TCR & BCR Repertoire Analysis — Hands-on

Develop an intuitive, analysis ready view of T cell and B cell receptor repertoires. This module covers biological foundations, core repertoire data structures, clonotype definitions, diversity metrics and conceptual workflows for tracking clonal dynamics across time, tissue and clinical groups.

TCR & BCR Repertoire Analysis

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Session Index

Session 1 — Repertoire Biology & Sequencing Overview | Session 2 — Clonotypes, CDR3 & Diversity Metrics | Session 3 — Comparing Repertoires & Clonal Dynamics | Session 4 — Mini Project: Repertoire Storyboard

Session 1

Fee: Rs 8800 Apply Now

Repertoire Biology & Sequencing Overview

TCR and BCR biology and why repertoires matter

V(D)J recombination concepts **clonal selection and expansion** **links to infection, vaccination and cancer**

Sample types and repertoire sequencing strategies (conceptual)

peripheral blood, tissue and tumour samples **bulk versus single cell oriented view** **alpha beta TCR, gamma delta TCR and BCR heavy light chains**

High level repertoire data outputs and file structures (orientation)

annotated rearrangements table concept | V, D, J calls and CDR3 sequences | counts, frequencies and metadata columns

Session 2

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Clonotypes, CDR3 & Diversity Metrics

Defining clonotypes from rearrangements (conceptual options)

CDR3 sequence based grouping | V and J gene usage considerations | nucleotide versus amino acid level definitions

Basic repertoire summaries and diversity metrics (orientation)

richness and clonality ideas | Shannon and Simpson style indices (conceptual) | Gini and related inequality views

CDR3 length, composition and motif oriented summaries

length distributions and usage plots | amino acid property based views | motif level orientation for public specificities

Session 3

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Comparing Repertoires & Clonal Dynamics

Concepts for comparing repertoires across samples or groups

overlap and shared clonotypes | distance based comparisons (orientation) | public versus private repertoire concepts

Tracking clonal expansion and contraction over time (conceptual)

following selected clonotypes across visits | link to vaccination or treatment time points | visual motifs for

expansion trajectories

Contextualising patterns in infection, vaccination and oncology examples

acute versus chronic infection patterns **vaccine responders versus non responders (conceptual)** **tumour infiltrating lymphocyte repertoires (orientation)**

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Mini Project: Repertoire Storyboard

From annotated repertoire table to core plots and summaries (conceptual workflow)

diversity and clonality overview **CDR3 length and VJ usage style plots** **top clonotypes table with simple annotations**

Building a simple clonal dynamics storyboard (conceptual)

selecting clonotypes of interest **depicting change across time or conditions** **relating patterns to clinical or experimental events**

Summarising findings for immunology and translational teams

short text narrative with key figures **tables and plots suitable for slide decks** **handoff to neoantigen, biomarker and trial modules**