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> library(Matrix)
> library(Seurat)
> library(SeuratWrappers)
> library(scales)
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> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.data)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.plot)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.stat)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.layout)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.theme)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.io)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.utils)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shiny)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.data)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.plot)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.stat)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.layout)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.theme)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.io)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.utils)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shiny)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp)
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> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.plot)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.stat)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.layout)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.theme)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.io)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.utils)
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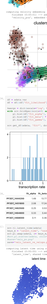
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.data)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.plot)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.stat)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.layout)
> library(ggsankeyfield.shiny.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.shinyapp.sh
```

```
clustering Seurat object of class seurat
clustering parameters:
 method louvain
 resolution 1
 random.seed 0
 cluster.by_row TRUE
 cluster.by_col TRUE
 hclust.method ward.D2
 distance euclidean
 ncol(x) 2000
 nrow(x) 2000
```

```
> ccd.plot.umap(ccd, "seurat_clusters", cols.map.discrete=c("red","blue"), ccd.map_points=T, ccd.map_points.size=0.5)
```

```
clustering Seurat object of class seurat
clustering parameters:
 method louvain
 resolution 1
 random.seed 0
 cluster.by_row TRUE
 cluster.by_col TRUE
 hclust.method ward.D2
 distance euclidean
 ncol(x) 2000
 nrow(x) 2000
```

```
> ccd.plot.umap(ccd, "velocity_clusters", cols.map.discrete=c("red","blue"), ccd.map_points=T, ccd.map_points.size=0.5)
```


velocity

```
Computing neighbors graph...
Computing Fuzzy simplicial set...
Computing spectral initialization, this may take a minute...
Computing layout, this may take a minute...
```

```
>>> sc.tl.leiden(adata, resolution=0.1)CPU times: user 1min 2s, sys: 1.1s, total: 1min 3s
Wall time: 1min 3s
```

```
/home/ubuntu/miniconda3/envs/rapids-24.08/lib/python3.10/site-packages/scanpy/tl/_rank_genes_groups.py:1000: RuntimeWarning: invalid value encountered in sqrt
  scores = np.abs(np.sqrt(n_vs) * mu / sd)
/home/ubuntu/miniconda3/envs/rapids-24.08/lib/python3.10/site-packages/numpy/lib/_nanfunctions_impl.py:1215: RuntimeWarning: Mean of empty slice
  return np.nanmean(a, axis=axis, dtype=dtype, keepdims=keepdims)
/home/ubuntu/miniconda3/envs/rapids-24.08/lib/python3.10/site-packages/numpy/lib/_nanfunctions_impl.py:1220: RuntimeWarning: invalid value encountered in sqrt
  return np.sqrt(avg)
```

```
[0.0, 0.0, 0.0, 
```

```
[Cell 1]
```

```
[Cell 2]
```

```
[Cell 3]
```

```
[Cell 4]
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```
[Cell 5]
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```
[Cell 6]
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```
[Cell 7]
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```
[Cell 8]
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```
[Cell 9]
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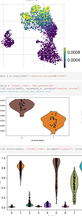
```
[Cell 10]
```

```
[Cell
```

```
Computing, 1[0]: random matrix of maximum length: 100
Computing, 1[0]: random matrix of maximum length: 100
Plotting single data ...
```

```
> p_plot_scatter_matrix=
    plot_scatter(
      object=scatterplot1,
      dim1=1,dim2=2,
      cex=0.5,
      cex.main=2,
      cex.lab=1.5,
      cex.legend=1.5,
      legend.pos=c(0.0008,0.0004),
      legend.cex=1.5,
      legend.bg=NA,
      legend.box=NA,
      legend.text=NA)

Computing, 1[0]: random matrix of maximum length: 100
Computing, 1[0]: random matrix of maximum length: 100
Plotting single data ...
```




```
> p_gr_scatter_matrix=
    ggplot(p_plot_scatter,aes(x=dim1,y=dim2,colour=clusters))+geom_point(size=0.5)
```

```
> ggsave(p_gr_scatter_matrix,"./plots/scatterplot.pdf")
> ggsave(p_gr_scatter_matrix,"./plots/scatterplot.jpeg")
> p_gr_violin=ggplot(p_plot_scatter,aes(x=clusters,y=dim1))+geom_violin(aes(fill=clusters))+geom_jitter(size=0.5)+theme
    +theme_bw()+theme(legend.position="none")
> p_gr_violin=ggplot(p_plot_scatter,aes(x=clusters,y=dim2))+geom_violin(aes(fill=clusters))+geom_jitter(size=0.5)+theme
    +theme_bw()+theme(legend.position="none")
```



```
> p_gr_violin=ggplot(p_plot_scatter,aes(x=clusters,y=dim1))+geom_violin(aes(fill=clusters))+geom_jitter(size=0.5)+theme
    +theme_bw()+theme(legend.position="none")+ylim(-0.5,0.5)
> p_gr_violin=ggplot(p_plot_scatter,aes(x=clusters,y=dim2))+geom_violin(aes(fill=clusters))+geom_jitter(size=0.5)+theme
    +theme_bw()+theme(legend.position="none")+ylim(-0.5,0.5)
```



```
> ggsave(p_gr_violin,"./plots/violin.pdf")
```



```
> q()
```