

Benchmark All Methods

Barcode

```
##
## output CD14 CD4 CD8 NK
##   CD14   99   0   0   0
##   CD4    0  93   3   0
##   CD8    1   7  97   1
##   NK     0   0   0  99
## [1] 1
## [1] 0.97

##
## output CD14
##   CD14  838
##   CD4    3
##   CD8    5
##   NK     4
## [1] 1
## [1] 0.9858824

##
## output          B Epithelial Stromal
##   B           100           0           2
##   Epithelial   0           100           0
##   other         0           0           1
##   Stromal       0           0          97
## [1] 0.9966667
## [1] 0.993311

##
## output          B Epithelial Stromal
##   B           998           2           0
##   Epithelial   0           996           0
##   other         0           1           1
##   Stromal       2           1          999
## [1] 0.9993333
## [1] 0.9983322

##
## output Astro Oligo
##   Astro   99   0
##   Micro    1   0
##   Oligo    0  100
## [1] 1
## [1] 0.995

##
## output Micro
```

```
## Micro 5097
## other 1930
## [1] 0.7253451
## [1] 1
```

```
##
## output      Alveolar Epithelial Type 2 Alveolar Fibroblast Artery Basophil/Mast 1 C
## Alveolar Epithelial Type 2      100              0      0      0
## Alveolar Fibroblast              0      100      0      0
## Artery                          0      0      95      0
## Basophil/Mast 1                  0      0      0      100
## Capillary                        0      0      5      0
## Capillary Aerocyte                0      0      0      0
## CD4+ Memory/Effector T            0      0      0      0
## CD8+ Naive T                     0      0      0      0
## Ciliated                         0      0      0      0
## Classical Monocyte                0      0      0      0
## Macrophage                       0      0      0      0
## Natural Killer                    0      0      0      0
## Pericyte                         0      0      0      0
```

```
##
## output      Capillary Aerocyte CD4+ Memory/Effector T CD8+ Naive T Ciliated Classical
## Alveolar Epithelial Type 2      0              0      0      0
## Alveolar Fibroblast              0              0      0      0
## Artery                          0              0      0      0
## Basophil/Mast 1                  0              0      0      0
## Capillary                        1              0      0      0
## Capillary Aerocyte                99             0      0      0
## CD4+ Memory/Effector T            0      92      9      0
## CD8+ Naive T                     0      8      89      0
## Ciliated                         0              0      100     0
## Classical Monocyte                0              0      0      0
## Macrophage                       0              0      0      0
## Natural Killer                    0              0      2      0
## Pericyte                         0              0      0      0
```

```
##
## output      Natural Killer Pericyte
## Alveolar Epithelial Type 2      0      0
## Alveolar Fibroblast              0      0
## Artery                          0      0
## Basophil/Mast 1                  0      0
## Capillary                        0      0
## Capillary Aerocyte                0      0
## CD4+ Memory/Effector T            0      0
## CD8+ Naive T                     5      0
## Ciliated                         0      0
## Classical Monocyte                0      0
## Macrophage                       0      0
## Natural Killer                    95     0
## Pericyte                         0     100
```

```
## [1] 1
## [1] 0.9684615
```

```
##
## output      Alveolar Epithelial Type 2 Artery Ciliated Natural Killer Pericyte
```

##	Alveolar Epithelial Type 2	137	0	0	0	0
##	Alveolar Fibroblast	0	0	0	0	1
##	Artery	0	36	0	0	0
##	CD4+ Memory/Effector T	0	0	0	2	0
##	CD8+ Naive T	0	0	0	25	0
##	Ciliated	24	0	240	1	0
##	Classical Monocyte	0	0	0	1	0
##	Natural Killer	0	0	0	126	0
##	other	89	3	0	28	5
##	Pericyte	0	0	0	0	65
##	[1] 0.8403576					
##	[1] 0.9179331					

CHETAH

##		CD14	CD4	CD8	NK
##	CD14	98	0	0	0
##	CD4	0	92	2	0
##	CD8	1	1	88	0
##	NK	0	0	0	100
##	Node1	0	0	2	0
##	Node2	0	3	8	0
##	Unassigned	1	4	0	0
##	[1] 0.955				
##	[1] 0.9895288				

##		CD14
##	CD14	816
##	CD4	3
##	CD8	3
##	NK	1
##	Node2	1
##	Unassigned	26
##	[1] 0.9682353	
##	[1] 0.9914945	

##		B	Epithelial	Stromal
##	B	95	0	0
##	Epithelial	0	100	1
##	Stromal	3	0	95
##	Unassigned	2	0	4
##	[1] 0.98			
##	[1] 0.9863946			

##		B	Epithelial	Stromal
##	B	132	0	0
##	Epithelial	0	283	0
##	Node1	20	714	2
##	Stromal	763	2	986
##	Unassigned	85	1	12

```
## [1] 0.722
## [1] 0.6468144
```

```
##
##           Astro Oligo
## Astro      90      0
## Node1       3      4
## Oligo       0     96
## Unassigned  7      0
## [1] 0.93
## [1] 1
```

```
##
##           Micro
## Micro     6728
## Unassigned 299
## [1] 0.9574498
## [1] 1
```

```
##
##           Alveolar Epithelial Type 2 Alveolar Fibroblast Artery Basophil/Mast 1 C
## Alveolar Epithelial Type 2      94              0      0      0
## Alveolar Fibroblast              0             93      0      0
## Artery                          0              0     89      0
## Basophil/Mast 1                  0              0      0     99
## Capillary                        0              0      2      0
## Capillary Aerocyte               0              0      0      0
## CD4+ Memory/Effector T            0              0      0      0
## CD8+ Naive T                     0              0      0      0
## Ciliated                         0              0      0      0
## Classical Monocyte                0              0      0      0
## Macrophage                       0              0      0      0
## Natural Killer                    0              0      0      0
## Node1                            5              1      0      0
## Node10                           0              0      0      0
## Node11                           0              0      0      0
## Node2                            0              3      5      0
## Node3                            0              0      0      0
## Node4                            0              0      4      0
## Node5                            0              3      0      0
## Node6                            0              0      0      0
## Node7                            0              0      0      0
## Node8                            0              0      0      0
## Node9                            0              0      0      0
## Pericyte                         0              0      0      0
## Unassigned                       1              0      0      1
```

```
##
##           Capillary Aerocyte CD4+ Memory/Effector T CD8+ Naive T Ciliated Classical
## Alveolar Epithelial Type 2      0              0      0      0
## Alveolar Fibroblast              0              0      0      0
## Artery                          0              0      0      0
## Basophil/Mast 1                  0              0      0      0
## Capillary                        0              0      0      0
## Capillary Aerocyte              94              0      0      0
## CD4+ Memory/Effector T            0             89      5      0
```

##	CD8+ Naive T	0	6	87	0
##	Ciliated	0	0	0	97
##	Classical Monocyte	0	0	0	0
##	Macrophage	0	0	0	0
##	Natural Killer	0	0	2	0
##	Node1	0	0	0	0
##	Node10	0	0	3	0
##	Node11	0	3	2	0
##	Node2	4	0	0	0
##	Node3	2	0	0	0
##	Node4	0	0	0	0
##	Node5	0	0	0	0
##	Node6	0	0	0	2
##	Node7	0	2	1	0
##	Node8	0	0	0	0
##	Node9	0	0	0	0
##	Pericyte	0	0	0	0
##	Unassigned	0	0	0	1

##

	Natural Killer	Pericyte
--	----------------	----------

##	Alveolar Epithelial Type 2	0	0
##	Alveolar Fibroblast	0	0
##	Artery	0	0
##	Basophil/Mast 1	0	0
##	Capillary	0	0
##	Capillary Aerocyte	0	0
##	CD4+ Memory/Effector T	0	0
##	CD8+ Naive T	3	0
##	Ciliated	0	0
##	Classical Monocyte	0	0
##	Macrophage	0	0
##	Natural Killer	96	0
##	Node1	0	0
##	Node10	1	0
##	Node11	0	0
##	Node2	0	6
##	Node3	0	0
##	Node4	0	0
##	Node5	0	4
##	Node6	0	0
##	Node7	0	0
##	Node8	0	0
##	Node9	0	0
##	Pericyte	0	90
##	Unassigned	0	0

[1] 0.9507692

[1] 0.9838188

##

	Alveolar Epithelial Type 2	Artery	Ciliated	Natural Killer	Pericyte
--	----------------------------	--------	----------	----------------	----------

##	Alveolar Epithelial Type 2	62	0	2	0	0
##	Alveolar Fibroblast	0	0	1	0	0
##	Artery	0	4	0	0	0
##	Capillary Aerocyte	0	0	1	0	0

```
##      CD4+ Memory/Effector T      0      0      0      3      0
##      CD8+ Naive T      0      0      0      1      0
##      Ciliated      0      0      111      0      0
##      Natural Killer      0      0      0      39      0
##      Node1      129      1      105      119      11
##      Node10      0      0      0      14      0
##      Node11      1      0      1      0      0
##      Node2      26      29      18      2      32
##      Node4      0      5      0      0      0
##      Node9      0      0      0      5      0
##      Pericyte      0      0      0      0      28
##      Unassigned      32      0      1      0      0
## [1] 0.3218391
## [1] 0.968254
```

scmap

```
##
##      CD14  CD4  CD8  NK
##      CD14      93      0      0      0
##      CD4       1     47      1      0
##      CD8       0      2     41      0
##      NK       0      0      5     98
##      unassigned  6     51     53      2
## [1] 0.72
## [1] 0.96875

##
##      CD14
##      CD14      656
##      CD4       2
##      NK       4
##      unassigned 188
## [1] 0.7788235
## [1] 0.9909366

##
##      B Epithelial Stromal
##      B      100      0      0
##      Epithelial  0      100      0
##      Stromal    0      0      56
##      unassigned  0      0      44
## [1] 0.8533333
## [1] 1

##
##      B Epithelial Stromal
##      B      328      2      0
##      Epithelial  0      908      0
##      Stromal    300      0     916
##      unassigned 372      90      84
## [1] 0.818
## [1] 0.8769356
```

```

##
##           Astro Oligo
## Astro      100    0
## Oligo       0    94
## unassigned  0     6
## [1] 0.97
## [1] 1

##
##           Micro
## Micro      22
## unassigned 7005
## [1] 0.003130781
## [1] 1

##
##           Alveolar Epithelial Type 2 Alveolar Fibroblast Artery Basophil/Mast 1 C
## Alveolar Epithelial Type 2      100          0          0          0
## Alveolar Fibroblast              0          90          0          0
## Artery                           0          0         84          0
## Basophil/Mast 1                  0          0          0         94
## Capillary                        0          0          0          0
## Capillary Aerocyte               0          0          0          0
## CD4+ Memory/Effector T           0          0          0          0
## CD8+ Naive T                     0          0          0          0
## Ciliated                         0          0          0          0
## Classical Monocyte               0          0          0          0
## Macrophage                      0          1          0          0
## Natural Killer                   0          0          0          0
## Pericyte                        0          0          0          0
## unassigned                       0          9         16          6
##
##           Capillary Aerocyte CD4+ Memory/Effector T CD8+ Naive T Ciliated Classic
## Alveolar Epithelial Type 2      0          0          0          0
## Alveolar Fibroblast              0          0          0          0
## Artery                           1          0          0          0
## Basophil/Mast 1                  0          0          0          0
## Capillary                        0          0          0          0
## Capillary Aerocyte               40          0          0          0
## CD4+ Memory/Effector T           0          80         13          0
## CD8+ Naive T                     0          1         11          0
## Ciliated                         0          0          0         98
## Classical Monocyte               0          0          0          0
## Macrophage                      0          1          0          0
## Natural Killer                   0          0          5          0
## Pericyte                        0          0          0          0
## unassigned                       59         18         71          2
##
##           Natural Killer Pericyte
## Alveolar Epithelial Type 2      0          0
## Alveolar Fibroblast              0          1
## Artery                           0          1
## Basophil/Mast 1                  0          0
## Capillary                        0          0
## Capillary Aerocyte               0          0

```

```

##      CD4+ Memory/Effector T          0      0
##      CD8+ Naive T                    0      0
##      Ciliated                        0      0
##      Classical Monocyte              0      0
##      Macrophage                      0      0
##      Natural Killer                  68      0
##      Pericyte                        0     69
##      unassigned                      32     29
## [1] 0.7807692
## [1] 0.9704433

##
##                                     Alveolar Epithelial Type 2 Artery Ciliated Natural Killer Pericyte
##      Alveolar Epithelial Type 2          69      0      1      0      0
##      Artery                             0      1      0      0      0
##      Ciliated                           0      0     12      0      0
##      unassigned                        181     38    227     183     71
## [1] 0.1060026
## [1] 0.9879518

```

CaSTLe

```

## <h2>Classifier for CD14</h2>[15:50:23] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGB
## <h2>Classifier for CD4</h2>[15:50:40] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGB
## <h2>Classifier for CD8</h2>[15:50:58] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGB
## <h2>Classifier for NK</h2>[15:51:16] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGB
##
##      CD14 CD4 CD8  NK
##      CD14  98  0  0  0
##      CD4   1  98  2  0
##      CD8   1  2  98  0
##      NK    0  0  0 100
## [1] 0.985

## <h2>Classifier for CD14</h2>[15:52:28] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGB
## <h2>Classifier for CD4</h2>[15:52:56] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGB
## <h2>Classifier for CD8</h2>[15:53:26] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGB
## <h2>Classifier for NK</h2>[15:53:56] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGB
##
##      CD14
##      CD14  836
##      CD8    8
##      NK     6
## [1] 0.9835294

## <h2>Classifier for B</h2>[15:55:06] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGB
## <h2>Classifier for Epithelial</h2>[15:55:38] WARNING: amalgamation/./src/learner.cc:1115: Starting
## <h2>Classifier for Stromal</h2>[15:56:09] WARNING: amalgamation/./src/learner.cc:1115: Starting in
##
##      B Epithelial Stromal
##      B      100      0      0
##      Epithelial  0     100      0
##      Stromal    0      0     100
## [1] 1

```



```

## <h2>Classifier for B</h2>[15:57:21] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
## <h2>Classifier for Epithelial</h2>[15:57:59] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
## <h2>Classifier for Stromal</h2>[15:58:34] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
##
##           B Epithelial Stromal
##   B           438         42         39
##   Epithelial    0         632         0
##   Stromal      562         326        961
## [1] 0.677

## <h2>Classifier for Astro</h2>[15:58:48] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
## <h2>Classifier for Micro</h2>[15:58:53] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
## <h2>Classifier for Oligo</h2>[15:58:58] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
##
##           Astro Oligo
##   Astro      100         0
##   Oligo         0        100
## [1] 1

## <h2>Classifier for Astro</h2>[15:59:17] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
## <h2>Classifier for Micro</h2>[15:59:23] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
## <h2>Classifier for Oligo</h2>[15:59:30] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
##
##           Micro
##   Astro      5983
##   Micro       953
##   Oligo         91
## [1] 0.1356198

## <h2>Classifier for Alveolar Epithelial Type 2</h2>[16:01:41] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
## <h2>Classifier for Alveolar Fibroblast</h2>[16:02:47] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
## <h2>Classifier for Artery</h2>[16:03:51] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
## <h2>Classifier for Basophil/Mast 1</h2>[16:04:56] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
## <h2>Classifier for Capillary</h2>[16:06:00] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
## <h2>Classifier for Capillary Aerocyte</h2>[16:07:05] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
## <h2>Classifier for CD4+ Memory/Effector T</h2>[16:08:12] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
## <h2>Classifier for CD8+ Naive T</h2>[16:09:19] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
## <h2>Classifier for Ciliated</h2>[16:10:26] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
## <h2>Classifier for Classical Monocyte</h2>[16:11:29] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
## <h2>Classifier for Macrophage</h2>[16:12:32] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
## <h2>Classifier for Natural Killer</h2>[16:13:40] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
## <h2>Classifier for Pericyte</h2>[16:14:45] WARNING: amalgamation/./src/learner.cc:1115: Starting in XGBoost
##
##           Alveolar Epithelial Type 2 Alveolar Fibroblast Artery Basophil/Mast 1 C
##   Alveolar Epithelial Type 2           100              0          0          0
##   Alveolar Fibroblast                0             100          0          0
##   Artery                             0              0         91          0
##   Basophil/Mast 1                    0              0          0        100
##   Capillary                          0              0          9          0
##   Capillary Aerocyte                  0              0          0          0
##   CD4+ Memory/Effector T              0              0          0          0
##   CD8+ Naive T                       0              0          0          0
##   Ciliated                           0              0          0          0
##   Classical Monocyte                  0              0          0          0
##   Macrophage                         0              0          0          0

```

```

## Natural Killer 0 0 0 0
## Pericyte 0 0 0 0
##
## Capillary Aerocyte CD4+ Memory/Effector T CD8+ Naive T Ciliated Classical
## Alveolar Epithelial Type 2 0 0 0 0
## Alveolar Fibroblast 0 0 0 0
## Artery 0 0 0 0
## Basophil/Mast 1 0 0 0 0
## Capillary 0 0 0 0
## Capillary Aerocyte 100 0 0 0
## CD4+ Memory/Effector T 0 97 7 0
## CD8+ Naive T 0 1 89 0
## Ciliated 0 0 0 100
## Classical Monocyte 0 0 0 0
## Macrophage 0 0 0 0
## Natural Killer 0 2 4 0
## Pericyte 0 0 0 0
##
## Natural Killer Pericyte
## Alveolar Epithelial Type 2 0 0
## Alveolar Fibroblast 0 0
## Artery 0 0
## Basophil/Mast 1 0 0
## Capillary 0 0
## Capillary Aerocyte 0 0
## CD4+ Memory/Effector T 0 0
## CD8+ Naive T 0 0
## Ciliated 0 0
## Classical Monocyte 0 0
## Macrophage 0 0
## Natural Killer 100 0
## Pericyte 0 100
## [1] 0.9807692

## <h2>Classifier for Alveolar Epithelial Type 2</h2>[16:16:50] WARNING: amalgamation/./src/learner.cc:
## <h2>Classifier for Alveolar Fibroblast</h2>[16:17:49] WARNING: amalgamation/./src/learner.cc:1115: S
## <h2>Classifier for Artery</h2>[16:18:47] WARNING: amalgamation/./src/learner.cc:1115: Starting in X
## <h2>Classifier for Basophil/Mast 1</h2>[16:19:46] WARNING: amalgamation/./src/learner.cc:1115: Star
## <h2>Classifier for Capillary</h2>[16:20:44] WARNING: amalgamation/./src/learner.cc:1115: Starting in
## <h2>Classifier for Capillary Aerocyte</h2>[16:21:44] WARNING: amalgamation/./src/learner.cc:1115: S
## <h2>Classifier for CD4+ Memory/Effector T</h2>[16:22:43] WARNING: amalgamation/./src/learner.cc:111
## <h2>Classifier for CD8+ Naive T</h2>[16:23:44] WARNING: amalgamation/./src/learner.cc:1115: Starting
## <h2>Classifier for Ciliated</h2>[16:24:45] WARNING: amalgamation/./src/learner.cc:1115: Starting in
## <h2>Classifier for Classical Monocyte</h2>[16:25:41] WARNING: amalgamation/./src/learner.cc:1115: S
## <h2>Classifier for Macrophage</h2>[16:26:41] WARNING: amalgamation/./src/learner.cc:1115: Starting i
## <h2>Classifier for Natural Killer</h2>[16:27:41] WARNING: amalgamation/./src/learner.cc:1115: Start
## <h2>Classifier for Pericyte</h2>[16:28:41] WARNING: amalgamation/./src/learner.cc:1115: Starting in
##
## Alveolar Epithelial Type 2 Artery Ciliated Natural Killer Pericyte
## Alveolar Epithelial Type 2 224 0 5 5 4
## Alveolar Fibroblast 3 4 1 0 3
## Artery 0 13 0 0 0
## Basophil/Mast 1 0 1 0 0 0
## Capillary 0 11 0 0 1

```

## Capillary Aerocyte	0	0	2	0	1
## CD4+ Memory/Effector T	14	1	17	147	6
## Ciliated	0	0	207	1	0
## Macrophage	9	9	8	22	12
## Natural Killer	0	0	0	8	0
## Pericyte	0	0	0	0	44
## [1] 0.633461					

Garnett

```
## training_sample
##      CD14      CD4      CD8      NK Unknown
##      500      500      500      500      500
##
##           CD14 CD4 CD8  NK
##      CD14      97  0  2  0
##      CD4       2 100  8  0
##      CD8       1  0 61  0
##      NK        0  0  6 100
##      Unknown   0  0 23  0
## [1] 0.9425
## [1] 0.9496021

## training_sample
##      CD14      CD4      CD8      NK Unknown
##      500      500      500      500      500
##
##           CD14
##      CD14  850
## [1] 1
## [1] 1

## training_sample
##           B Epithelial      Stromal      Unknown
##           500           500           500           500
##
##           B Epithelial Stromal
##      B      100           0      12
##      Epithelial  0           100      0
##      Stromal    0           0      88
## [1] 1
## [1] 0.96

## training_sample
##           B Epithelial      Stromal      Unknown
##           500           500           500           500
##
##           B Epithelial Stromal
##      B      872           1      157
##      Epithelial 32           998      14
##      Stromal    1           1      93
##      Unknown   95           0      736
## [1] 0.723
## [1] 0.9050254
```

```
## training_sample
## Astro Micro Oligo Unknown
## 500 110 500 500
##
## Astro Oligo
## Astro 100 1
## Oligo 0 71
## Unknown 0 28
## [1] 0.86
## [1] 0.994186
```

```
## training_sample
## Astro Micro Oligo Unknown
## 500 110 500 500
##
## Micro
## Micro 7027
## [1] 1
## [1] 1
```

```
## training_sample
## Alveolar Epithelial Type 2 Alveolar Fibroblast Artery Basophil/Mast 1
## 500 500 429
## Capillary Capillary Aerocyte CD4+ Memory/Effector T CD8+ Naive T
## 500 500 500
## Ciliated Classical Monocyte Macrophage Natural Killer
## 500 500 500
## Pericyte Unknown
## 126 500
```

```
## Alveolar Epithelial Type 2 Alveolar Fibroblast Artery Basophil/Mast 1 Ciliated
## Alveolar Epithelial Type 2 100 0 0 0
## Alveolar Fibroblast 0 100 0 0
## Artery 0 0 100 0
## Basophil/Mast 1 0 0 0 100
## Capillary 0 0 0 0
## Capillary Aerocyte 0 0 0 0
## CD4+ Memory/Effector T 0 0 0 0
## CD8+ Naive T 0 0 0 0
## Ciliated 0 0 0 0
## Classical Monocyte 0 0 0 0
## Macrophage 0 0 0 0
## Natural Killer 0 0 0 0
## Pericyte 0 0 0 0
## Unknown 0 0 0 0
```

```
## Capillary Aerocyte CD4+ Memory/Effector T CD8+ Naive T Ciliated Classical
## Alveolar Epithelial Type 2 0 0 0 0
## Alveolar Fibroblast 0 0 0 0
## Artery 0 0 0 0
## Basophil/Mast 1 0 0 0 0
## Capillary 0 1 0 0
## Capillary Aerocyte 100 1 0 0
## CD4+ Memory/Effector T 0 64 3 0
## CD8+ Naive T 0 4 34 0
```

```

##      Ciliated      0      0      0      100
##      Classical Monocyte      0      0      0      0
##      Macrophage      0      0      0      0
##      Natural Killer      0      9      25      0
##      Pericyte      0      6      1      0
##      Unknown      0      15      37      0
##
##                                     Natural Killer Pericyte
##      Alveolar Epithelial Type 2      0      0
##      Alveolar Fibroblast      0      0
##      Artery      0      0
##      Basophil/Mast 1      0      0
##      Capillary      0      0
##      Capillary Aerocyte      0      0
##      CD4+ Memory/Effector T      1      0
##      CD8+ Naive T      0      0
##      Ciliated      0      0
##      Classical Monocyte      0      0
##      Macrophage      0      0
##      Natural Killer      98      0
##      Pericyte      0      100
##      Unknown      1      0
## [1] 0.9261538
## [1] 0.9219269
##
## training_sample
## Alveolar Epithelial Type 2      Alveolar Fibroblast      Artery      Basophil
##      500      500      429
##      Capillary      Capillary Aerocyte      CD4+ Memory/Effector T      CD8+
##      500      500      500
##      Ciliated      Classical Monocyte      Macrophage      Natural
##      500      500      500
##      Pericyte      Unknown
##      126      500
##
##                                     Alveolar Epithelial Type 2 Artery Ciliated Natural Killer Pericyte
##      Alveolar Epithelial Type 2      203      0      9      7      4
##      Alveolar Fibroblast      0      0      0      2      4
##      Artery      0      39      0      0      2
##      Capillary      0      0      2      1      1
##      Capillary Aerocyte      5      0      2      1      2
##      CD4+ Memory/Effector T      1      0      0      0      0
##      CD8+ Naive T      1      0      1      8      1
##      Ciliated      0      0      162      0      0
##      Macrophage      0      0      3      0      2
##      Natural Killer      0      0      3      105      2
##      Pericyte      8      0      22      24      38
##      Unknown      32      0      36      35      15
## [1] 0.8492976
## [1] 0.8225564

```

Cell Assign

```
##
##           CD14 CD4 CD8  NK
##   CD14      98  0  0  0
##   CD8       0  0  1  0
##   NK        0  1 19 100
##   other     2 99 71  0
##   unassigned 0  0  9  0
## [1] 0.5475
## [1] 0.9086758
```

```
##
##           CD14
##   CD14      831
##   CD4        6
##   CD8         2
##   NK          5
##   other       3
##   unassigned  3
## [1] 0.9929412
## [1] 0.9845972
```

```
##
##           B Epithelial Stromal
##   B      100          0      4
##   Epithelial 0          100    0
##   Stromal    0          0     89
##   unassigned 0          0      7
## [1] 0.9766667
## [1] 0.9863481
```

```
##
##           B Epithelial Stromal
##   B      922          2      5
##   Epithelial 2          992    0
##   Stromal    8          1    976
##   unassigned 68          5     19
## [1] 0.9693333
## [1] 0.9938102
```

```
##
##           Astro Oligo
##   Astro      99      0
##   other       0     98
##   unassigned  1      2
## [1] 0.495
## [1] 1
```

```
##
##           Micro
##   other    7027
## [1] 0
## [1] NaN
```

```
##
##           Alveolar Epithelial Type 2 Alveolar Fibroblast Artery Basophil/Mast 1 C
```

##	Alveolar Epithelial Type 2	99	0	0	0
##	Alveolar Fibroblast	0	99	0	0
##	Artery	0	0	84	0
##	Basophil/Mast 1	1	0	0	100
##	Capillary	0	0	10	0
##	Capillary Aerocyte	0	0	0	0
##	CD4+ Memory/Effector T	0	0	0	0
##	CD8+ Naive T	0	0	0	0
##	Ciliated	0	0	0	0
##	Classical Monocyte	0	0	0	0
##	Macrophage	0	0	0	0
##	Natural Killer	0	0	0	0
##	Pericyte	0	1	1	0
##	unassigned	0	0	5	0

##		Capillary Aerocyte	CD4+ Memory/Effector T	CD8+ Naive T	Ciliated	Classical Monocyte
##	Alveolar Epithelial Type 2	0	0	0	0	
##	Alveolar Fibroblast	0	0	0	0	
##	Artery	0	0	0	0	
##	Basophil/Mast 1	0	0	1	0	
##	Capillary	1	0	0	0	
##	Capillary Aerocyte	97	0	0	0	
##	CD4+ Memory/Effector T	0	81	4	0	
##	CD8+ Naive T	0	7	69	0	
##	Ciliated	0	0	0	100	
##	Classical Monocyte	0	0	0	0	
##	Macrophage	0	0	0	0	
##	Natural Killer	0	1	10	0	
##	Pericyte	0	0	0	0	
##	unassigned	2	11	16	0	

##		Natural Killer	Pericyte
##	Alveolar Epithelial Type 2	0	0
##	Alveolar Fibroblast	0	0
##	Artery	0	0
##	Basophil/Mast 1	0	0
##	Capillary	0	0
##	Capillary Aerocyte	0	0
##	CD4+ Memory/Effector T	0	0
##	CD8+ Naive T	0	0
##	Ciliated	0	0
##	Classical Monocyte	0	0
##	Macrophage	0	0
##	Natural Killer	97	0
##	Pericyte	0	100
##	unassigned	3	0

[1] 0.9684615
[1] 0.9698173

##		Alveolar Epithelial Type 2	Artery	Ciliated	Natural Killer	Pericyte
##	Alveolar Epithelial Type 2	218	0	9	2	8
##	Artery	0	31	0	0	0
##	CD8+ Naive T	0	0	0	2	0

```
## Natural Killer      0      0      1      113      1
## other               2      1     152       0     10
## unassigned         30      7      78      66     52
## [1] 0.4916986
## [1] 0.9402597
```

SingleR

```
##
##      CD14 CD4 CD8 NK
## CD14    94  0  0  0
## CD4      2 88  3  0
## CD8      0 11 90  0
## NK       0  0  3 100
## other    4  1  4  0
## [1] 0.9775
## [1] 0.9514066
```

```
##
##      CD14
## CD14   812
## CD4     2
## CD8    32
## NK      4
## [1] 1
## [1] 0.9552941
```

```
##
##      B Epithelial Stromal
## B      100      0      0
## Epithelial 0     99      0
## other      0      1      3
## Stromal    0      0     97
## [1] 0.9866667
## [1] 1
```

```
##
##      B Epithelial Stromal
## B      824      57      79
## Epithelial 66     922     30
## Stromal    110     21     891
## [1] 1
## [1] 0.879
```

```
##
##      Astro Oligo
## Astro    94      0
## Oligo     0     93
## other     6      7
## [1] 0.935
## [1] 1
```

```
##
##      Micro
## Astro   237
```



```
## Micro 6712
## Oligo 15
## other 63
## [1] 0.9910346
## [1] 0.9638139
```

```
##
## Alveolar Epithelial Type 2 Alveolar Fibroblast Artery Basophil/Mast 1 C
## Alveolar Epithelial Type 2 93 0 0 0
## Alveolar Fibroblast 0 97 0 0
## Artery 0 0 95 0
## Basophil/Mast 1 0 0 0 100
## Capillary 0 0 2 0
## Capillary Aerocyte 0 0 0 0
## CD4+ Memory/Effector T 0 0 0 0
## CD8+ Naive T 0 0 0 0
## Ciliated 0 0 0 0
## Classical Monocyte 0 0 0 0
## Macrophage 0 0 0 0
## Natural Killer 0 0 0 0
## other 7 3 3 0
## Pericyte 0 0 0 0
```

```
##
## Capillary Aerocyte CD4+ Memory/Effector T CD8+ Naive T Ciliated Classical
## Alveolar Epithelial Type 2 0 0 0 0
## Alveolar Fibroblast 0 0 0 0
## Artery 0 0 0 0
## Basophil/Mast 1 0 0 0 0
## Capillary 0 0 0 0
## Capillary Aerocyte 99 0 0 0
## CD4+ Memory/Effector T 0 92 13 0
## CD8+ Naive T 0 5 83 0
## Ciliated 0 0 0 93
## Classical Monocyte 0 0 0 0
## Macrophage 0 0 0 0
## Natural Killer 0 0 0 0
## other 1 3 4 7
## Pericyte 0 0 0 0
```

```
##
## Natural Killer Pericyte
## Alveolar Epithelial Type 2 0 0
## Alveolar Fibroblast 0 0
## Artery 0 0
## Basophil/Mast 1 0 0
## Capillary 0 0
## Capillary Aerocyte 0 0
## CD4+ Memory/Effector T 0 0
## CD8+ Naive T 1 0
## Ciliated 0 0
## Classical Monocyte 0 0
## Macrophage 0 0
## Natural Killer 97 0
## other 2 1
## Pericyte 0 99
```

```

## [1] 0.9746154
## [1] 0.9771113

##
##               Alveolar Epithelial Type 2 Artery Ciliated Natural Killer Pericyte
## Alveolar Epithelial Type 2           240      0      17              3      0
## Alveolar Fibroblast                 2      0      3              3      1
## Artery                             2     27      6              2      4
## Basophil/Mast 1                     0      0      0              1      0
## Capillary                           3     11      6              2      2
## Capillary Aerocyte                   0      1      3              3      7
## CD4+ Memory/Effector T               0      0      2             13      1
## CD8+ Naive T                         0      0      0             28      0
## Ciliated                             0      0     201              0      0
## Classical Monocyte                   0      0      0              1      1
## Macrophage                           1      0      0              4      0
## Natural Killer                       0      0      1            123      1
## other                                0      0      0              0      1
## Pericyte                             2      0      1              0     53
## [1] 0.9987229
## [1] 0.8235294

```

SVM

```

## col_0  CD14  CD4  CD8  NK
## row_0
## CD14      98    0    0    0
## CD4        2  100    0    0
## CD8        0    0  100    0
## NK         0    0    0  98
## Unkn       0    0    0    2
## 0.995
## 0.9949748743718593

## col_0  CD14
## row_0
## CD14    177
## CD8      3
## NK       4
## Unkn    666
## 0.2164705882352941
## 0.9619565217391305

## col_0      B  Epithelial  Stromal
## row_0
## B          100          0          0
## Epithelial    0        100          0
## Stromal       0          0        100
## 1.0
## 1.0

## col_0      B  Epithelial  Stromal
## row_0
## B          17          0          0

```

```

## Epithelial      0      464      0
## Stromal        967     417    1000
## Unknown         16     119      0
## 0.955
## 0.5169284467713787

## col_0 Astro Oligo
## row_0
## Astro      100      0
## Oligo       0     100
## 1.0
## 1.0

## col_0 Micro
## row_0
## Micro     5168
## Unkno     1859
## 0.7354489824960865
## 1.0

## col_0          Alveolar Epithelial Type 2 ... Pericyte
## row_0          ...
## Alveolar Epithelial Type 2          100 ...      0
## Alveolar Fibroblast                0 ...      0
## Artery                            0 ...      0
## Basophil/Mast 1                    0 ...      0
## CD4+ Memory/Effector T              0 ...      0
## CD8+ Naive T                       0 ...      0
## Capillary                          0 ...      0
## Capillary Aerocyte                  0 ...      0
## Ciliated                           0 ...      0
## Classical Monocyte                  0 ...      0
## Macrophage                          0 ...      0
## Natural Killer                      0 ...      0
## Pericyte                            0 ...     100
## Unknown                            0 ...      0
##
## [14 rows x 13 columns]
## 0.9792307692307692
## 0.9945011783189317

## col_0          Alveolar Epithelial Type 2 ... Pericyte
## row_0          ...
## Alveolar Epithelial Type 2          52 ...      0
## Artery                            0 ...      0
## Ciliated                           0 ...      0
## Pericyte                            0 ...      1
## Unknown                          198 ...     70
##
## [5 rows x 5 columns]
## 0.24904214559386972
## 1.0

```

SingleCellNet

```
## Sample table has been prepared
## Expression data has been normalized
## Finding classification genes
## Done testing
## There are 61 classification genes
## Finding top pairs
## nPairs = 190 for CD4
## nPairs = 190 for CD14
## nPairs = 190 for CD8
## nPairs = 190 for NK
## There are 100 top gene pairs
## Finished pair transforming the data
## Number of missing genes 0
## All Done
## Loaded in the cnProc
## All Done
##
## predict CD14 CD4 CD8 NK
##   CD14   98   0   0   0
##   CD4    1  96   9   0
##   CD8    1   4  91   0
##   NK     0   0   0 100
## [1] 1
## [1] 0.9625

## Sample table has been prepared
## Expression data has been normalized
## Finding classification genes
## Done testing
## There are 61 classification genes
## Finding top pairs
## nPairs = 190 for CD4
## nPairs = 190 for CD14
## nPairs = 190 for CD8
## nPairs = 190 for NK
## There are 100 top gene pairs
## Finished pair transforming the data
## Number of missing genes 0
## All Done
## Loaded in the cnProc
## All Done
##
## predict CD14
##   CD14  836
##   CD4    5
##   CD8    7
##   NK     2
## [1] 1
## [1] 0.9835294

## Sample table has been prepared
## Expression data has been normalized
## Finding classification genes
```

```

## Done testing
## There are 49 classification genes
## Finding top pairs
## nPairs = 190 for Epithelial
## nPairs = 190 for B
## nPairs = 190 for Stromal
## There are 75 top gene pairs
## Finished pair transforming the data
## Number of missing genes 0
## All Done
## Loaded in the cnProc
## All Done
##
## predict      B Epithelial Stromal
## B           100          0      0
## Epithelial   0          100     0
## Stromal      0          0      100
## [1] 1
## [1] 1

## Sample table has been prepared
## Expression data has been normalized
## Finding classification genes
## Done testing
## There are 50 classification genes
## Finding top pairs
## nPairs = 190 for Epithelial
## nPairs = 190 for B
## nPairs = 190 for Stromal
## There are 75 top gene pairs
## Finished pair transforming the data
## Number of missing genes 0
## All Done
## Loaded in the cnProc
## All Done
##
## predict      B Epithelial Stromal
## B           154          83      2
## Epithelial   0          797     0
## rand         2           1      0
## Stromal      844         119    998
## [1] 0.999
## [1] 0.650317

## Sample table has been prepared
## Expression data has been normalized
## Finding classification genes
## Done testing
## There are 45 classification genes
## Finding top pairs
## nPairs = 190 for Astro
## nPairs = 190 for Oligo
## nPairs = 190 for Micro
## There are 75 top gene pairs
## Finished pair transforming the data

```

```

## Number of missing genes 0
## All Done
## Loaded in the cnProc
## All Done
##
## predict Astro Oligo
##   Astro   100    0
##   Oligo    0   100
## [1] 1
## [1] 1

## Sample table has been prepared
## Expression data has been normalized
## Finding classification genes
## Done testing
## There are 45 classification genes
## Finding top pairs
## nPairs = 190 for Astro
## nPairs = 190 for Oligo
## nPairs = 190 for Micro
## There are 75 top gene pairs
## Finished pair transforming the data
## Number of missing genes 0
## All Done
## Loaded in the cnProc
## All Done
##
## predict Micro
##   Micro 7024
##   Oligo  2
##   rand  1
## [1] 0.9998577
## [1] 0.9997153

## Sample table has been prepared
## Expression data has been normalized
## Finding classification genes
## Done testing
## There are 202 classification genes
## Finding top pairs
## nPairs = 190 for Capillary Aerocyte
## nPairs = 190 for Capillary
## nPairs = 190 for Macrophage
## nPairs = 190 for CD8+ Naive T
## nPairs = 190 for CD4+ Memory/Effector T
## nPairs = 190 for Artery
## nPairs = 190 for Pericyte
## nPairs = 190 for Alveolar Epithelial Type 2
## nPairs = 190 for Natural Killer
## nPairs = 190 for Basophil/Mast 1
## nPairs = 190 for Classical Monocyte
## nPairs = 190 for Ciliated
## nPairs = 190 for Alveolar Fibroblast
## There are 320 top gene pairs
## Finished pair transforming the data

```

```

## Number of missing genes 0
## All Done
## Loaded in the cnProc
## All Done
##
## predict
## Alveolar Epithelial Type 2 Alveolar Fibroblast Artery Basophil/Mast 1 C
## Alveolar Epithelial Type 2 99 0 0 0
## Alveolar Fibroblast 0 99 0 0
## Artery 0 0 81 0
## Basophil/Mast 1 1 0 0 100
## Capillary 0 0 19 0
## Capillary Aerocyte 0 0 0 0
## CD4+ Memory/Effector T 0 0 0 0
## CD8+ Naive T 0 0 0 0
## Ciliated 0 0 0 0
## Classical Monocyte 0 0 0 0
## Macrophage 0 0 0 0
## Natural Killer 0 0 0 0
## Pericyte 0 1 0 0
##
## predict
## Capillary Aerocyte CD4+ Memory/Effector T CD8+ Naive T Ciliated Classic
## Alveolar Epithelial Type 2 0 0 0 0
## Alveolar Fibroblast 0 0 0 0
## Artery 0 0 0 0
## Basophil/Mast 1 0 0 0 0
## Capillary 1 0 0 0
## Capillary Aerocyte 99 0 0 0
## CD4+ Memory/Effector T 0 95 9 0
## CD8+ Naive T 0 4 88 0
## Ciliated 0 0 0 100
## Classical Monocyte 0 0 0 0
## Macrophage 0 1 0 0
## Natural Killer 0 0 3 0
## Pericyte 0 0 0 0
##
## predict
## Natural Killer Pericyte
## Alveolar Epithelial Type 2 0 0
## Alveolar Fibroblast 0 0
## Artery 0 0
## Basophil/Mast 1 0 0
## Capillary 0 0
## Capillary Aerocyte 0 0
## CD4+ Memory/Effector T 0 0
## CD8+ Naive T 0 0
## Ciliated 0 0
## Classical Monocyte 0 0
## Macrophage 0 0
## Natural Killer 100 0
## Pericyte 0 100
## [1] 1
## [1] 0.9692308

## Sample table has been prepared
## Expression data has been normalized

```

```

## Finding classification genes
## Done testing
## There are 201 classification genes
## Finding top pairs
## nPairs = 190 for Capillary Aerocyte
## nPairs = 190 for Capillary
## nPairs = 190 for Macrophage
## nPairs = 190 for CD8+ Naive T
## nPairs = 190 for CD4+ Memory/Effector T
## nPairs = 190 for Artery
## nPairs = 190 for Pericyte
## nPairs = 190 for Alveolar Epithelial Type 2
## nPairs = 190 for Natural Killer
## nPairs = 190 for Basophil/Mast 1
## nPairs = 190 for Classical Monocyte
## nPairs = 190 for Ciliated
## nPairs = 190 for Alveolar Fibroblast
## There are 321 top gene pairs
## Finished pair transforming the data
## Number of missing genes 0
## All Done
## Loaded in the cnProc
## All Done
##
## predict
## Alveolar Epithelial Type 2 Artery Ciliated Natural Killer Pericyte
## Alveolar Epithelial Type 2 249 0 27 55 35
## Alveolar Fibroblast 0 0 1 0 1
## Artery 0 5 0 0 0
## Capillary 1 31 6 13 6
## Capillary Aerocyte 0 1 2 2 5
## CD4+ Memory/Effector T 0 0 0 56 1
## CD8+ Naive T 0 0 0 2 0
## Ciliated 0 0 199 1 0
## Classical Monocyte 0 0 1 3 1
## Macrophage 0 2 4 19 4
## Natural Killer 0 0 0 31 1
## Pericyte 0 0 0 1 17
## [1] 1
## [1] 0.6398467

```