Lecture 0: Administrivia/Introduction

BT 3051 – Data Structures and Algorithms for Biology

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Bhupat and Jyoti Mehta School of Biosciences
Indian Institute of Technology Madras

ADMINISTRIVIA

Logistics

Lectures:	**E Slot**, Tuesdays (11:00), Wednesdays (10:00)
Labs:	**T Slot**, Fridays (14:00)*
Tutorial:	**E Slot**, Fridays (16:50)
Venue:	BT 108
E-mail:	kraman @ iitm·ac·in
Office:	BT 221 (Block II)
Office hours:	By appointment
Teaching Assistants:	Lavanya Raajaraam (bt17d401@smail / BT 516)
	Shreya Swaminathan (be15b027@smail / BT 516)
	Shreyansh Umale (be15b028@smail)
	Ramya Vijayram (be15b032@smail)
Piazza:	http://piazza.com/iitm.ac.in/fall2019/bt3051

Piazza

▶ This term, we will be using Piazza for class discussion

▶ The system is highly catered to getting you help fast and efficiently from classmates, the TAs, and myself

   ▶ Piazza is of course the anti-thesis of RG!

▶ Rather than emailing questions to me/TAs, I encourage you to post your questions on Piazza

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Course Objectives

▶ Introduce you to basic algorithms (methods for problem solving)

▶ Introduce elementary data structures (methods for storing information)

▶ Improve your programming skills (learn good programming practices)

▶ Be able to **read** and write good programs

▶ Study algorithms and data structures of importance in biology

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Course Objectives

At the end of the course, it is expected that you will

▶ have a good understanding of basic algorithms/data structures

▶ understand and apply general computational techniques such as dynamic programming/randomisation/...

▶ be able to understand and use standard libraries to solve biological problems

▶ be able to develop algorithms and data structures to solve biological problems

▶ ... and write and test correct and readable programs!

▶ inculcate professionalism

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Coursework and Grading

▶ Attendance to the lectures is required; late-comers will be marked absent
▶ Weightage:
   ▶ Quizzes I/II/Pop: 30%
   ▶ Homework: 30%
   ▶ End-semester exam: 40%
▶ Some homework may be assigned in pairs
▶ Class participation (incl. on Piazza online) will also carry weightage ($\approx$bonus)

Coursework and Grading

Academic Integrity Policy

- ▶ Obviously, NO COPYING, in homework or tests
- ▶ Collaboration on homework (informal discussions) is permitted
- ▶ No sharing of code or looking at others' codes (even on the web)
- ▶ Copying from the Web is also NOT permitted (Use piazza instead of stackoverflow!)
- ▶ Offenders will be penalised severely (and will likely fail the course)

Assignments

▶ Practically all assignments will involve coding a program to solve a problem

▶ I intend to also hand out many *self-assessment homework* problems
  ▶ Won't grade them
  ▶ Encourage discussion on piazza
  ▶ Opportunity to learn, discuss (and increase course participation points!)
  ▶ Of course, solving them will help you perform better!
  ▶ **Some quiz questions will be based on self-assessment problems**

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Classroom decorum/etiquette

- ► A major part of professional education is to inculcate professionalism!

- ► Be punctual to classes; 100% attendance is encouraged (will include prizes :-))

  - ► Inform me a priori if you know you will miss a class

- ► I strongly encourage classroom discussion

  - ► Feel free to stop me at any time and raise doubts
  - ► But avoid consulting your friends during class
  - ► Chances are someone else has the same doubt and is keeping quiet

- ► No mobile phone/tablet use (disable notifications and keep off person, ideally)

- ► Laptops will be necessary in lab sessions (not otherwise)

- ► I encourage *hand-written notes*

  - ► Will come handy in an open-notes pop quiz!

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Important Dates

Date	Day	Time	Event
5-Sep-19	Thu	08:00	Quiz I
13-Sep-19	Fri	11:00	Mid-term feedback
10-Oct-19	Thu	08:00	Quiz II
30-Oct-19	Wed	11:00	Final feedback/TCF
21-Nov-19	Thu	09:00	End-semester Exam

How to succeed in this course?

▶ Be regular to classes

    ▶ If you miss a class, sync with your classmates before the next class!

▶ Submit assignments promptly

    ▶ Start working early! Start a draft version to reduce E_a!

▶ Study regularly

    ▶ Clichéd as it may sound, it will save you time through the semester!

▶ Have fun!

    ▶ Try to see the algorithms around you!

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Scott Hanselman on Programming
http://www.hanselman.com/blog/StopSayingLearningToCodeIsEasy.aspx

▶ Programming is hard

▶ It's complicated / exhausting / exasperating

▶ Some things will totally make sense to you and some won't!

▶ The documentation usually is lousy

▶ Sometimes computers are stupid and crash

▶ You'll meet amazing ~~people~~ TAs who will mentor you

▶ You'll feel powerful and create things you never thought possible

▶ You'll better understand the tech world around you

▶ You'll try new tools and build your own personal toolkit

▶ You'll start to *see* how systems fit together

▶ Over the years you'll learn about the history of computers and how we are all standing on the shoulders of giants!

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▶ It's rewarding. It's empowering. It's worthwhile.

▶ And you can do it. Stick with it. Join positive communities. Read code. Watch videos about code.

▶ Try ~~new languages~~ Python! Maybe the language you learned first isn't the *programming language of your soul*

▶ *Learning to programming is NOT easy but it's totally possible. You can do it.*

Reading/Resources

Many excellent textbooks on algorithms:

▶ **Gries P et al.** (2013) *Practical Programming: An Introduction to Computer Science Using Python 3 (Pragmatic Programmers)*. Pragmatic Bookshelf, third edition/e. ISBN 9789351104698

▶ **Goodrich MT et al.** (2013) *Data Structures and Algorithms in Python*. Wiley, 1/e. ISBN 1118290275

▶ **Compeau P & Pevzner P** (2014) *Bioinformatics Algorithms: An Active Learning Approach*. Active Learning Publishers, 1st/e. ISBN 0990374602

▶ **Guttag JV** (2013) *Introduction to Computation and Programming Using Python*. The MIT Press, revised and expanded edition/e. ISBN 0262525003

▶ **Skiena SS** (2010) *The Algorithm Design Manual*. Springer, softcover reprint of hardcover 2nd ed. 2008/e. ISBN 1849967202

▶ **Cormen TH** (2010) *Introduction to algorithms*. PHI Learning. ISBN 9788120340077

▶ **Sedgewick R et al.** (2015) *Introduction to Programming in Python: An Interdisciplinary Approach*. Addison-Wesley Professional, 1/e. ISBN 0134076435

Reading/Resources

▶ But none explicitly for biology!

▶ We will draw from various sources through the course

▶ Many useful online courses too

▶ Python will be the language of choice in the course

▶ http://codeskulptor.org: online Python 2

▶ http://rosalind.info: online challenges for computational biology!
  Sign up **today** without fail!

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"Any idea or problem or body of knowledge can be presented in a form simple enough so that any particular learner can understand it in a recognizable form."

— Jerome Bruner (1915–2016)
http://psych.nyu.edu/bruner

Questions?

Also remember