Course Description:

CS338/BI338 is an interdisciplinary course in Bioinformatics offered by the Departments of Computer Science/Math and Biology. The focus of this course is on the subdiscipline of genomics, including genome organization, gene structure and function. Students will learn how to access data from genome databases and to visualize genetic information using genome browsers. Bioinformatic tools will be employed for the manipulation of genomic information and for gene model prediction (annotation). Throughout the semester various cloud computing services will be employed to analyze biological and medically related datasets. Students will be given instruction on algorithm design based on pattern-matching and will gain hands-on experience in the use of algorithms to help predict gene models and to test those models for accuracy within the context of the programming language Python/BioPython. Collaboration between students trained in different disciplines (math, computer science, biology) will be encouraged in order to address complex problems in genomics, and to reflect the interdisciplinary nature of the field.

Learning Outcomes:

1. Students will be able to describe the Central Dogma that explains the flow of information from the genetic code to the transcription of DNA to RNA, and the translation of RNA to protein.
2. Students will utilize bioinformatic tools to distinguish elements of gene structure, including exons, introns, 5’- and 3’- untranslated regions, and upstream regulatory regions (transcription start sites, enhancers, promoter, and TATA box regions).
3. Students will use bioinformatic tools to identify functional DNA elements (i.e. palindromes)
4. Students will analyze gene structure and utilize bioinformatics tools to propose a gene model for previously unannotated sequences.
5. Students will be able to utilize genome browsers to identify epigenetic marks and to explain/proposal the role of these modifications on gene expression.
6. Students will be able to use bioinformatic tools to analyze gene conservation within a metabolic pathway.
7. Students will utilize the web-based interactive computational environment of Jupyter and make extensive use of the Jupyter Notebook to document workflows.
8. Students will be able to write basic commands in the programming language of Python and Biopython to analyze sequences for patterns.

Location and times:

Boyer Hall, Rm 8
Tuesday/Thursday
10:20-12:00 PM

Instructors

Carlos Ortiz, Ph.D.
Department of Math/Computer Science
Professor and Chair
Boyer Hall, Rm 112B
Ortiz@arcadia.edu
215-572-4057

Sheryl T. Smith, Ph.D.
Department of Biology
Associate Professor
Boyer Hall, Rm 334
smiths@arcadia.edu
Course Text:

No text has been assigned for this course. Materials for the course will be posted on CANVAS or distributed in hard copy.

Homework assignments

Homework assignments will be given throughout the Fall session. All of the homework assignments combined will be worth 35% of your grade.

Policy on late assignments:

All assignments must be turned in by 6:00 p.m. on the due date. Late assignments will be penalized with a 5% reduction for each 24-hour time block.

Grading scale

This scale is used to translate letter grades into point values, and vice versa, when calculating your final grade:

<table>
<thead>
<tr>
<th>Letter</th>
<th>Point value range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>94-100</td>
</tr>
<tr>
<td>A-</td>
<td>90-93</td>
</tr>
<tr>
<td>B+</td>
<td>87-89</td>
</tr>
<tr>
<td>B</td>
<td>84-86</td>
</tr>
<tr>
<td>B-</td>
<td>80-83</td>
</tr>
<tr>
<td>C+</td>
<td>77-79</td>
</tr>
<tr>
<td>C</td>
<td>74-76</td>
</tr>
<tr>
<td>C-</td>
<td>70-73</td>
</tr>
<tr>
<td>D+</td>
<td>67-69</td>
</tr>
<tr>
<td>D</td>
<td>65-66</td>
</tr>
<tr>
<td>D-</td>
<td>60-64</td>
</tr>
<tr>
<td>F</td>
<td>0-59</td>
</tr>
</tbody>
</table>

Support Services:

- Arcadia University provides reasonable accommodations for students with documented disabilities. If you require accommodations or other academic supports due to a physical, psychological, psychiatric or learning disability, you should contact Disability Support Services at 215-572-4033. Students with disabilities are encouraged to register with the Disability Services Office.
- Students requiring accommodations should speak with their instructors confidentially and early in the semester, so that their learning needs may best be met.
- Students can access the Disability Support Service’s website at https://www.arcadia.edu/academics/academic-support/disability-support-services. Please speak to me about any requests for academic accommodations or other concerns as early in the semester as possible.
Title IX Statement:

- Title IX of the Education Amendments of 1972 ("Title IX") is a federal civil rights law that prohibits discrimination on the basis of sex in any federally funded education program or activity. Arcadia University is committed to assuring a safe and productive educational environment for all students. In order to meet this commitment and to comply with Title IX of the Education Amendments of 1972 and guidance from the Office for Civil Rights, the University requires faculty members to report incidents of sexual misconduct to the University’s Title IX coordinator when students bring this information to their attention. Faculty members are not required to report incidents of sexual misconduct that are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project.

- Information regarding the reporting of sexual misconduct and the resources that are available to victims of sexual misconduct is set forth at https://www.arcadia.edu/university/policies-guidelines/title-ix

Code of Academic Responsibility:

- It is the responsibility of all students to understand the standards and methods of proper attribution and to clarify with each instructor the standards, expectation, and reference techniques appropriate to the subject area and class requirements, including group work and internet use. Students are encouraged to seek out information about these methods from instructors and other resources and to apply this information in all submissions of academic work. Each of the following constitutes a violation of the Code of Academic Responsibility:

  I. Plagiarism:
  - Appropriating the ideas, concepts, images (including but not limited to drawings, designs, or photographs) or language of another person and presenting them without attribution, constitutes plagiarism.

  II. Other Academic Misconduct:
  - A. Submitting the same work for credit in more than one course without permission of each instructor involved.
  - B. Attempting to give or to receive unauthorized assistance on academic work, and attempting to hinder others in their academic work.
  - C. Furnishing false information to University officials on matters relating to academic work.
  - Each student accepts the responsibility of maintaining high standards of integrity in his or her academic performance. It is the responsibility of all students to uphold the code through the procedures set forth by the University as outlined in the Student Handbook: http://handbook.arcadia.edu/node/129

Other classroom policies:

- Attendance: Students are expected to attend all classes. If you must miss a class session, please contact the instructor as soon as possible (preferably at
least 24 hours in advance of the missed class. It is your responsibility to make up any in-class assignments/homework. Excessive absence (more than two class periods) will directly impact your participation grade (worth a total of 10% of your final grade).

- Cell phone use in the classroom is prohibited unless directed by the instructor, under certain circumstances.

**Course-related information and documents:**

Login to CANVAS at: https://my.arcadia.edu, follow the CS338/BI338 link, select “Course Documents”

**Evaluation:**

<table>
<thead>
<tr>
<th>Course Requirements</th>
<th>Points (total 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercises/homework assignments</td>
<td>35</td>
</tr>
<tr>
<td>Quizzes</td>
<td>20</td>
</tr>
<tr>
<td>Submission of all project materials (GEP/Wasp projects)</td>
<td>15</td>
</tr>
<tr>
<td>Presentation (based on an extension of one of the modules)</td>
<td>20</td>
</tr>
<tr>
<td>In-class participation</td>
<td>10</td>
</tr>
</tbody>
</table>