Personalized Systems Medicine & Digital Twins (Intro) — Hands-on

Explore how systems biology and computational modeling can be used to build patient specific models and digital twins for precision medicine. This introductory module covers concepts of personalized systems medicine, data flows from clinical and multi omics sources, construction of virtual patients and cohorts, and in silico scenario testing for therapy optimization and risk prediction. You will implement simple digital twin style workflows in Python or R and learn how to communicate results to clinical and translational teams.

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Session Index

Session 1

Fee: Rs 8800 Apply Now

Concepts of Systems Medicine & Digital Twins

From population averages to personalized systems medicine

systems level view of patients **heterogeneity and subgroups** **role of models in decision support**

What is a digital twin in medicine

conceptual definitions | levels of fidelity | examples from oncology, cardio and ICU (high level)

Model types for digital twins

mechanistic models (ODE, PK PD overview) | statistical and ML models | hybrid and surrogate models

Session 2

Fee: Rs 11800 Apply Now

Data Flows, Feature Spaces & Simple Twin Models

Data streams for digital twins

EHR and clinical variables | omics and imaging summaries | wearables and time series (overview)

Feature engineering and patient state representation

static vs dynamic features | risk scores and composite indices | embedding and dimensionality reduction (overview)

Simple digital twin style models

basic progression and survival models | response prediction models | Python or R workflow notebooks

Session 3

Fee: Rs 14800 Apply Now

Virtual Cohorts, Risk & Therapy Scenario Testing

Virtual patients and cohorts

sampling from fitted models | parameter distributions and strata | use in study and trial design (intro)

Risk, progression and outcome simulation

risk curves and survival estimates | progression

trajectories | stratified outcome summaries

Therapy scenario and regimen comparisons

what if therapy changes | sensitivity to dosing or schedule (concept level) | reporting scenario outcomes to clinicians

Session 4

Fee: Rs 18800 Apply Now

Mini Capstone: Intro Digital Twin Pilot

Small pilot digital twin style workflow for one condition

Theory + Practical

From data to patient level model and scenarios

basic data preparation | model fitting or calibration at simple level | one or two therapy scenarios per virtual patient

Deliverables

PDF/HTML digital twin pilot report | Python or R notebook and scripts | environment.yml / requirements.txt