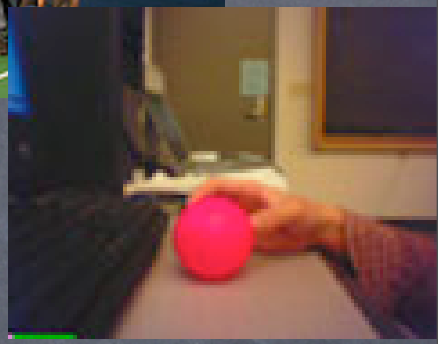
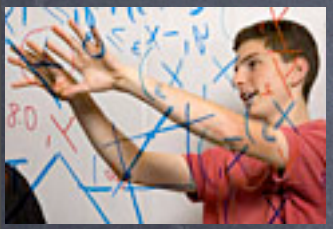
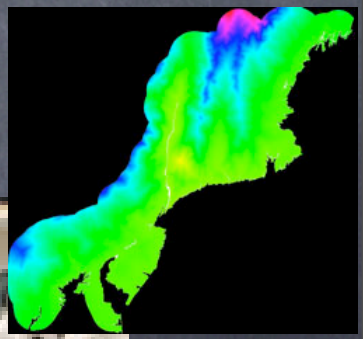
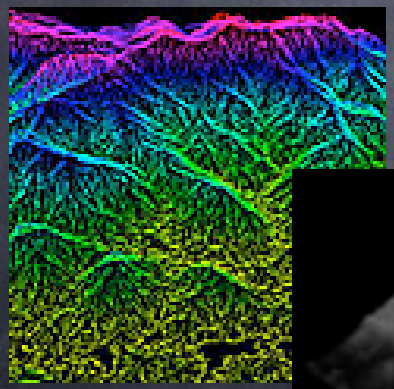
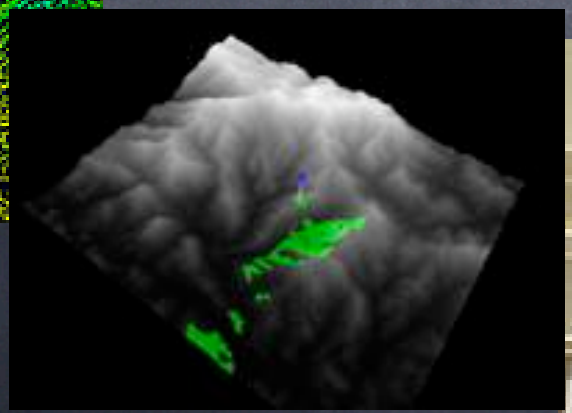


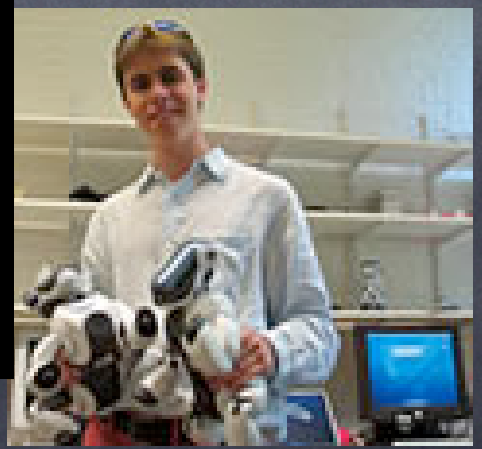
Bowdoin Computer Science

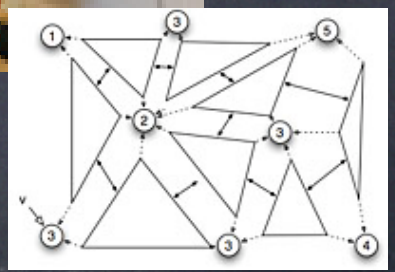












What is computer science, what are its applications in other disciplines, and its impact in society?

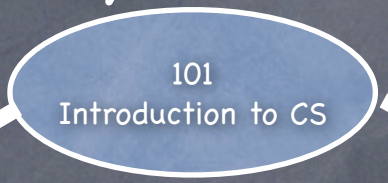
101: Introduction to CS

- Pre-requisites: none
- Assumes no prior knowledge of programming or computers.

- Provides a broad introduction to computer science and programming through real-life applications.
- How to think carefully and how to solve problems more effectively
  - applicable far beyond computer science
- Java Programming

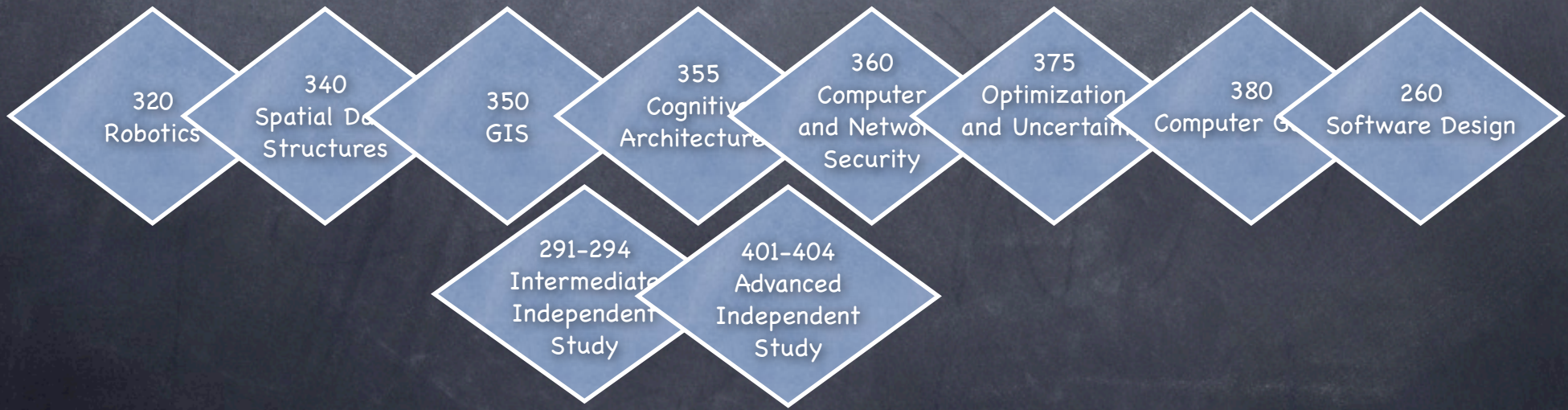
The major in Computer Science

1 entry-level class



5 core classes

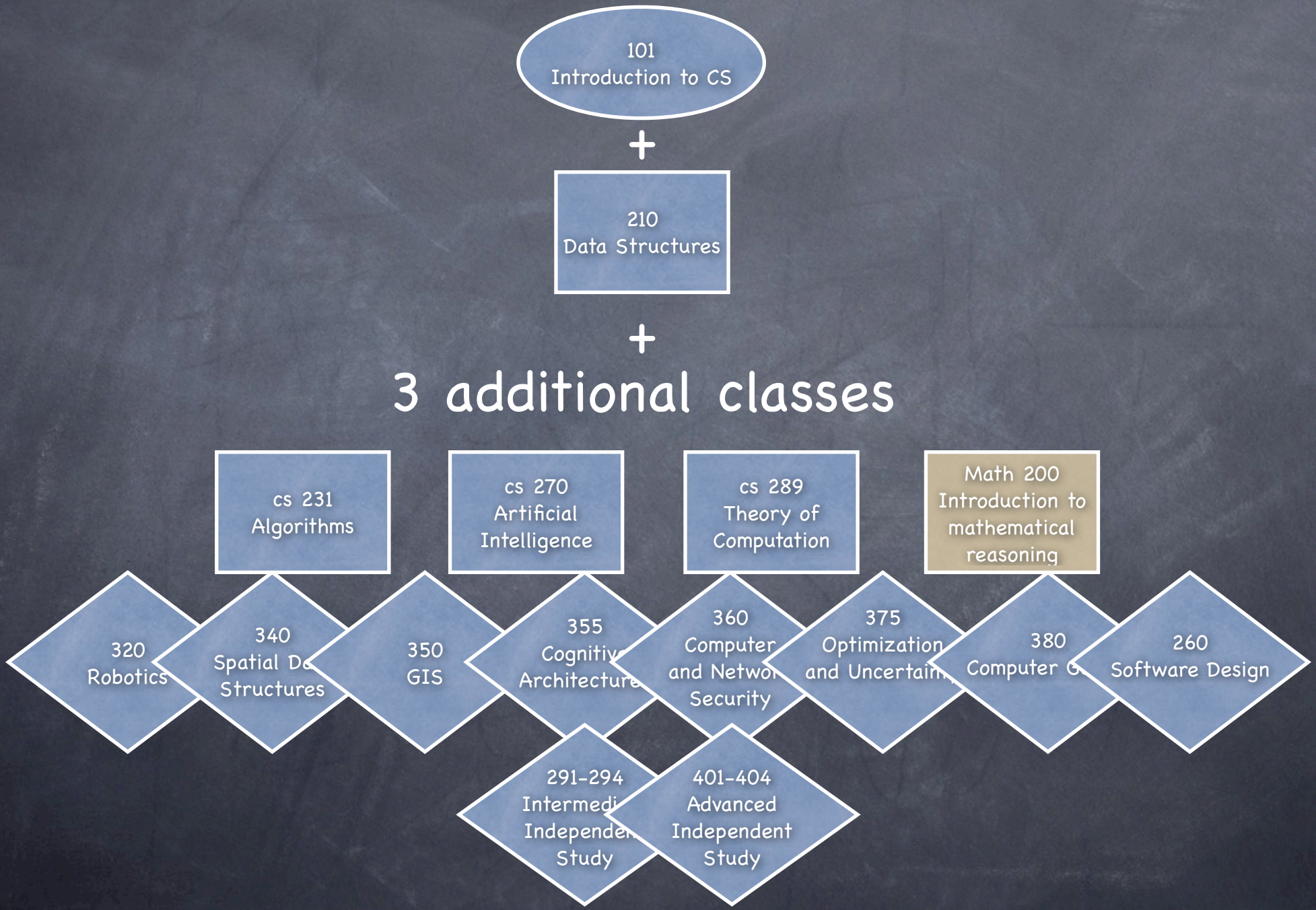
3 electives



Independent Studies and Honors

- Computer Science faculty research
  - Eric Chown
    - robot soccer and cognitive science
  - Steve Majercik
    - artificial intelligence and planning
  - Laura Toma
    - algorithms and GIS
  - Adriana Palacio
    - cryptography and information security

The minor in Computer Science



Bowdoin Computer Science

Location: Searles, 2nd floor

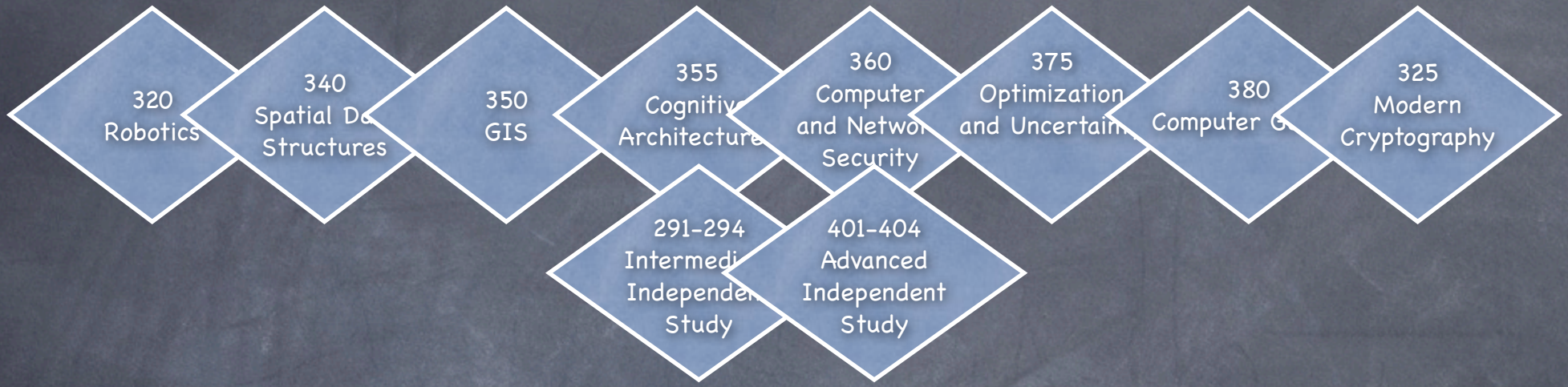
The major in Computer Science

5 core classes

- 210: Data Structures
  - A study of basic data structures, their efficiency, and their use in solving computational problems.
  - Programming intensive
- 231: Algorithms
  - Explores a variety of solutions for fundamental problems while introducing the main techniques for the design and analysis of algorithms.
  - Theoretical
- 270: Artificial Intelligence
  - Explores the principles involved in programming computers to do tasks that would require intelligence if people did them.
  - Theoretical + programming
- 289: Theory of Computation
  - What can a computer do? What is computation? What are the limits of computation?
  - Theoretical

The major in Computer Science

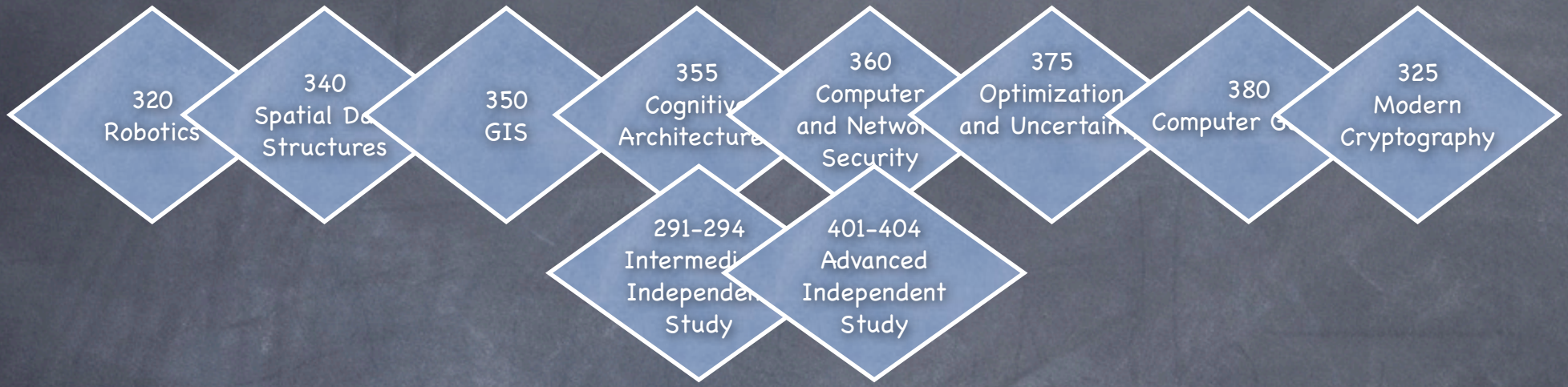
3 electives



- **320: Robotics**
  - Robotics incorporates ideas from a number of different areas—artificial intelligence, cognitive science, operations research—in pursuit of an exciting goal: programming robots to do useful tasks.
  - Challenge: build effective models of the world using inaccurate and limited sensors, and using such models for efficient robotic planning and control.
  - Students address these problems from both a theoretical and a practical perspective. Robot soccer
  - Theory and programming

The major in Computer Science

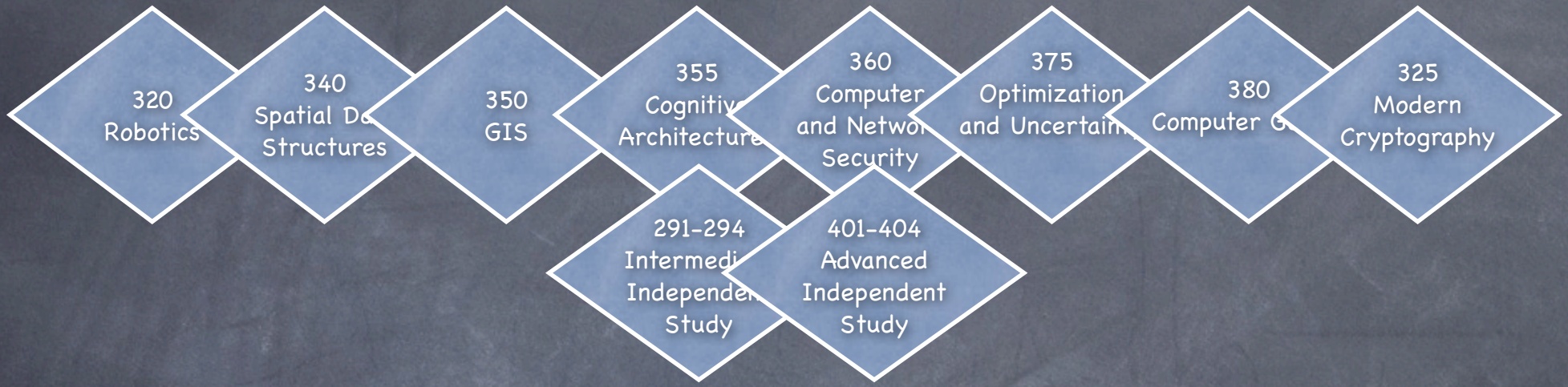
3 electives



- **340: Spatial Data Structures**
  - In many disciplines the data being collected have spatial coordinates.
  - Presents algorithms and data structures for problems involving spatial data, exploring both their theory and practical efficiency.
  - Includes topics from spatial database design and computational geometry
    - triangulations, spatial join, range searching, nearest-neighbor queries and window queries; techniques for dynamization of spatial data structures; clustering techniques and external memory algorithms.
  - Theory and programming

The major in Computer Science

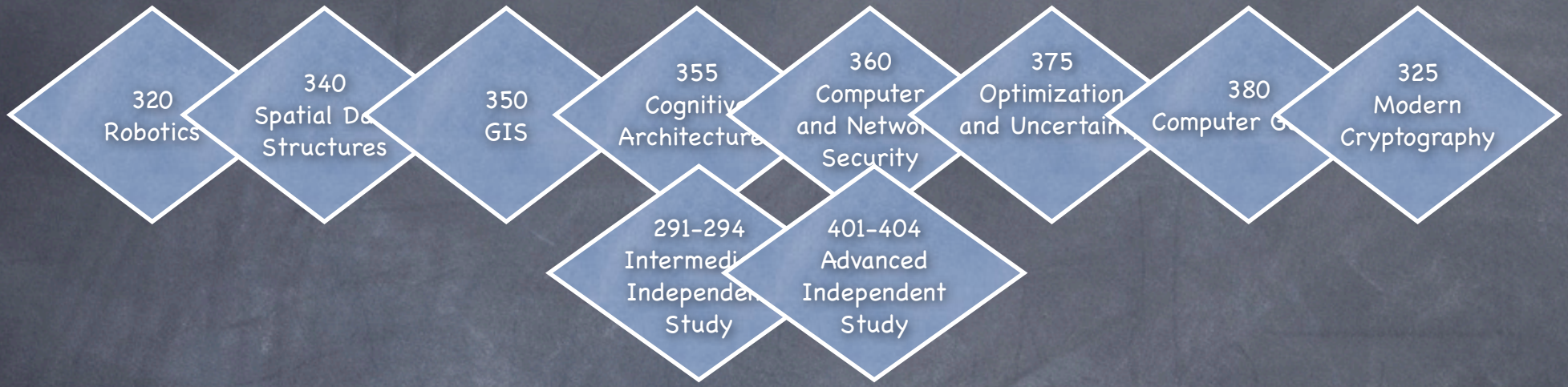
3 electives



- **350: Geographic Information Systems (GIS)**
  - GIS handle geographical data: boundaries of countries; course of rivers; height of mountains; location of cities, roads, railways; power lines.
  - GIS can help determine the closest public hospital, find areas susceptible to flooding or erosion, track the position of a car on a map, or find the shortest route from one location to another.
  - GIS provide a rich source of new research problems in computer science.
  - Topics covered include data representation, meshing and simplification, flow, overlay and visibility.
  - Theory and programming

The major in Computer Science

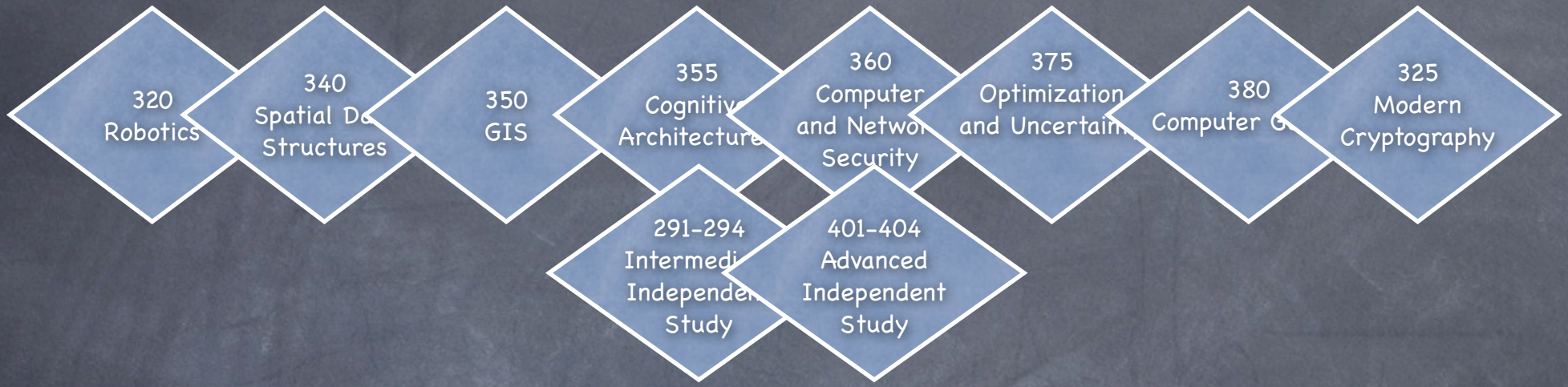
3 electives



- **355: Cognitive Architectures**
  - Explores the architecture and mechanisms that the human brain uses to process information. In many cases, these mechanisms are contrasted with their counterparts in traditional computer design.
  - A central focus is to discern when the human cognitive architecture works well, when it performs poorly, and why.
  - The course is conceptually oriented, drawing ideas from computer science, psychology, and neuroscience.
  - Theoretical

The major in Computer Science

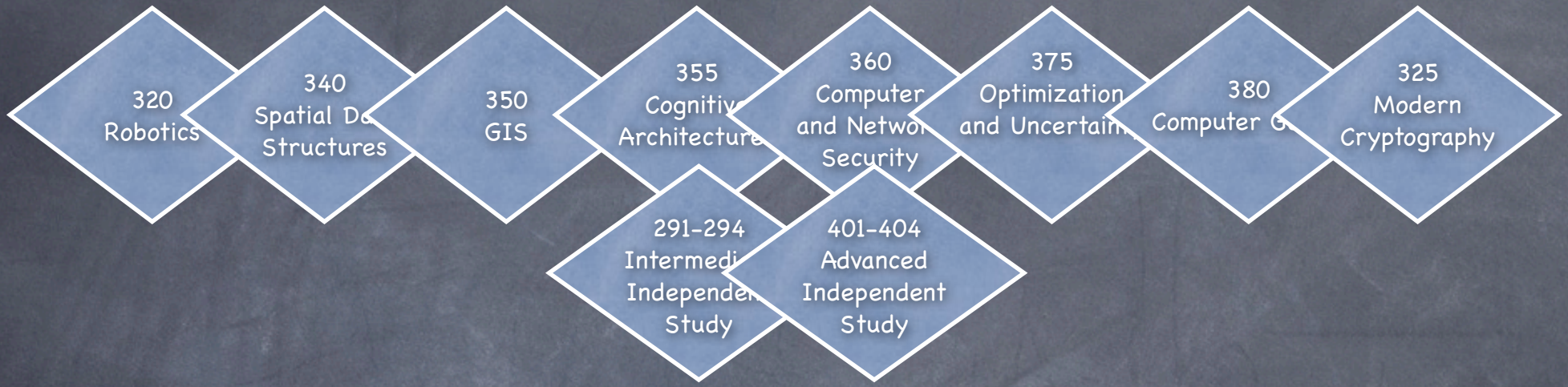
3 electives



- **360: Computer and Network Security**
  - The smooth functioning of society increasingly depends on the flow of information through computer networks.
  - Explores privacy and authenticity of information

The major in Computer Science

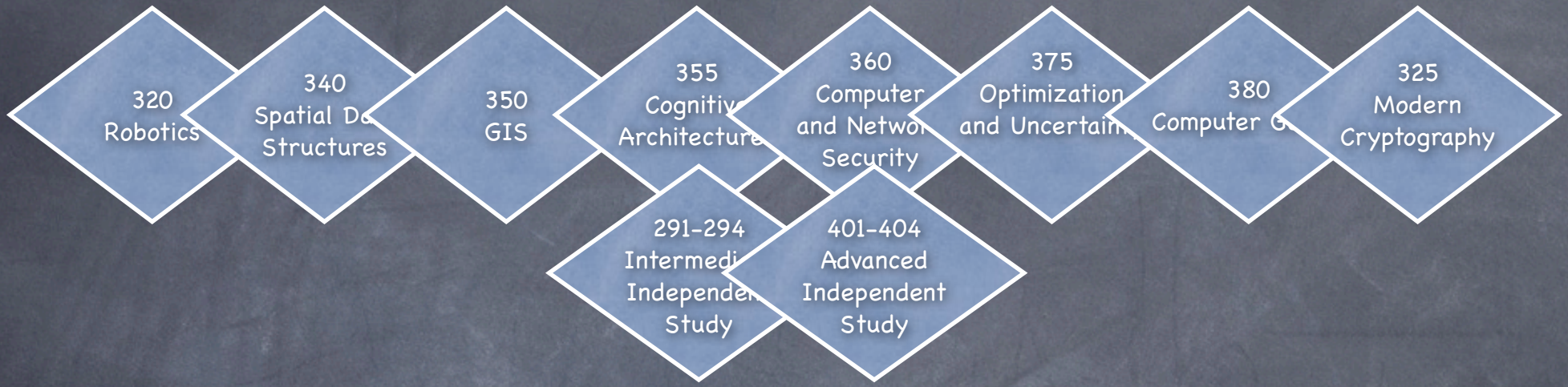
3 electives



- **375: Optimizitation and Uncertainty**
  - Optimization problems and coping with uncertainty arise frequently in the real world.
  - Expressed using a numeric framework, which permits performance guarantees for algorithms.
  - Topics include constraint satisfaction, systematic and non-systematic search techniques, and probabilistic inference and planning.
  - Theory and programming

The major in Computer Science

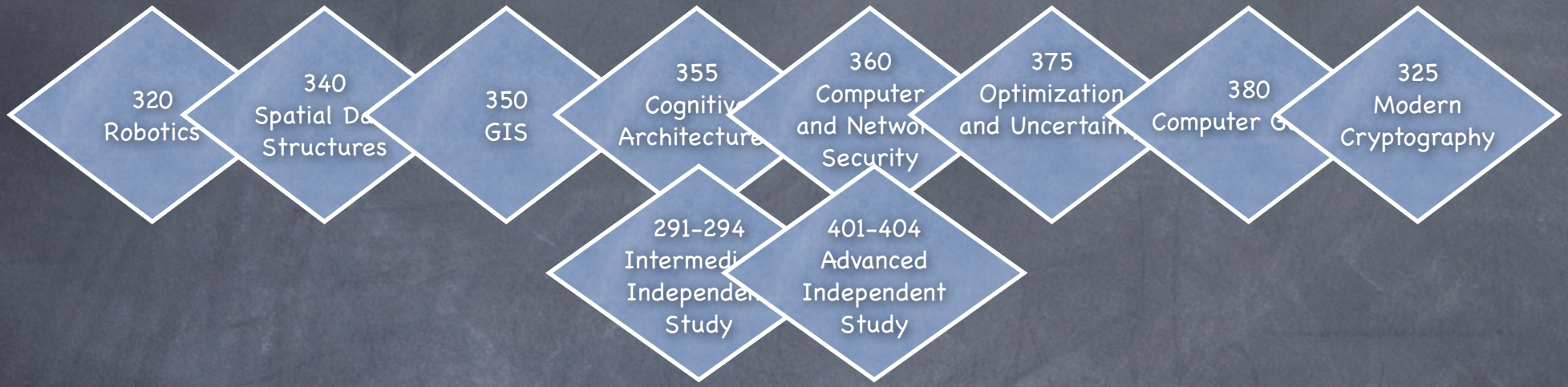
3 electives



- **380: Computer Games**
  - Computer games: a test-bed for the development of new techniques in AI
  - AI techniques are becoming increasingly necessary in commercial computer games to provide interesting, realistic synthetic characters (entities, human or otherwise, that assist or oppose the game player).
  - Explores this symbiosis by studying a subset of AI techniques that are relevant to the creation of synthetic characters in computer games, using these techniques to create AI-endowed synthetic characters (e.g. characters that can learn from their experience and thus do not become predictable), and testing them in actual computer games.
  - Theory and programming

The major in Computer Science

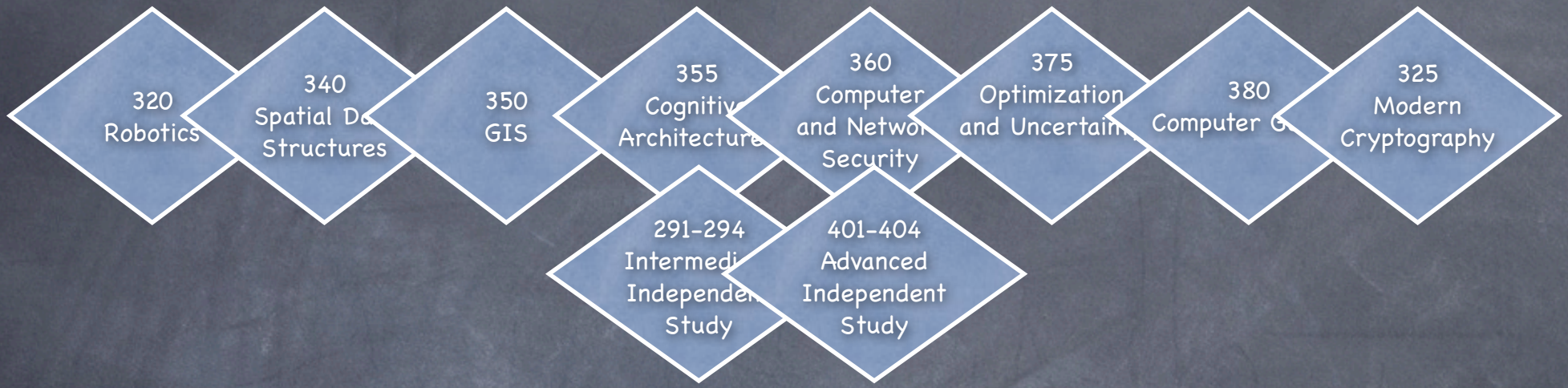
3 electives



- **325: Modern Cryptography**
  - An introduction to modern cryptography, covering topics such as block ciphers, private-key encryption, hash functions, digital signatures, public-key encryption, RSA, public-key infrastructure, and various applications.
  - Theoretical, emphasizes a rigorous mathematical approach

The major in Computer Science

3 electives



- 291-294, 401-404: Independent Study & Honors