



CSCI 2320
Principles of Programming
Languages

Introduction

Mohammad T. Irfan

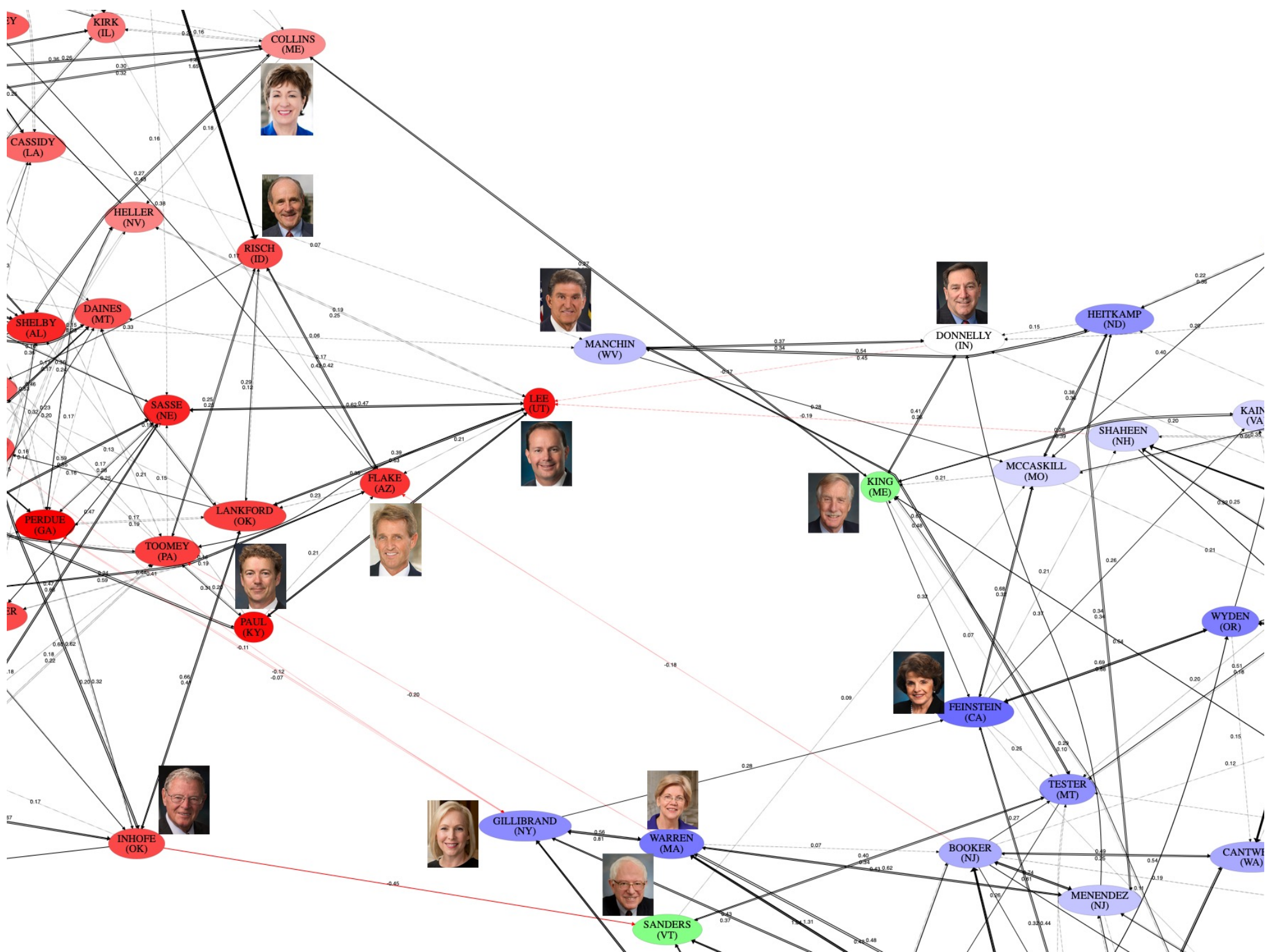
mirfan@bowdoin.edu

Course website:

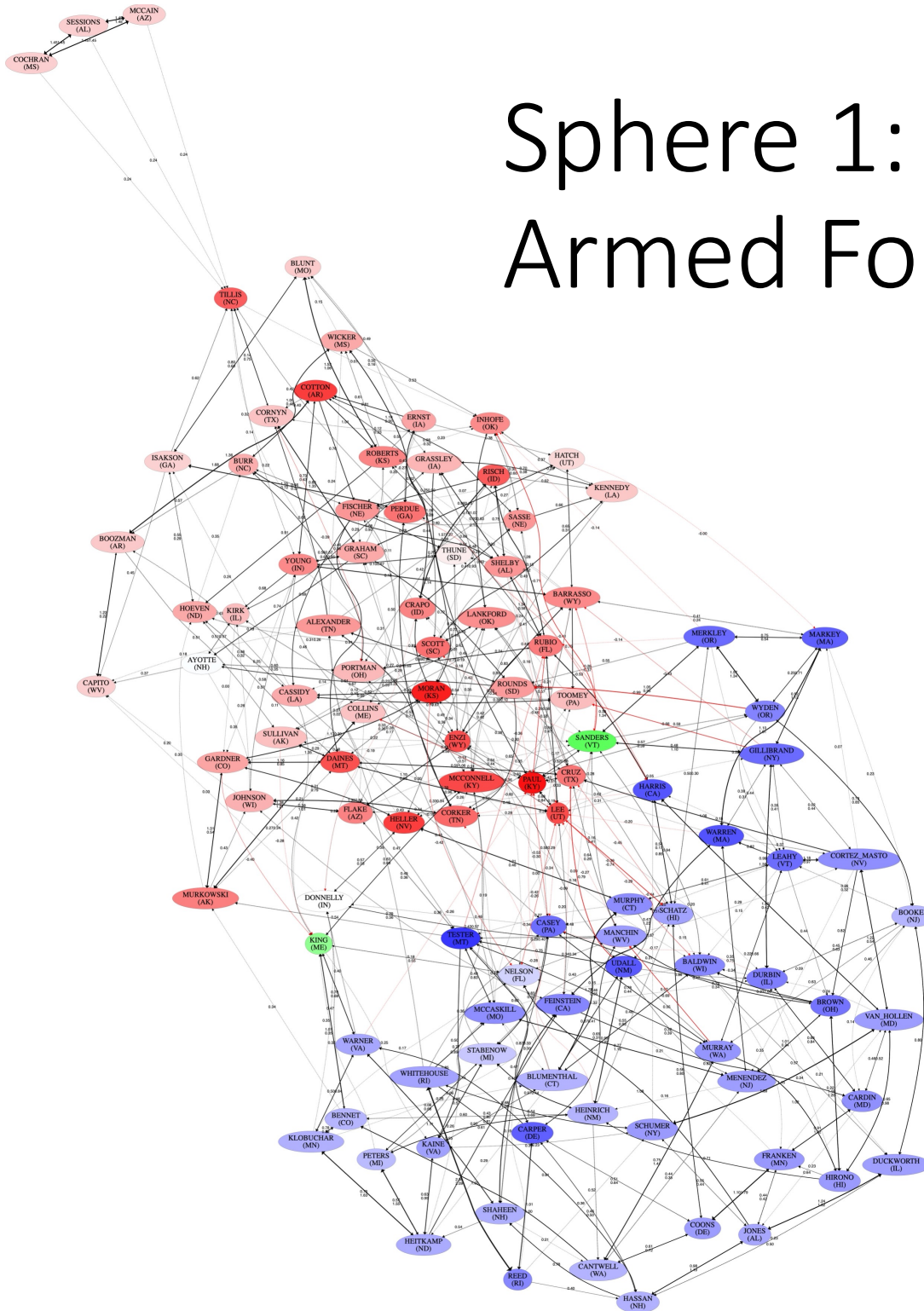
<https://mtirfan.com/CSCI-2320>

About myself

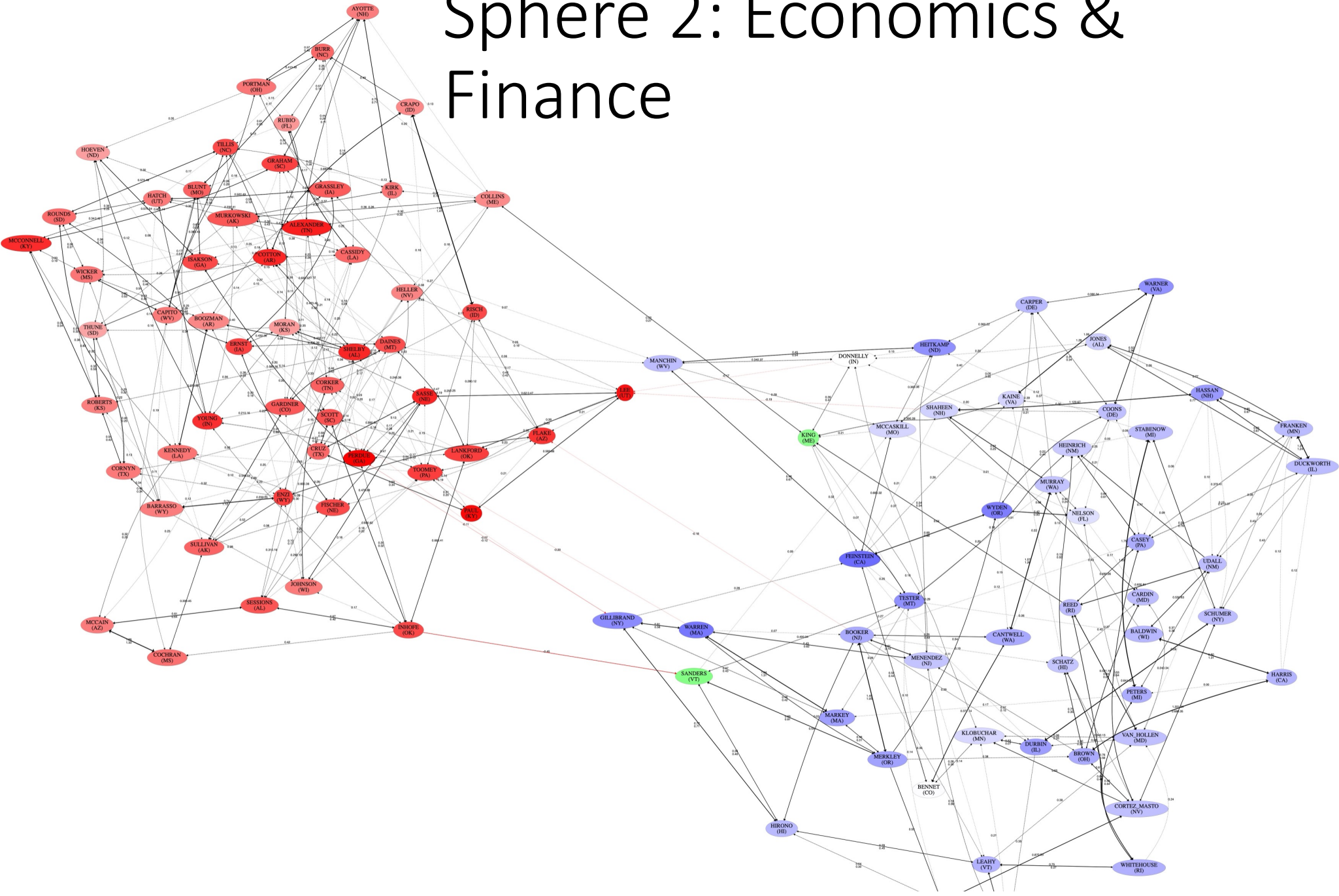




Sphere 1: Security & Armed Forces



Sphere 2: Economics & Finance



Bowdoin Effort Earns Top Award at International Computer Science Conference Archives

July 31, 2018 by Tom Porter

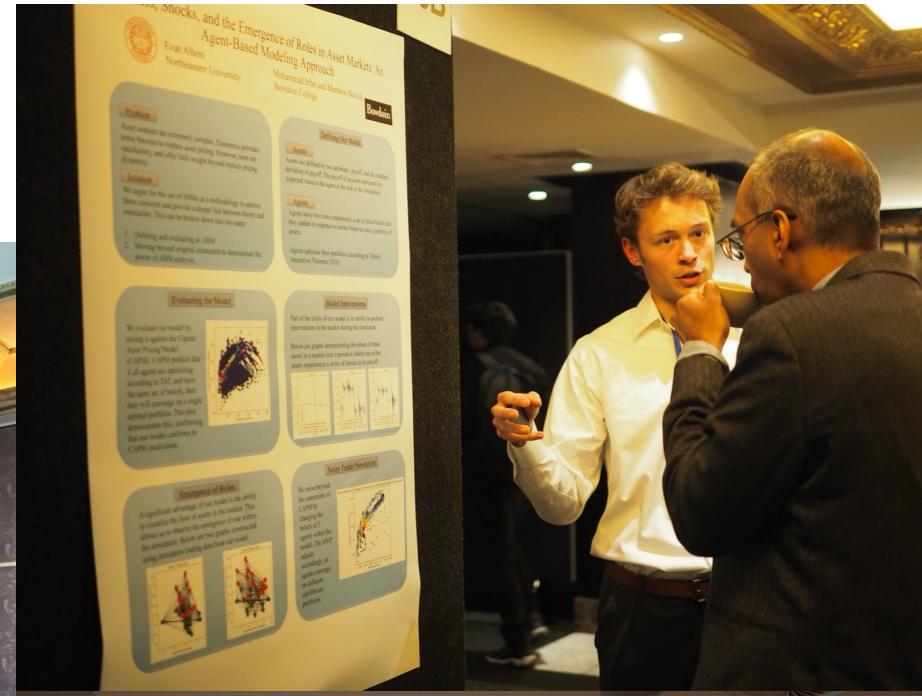
Best Paper Award
AAMAS 2018, Sweden
(# submissions: 607,
acceptance rate 25%)



Professor Mohammad Irfan, in the middle, receives the Best Paper Award from AAMAS Program Chairs Gita Sukthankar (L) and Mehdi Dastani (R).

A research paper coauthored by a Bowdoin professor and one of his former students has earned the top spot at a recent computer science conference in Sweden. The paper employs computational game theory to model and predict congressional voting patterns. It was written by Assistant Professor of Digital and Computational Studies and Computer Science Mohammad Irfan and Tucker Gordon '17,

Best Paper Runner-Up Award
AAMAS 2024, New Zealand
(# submissions: 1,113, acceptance rate 20%)



How Does Our Social Network Influence Our Behavioral Choices?

“No man is an island” wrote the poet John Donne in 1624, meaning whether we like it or not, we are all connected. It’s an assertion that rings truer than ever in today’s networked world, and it’s a central theme of the research currently being done by computer scientist Mohammad Irfan and his colleagues.

NSF Core Research Grant

Professor of Digital and Computational and Computer Science (CS) Irfan secured around half a million dollars for an exciting multiyear research project studying human interactions in networks. The research could have implications for many fields, he says, from public health to energy pricing to finance to the analysis of congressional voting patterns.

The award was made by the National Science Foundation (NSF) and done in collaboration with Luis E. Ortiz of the University of Michigan—Dearborn, for a multiyear research initiative. It’s all part of a core NSF program called Information and Intelligent Systems, says Irfan, who is the project director (while Bowdoin is the lead organization.)



FLOWER DARBY
with JAMES M. LANG

small
TEACHING
ONLINE

Applying Learning Science
in Online Classes

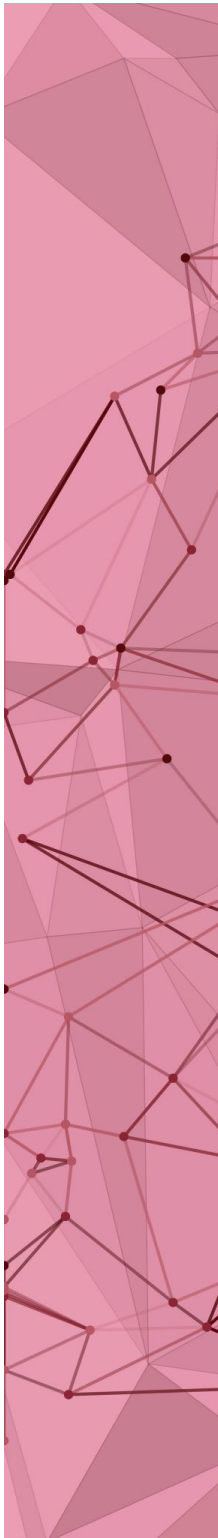
Advice to faculty

"Your students want you. Great content and a well-organized class help. But mostly they want you ...

No amount of sophisticated bells and whistles can replace an authentic, present and engaged instructor."

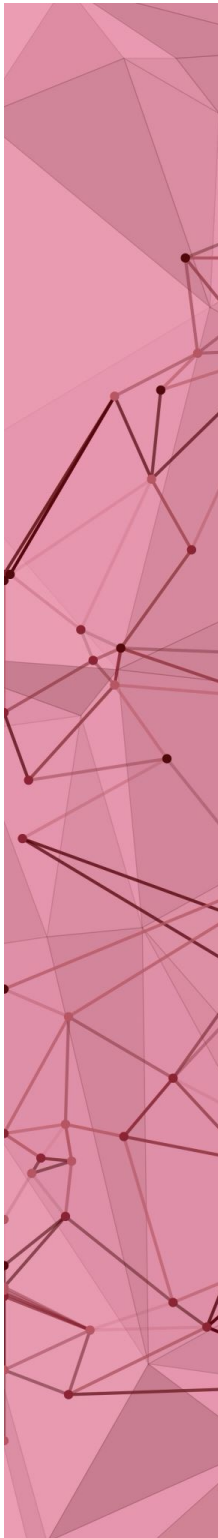
(www.insidehighered.com)

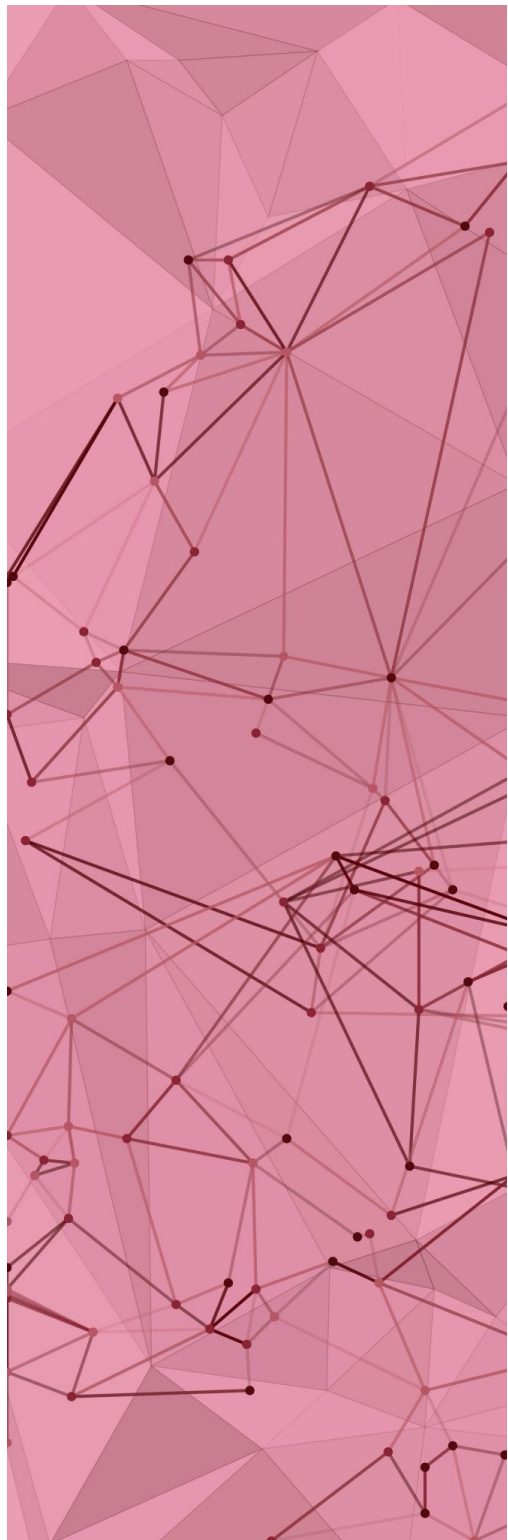
I teach humans
intellectually challenging
courses with
care, compassion, and
emotional engagement.



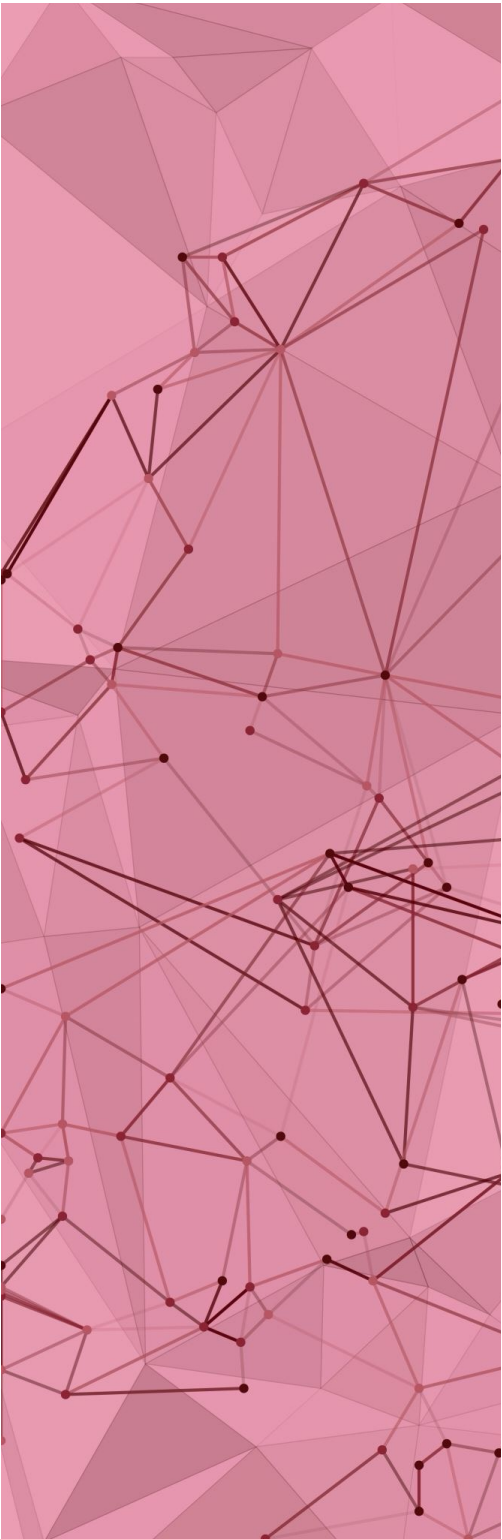
Lunch?

Mon, Tue, Thu: 1:10pm





You



How would you write a program to evaluate the following C code?

```
i = 15 + 5 * 2;
```

Can you think of some steps to follow?



Compilers vs. interpreters

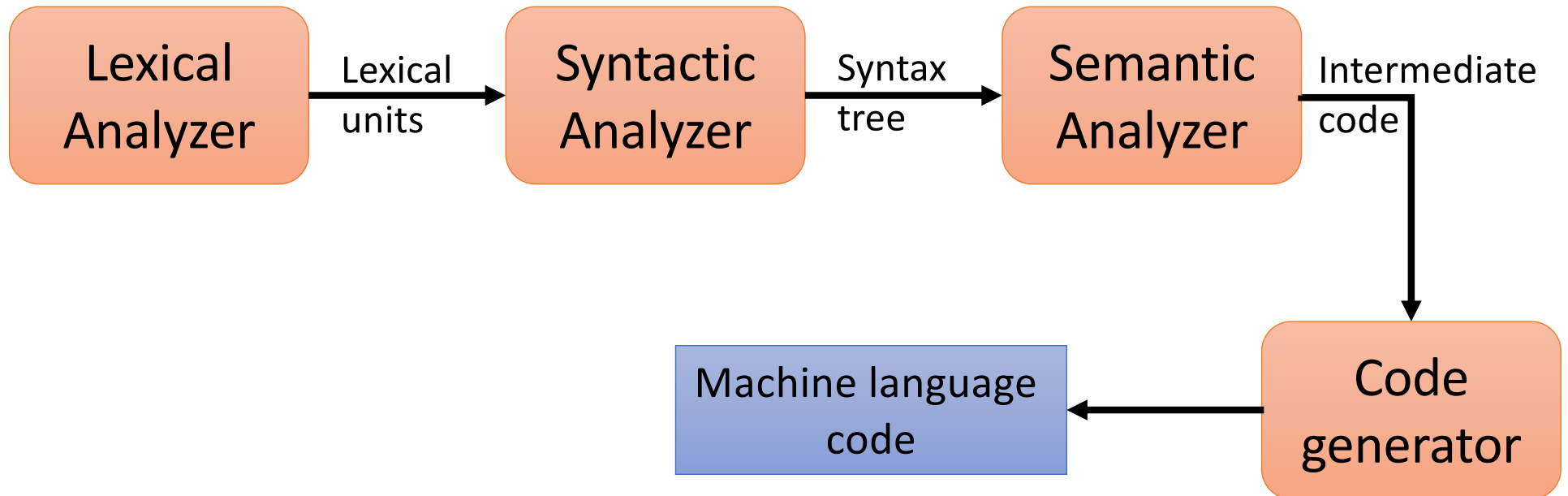
Compiled: C

Interpreted: Python

Both compiled and interpreted: Java

Compiler

`i = 15 + 5 * 2;`



We can run it **later**

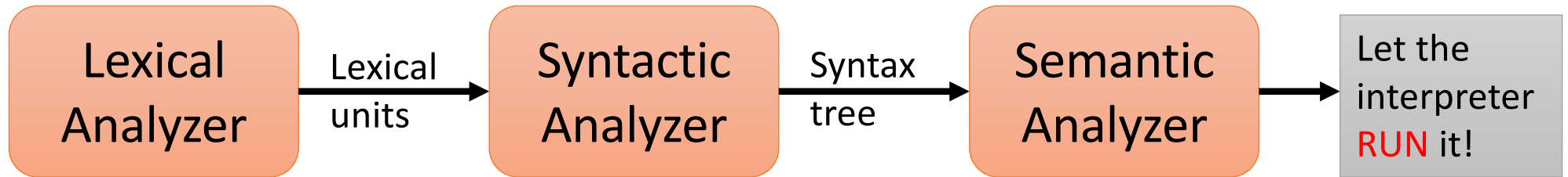


Compilers vs. interpreters

Interpreted languages:
Python, Java, etc.

Interpreter for Python

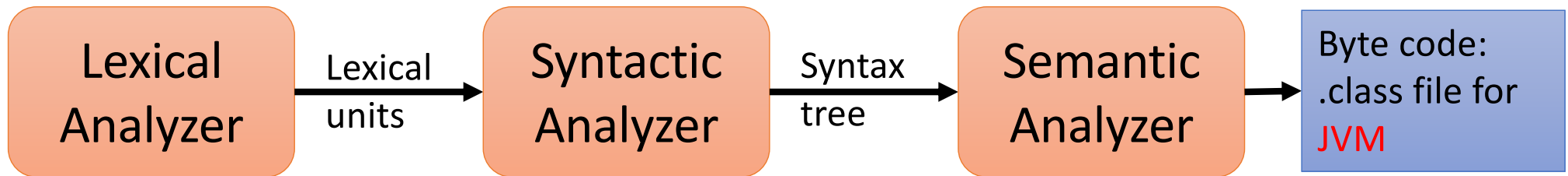
`i = 15 + 5 * 2`

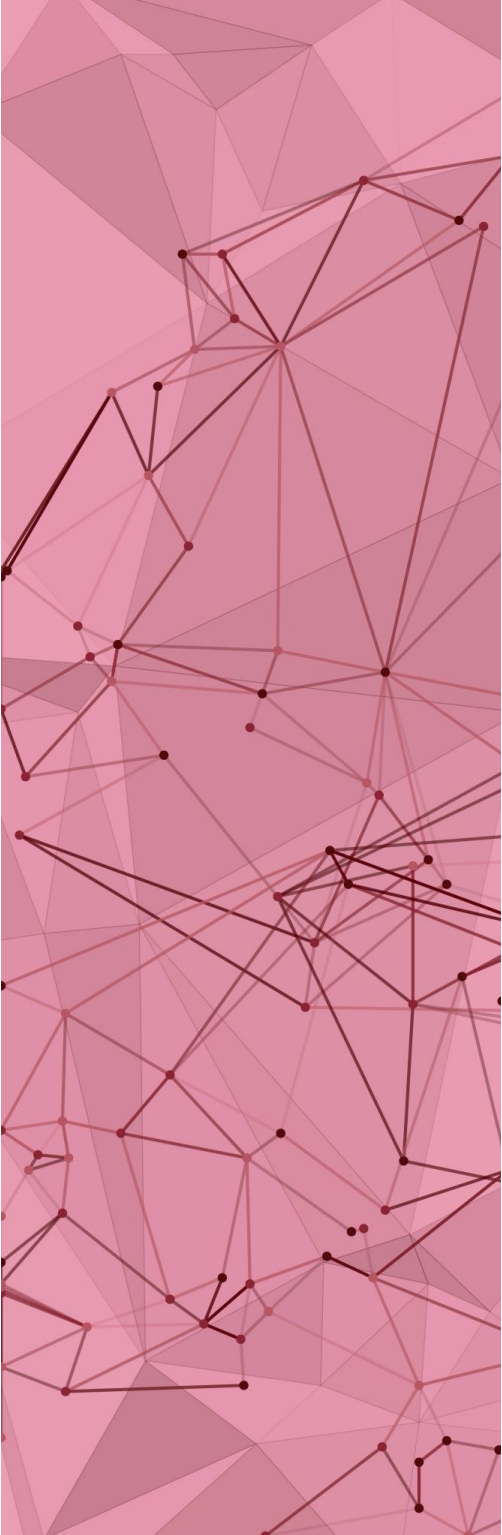


We'll implement an interpreter from scratch!

Java: compiled
AND
interpreter

```
i = 15 + 5 * 2;
```

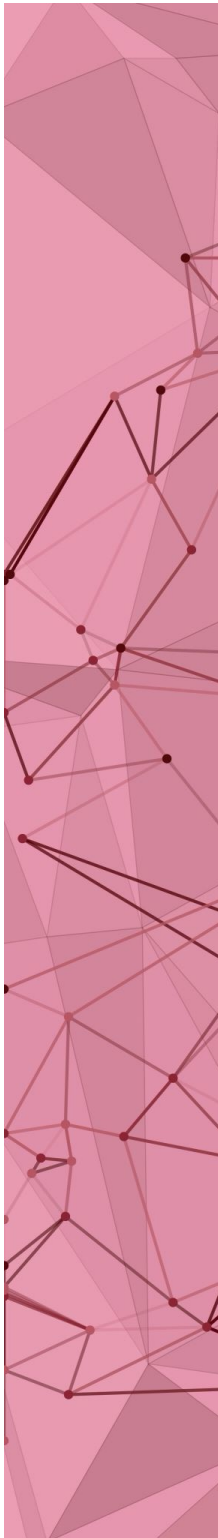




FA 1: History of PL
Reading: Ch 1
Due by Sunday

Course Logistics

- Course Website:
<https://mtirfan.com/CSCI-2320>
- Canvas



Taking class notes

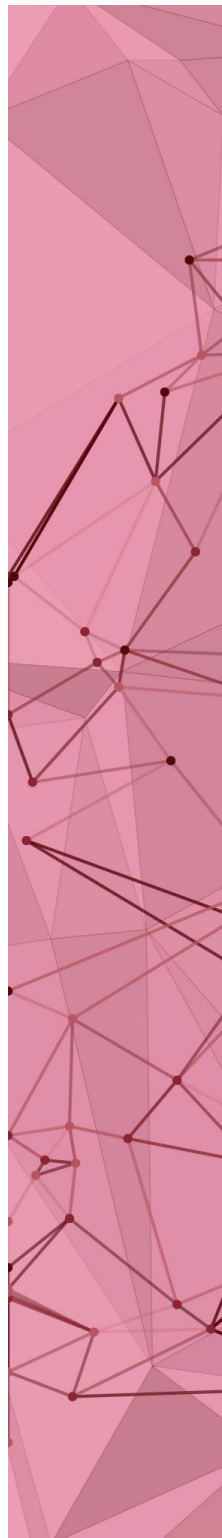


YOU'RE READING



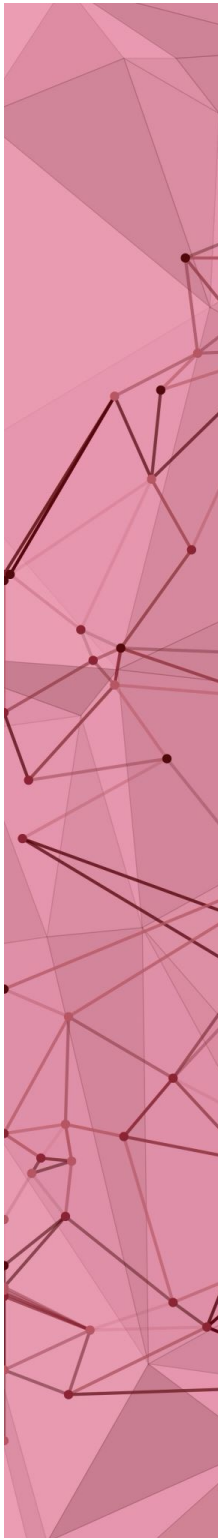
By Claudia Hammond
27th November 2019

Most students take a laptop with them to lectures. But are there times when they might be better off taking a pad and pen?



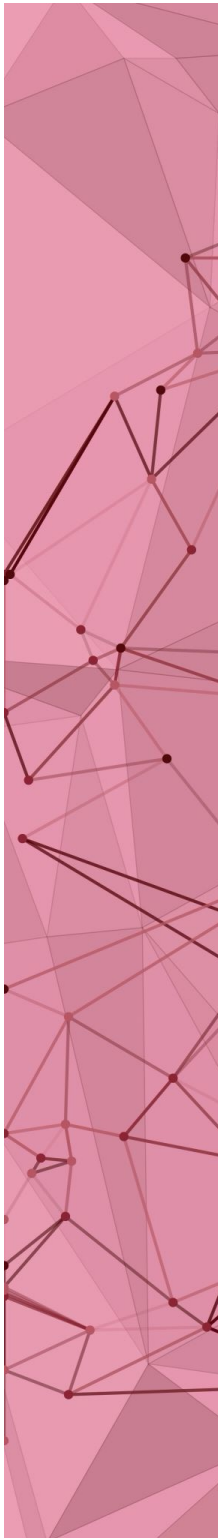
Taking handwritten notes

- Deeper cognitive processing compared to typing
- You can explain better
- “It's hard to avoid typing verbatim even if you are asked not to”
 - Typing verbatim has the shallowest level of cognitive processing



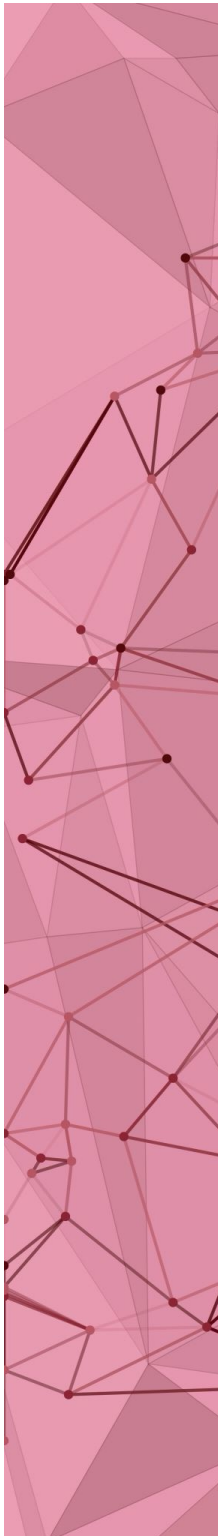
Computer programs

- [Beginning of computer programs](https://www.youtube.com/watch?v=uBbVbqRvqTM)
<https://www.youtube.com/watch?v=uBbVbqRvqTM>
- Natural language vs. programming language (PL)
 - 2 key differences



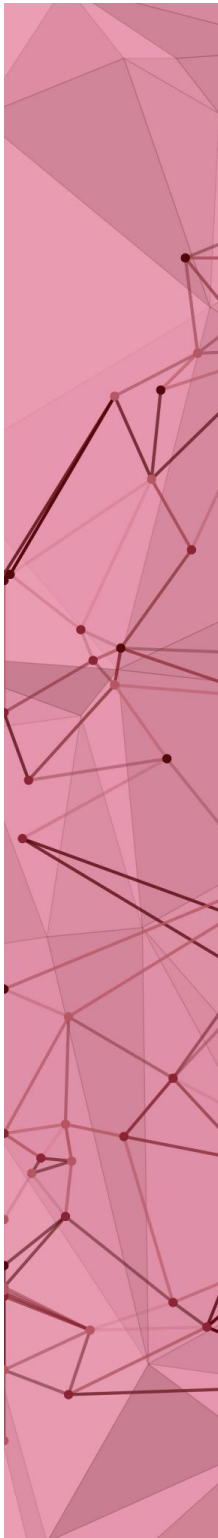
Why study PL?

- Understand how prog. languages work
- Express ideas better
- Learn new language fast
 - Tiobe index: <https://www.tiobe.com/tiobe-index/>
- Better use of known languages
- Choose an “appropriate” language
 - [Emergence of data science](http://bit.ly/1wb97wH)
<http://bit.ly/1wb97wH>
- Better understanding of implementation



Main units of the course

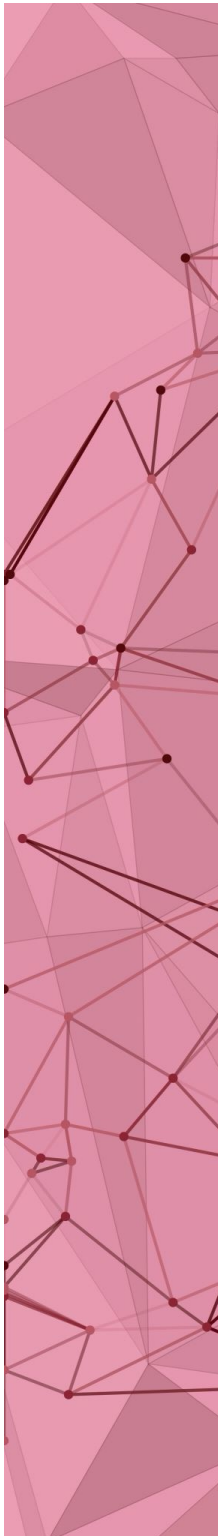
- Design principles of PL
- AI & LLM for program synthesis
- Paradigms of PL



Design Principles (~8 weeks)

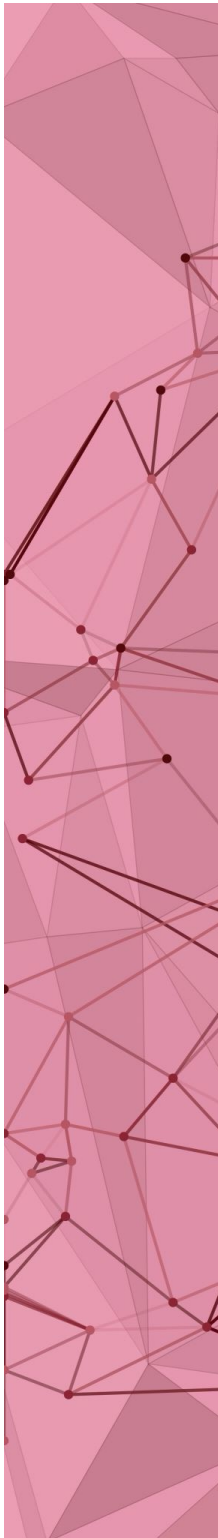
- Syntax
- Semantics
- Names and types
- Time permitting: Functions and memory management

Assignments 1, 2, 3: **Implementation** of some of these design principles



AI & LLM (~2 weeks)

- Intro to LLM
- LLM for program synthesis



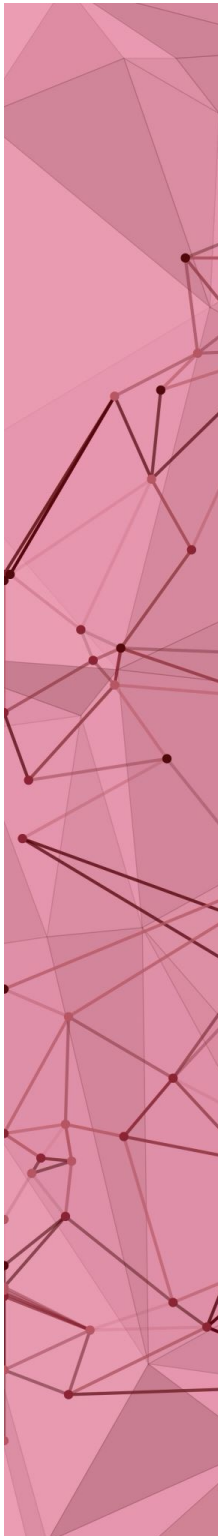
Paradigms (~4 weeks)

- Imperative
- Object-oriented programming (OOP)
- Web
- Functional

Bjarne Stroustrup:

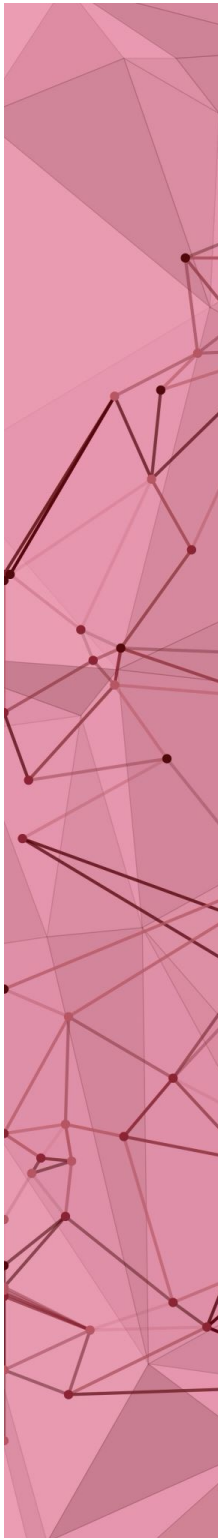
<https://www.youtube.com/watch?v=NvWTnIoQZj4>

Final Project



Art of language design (see book)

- Architecture
- Technical setting
- Standards
- Legacy systems



Goals of language design (see book)

- Simplicity and readability
- Clarity about binding
- Reliability
- Good support
- Good library base
- Orthogonality
- Efficient implementation

