Protein Design & Directed Evolution (In Silico) — Hands-on

Learn how to design, optimize and evolve proteins using purely computational workflows. This module connects fitness landscapes, in-silico mutagenesis, library design and multi-parameter scoring to support directed evolution style campaigns for enzymes, antibodies and other protein products.

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Session Index

Session 1

Fee: Rs 21800 Apply Now

Protein Design Concepts & Fitness Landscapes

Foundations of protein design and directed evolution

design vs selection paradigms **sequence space and search** **local vs global optimization**

Fitness landscapes and design objectives

activity, stability, specificity **solubility and expression** **developability style constraints**

Structural and sequence contexts for design

active site vs scaffold regions | loops, surface and core positions | conservation and covariation signals

Session 2

Fee: Rs 25800 Apply Now

In-Silico Mutagenesis & Virtual Libraries

In-silico mutagenesis strategies

single site scans and saturation maps | combinatorial positions and libraries | restricting to allowed amino acid sets

Building structure and sequence based libraries

focused libraries around hotspots | codon based design considerations | reducing library size with heuristics

Scoring variants with simple predictors

stability and aggregation scores | sequence based functional predictors | filtering libraries before heavy calculations

Session 3

Fee: Rs 29800 Apply Now

Computational Directed Evolution Campaigns

Emulating directed evolution cycles in silico

design → screen → select → iterate | exploration vs exploitation balance | capturing epistatic interactions

Using structural and docking scores in campaigns

docking and interaction metrics | stability and biophysical constraints | integrating multiple score

components

Basic ML assisted directed evolution ideas

surrogate models for fitness prediction | iterative model update with new data | uncertainty and exploration candidates

Session 4

Fee: Rs 32800 Apply Now

Multi-Objective Design, Reporting & Case Studies

Multi-objective ranking and Pareto style views

activity vs stability trade offs | solubility and developability filters | shortlisting balanced variants

Case studies: enzymes, binders and industrial proteins

improving catalytic efficiency or selectivity | tuning binding affinity and specificity | engineering robustness for process conditions

Deliverables: design report, variant panel and documentation

ranked variant tables and scores | structure figures and interaction views | experiment ready design summary