

I/O LAYER

H5AD Reader / Writer

RDS Reader / Writer

HDF5 native

custom Rust parser

CORE

Apache Arrow Intermediate Representation
Stage 1: SEXP Discard — skip closures, environments, bytecode

Discards ~40% of RDS objects (closures, bytecode, environments)

Stage 2: Selective Extraction — only biologically relevant data

Extracts X, obs, var, obsm, layers; skips graphs, commands, tools

Stage 3: Compact IR — Arrow columnar format

Peak memory ~68 MB/M nnz (vs 158 MB for Zellkonverter)

format-specific
serialization

INTERFACE LAYER

 CLI

 Python (PyO3)

 R (extendr)



All layers implemented in Rust — zero runtime dependencies