

PROJECTS

Analysis of the SNP, rs7176005 of CYP19A1 in Breast Cancer Pathogenesis using Computational and Molecular Approaches

- Analyzed SNP rs7176005 in CYP19A1 for its role in breast cancer using computational methods.
- Led and Collaborated with labmates to design and validate the PCR primers for SNP detection and confirmed via agarose gel electrophoresis.
- Investigated estrogen roles, identifying SNP rs7176005 as a potential therapeutic target.

cyIM Gene Incidence and Molecular Docking of Swietenia macrophylla Compounds against Cytolysin in *E. faecalis* Dental Isolates

- Investigated the incidence of the cyIM gene in *Enterococcus faecalis* isolates from dental infections.
- Screened 35 clinical isolates using PCR to determine the presence and distribution of the cyIM gene.
- Performed homology modeling of the CyIM protein using SWISS-MODEL and conducted molecular docking with 15 *Swietenia macrophylla* compounds using AMDock.
- Evaluated binding affinities and interactions to identify potential bioactive compounds targeting the CyIM protein.

Predicting Chronic Hepatitis B Progression Using Interpretable Machine Learning on Sparse Clinical Data

- Developed an interpretable machine learning model using XGBoost in Julia to predict disease progression.
- Achieved 90.9% accuracy in classifying acute vs chronic Hepatitis B cases.
- Engineered and analyzed 34 clinical and serological features from real-world datasets.
- Identified and ranked key biomarkers contributing to chronic disease progression.
- Provided insights for early risk stratification and improved clinical management of high-risk patients.

MANUSCRIPT

Virulence Gene Prevalence in *Enterococcus faecalis* from Dental Infections in South India

- Co-authored a study on virulence genes in *Enterococcus faecalis*, submitted to Indian Journal of Microbiology Research, a Scopus-indexed journal.
- Focused on understanding pathogenic mechanisms in dental infections from South Indian clinical isolates.
- Analyzed eight key virulence genes across 36 isolates using PCR techniques.
- Interpreted gene prevalence patterns to assess their role in infection severity and pathogenicity.
- Contributed to manuscript drafting, editing, and scientific validation of results.

Machine Learning-Based Prediction of Diabetic Retinopathy and Nephropathy Progression: Evaluating Hornerin and SFN as Novel Biomarkers

- Co-authored a research manuscript on ML-based classification of diabetic retinopathy and nephropathy, submitted to Journal of Basic and Clinical Physiology and Pharmacology (scopus-indexed).
 - Analyzed 33 clinical and biomarker features (Hornerin, SFN) from 84 patients.
 - Developed a Random Forest model in Julia with a leakage-free 5-fold cross-validation pipeline.
 - Performed data preprocessing, analysis, and contributed to manuscript drafting.
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TECHNICAL EXPERIENCE

- **Biological Data Curation & Patent Analytics:** Expertise in curation, interpretation, and indexing of biological sequence data from patent literature; ensuring data accuracy, consistency, and integrity.
 - **Bioinformatics & Computational Biology:** Sequence analysis, SNP analysis, homology modeling (SWISS-MODEL), molecular docking (AMDock), and protein–ligand interaction analysis.
 - **Programming & Machine Learning:** Proficient in Julia; experience with XGBoost and Random Forest for predictive modeling, including feature importance analysis.
 - **Data Analysis & Validation:** Data wrangling, encoding, exploratory data analysis (EDA), and model evaluation using cross-validation techniques (LOOCV and k-fold).
 - **Libraries & Tools:** Genie.jl, DataFrames.jl, CSV.jl, MLJ.jl, Plots.jl, StatsPlots.jl; version control using Git and GitHub; development using VS Code and Linux (command-line operations, file management).
 - **Molecular Biology Techniques:** PCR (standard, gradient, touchdown), DNA isolation, cloning, ligation, transformation, ELISA, and gel electrophoresis.
 - **Microbiology Techniques:** Pure culture methods (streak, spread, pour plate), serial dilution, antimicrobial susceptibility testing, and microbial screening from clinical samples.
 - **Visualization & Scientific Communication:** PyMOL, Discovery Studio Visualizer; strong skills in manuscript writing, data interpretation, and technical documentation.
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CERTIFICATIONS

Poster Presentation: "Green Tea Bioactives as Natural DHT Blocker: A Computational Perspective on Sustainable Therapeutics"

- Presented an e-poster on green tea bioactives as DHT blockers, showcasing expertise in computational biology.
- Effectively communicated complex scientific concepts in a clear and engaging manner.

Seminar & Workshop on Biodiversity to Biotechnology

- Participated in a two-day seminar on "Biodiversity to Biotechnology," gaining insights into biodiversity's role in biofuels, pharmaceuticals, and climate solutions.
- Engaged with traditional and modern biotechnological approaches, aligning with global and Indian biodiversity initiatives.

OUTSKILL- Generative AI MasterMind

- Completed the Generative AI MasterMind – Outskill certification with a strong focus on prompt engineering.
- Gained hands-on experience in content generation and practical AI applications.
- Applied AI techniques to improve efficiency and support data-driven problem-solving.

SWAYAM NPTEL- Basics of Crop Breeding and Plant Biotechnology

- Completed a 12-week IIT Kharagpur course on crop breeding, learning the principles of molecular markers, genetic engineering, and transgenic plant screening.
 - Gained knowledge in applying biotechnological techniques for sustainable agriculture and crop improvement.
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LANGUAGES KNOWN

- English: Full Professional Proficiency
 - Tamil: Native Proficiency
 - Hindi: Limited Working Proficiency
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