Development of a Cancer-Actionability Web Platform for Interpreting Clinically Relevant Genetic Variants

Project Description

Advances in genomic sequencing have enabled the identification of millions of human genetic variants. However, only a small fraction of these variants are clinically actionable in cancer, meaning they influence disease mechanisms, therapy response, drug resistance, or prognosis.

Public databases such as ClinVar and CIViC provide valuable variant information, but they differ in structure, formatting, and interpretation standards. There is currently no unified platform that integrates, standardizes, ranks, and biologically contextualizes cancer-relevant genetic findings in a scalable and user-friendly way.

This project aims to develop a Cancer-Actionability Platform — a web-based system that integrates public cancer genomics resources, harmonizes variant annotations, ranks clinical evidence, and links variants to cancer mechanisms and drug targets.

The platform will serve as a structured reference layer for interpreting incidental findings in genomic datasets and will be designed to support future integration with population-scale studies such as QGP/QPHI for Qatari population.

Students will contribute to data integration, bioinformatics processing, clinical evidence ranking, database construction, and web platform development.

Duties / Activities
Students will:
- Work with large-scale genomic datasets
- Perform data cleaning and transformation using Python
- Standardize genetic variant annotations
- Implement evidence-based ranking systems
- Build and optimize database schemas
- Develop backend APIs
- Contribute to frontend web interface design
- Generate analytical reports and visual summaries
- Participate in system testing and validation

Required Skills
- Strong programming skills in Python
- Understanding of backend development concepts (APIs, routing, REST principles)
- Basic knowledge of databases (SQL / PostgreSQL / SQLite)
- Experience with data processing libraries (e.g., pandas)
- Familiarity with Git and version control
- Ability to write clean, modular, well-documented code

Nice to Have:

- Experience with Flask, FastAPI, or Django
- Basic knowledge of frontend development (React, HTML/CSS, JavaScript)
- Experience working with large datasets
- Interest in genomics, precision medicine, or AI in healthcare

Learning Opportunities

Students will gain experience in:

- Real-world bioinformatics data integration
- Clinical variant interpretation
- Cancer genomics
- Database engineering
- Web platform development
- Translational precision medicine applications
- Working on scalable biomedical systems
- Research-oriented project development

Expected Team Size: *2-4*

Mentor

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