Postlude

Done with CS 1110
Where to Next?

Announcements

Prelim 2

- Tonight at **7:30 pm**
  - Should know where to go
  - Make-ups are notified
- **Material up to Nov. 12**
  - Recursion + Loops + Classes
  - No short answer!
- Will be graded Sunday
  - Announcement in CMS
  - Holding OH Monday am

Final Exam

- **Final, Dec 14th 2-4:30 pm**
  - Everyone is in Barton Hall
  - (Except SDS students)
- **Study guide is posted**
  - Multiple review sessions
  - Tuesday-Thursday
- **Conflict with Final Exam?**
  - e.g. > 2 finals in 24 hours
  - Submit conflicts to CMS

Final Review Sessions

- **Tue 1:30-4:30 (Phillips 101)**
  - Call frames & diagramming
  - Classes, try-except
- **Wed 1:30-3:30 (Phillips 101)**
  - Lists, Sequences, and Iteration
  - Recursion
- **Thu 1:30-3:30 (Statler Auditorium)**
  - Generators
  - Open question session

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

Major CS Topic

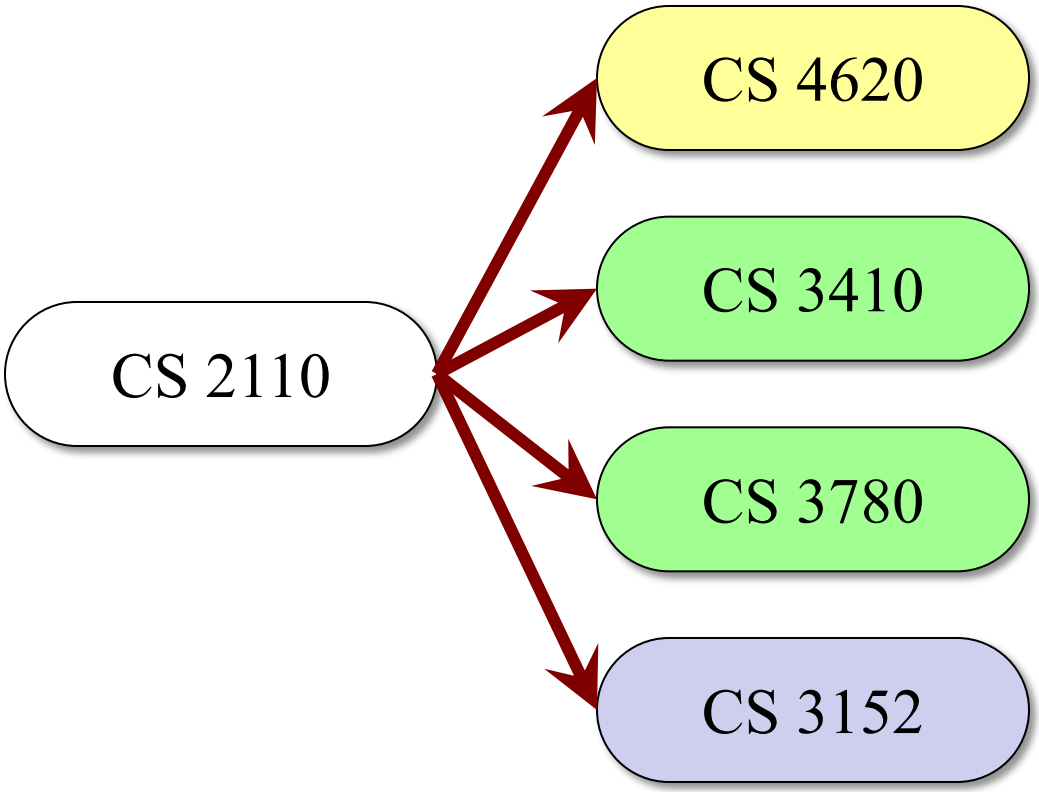
Java Specific

Language Independent

Unless You are Going to Info Science

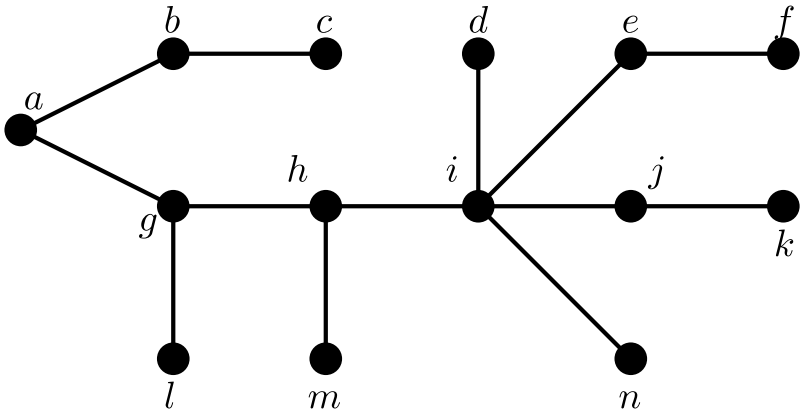
- **INFO 2950:** Introduction to Data Science
  - Gathering and recording data sets
  - Visualizing data
  - Performing statistical calculations
  - Basically more of A6 (and how to do yourself)
- Historically another Python course
  - But now Python Fall/R in Spring
  - Picking up R from Python is not too hard
  - No different than 2110/Java transition

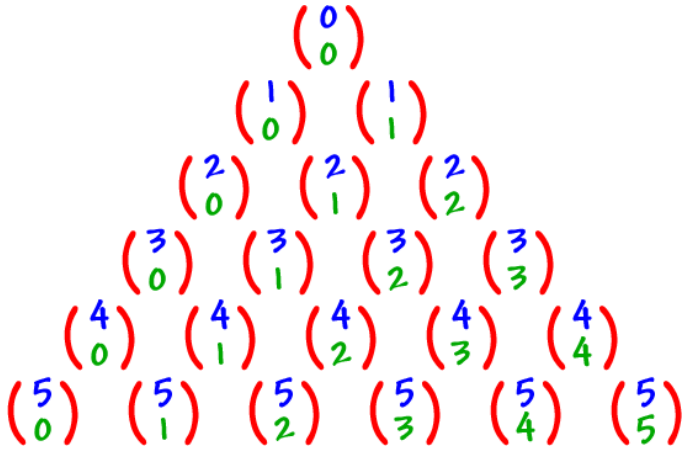
CS 2110 Immediately Opens your Options



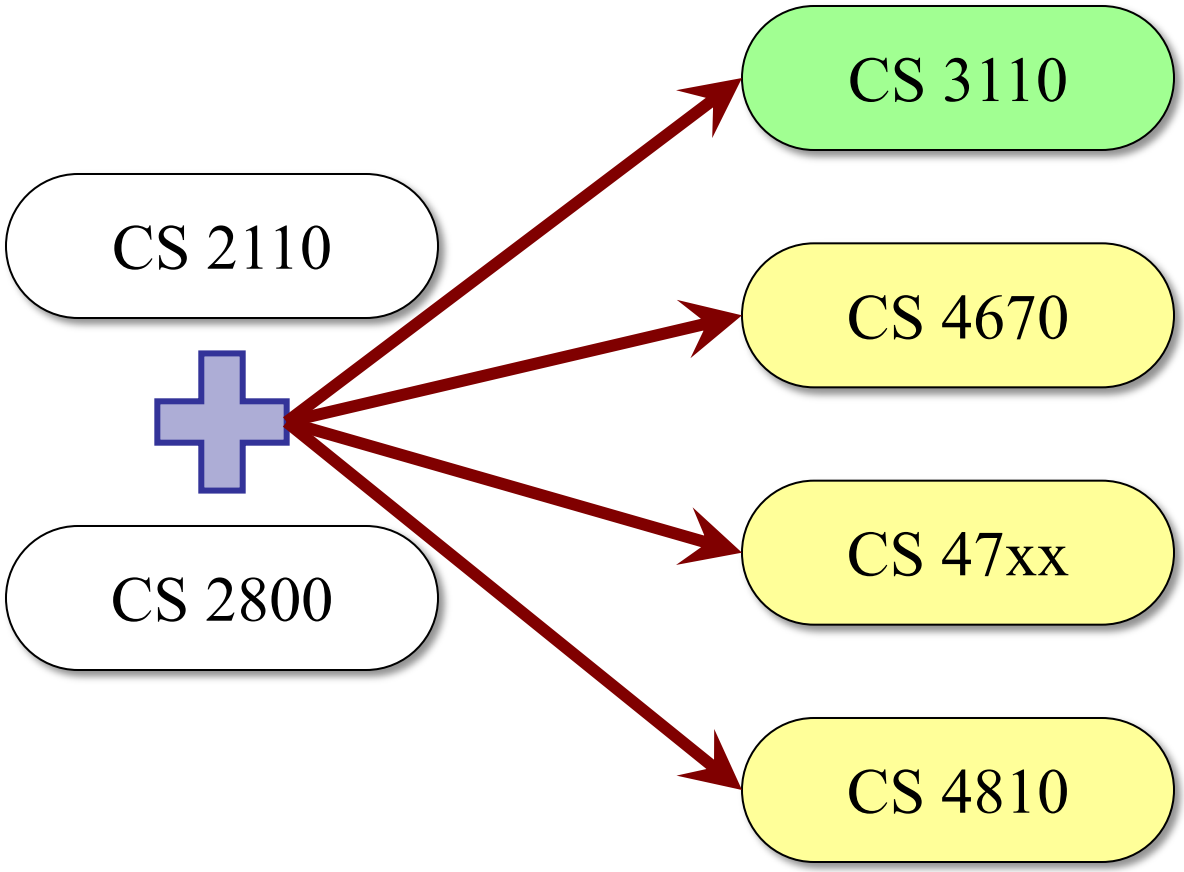
CS 2800: The Other Important Course

- 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**





CS 2110 + CS 2880 = Even More Options



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)

Higher Level Computer Science Courses

- Programming Languages x1xx (e.g. 1110, 2110)
- Scientific Computing x2xx (e.g. 4210)
- Data Management x3xx (e.g. 3200, 4320)
- Systems
- Compu
- 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)

Separation not perfect;
there is a lot of overlap

Aside: What Does the First Digit Mean?

- **1xxx**: General Interest (YOU ARE HERE)
- **2xxx**: Prerequisites to the major
  - Your 1110 grade does not affect CS affiliation!
  - You can use 2110 as a **do-over**
- **3xxx**: Core major classes (sort-of)
- **4xxx**: Special topics courses
- **5xxx**: Master of Engineering courses
- **6xxx**: Graduate-level courses

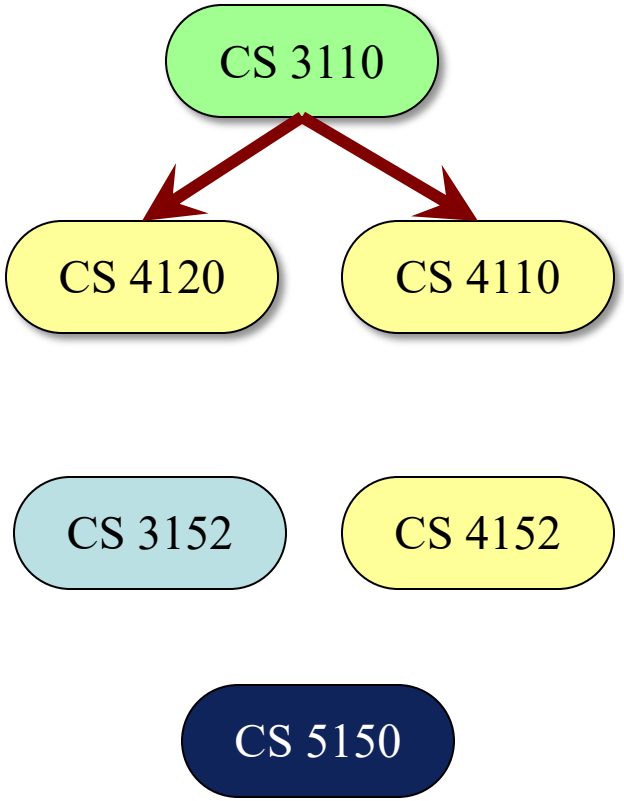
Aside: What Does the First Digit Mean?

- **1xxx**: General Interest (YOU ARE HERE)
- **2xxx**: Prerequisites to the major
  - Your 1110 grade does not affect CS affiliation!
  - You can use 2110 as a **do-over**
- **3xxx**: Core major classes (sort-of)
- **4xxx**: Special topics courses
- **5xxx**: Master of Engineering courses
- **6xxx**: Graduate-level courses

Undergrads take these too

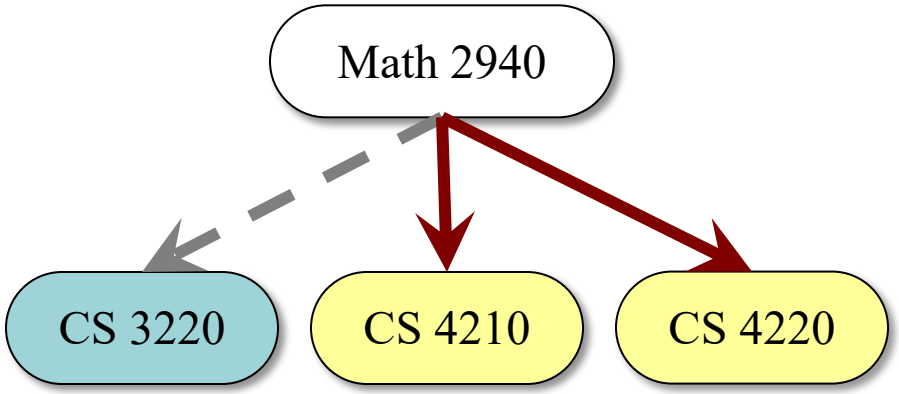
Programming Languages

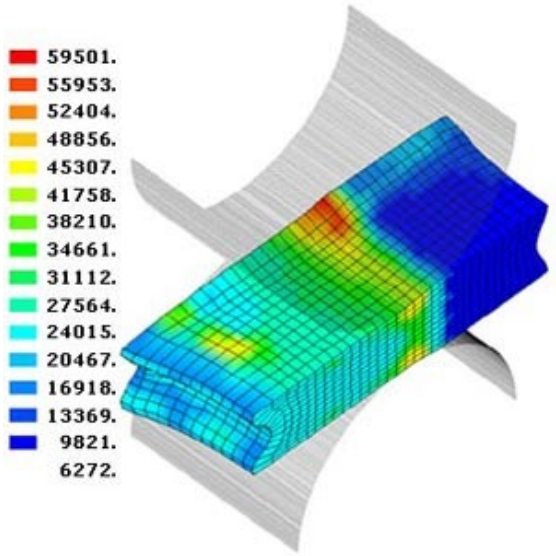
- **Adv. Language Topics**
  - Functional languages
  - Streaming languages
  - Parallel programming
- **Language Theory**
  - New languages/compilers
  - Software verification
- **Software Engineering**
  - Design patterns
  - Architecture principles



Scientific Computing

- **Calculus + Computing**
  - Problems from other science domains
  - *Used* to require MatLab
- **Applications**
  - Complex simulations
  - Physics (games!)
- **Challenge**: Performance
  - Programs can run for days!
  - How do we make faster?





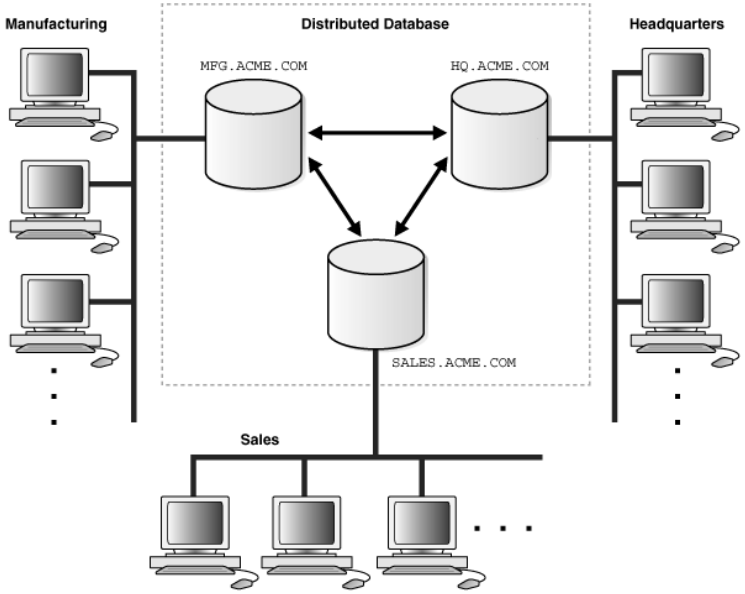
Data Management

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

CS 4300

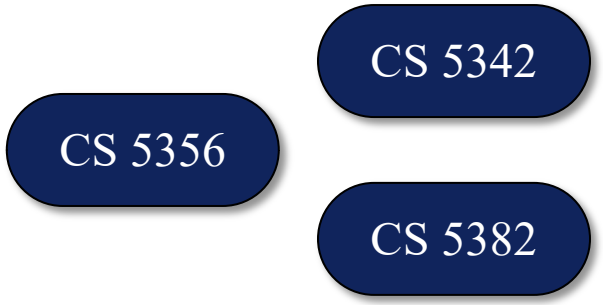
CS 4320

CS 5306

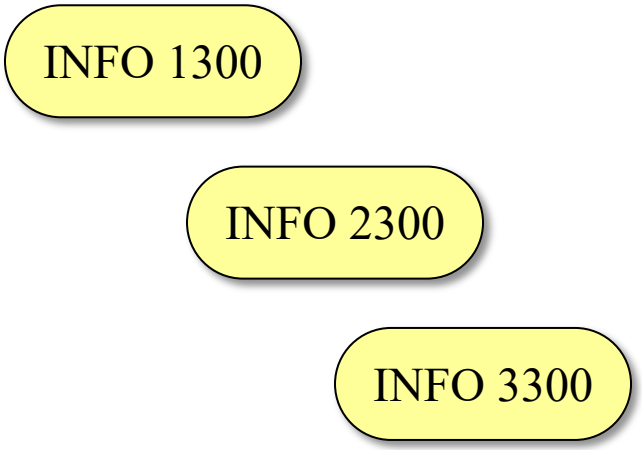


Data Management

- **Many courses in NYC**
  - Start-up focused courses
  - Also include security
  - Not easy to take in Ithaca



- **Also many INFO courses**
  - The INFO intro sequence
  - Focus on web development
  - Some new programming (e.g. JavaScript)
  - But emphasize the **design**



Data Management

- **Many courses in NYC**
  - Start-up focused courses
  - Also include security
  - Not easy to take in Ithaca

CS 5342

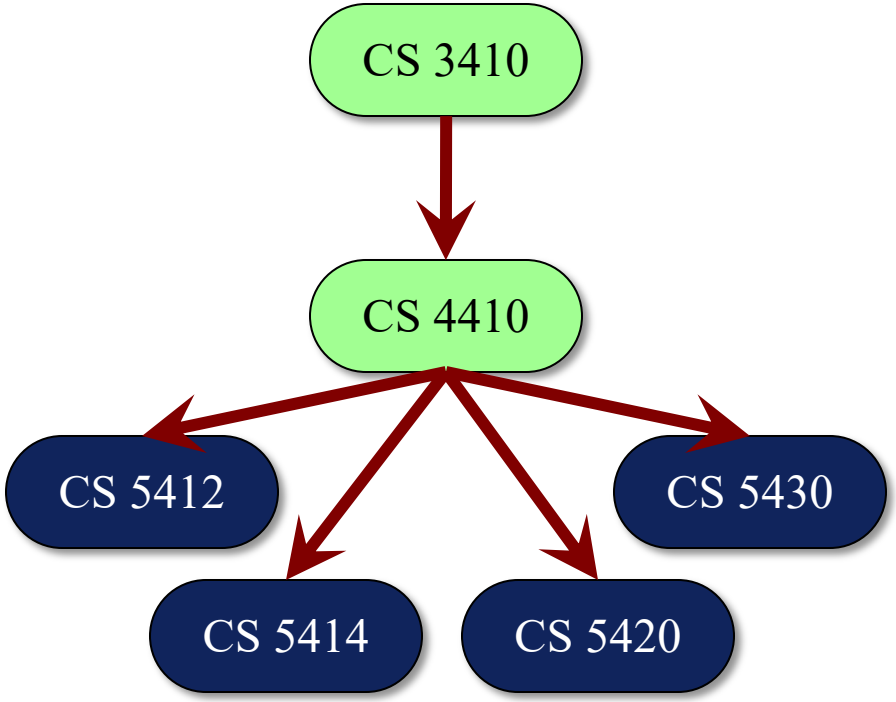
CS 5356

CS 5382

- **Also many INFO courses**
  - The INFO intro sequence
  - Focus on web development
  - Some new programming (e.g. JavaScript)
  - But emphasize the **design**

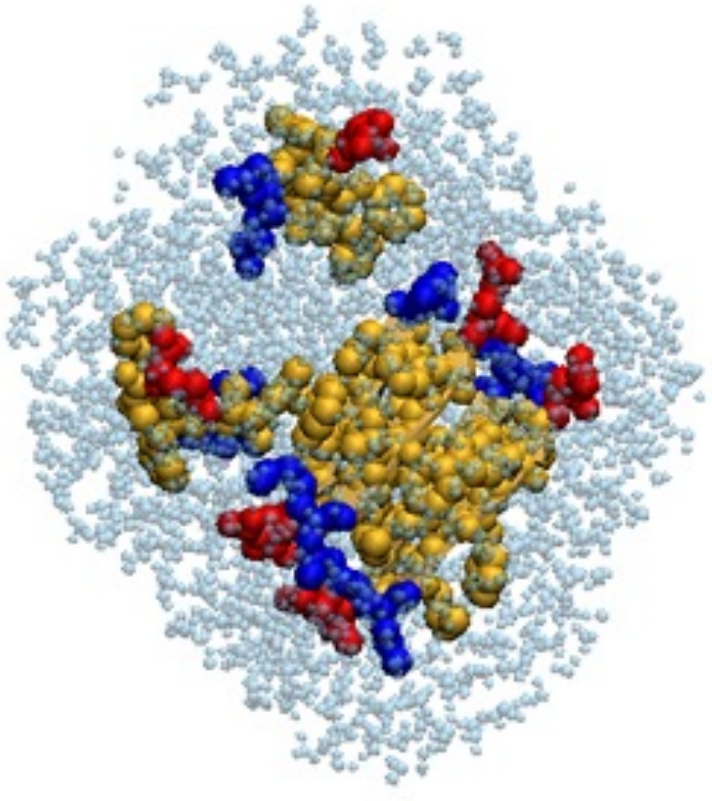
Systems

- **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!



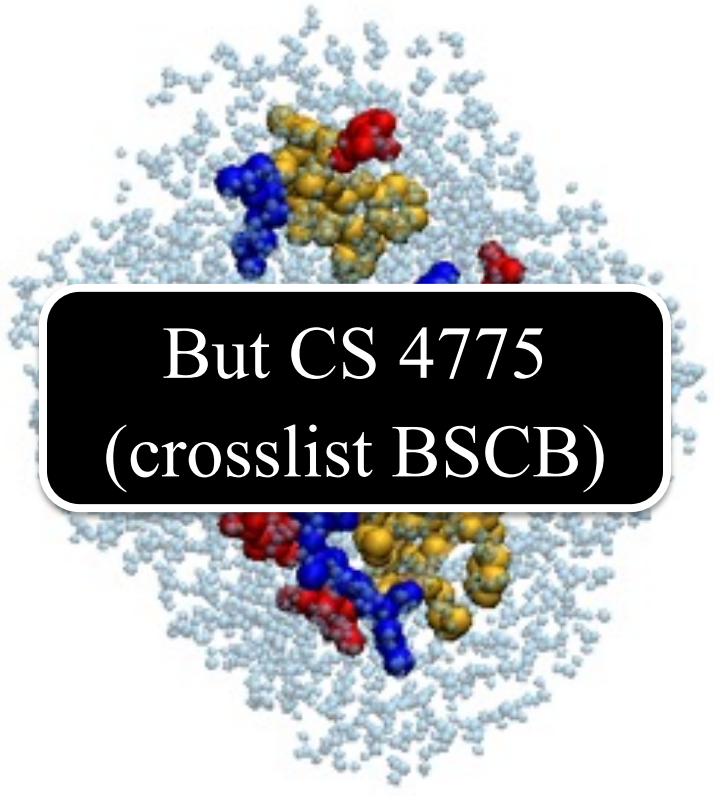
Computation Health/Biology

- **No undergrad classes**
  - Used at CornellTech
  - Too much to learn
  - Also needs Weil Cornell
- 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
  - Has its own concentration



Computation Health/Biology

- **No undergrad classes**
  - Used at CornellTech
  - Too much to learn
  - Also needs Weil Cornell
- 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
  - Has its own concentration



Graphics and Vision

- **Rendering & Animation**
  - **Not** modeling/art!
  - Illumination/reflection
  - Cloth/hair simulation
  - Water and fluids

CS 4620

CS 5625

CS 5643

- **Processing Images**
  - Recognizing shapes
  - Assembling 3D models from 2D pictures
  - Smart cameras

CS 4670

CS 6662

CS 6682

Graphics and Vision

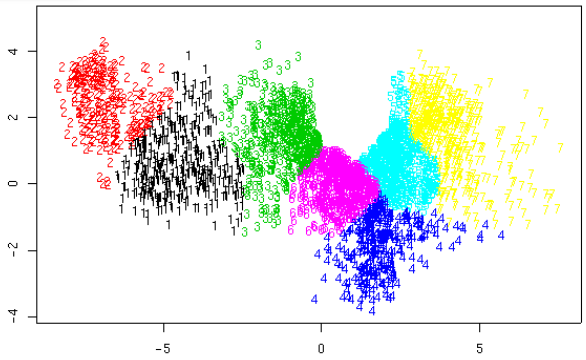
- **Rendering & Animation**
  - **Not** modeling/art!
  - Illumination/reflection
  - Cloth/hair simulation
  - Water and fluids

- **Processing Images**
  - Recognizing shapes
  - Assembling 3D models from 2D pictures
  - Smart cameras

Artificial Intelligence

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

CS 4700 CS 4740 CS 4750
CS 4780 CS 4744 CS 4754
CS 4783 CS 4745 CS 4758
CS 4786
CS 478x

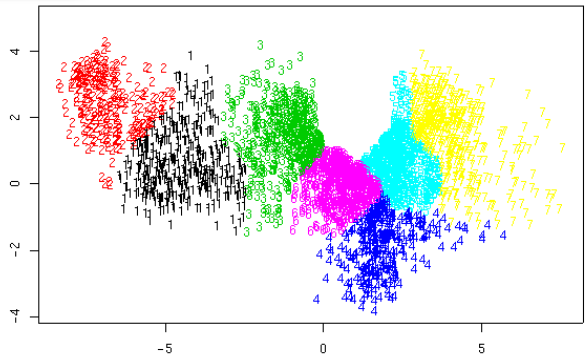


Artificial Intelligence

- **Machine learning**
  - Discovering patterns
  - Making predictions
- **Natural Language Proc.**
  - Automatic tra
  - Searchin
  - Voice-co
- **Robotics**
  - Autonomous control
  - **Not** sentient computers

CS 4700 CS 4740 CS 4750
CS 4780 CS 4744 CS 4754
CS 4783 CS 4745 CS 4758

This area has exploded!

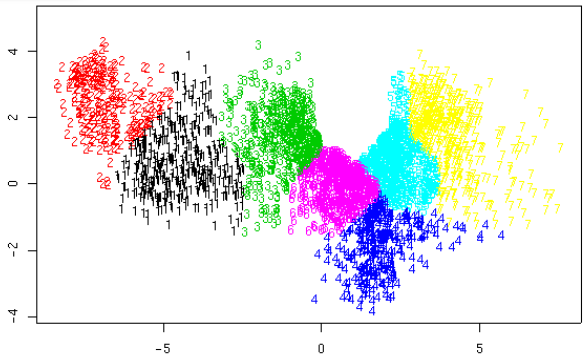


Artificial Intelligence

- **Machine learning**
  - Disco[illegible] patterns
  - Maki[illegible]
- **Natural Language Proc.**
  - Automatic translation
  - Searching text/books
  - Voice-control interfaces
- **Robotics**
  - Autonomous control
  - **Not** sentient computers

Primary reason for the increase

CS 4700 CS 4740 CS 4750
CS 4780 CS 4744 CS 4754
CS 4783 CS 4745 CS 4758
CS 4786
CS 478x



Machine Learning

- Also in other depts.
  - ORIE 3120
  - ECE 4200

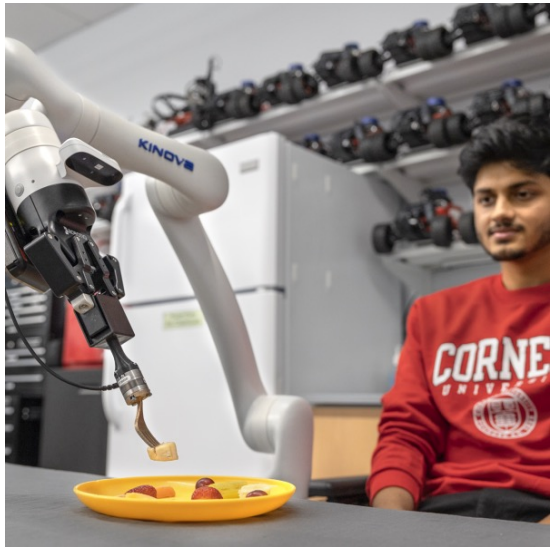
  Tailored to those areas
- Many grad classes
  - ASTRO 6523
  - BME 5310
  - MATH 7740
  - NBA 4920
  - SYSEN 5880
  - And more…

  Narrow in scope

General-purpose classes are almost all in CS dept.

Artificial Intelligence

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



Robotics

- More classes in MAE
  - MAE 3780
  - MAE 4710
  - MAE 4780
  - MAE 67xx

Pure MAE
Not cross-listed

- CS focus on algorithms
  - Planning/perception
  - Also human interaction
  - (with some in IS)

Minor is available!
Offered through MAE

Robotics

- More classes in MAE
  - M 3780
  - MAE 4710
  - MAE 4780
  - MAE 67xx

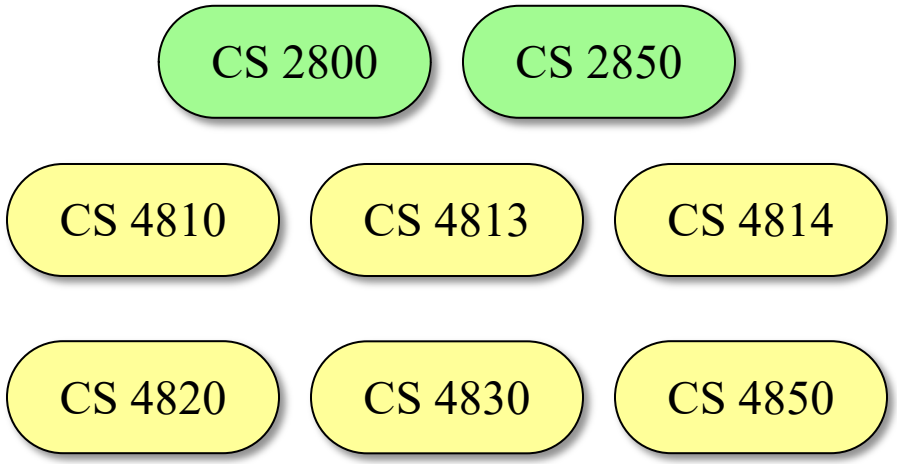
Pure MAE
Not cross-listed

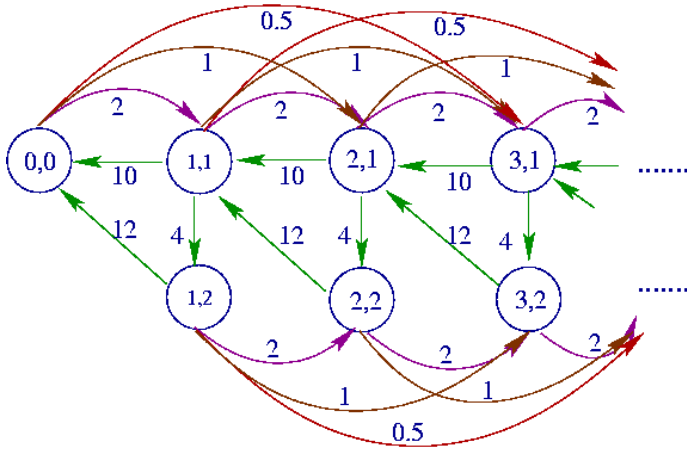
- CS focus on algorithms
  - Planning/perception
  - Also human interaction
  - (with some in IS)

Minor is available!
Offered through MAE

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

What About Games?

- CS 3152, Software Engineering
  - 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

You Own Your IP

Underhand

- Strategic card game
- Inspired by *Reigns*
- 1 million Android downloads

Family Style

- Multiplayer Coop
- Featured on App Store!
- 20k daily users

Games and the Designer Track

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

Good Bye!