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CMSI 402
3/2/2020

Software Development Plan for GRNsight Expression Database

Document Outline:

4.1 Plan Introduction

This Software Development Plan contains the details of the development of the GRNsight Expression Database, which will allow users to access and use existing expression data to do node coloring on their gene regulatory network.

More specifically, the GRNsight Expression Database project will be a feature added to GRNsight, a gene regulatory network visualization site. The database itself will contain gene expression data so that users of the site can access and interact with pre-existing expression data without necessarily having to upload their own expression data file. This will help ensure that expression data has consistent formatting, and it will provide examples of this proper formatting for the user. Also, it will allow the user to do node coloring on their GRN data. Development of this project will require the creation of the database, the standardization of the data, uploading the data to the database, writing APIs to connect GRNsight to the database in a way that will allow specific data to be queried from GRNsight, and creating a UI element that will allow the user to interact easily with the data in this database. The completion dates of these various tasks, along with the due dates of the required deliverables, will be detailed in the following sections.

4.1.1 Project Deliverables

4.1.1.1 Project Proposal Presentation

- Due Week 3
- Provide the instructor and class with an informative presentation covering the conceptual overview, tools,

elements, and projected timeline of the GRNsight Expression Database project with the goal of both informing the audience about the project.

4.1.1.2 Project Proposal Document

- Due Week 3
- Provide the instructor with a document containing necessary information about the proposed GRNsight Expression Database project (tools to be used, general outline and goal of the project, etc.). This document will contain both the description and the justification of the project.

4.1.1.3 Requirements Specification

- Due Week 5, 13
- The Software Requirements Specification is to be turned in to the instructor and contain details about the low-level requirements of the GRNsight Expression Database project. Specifically, this document will contain an introduction, the breakdown of the CSCI components, functional requirements, performance requirements, and requirements for the project, development, and execution environments. It outlines the gritty details of the contract of the functionality of the application agreed upon between developer (student) and client (instructor). This document will be submitted for the first time in Week 5, and an updated version will be submitted in Week 13.

4.1.1.4 Oral Status Report

- Week 6, 8
- Oral status reports will give the team an opportunity to go over what has been done thus far and what still needs to be done, either in the current sprint or farther along in the schedule. It will also allow the team to update the client (instructor) on the current progress of the project.

4.1.1.5 Written Status Report

- Week 7, 11, 13, 15
- Written status reports will give the team an opportunity to go over what has been done thus far and what still needs to be done, either in the current sprint or farther along in the schedule. It will also allow the team to update the client (instructor) on the current progress of the project and adjust the goals and deadlines accordingly.

4.1.1.6 Software Development Plan Document

- Due Week 8, 11
- This document will detail the software development process that will be used throughout the production of the GRNsight Expression Database project, including details about the project deliverables, software and hardware resources, organization, and schedule.

4.1.1.7 ALPHA/BETA Presentation/Demonstration

- Due Week 13
- This presentation will act as an update to the class and instructor about the progress of the design of the GRNsight Expression Database project. It will provide a demonstration of the application's uses in its Alpha or Beta level (nearing the final delivery of the completed application).

4.1.1.8 Poster

- Due Week 14
- The rough draft of the project poster will contain the information necessary to hold an informative poster session, with data about the development process, the project itself, and the tools used.

4.1.1.9 Final Project Presentation

- Due Week 16
- This presentation will act as an update to the class and instructor about the finalized version of the GRNsight Expression Database at its formal delivery. It will contain details about the full functionality of the application, challenges the team faced in producing the application, and a demonstration of the use of the application.

4.1.1.16 Final Product Delivery (Final Report and Code)

- Due Week 16
- This will contain the delivery of the entire finalized project, including its code, documentation, and a final report on the status of the final applications functionality.

4.2 Project Resources

This section will outline the various resources that will be necessary in the development of the GRNsight Expression Database project.

4.2.1 Hardware Resources

4.2.1.1 GRNsight Expression Database development will require a computer that is able to run a Node.js server.

4.2.1.2 GRNsight Expression Database development will require a computer that possesses some sort of IDE, preferably VSCode.

4.2.1.3 GRNsight Expression Database development will require a computer that is able to connect via SSH to an EC2 instance, and from there to an AWS RDS PostgreSQL instance.

4.2.2 Software Resources

4.2.2.1 GRNsight Expression Database development will require a Node.js server.

4.2.2.2 GRNsight Expression Database development will require an AWS Educate account.

4.2.2.3 GRNsight Expression Database development will require an AWS EC2 instance.

4.2.2.4 GRNsight Expression Database development will require an AWS RDS instance running a PostgreSQL engine.

4.2.2.5 GRNsight Expression Database development will require an AWS Lambda instance to allow GRNsight to make queries to the database.

4.2.2.6 GRNsight Expression Database development will require a text editor or IDE for coding and editing purposes.

4.2.2.7 GRNsight Expression Database development will require git and GitHub access.

4.2.2.8 GRNsight Expression Database development will require Microsoft Excel for the purpose of editing and manipulating data between xlsx and csv formats.

4.2.3 Human Resources

4.2.3.1 Dr. Dahlquist is the LMU Biology professor associated with this project and will be closely involved in the planning and instruction for this project.

4.2.3.1 Dr. Dionisio is the LMU Computer Science professor associated with this project and will be closely involved in the planning and instruction for this project.

4.3 Project Organization

This section outlines how the GRNsight Expression Database project will be divided, including the subsections of tasks that must be accomplished.

4.3.1 Database Setup

- Verify what data means, what data needs to go where, how everything will be organized
- Complete detailed database design

- Figure out configurations of RDS instance (meet/discuss with Dondi)
- Start instance of RDS with decided configurations
- Upload data to RDS
- Clean/fix database data
- Update database design as necessary

4.3.2 General Back-end

- Connect database to GRNsight
- Write APIs to run specific queries to the database
- Add export to Excel functionality

4.3.3 General Front-End

- Design UI where client can interact with database
- Implement this UI

4.3.4 Class Deliverables

- See section 4.1.1

4.4 Project Schedule

This section provides schedule information for the GRNsight Expression Database project.

4.4.1 GANTT Chart

A GANTT Chart outlining the series of tasks and goals for this project, including duration of tasks and end date goals, are in the Excel file in this folder labeled "GANTT Chart."

4.4.2 Task / Resource Table

This task/resource table shows the relationship between which tasks will use/require which resources.

Tasks	Resources
Discuss and solidify project with GRNsight team	Dr. Dahlquist and Dr. Dionisio
Figure out configurations of RDS instance	Dr. Dionisio, AWS Educate Account
Start instance of RDS with decided	Dr. Dionisio, AWS Educate account, AWS RDS,

configurations	AWS EC2
Verify what data means, what data needs to go where, how everything will be organized	Dr. Dahlquist
Complete detailed database design	Dr. Dahlquist and Dr. Dionisio
Clean/fix database data	Excel
Upload data to RDS	AWS RDS, AWS EC2, Excel
Update database design as necessary	Dr. Dahlquist and Dr. Dionisio, Excel, AWS RDS, AWS EC2
Solidify what functionality needs to exist in APIs that will connect the database to GRNsight	Dr. Dahlquist and Dr. Dionisio
List desired queries	Dr. Dahlquist and Dr. Dionisio, AWS RDS, AWS EC2
Create AWS Lambda instance to allow the queries to happen	AWS Educate, AWS Lambda, Dr. Dionisio
Connect database to GRNsight	AWS Educate, AWS Lambda
Write APIs to run specific queries to the database	AWS Educate, AWS Lambda, NodeJS
Design UI for users to interact with data	Dr. Dahlquist and Dr. Dionisio
Implement this UI	NodeJS, HTML
Connect UI to backend calls	AWS Educate, AWS Lambda
Add export to Excel functionality	NodeJS, AWS Educate, AWS Lambda, AWS RDS, Excel
Finish up testing	NodeJS