Campus-Wide Computation Initiative: A New Model for Computing Education

Valerie Barr – Union College
Chun Wai Liew – Lafayette College

October 30, 2008

A word on our schools....

- size and type
- programs
- our goals before CPATH came along

Our focus, and the challenges

Build computational skills in non-CS disciplines:

- students
  - both: convince non-CS students to study computation
  - Union: provide alternate pathways to major/minor
- faculty and departments – convince them to devote resources, advising, and space in their curricula to incorporate computation
- administrators – convince them they should promote computation

Factors affecting.....

Students:

- negative impression of computing (the field and the practitioners)
- lack of self-confidence
- need to be aware of relevance of computation to their field

Faculty:

- startup/learning costs
- some not using computation in their field (teaching or research)
- time/resources needed to develop or modify courses

Curriculum Changes

- Intro to computational science course
- Intermediate courses (in CS, in other fields)
- Course modules (in non-CS fields)
- computational methods minor, track, or certificate

Key features:

- courses that are relevant to other fields
- courses that do not have many prerequisites

Intro to Computational Science

- goal – students learn to think computationally, write short programs (2-3 pages)
- use a scripting language (Python)
- take more time for basic concepts (functions, control structures, sequences)
- cover regular expressions (to process data)
- cover control of external programs through generation and execution of command scripts
- use datasets and applications from multiple disciplines
- application oriented projects - e.g., analysis of large economic data sets using R (statistical package)

Intro, cont.

- No object oriented design/programming
- Algorithm analysis
  - Lafayette – none
  - Union – minimal introduction
- CS & ECE majors
  - Lafayette – these students will not receive credit for this course.
  - Union -- is one of 5 intro courses. Open to entire campus, including CS and ECE.

After the intro.....

- Faculty develop modules and courses in own discipline (grant support)
- CS develops intermediate application oriented courses
- Non-CS faculty and students pursue computational projects (grant support)
- Push for computational prerequisites or requirements in other departments.

Building interest in computation

- Faculty are key, students will follow
  - consultation on curriculum
  - joint development of track/minor/certificate program
  - support for change in other depts. (modules, courses, tracks)

Faculty Interest....

Some things don't work!

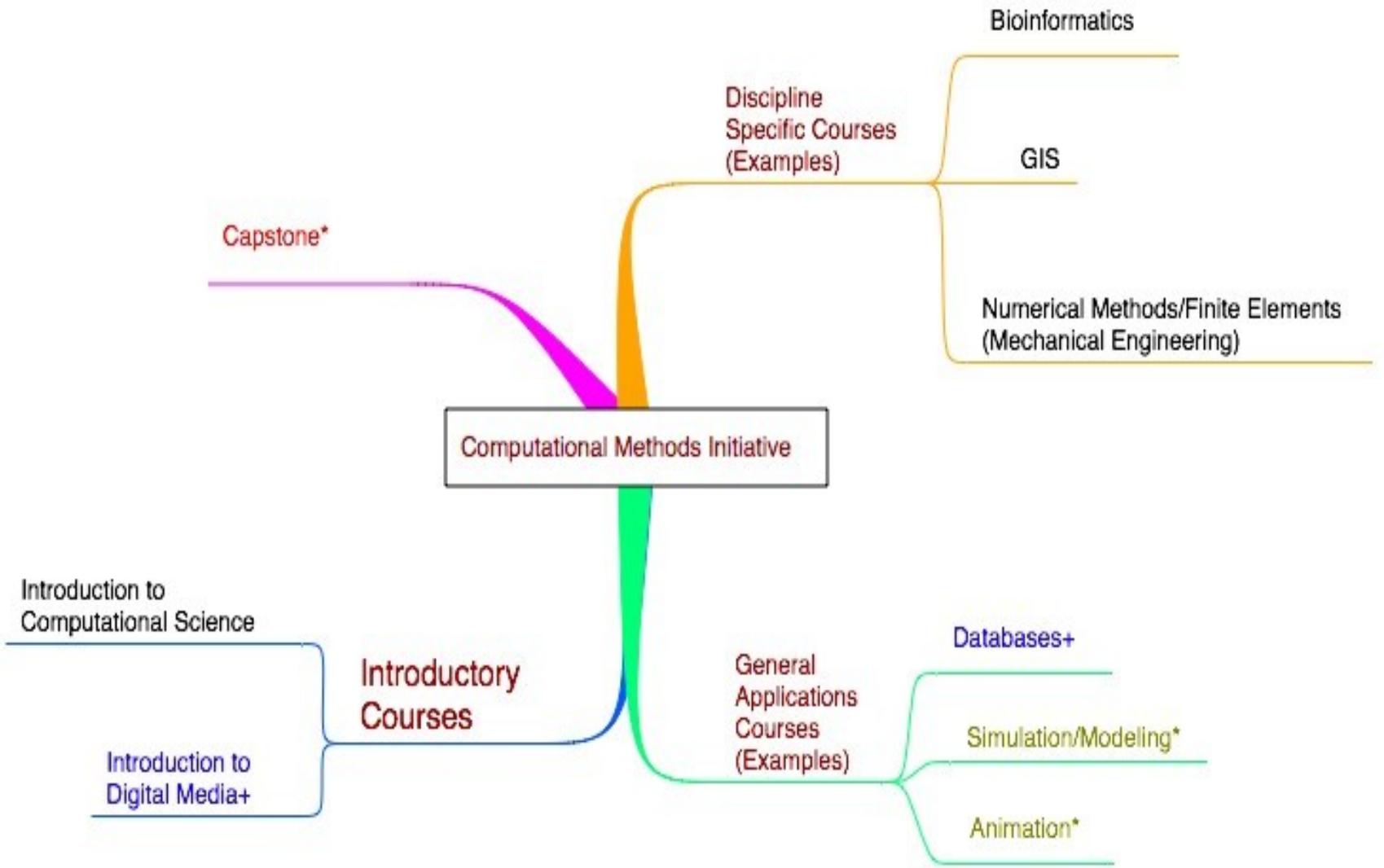
- email to entire faculty

Some things do work

- one on one conversations; reminders before advising
- money, ongoing contact, more conversations
- administrators who are interested and will help push

Building student interest

- Publicity: advantages of having computational skills (Career Center)
- Publicity: information about courses, minor, tracks
- Advising: faculty from other depts. (faculty are key!)


Bioinformatics
Discipline Specific Courses (Examples)
GIS
Capstone*
Numerical Methods/Finite Elements (Mechanical Engineering)
Computational Methods Initiative
Introduction to Computational Science
Introductory Courses
Introduction to Digital Media+
Databases+
General Applications Courses (Examples)
Simulation/Modeling*
Animation*

Where are we now? (Lafayette)

- computational methods minor
- computational neuroscience track
- quantitative economics track
- computational methods for engineering (track under development)
- introduction to neuroscience (computation module)
- intermediate art (computation module)
- agent based modeling (research)

Where are we now? (Union)

- computational methods minor, under development
- computational neuroscience track
- digital art program (joint between CS and Visual Arts)
- Bio & CS – Intro to Bioinformatics course
- Economics – computation integrated into “Contemporary Problems in macroeconomics”
- ECE – modules for “Acoustics of Speech Production” and non-majors course
- Physics – module on Monte Carlo Methods in statistical mechanics
- Chemistry module for intro computational methods course

Questions?