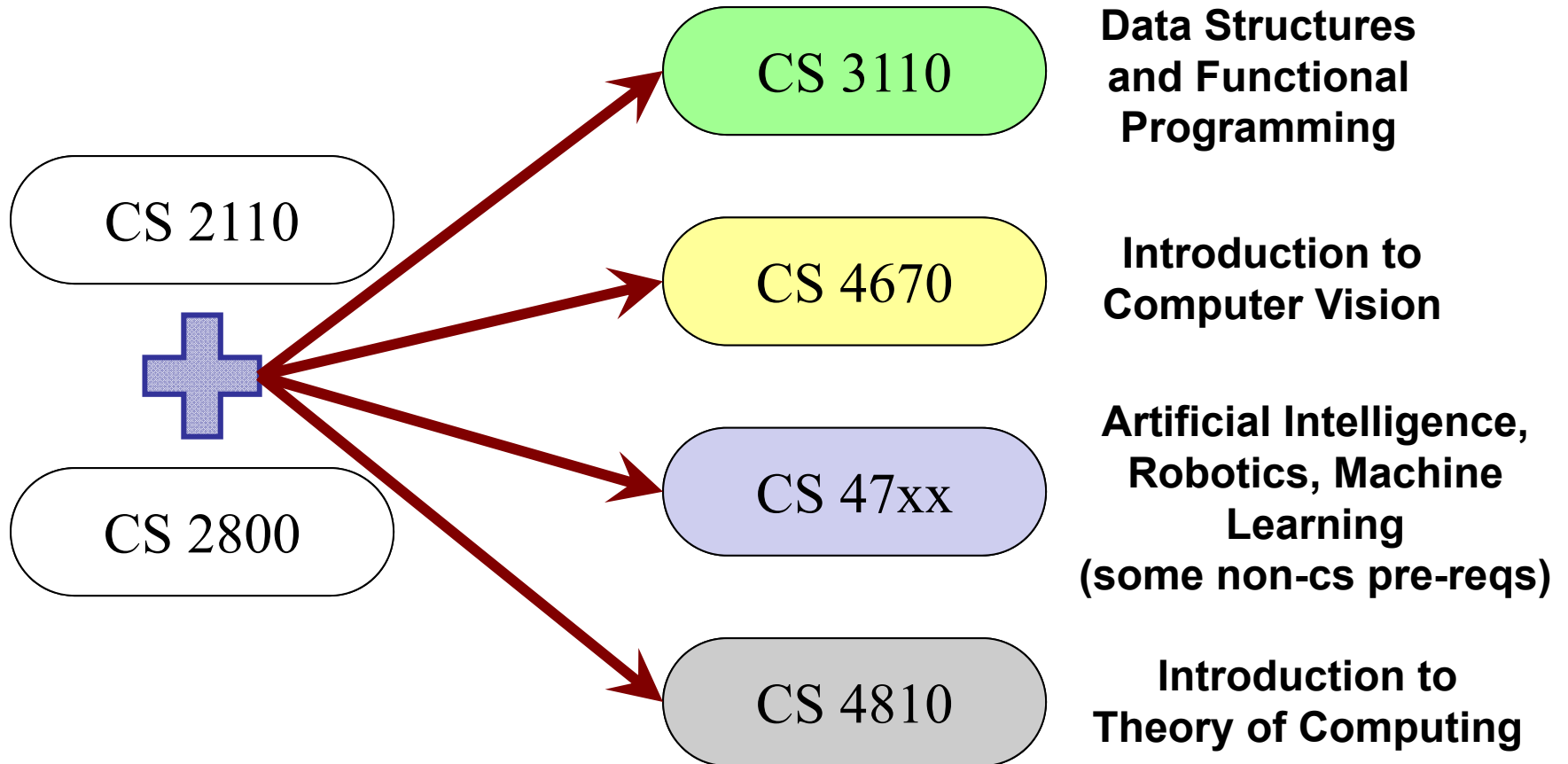CS 4740 — **Natural Language Processing**

CS 2800: The Other Important Course

- CS requires a lot of math
  - Analyzing code performance
  - Analyzing data
  - Proving code correctness
- Calculus not the only math
  - Data often not "continuous"
  - Limited to specific uses (e.g. spatial data)
- "Grab-bag" course
  - All math needed for CS
  - Includes writing proofs

CS 2110 + CS 2800 = Even More Options

CS 2110
+
CS 2800

→ CS 3110 — **Data Structures and Functional Programming**

→ CS 4670 — **Introduction to Computer Vision**

→ CS 47xx — **Artificial Intelligence, Robotics, Machine Learning (some non-cs pre-reqs)**

→ CS 4810 — **Introduction to Theory of Computing**

Computer Science Course Numbers

- Programming Languages   x1xx   (e.g. 1110, 2110)

- Scientific Computing   x2xx   (e.g. 3220, 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)

Level Area

Computer Science Course Numbers

- Programming Languages   x1xx (e.g. 1110, 2110)

- Scientific Computing   x2xx (e.g. 3220, 4210)

- Data Management   x3xx (e.g. ____ 4320)

- Systems   ____410)

- Compu____   ____333)

- Graphics   x6xx (e.g. 4620)

- Artificial Intelligence   x7xx (e.g. 4758, 4700)

- Theory   x8xx (e.g. 4810, 4820)

- Research   x9xx (e.g. 4999)

Separation not perfect; there is a lot of overlap

Level Area

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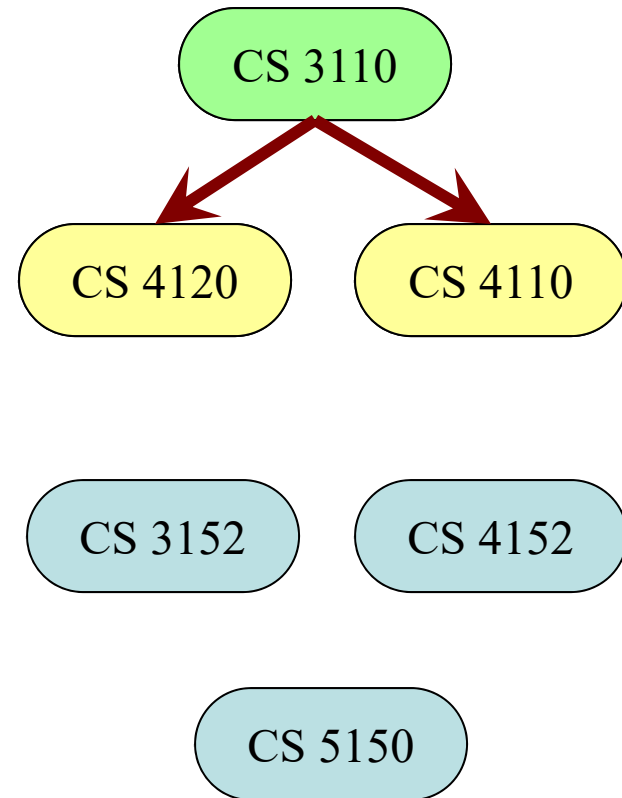
- **Adv. Language Topics**
  - Functional languages
  - Streaming languages
  - Parallel programming
- **Language Theory**
  - New languages/compilers
  - Software verification
- **Software Engineering**
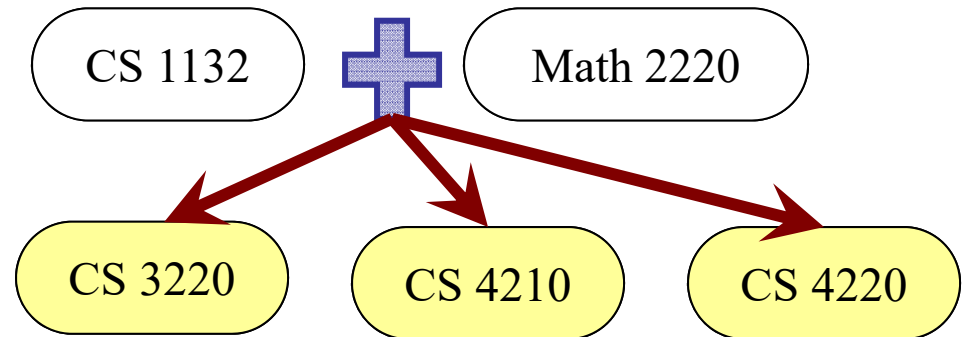 - Design patterns
  - Architecture principles

Scientific Computing

- **Calculus + Computing**
  - Problems from other science domains
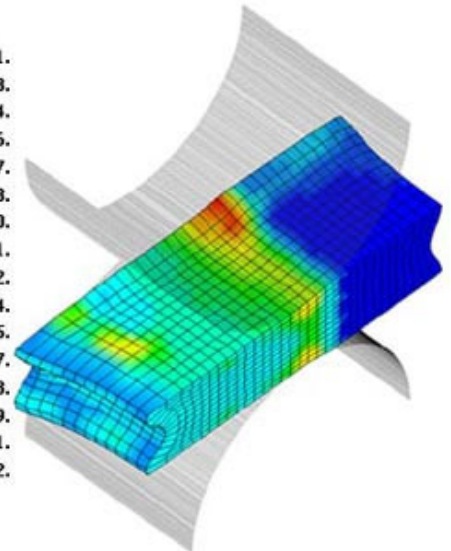 - Process with computer

- **Applications**
  - Complex simulations
  - Physics (games!)

- **Challenge**: Performance
  - Programs can run for days!
  - How do we make faster?

CS 1132 ✚ Math 2220

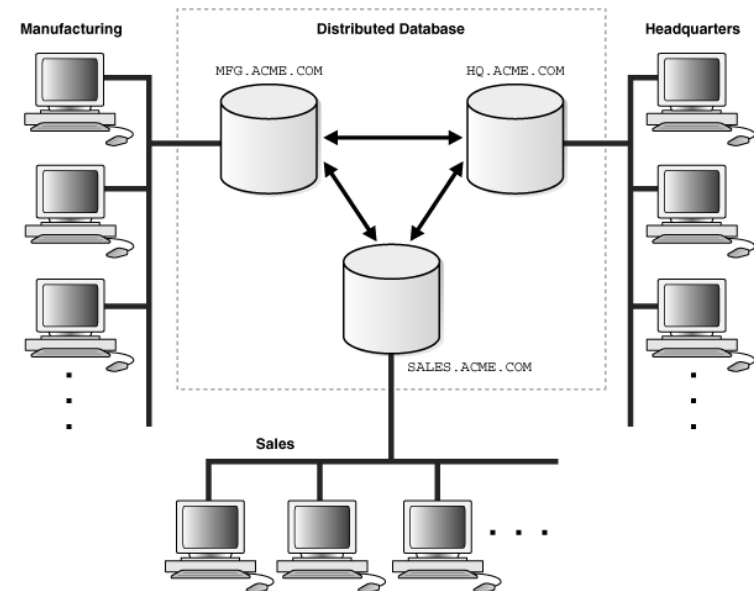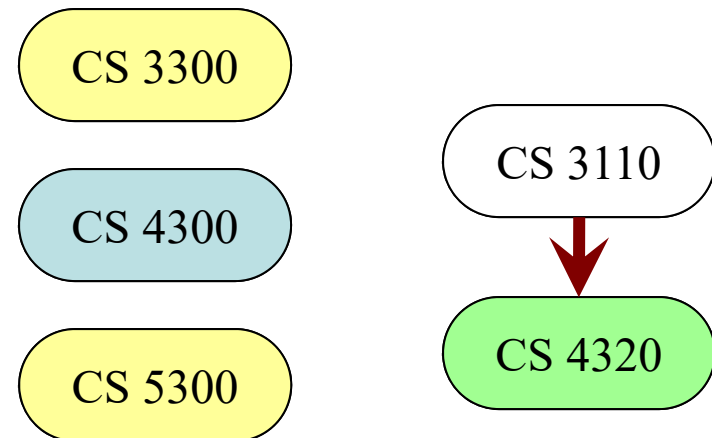CS 3220   CS 4210   CS 4220

CS 5643

CS 5650

Data Management

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

CS 3300

CS 4300

CS 5300

CS 3110

CS 4320

Manufacturing

Distributed Database

Headquarters

MFG.ACME.COM

HQ.ACME.COM

SALES.ACME.COM

Sales

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!

CS 3410 → CS 4410 → CS 5412, CS 5414, CS 5420, CS 5430
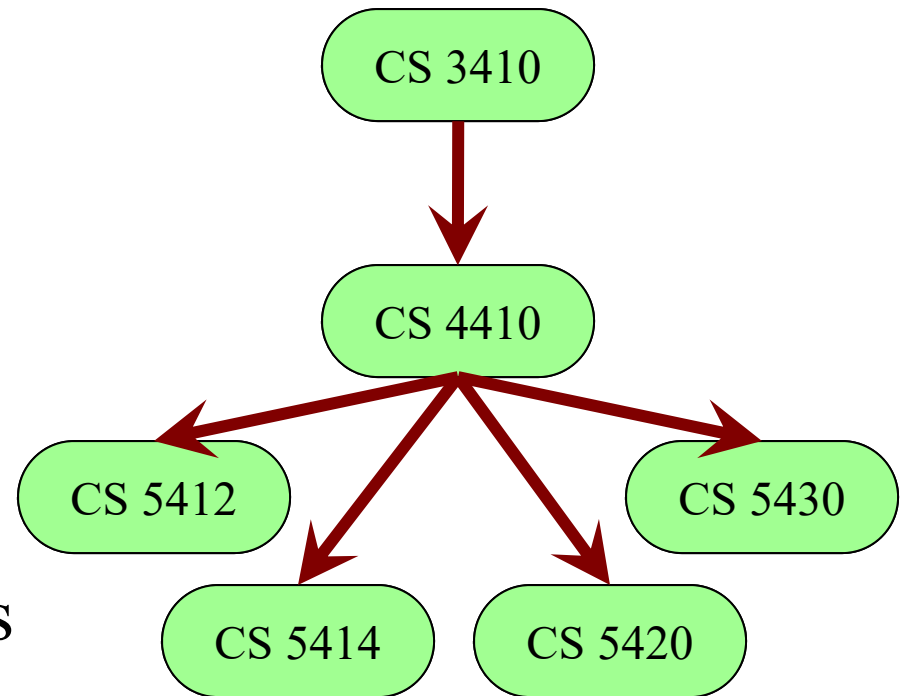
Computational Health/Biology

- No undergrad classes
  - Too much to learn
  - Masters/PhD level
- Undergrad options
  - **BTRY 4840**: Comp. Genomics
  - BSCB department
- Stay tuned for more…
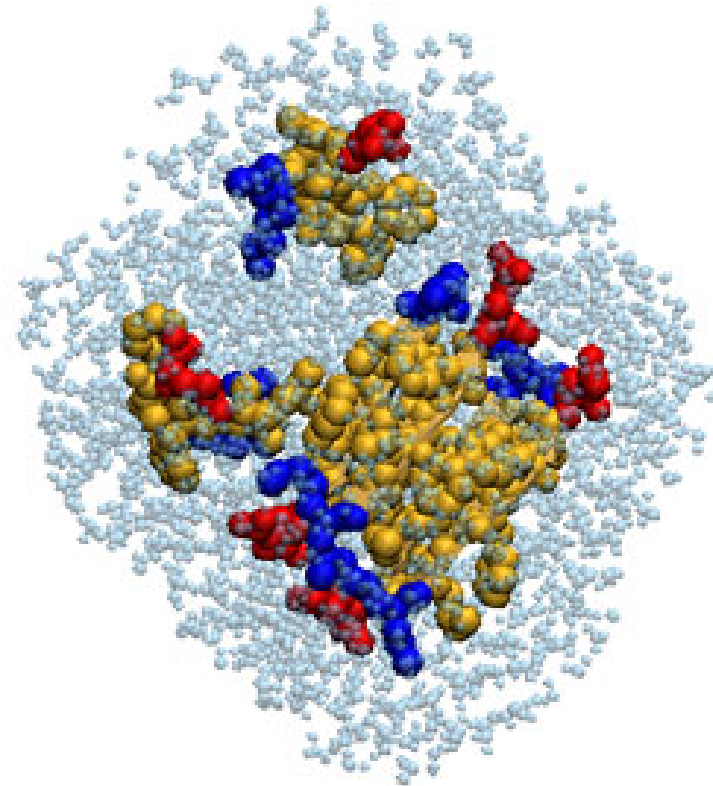
Graphics and Vision

- **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

CS 4620

CS 5625

CS 4670

CS 5643

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
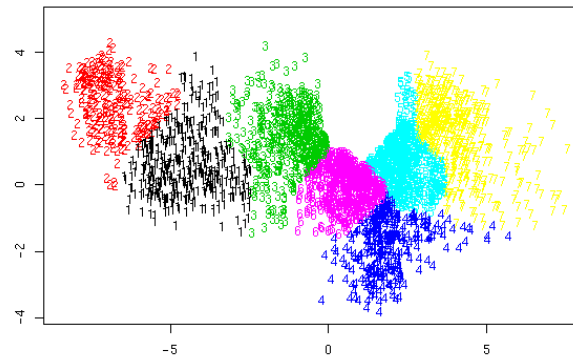
CS 4700

CS 4750

CS 4740

CS 4780

CS 4758

Theory

- **Analysis of Algorithms**
  - What is *possible*?
  - What is *feasible*?
- **Analysis of Structures**
  - Social network theory
  - Complex data structures
- **Cryptography**
  - Theory side of security

CS 4810   CS 4830   CS 4860

CS 4820
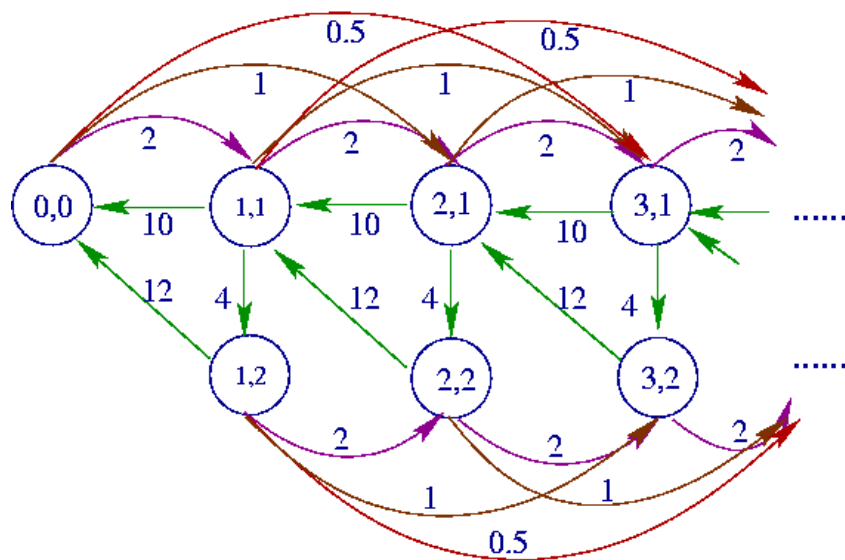
What About Games?

- 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
  - 5 to 6 people on a team
  - With artists/designers
- **Final**: public showcase

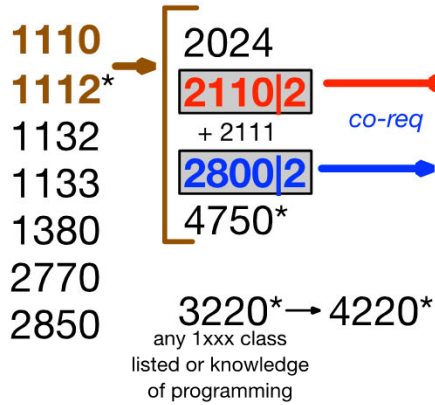# Games and the Designer Track

- Coding not your thing?
- INFO 3152 (co-meets)
  - Artists/designer track
  - No formal training needed
  - Submit a portfolio
- Recommend: INFO 2450
  - Start of the HCI sequence
  - How design affects the user experience
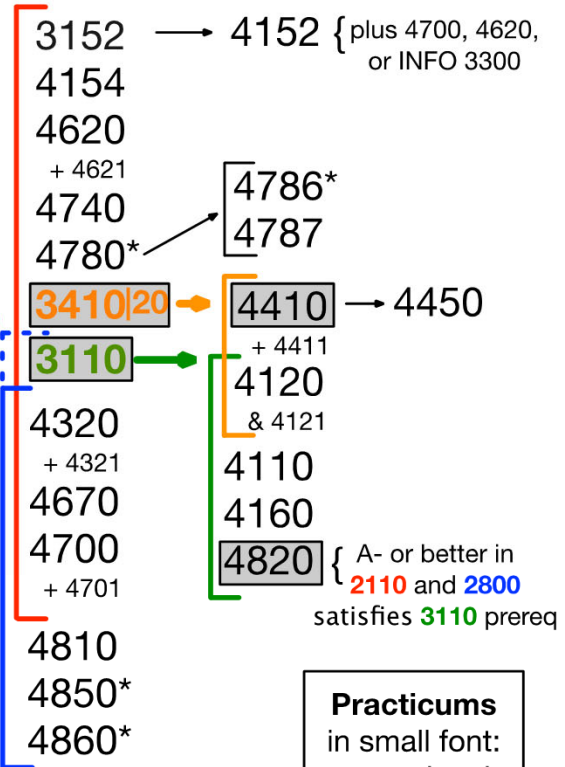 - Fall course; no prereqs

CS Undergraduate Prerequisite Structure

bold & **colored** courses (with corresponding arrows) indicate prerequisites

3152 → 4152 { plus 4700, 4620, or INFO 3300

4154
4620
+ 4621
4740
4780*

4786*
4787

1110
1112*
1132
1133
1380
2770
2850

2024
2110|2
+ 2111
2800|2
4750*

co-req

3220* → 4220*
any 1xxx class listed or knowledge of programming

3410|20
3110
4320
+ 4321
4670
4700
+ 4701
4810
4850*
4860*

4410 → 4450
+ 4411
4120
& 4121
4110
4160
4820 { A- or better in **2110** and **2800** satisfies **3110** prereq

core classes

starred (*) courses have at least 1 MATH pre- or co-requisite *See Roster.*

Practicums in small font: + : optional & : required

3110: Data Structures and Functional Programming
3152: Introduction to Computer Game Architecture
3220: Introduction to Scientific Computation
3410: Computer System Organization and Programming
3420: Embedded Systems *(prereq: ENGRD 2300, not shown)*
4110: Programming Languages and Logics
4120: Introduction to Compilers
4152: Advanced Topics in Computer Game Architecture
4154: Analytics-driven Game Design
4160: Formal Verification
4220: Numerical Analysis: Linear and Nonlinear Problems
4320: Introduction to Database Systems
4410: Operating Systems
4450: Introduction to Computer Networks
4620: Introduction to Computer Graphics
4670: Introduction to Computer Vision
4700: Foundations of Artificial Intelligence
4740: Natural Language Processing
4750: Foundations of Robotics
4780: Machine Learning for Intelligent Systems
4786: Machine Learning for Data Science
4787: Principles of Large-Scale Machine Learning
4810: Introduction to Theory of Computing
4820: Introduction to Analysis of Algorithms
4850: Mathematical Foundations for the Information Age
4860: Applied Logic

1110: Introduction to Computing Using Python
1112: Introduction to Computing Using MATLAB
1132: Short Course in MATLAB
1133: Short Course in Python
1380: Data Science for All
2024: C++ Programming

2110: Object-Oriented Programming and Data Structures
2112: Object-Oriented Design and Data Structures - Honors
2770: Excursions in Computational Sustainability
2800: Discrete Structures
2802: Discrete Structures - Honors
2850: Networks

Cornell CIS
Computer Science

Computer Science not your ☕ ?

Try one of our neighbors!

- Information Science
- Statistics
- Operations Research & Information Engineering
- Electrical and Computer Engineering
  - ECE 2400 is a good next step

It's been a challenging semester given the state of the world and everyone's individual situation.

Thank you for persevering!!!!

Hope you've found some parts of CS1110 interesting and will find some parts useful in the future!