

# Package: seurust (via r-universe)

September 27, 2026

**Title** 'Rust' Native Kernels for 'Seurat'

**Version** 0.1.5

**Description** Provides 'Rust' implementations of performance-critical 'Seurat' native routines such as log-normalization, sparse row scaling, shared nearest-neighbor graph construction, and integration helpers. Install alongside 'Seurat' to use the same function signatures with a 'Rust' backend. Builds require 'Cargo' and 'rustc' ( $\geq 1.81$ ); CRAN source builds include offline crate sources under 'src/rust'.

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**URL** <https://github.com/Nebili/seurust>,  
<https://github.com/Nebili/seurust/tree/main/seurust>

**BugReports** <https://github.com/Nebili/seurust/issues>

**Depends** R ( $\geq 4.0.0$ )

**Imports** Matrix ( $\geq 1.5-0$ ), methods

**Suggests** Seurat, testthat ( $\geq 3.0.0$ )

**SystemRequirements** Cargo (Rust's package manager), rustc ( $\geq 1.81$ )

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ComputeSNN

*Build a shared nearest-neighbor graph*

---

### Description

Rust/extendr reimplementation matching Seurat's native API for ComputeSNN.

### Usage

ComputeSNN(nn\_ranked, prune)

**Arguments**

|           |                                                                    |
|-----------|--------------------------------------------------------------------|
| nn_ranked | Matrix of 1-based neighbor indices (cells x k); integer or double. |
| prune     | Numeric threshold.                                                 |

**Value**

A dgCMatrix SNN graph.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

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|                  |                                                  |
|------------------|--------------------------------------------------|
| DirectSNNTToFile | <i>Build an SNN graph and write it to a file</i> |
|------------------|--------------------------------------------------|

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for DirectSNNTToFile. Computes the SNN graph as [ComputeSNN](#) does and writes its lower triangle to filename in the same tab-separated format as [WriteEdgeFile](#).

**Usage**

```
DirectSNNTToFile(nn_ranked, prune, display_progress, filename)
```

**Arguments**

|                  |                                                                    |
|------------------|--------------------------------------------------------------------|
| nn_ranked        | Matrix of 1-based neighbor indices (cells x k); integer or double. |
| prune            | Numeric pruning threshold.                                         |
| display_progress | Logical.                                                           |
| filename         | Output path.                                                       |

**Value**

The SNN graph as a dgCMatrix, as returned by Seurat.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

|           |                                                           |
|-----------|-----------------------------------------------------------|
| fast_dist | <i>Distances between cells and their listed neighbors</i> |
|-----------|-----------------------------------------------------------|

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for fast\_dist.

**Usage**

```
fast_dist(x, y, n)
```

**Arguments**

|      |                                                                                                                                  |
|------|----------------------------------------------------------------------------------------------------------------------------------|
| x, y | Numeric matrices of embeddings with the same number of columns (cells in rows).                                                  |
| n    | A list with one element per row of x, each a vector of 1-based row indices into y. Integer and double vectors are both accepted. |

**Value**

A list the same length (and with the same names) as n, holding the distances in the same order as the neighbor indices. An empty list if length(n) != nrow(x), matching Seurat.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

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|         |                                          |
|---------|------------------------------------------|
| FastCov | <i>Fast covariance of a dense matrix</i> |
|---------|------------------------------------------|

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for FastCov.

**Usage**

```
FastCov(mat, center = TRUE)
```

**Arguments**

|        |                 |
|--------|-----------------|
| mat    | Numeric matrix. |
| center | Logical.        |

**Value**

A covariance matrix.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

FastCovMats

*Fast cross-covariance of two dense matrices*

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for FastCovMats.

**Usage**

```
FastCovMats(mat1, mat2, center = TRUE)
```

**Arguments**

|            |                   |
|------------|-------------------|
| mat1, mat2 | Numeric matrices. |
| center     | Logical.          |

**Value**

A cross-covariance matrix.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

FastExpMean

*Fast exp-mean of sparse matrix rows*

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for FastExpMean.

**Usage**

```
FastExpMean(mat, display_progress)
```

**Arguments**

|                  |              |
|------------------|--------------|
| mat              | A dgCMatrix. |
| display_progress | Logical.     |

**Value**

Numeric vector.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

FastLogVMR

*Fast log variance-to-mean ratio*

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for FastLogVMR.

**Usage**

```
FastLogVMR(mat, display_progress)
```

**Arguments**

mat                    A dgCMatrix.  
display\_progress      Logical.

**Value**

Numeric vector.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

FastRBind

*Fast row-bind of two dense matrices*

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for FastRBind.

**Usage**

```
FastRBind(mat1, mat2)
```

**Arguments**

mat1, mat2            Numeric matrices.

**Value**

A row-bound numeric matrix.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

|                    |                                               |
|--------------------|-----------------------------------------------|
| FastSparseRowScale | <i>Scale and/or center sparse matrix rows</i> |
|--------------------|-----------------------------------------------|

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for FastSparseRowScale.

**Usage**

```
FastSparseRowScale(  
  mat,  
  scale = TRUE,  
  center = TRUE,  
  scale_max = 10,  
  display_progress = TRUE  
)
```

**Arguments**

|                  |              |
|------------------|--------------|
| mat              | A dgCMatrix. |
| scale, center    | Logical.     |
| scale_max        | Numeric.     |
| display_progress | Logical.     |

**Value**

Dense numeric matrix.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

`FastSparseRowScaleWithKnownStats`*Scale sparse rows with known statistics*

---

## Description

Rust/extendr reimplementation matching Seurat's native API for `FastSparseRowScaleWithKnownStats`.

## Usage

```
FastSparseRowScaleWithKnownStats(  
  mat,  
  mu,  
  sigma,  
  scale = TRUE,  
  center = TRUE,  
  scale_max = 10,  
  display_progress = TRUE  
)
```

## Arguments

|                               |                    |
|-------------------------------|--------------------|
| <code>mat</code>              | A dgCMatrix.       |
| <code>mu, sigma</code>        | Row means and sds. |
| <code>scale, center</code>    | Logical.           |
| <code>scale_max</code>        | Numeric.           |
| <code>display_progress</code> | Logical.           |

## Value

Dense numeric matrix.

## Author(s)

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

FindWeightsC*Find integration anchor weights*

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for FindWeightsC.

**Usage**

```
FindWeightsC(  
  cells2,  
  distances,  
  anchor_cells2,  
  integration_matrix_rownames,  
  cell_index,  
  anchor_score,  
  min_dist,  
  sd,  
  display_progress  
)
```

**Arguments**

cells2, anchor\_cells2, integration\_matrix\_rownames  
Character vectors.

distances, anchor\_score, min\_dist, sd  
Numeric.

cell\_index Integer.

display\_progress  
Logical.

**Value**

A dgCMatrix.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

GraphToNeighborHelper    *Convert a sparse graph to neighbor lists*

---

### Description

Rust/extendr reimplementation matching Seurat's native API for GraphToNeighborHelper. Reads each row of mat (cell k's neighbors are the non-zero columns of row k), exactly like Seurat. Every row must have the same number of non-zero entries.

### Usage

```
GraphToNeighborHelper(mat)
```

### Arguments

mat                      Sparse adjacency matrix (cells x cells), dgCMatrix or coercible.

### Value

An unnamed list of two nrow(mat) x k numeric matrices: 1-based neighbor indices and the corresponding distances, both sorted by increasing distance.

### Author(s)

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

IntegrateDataC            *Integrate expression using anchor weights*

---

### Description

Rust/extendr reimplementation matching Seurat's native API for IntegrateDataC.

### Usage

```
IntegrateDataC(integration_matrix, weights, expression_cells2)
```

### Arguments

integration\_matrix, weights, expression\_cells2  
Sparse matrices.

### Value

A dgCMatrix.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

LogNorm

*Log-normalize a sparse count matrix*

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for LogNorm.

**Usage**

```
LogNorm(data, scale_factor, display_progress = TRUE)
```

**Arguments**

|                  |                       |
|------------------|-----------------------|
| data             | A dgCMatrx of counts. |
| scale_factor     | Numeric scale factor. |
| display_progress | Logical.              |

**Value**

A log-normalized dgCMatrx.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

**Examples**

```
## Not run:
library(Matrix)
mat <- sparseMatrix(i = c(1, 3, 2), j = c(1, 2, 3), x = 1:3, dims = c(3, 3))
LogNorm(mat, scale_factor = 1e4, display_progress = FALSE)

## End(Not run)
```

---

|              |                                           |
|--------------|-------------------------------------------|
| ReplaceColsC | <i>Replace columns of a sparse matrix</i> |
|--------------|-------------------------------------------|

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for ReplaceColsC.

**Usage**

```
ReplaceColsC(mat, col_idx, replacement)
```

**Arguments**

|             |                         |
|-------------|-------------------------|
| mat         | A dgCMatrix.            |
| col_idx     | Integer column indices. |
| replacement | A dgCMatrix.            |

**Value**

A dgCMatrix.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

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|                    |                                        |
|--------------------|----------------------------------------|
| row_mean_dgcmatrix | <i>Row means for dgCMatrix storage</i> |
|--------------------|----------------------------------------|

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for row\_mean\_dgcmatrix.

**Usage**

```
row_mean_dgcmatrix(x, i, rows, cols)
```

**Arguments**

|            |                      |
|------------|----------------------|
| x          | Numeric values.      |
| i          | Integer row indices. |
| rows, cols | Dimensions.          |

**Value**

Numeric vector.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

|                   |                                      |
|-------------------|--------------------------------------|
| row_sum_dgcmatrix | <i>Row sums for dgCMatrx storage</i> |
|-------------------|--------------------------------------|

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for row\_sum\_dgcmatrix.

**Usage**

```
row_sum_dgcmatrix(x, i, rows, cols)
```

**Arguments**

|      |                      |
|------|----------------------|
| x    | Numeric values.      |
| i    | Integer row indices. |
| rows | Number of rows.      |
| cols | Number of columns.   |

**Value**

Numeric vector.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

|                   |                                           |
|-------------------|-------------------------------------------|
| row_var_dgcmatrix | <i>Row variances for dgCMatrx storage</i> |
|-------------------|-------------------------------------------|

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for row\_var\_dgcmatrix.

**Usage**

```
row_var_dgcmatrix(x, i, rows, cols)
```

**Arguments**

|            |                      |
|------------|----------------------|
| x          | Numeric values.      |
| i          | Integer row indices. |
| rows, cols | Dimensions.          |

**Value**

Numeric vector.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

|                  |                                               |
|------------------|-----------------------------------------------|
| RowMergeMatrices | <i>Merge two sparse matrices by row names</i> |
|------------------|-----------------------------------------------|

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for RowMergeMatrices. Seurat's C++ entry point only accepts row-compressed (RsparseMatrix) inputs and errors on a dgCMatrix. This version accepts either layout (or any coercible matrix) and converts to row-compressed form first; for RsparseMatrix inputs the result is identical to Seurat's.

**Usage**

```
RowMergeMatrices(mat1, mat2, mat1_rownames, mat2_rownames, all_rownames)
```

**Arguments**

|                                            |                                                                                           |
|--------------------------------------------|-------------------------------------------------------------------------------------------|
| mat1, mat2                                 | Sparse matrices, preferably row-compressed (dgRMatrix); other matrix classes are coerced. |
| mat1_rownames, mat2_rownames, all_rownames | Character vectors.                                                                        |

**Value**

A dgCMatrix.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

|        |                                        |
|--------|----------------------------------------|
| RowVar | <i>Row variances of a dense matrix</i> |
|--------|----------------------------------------|

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for RowVar.

**Usage**

```
RowVar(x)
```

**Arguments**

x                      Numeric matrix.

**Value**

Numeric vector of row variances.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

|                            |                                                  |
|----------------------------|--------------------------------------------------|
| RunModularityClusteringCpp | <i>Run modularity clustering on an SNN graph</i> |
|----------------------------|--------------------------------------------------|

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for RunModularityClusteringCpp.

**Usage**

```
RunModularityClusteringCpp(  
  SNN,  
  modularityFunction = 1,  
  resolution = 1,  
  algorithm = 1,  
  nRandomStarts = 1,  
  nIterations = 1,  
  randomSeed = 0,  
  printOutput = FALSE,  
  edgefilename = ""  
)
```

**Arguments**

SNN                      Sparse SNN graph.  
modularityFunction, algorithm, nRandomStarts, nIterations, randomSeed  
                         Integers.  
resolution              Numeric.  
printOutput              Logical.  
edgefilename            Optional path.

**Value**

Integer cluster assignments.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

|                |                                 |
|----------------|---------------------------------|
| RunUMISampling | <i>Downsample UMIs globally</i> |
|----------------|---------------------------------|

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for RunUMISampling.

**Usage**

```
RunUMISampling(data, sample_val, upsample = FALSE, display_progress = TRUE)
```

**Arguments**

data                    A dgCMatrix.  
sample\_val              Numeric.  
upsample                Logical.  
display\_progress        Logical.

**Value**

A dgCMatrix.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

RunUMISamplingPerCell *Downsample UMIs per cell*

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for RunUMISamplingPerCell.

**Usage**

```
RunUMISamplingPerCell(data, sample_val, upsample = FALSE, display_progress = TRUE)
```

**Arguments**

|                  |              |
|------------------|--------------|
| data             | A dgCMatrix. |
| sample_val       | Numeric.     |
| upsample         | Logical.     |
| display_progress | Logical.     |

**Value**

A dgCMatrix.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

ScoreHelper *Score query cells using an SNN graph*

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for ScoreHelper.

**Usage**

```
ScoreHelper(  
  snn,  
  query_pca,  
  query_dists,  
  corrected_nns,  
  k_snn,  
  subtract_first_nn,  
  display_progress  
)
```

**Arguments**

snn                    Sparse SNN graph.  
 query\_pca, query\_dists, corrected\_nns  
                           Numeric inputs.  
 k\_snn                 Integer.  
 subtract\_first\_nn, display\_progress  
                           Logical.

**Value**

Numeric scores.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

SNN\_SmallestNonzero\_Dist

*Smallest non-zero SNN distances*

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for SNN\_SmallestNonzero\_Dist.

**Usage**

SNN\_SmallestNonzero\_Dist(snn, mat, n, nearest\_dist)

**Arguments**

snn                    Sparse SNN graph.  
 mat                    Numeric matrix.  
 n                      Integer.  
 nearest\_dist         Numeric vector.

**Value**

Numeric vector.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

|              |                             |
|--------------|-----------------------------|
| SparseRowVar | <i>Sparse row variances</i> |
|--------------|-----------------------------|

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for SparseRowVar.

**Usage**

```
SparseRowVar(mat, display_progress)
```

**Arguments**

|                  |              |
|------------------|--------------|
| mat              | A dgCMatrix. |
| display_progress | Logical.     |

**Value**

Numeric vector.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

|               |                                         |
|---------------|-----------------------------------------|
| SparseRowVar2 | <i>Sparse row variances given means</i> |
|---------------|-----------------------------------------|

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for SparseRowVar2.

**Usage**

```
SparseRowVar2(mat, mu, display_progress)
```

**Arguments**

|                  |              |
|------------------|--------------|
| mat              | A dgCMatrix. |
| mu               | Row means.   |
| display_progress | Logical.     |

**Value**

Numeric vector.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

SparseRowVarStd

*Sparse row variances with clipping*

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for SparseRowVarStd.

**Usage**

```
SparseRowVarStd(mat, mu, sd, vmax, display_progress)
```

**Arguments**

|                  |              |
|------------------|--------------|
| mat              | A dgCMatrix. |
| mu               | Row means.   |
| sd               | Row sds.     |
| vmax             | Clip value.  |
| display_progress | Logical.     |

**Value**

Numeric vector.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

Standardize

*Standardize columns of a dense matrix*

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for Standardize.

**Usage**

```
Standardize(mat, display_progress = TRUE)
```

**Arguments**

mat                    Numeric matrix.  
display\_progress       Logical.

**Value**

A numeric matrix.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

---

|               |                                  |
|---------------|----------------------------------|
| WriteEdgeFile | <i>Write SNN edges to a file</i> |
|---------------|----------------------------------|

---

**Description**

Rust/extendr reimplementation matching Seurat's native API for WriteEdgeFile.

**Usage**

```
WriteEdgeFile(snn, filename, display_progress)
```

**Arguments**

snn                    Sparse SNN graph.  
filename               Path.  
display\_progress       Logical.

**Value**

Invisibly returns NULL.

**Author(s)**

Nebil Ibrahim <nebil.b.ibrahim@gmail.com>

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