Multi Omics Integration with Transcriptomics and Metabolomics — Hands-on

Learn how to conceptually integrate proteomics with transcriptomics and metabolomics to obtain multi layer views of biology. This module focuses on matching samples and identifiers, normalization and scaling ideas, correlation and pathway level interpretation, and how to summarize multi omics signatures for discovery and translational studies.

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Session Index

Session 1

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Multi Omics Integration Foundations & Study Context

What multi omics integration aims to capture

DNA / RNA / protein / metabolite layers | **regulation vs functional readouts** | **pathway and network context thinking**

Typical proteo transcriptomic and proteo metabolomic scenarios

differential expression in RNA and proteins

metabolic pathway activity indications | biomarker and mechanism exploration

Study designs that support multi omics interpretation

matched samples across platforms | time course and perturbation ideas | batching and blocking across omics

Session 2

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Matching Samples, IDs & Normalization Concepts

Sample matching and identifier mapping concepts

consistent IDs across omics layers | handling partial and missing layers | gene / protein / metabolite linkage ideas

Within omics normalization and scaling at high level

library size and global scaling concepts | log transforms and variance stabilisation | batch and unwanted variation thinking

Between omics alignment ideas for joint views

z scores and rank based approaches | rescaling to comparable ranges | feature selection for integration

Session 3

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Correlation, Signatures & Pathway Views

Correlation and concordance concepts across layers

RNA vs protein relationships | protein vs metabolite patterns | discordant and buffered signals

Building multi omics signatures conceptually

combined marker panels ideas | scores from multiple features | simple integration rules thinking

Pathway and network level integration views

mapping each omics to pathways | multi layer pathway activity concepts | overlaying changes on networks

Session 4

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Case Study Planning, Dashboards & Reporting

Sketching a multi omics integration case study

theory plus planning worksheet

Dashboard and visualization ideas for multi layer data

linked heatmaps and profiles | pathway maps with layered signals | summary plots for stakeholders

Reporting multi omics findings and limitations clearly

figures tying omics to biology | tables of key genes, proteins, metabolites | transparent notes on assumptions