Group Project Instructions
IBI 1, Semester 2, 2018-19

Important deadlines:
Formative assessment: Thursday, 4 April 2019.
Summative assessment poster and code submission: Monday, 29 April 2019
Summative assessment poster presentation: Thursday, 2 May 2019

Introduction

This assessment asks you to complete a task with several small sub-tasks relating to analysing nucleotide sequences. You will complete the tasks as a group and present your results in the form of a poster. Groups have been assigned randomly, and the group assignments are posted on Blackboard Learn.

This assessment allows you to practice concepts realted to programming and Python that you have encountered before and to use them in a small real-world biological applciation. It is also an opportunity to practice the planning and execution of a bigger project as a team, and develop your skills around time management, team work, and presentation.

Task

1. GC content calculator

GC content, i.e. the fraction of total DNA that is comprised of Guanine and Cytosine nucelotides, varies from species to species. Guanine-Cytosine base pairs use three hydrogen bonds, whereas Adenine-Thymine base pairs use only two. This means that the stability of the DNA double helix and consequently its "melting temperature", i.e. the temperature that is required to separate both strands in the lab, varies depending on GC content. It is therefore useful to be able to compute the GC content.

Write a function that computes the GC content (in % of total bases) for any user-specified DNA sequence.

2. Complementary DNA strand calculator

Write a function that computes the complementary DNA strand (from 5' to 3') for any user-specified DNA sequence (assuming the user has also specified it 5' to 3')

3. DNA to mRNA convertor

Write a function that computes the mRNA sequence form any user-specified DNA sequence.

4. mRNA to protein

Write a function that computes a polypeptide sequence from any user-specified mRNA sequence. For simplicity, you are allowed to assume that the mRNA contains exactly one start codon and one stop codon.

5. Additional function

Write an additional function that takes a nucleotide or polypeptide sequence as input and computes something interesting and/or biologically meaningful. You can be as creative as you like, but we prefer a simple idea that works to a complex idea that is poorly implemented.

For the Formative Assessment

For the Formative Assessment, you do not need to submit any code or document. But what we would like to see is a plan. What functions will you need? What will those functions need to do? Who of you will do what when? What skills/tools will you need? What questions do you have? This formative assessment is not so much a traditional assessment, but more an opportunity for you to self-assess your skill level, to plan the assignment, and to get help.

You will be given a time slot of 20 minutes on Thursday, 4 April between 11am and 1pm to talk to an instructor. You should come to the meeting as a group and present your ideas. This can be quite informal. It is also a good opportunity to ask questions.

For the Summative Assessment

This task is assessed in the form of a poster presentation. This has three components:

1. A poster explaining the problem(s), the approach you took, and the results. This can contain screenshots and snippets of code, but it is more important to explain the ideas behind the code than show the actual code itself on the poster.

2. A "demo" of your code on one of your computers: You will have a little table next to your poster, where you can run an instance of python and show visitors how your code works in practice. It is a good idea to prepare not only the code that implements your functions, but also some examples, so you can run the demonstration smoothly.

3. An oral presentation where you explain the content of your poster and show your demo code. This should be about 5-8 minutes. Every member of the group has to participate in the oral presentation.

Your poster should be A1 size (594mm x 841 mm) and can be presented in either protrait or landscape format. You need to submit the poster as a pdf file by Monday, 29 April 2019. It will be printed out for you and brought to the presentation on Thursday, 2 May. In addition, you should bring a computer running the demo code to the presentation on Thursday, 2 May. There is no need to submit the demo code.

Marking criteria will be made available to you before the submission deadline.

The deadline to submit the summative assessment is Monday, 29 April 2019.