Figures Draft

Xinyi Lin

3/26/2021

## Figure A

confusion matrix

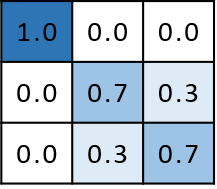
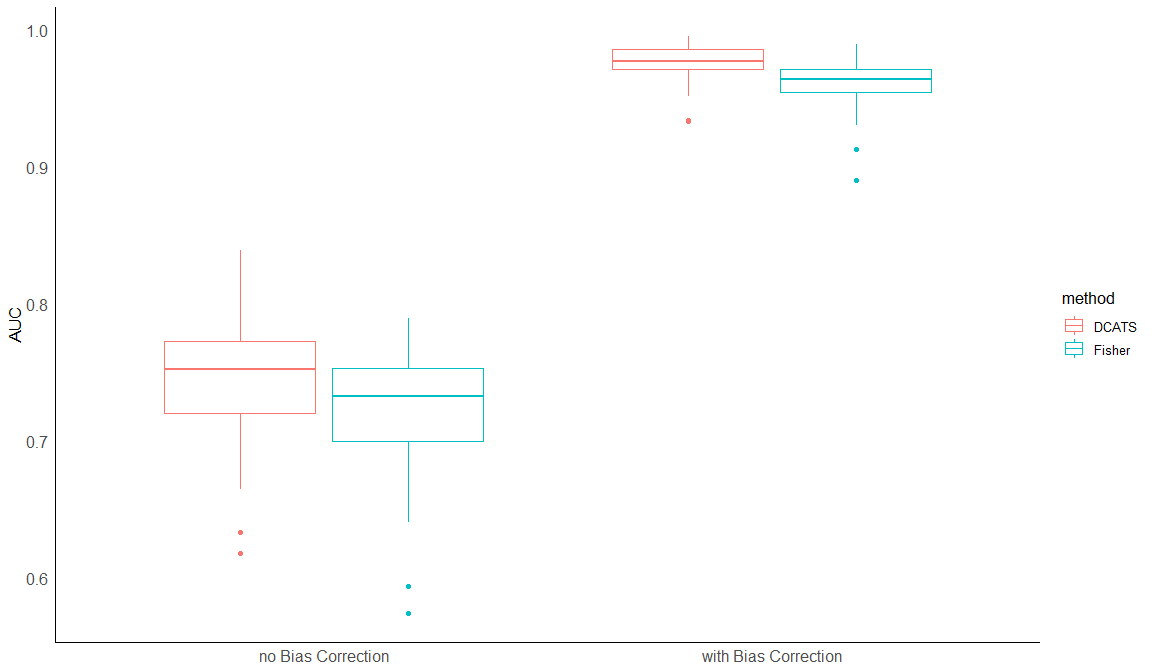


Figure A-1

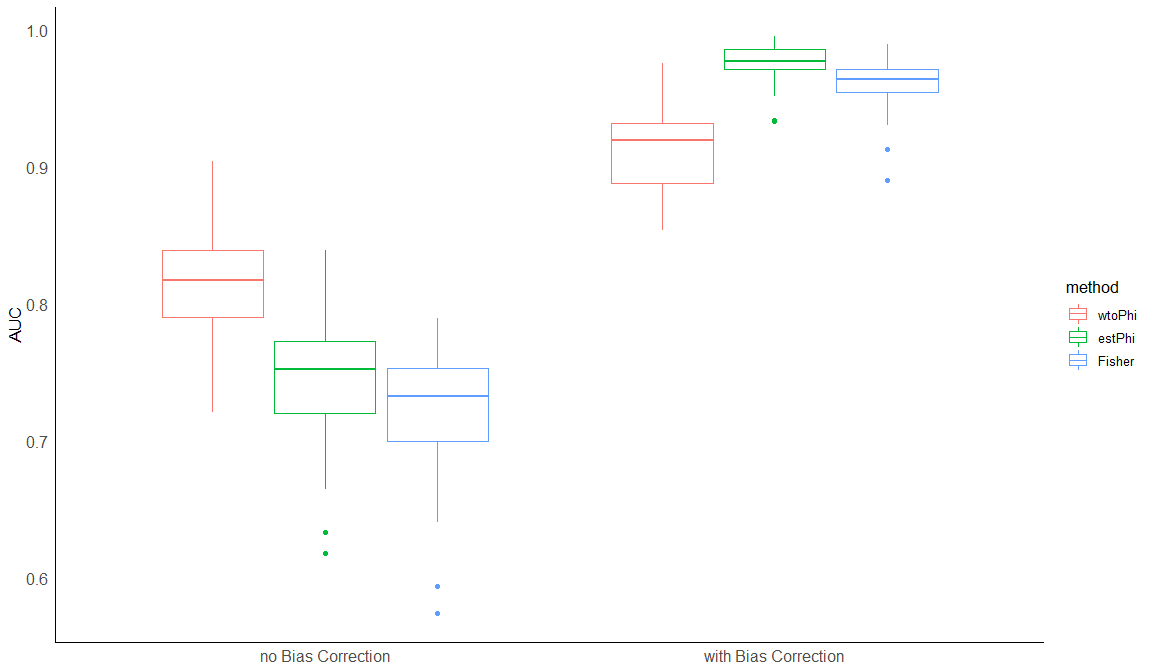
#Figure A-1

## Fig A-2



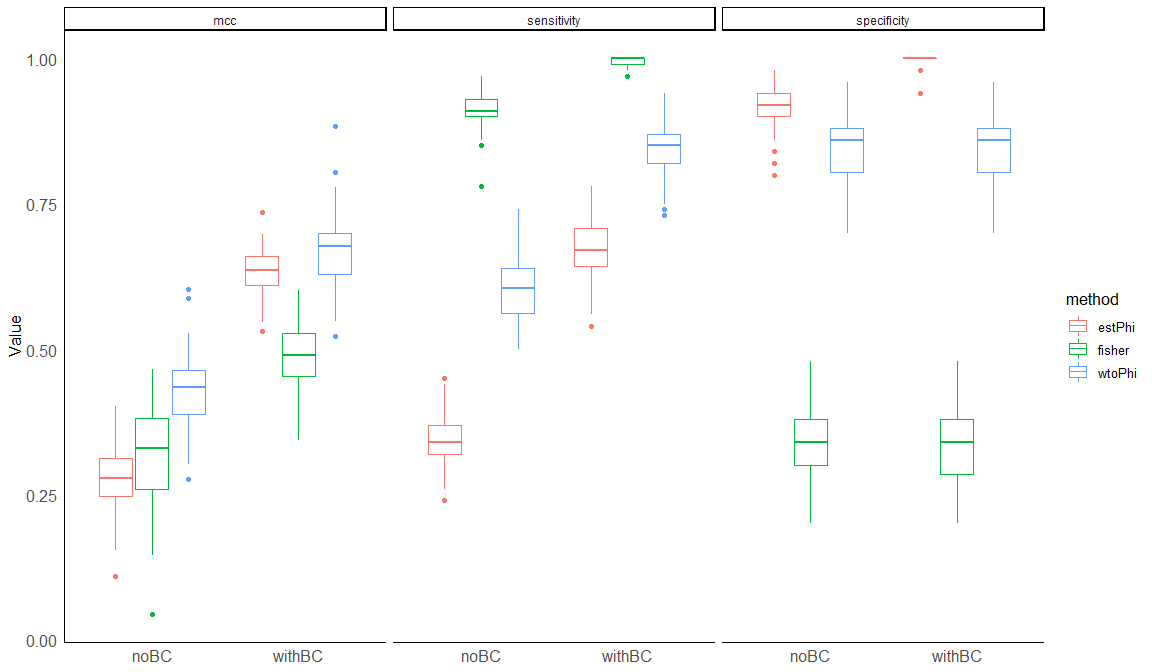
## Saving 12 x 7 in image

Plots -Supplementary1

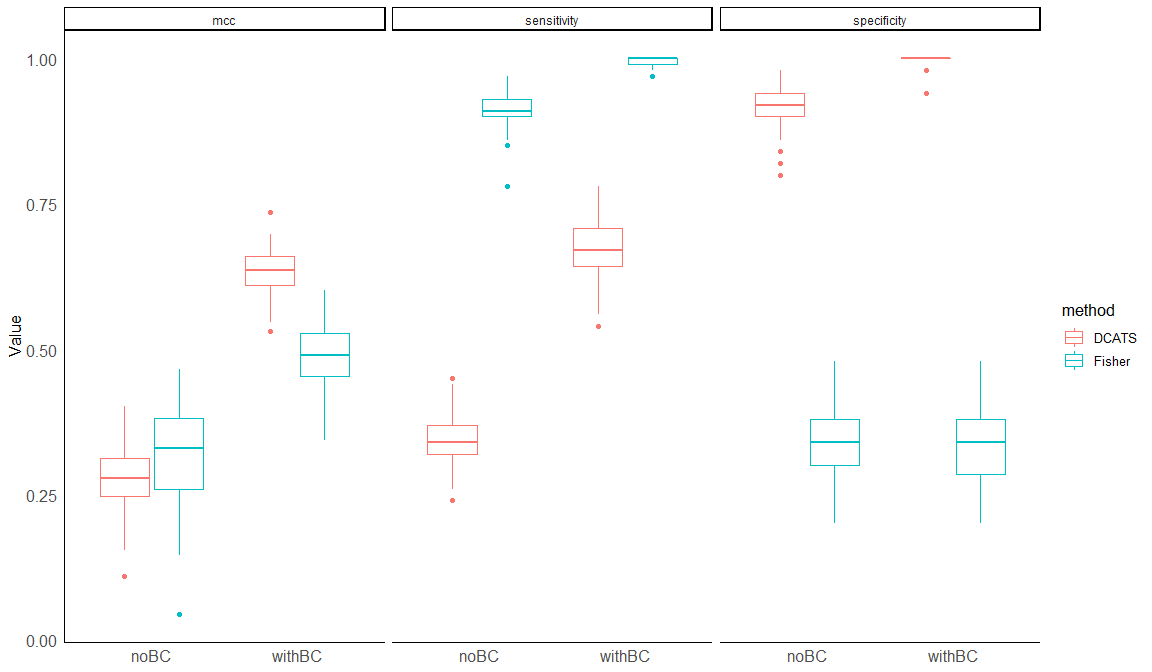


## Saving 12 x 7 in image

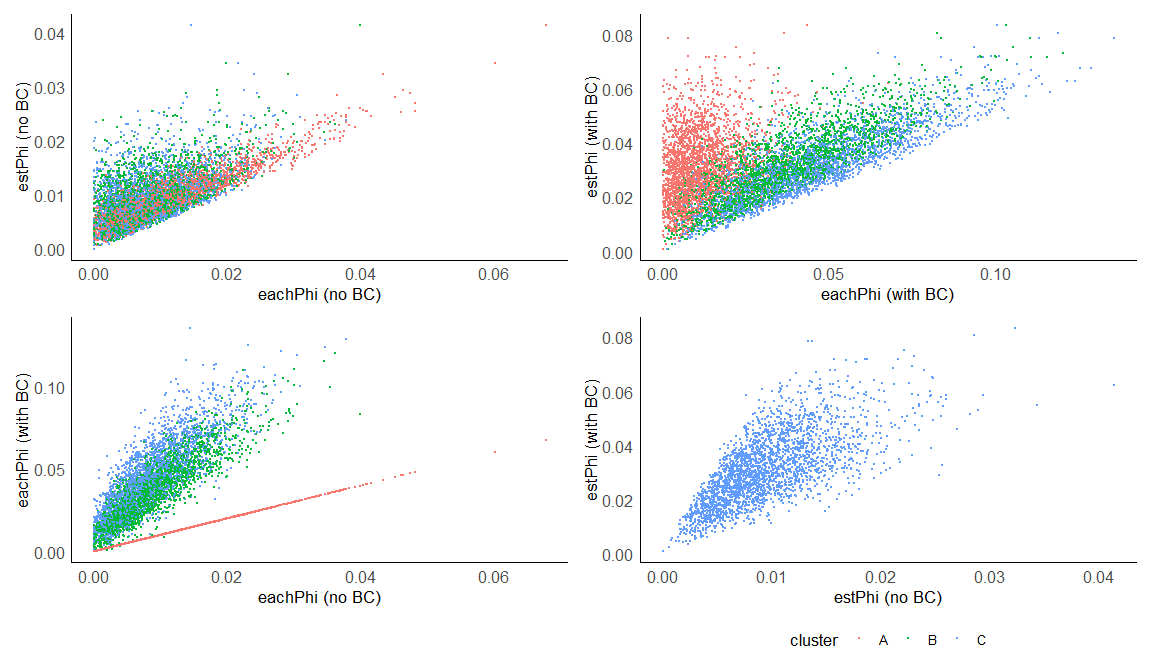
Plots -Supplementary2



## Saving 12 x 7 in image



## Saving 12 x 7 in image



## Figure B

### Different number of replicates

## [1] "D:/Data/DCATS/simulation/replicates2&2\_K8\_con100\_splatter1500&2500para.RData"  
## [2] "D:/Data/DCATS/simulation/replicates3&3\_K8\_con100\_splatter1500&2500para.RData"  
## [3] "D:/Data/DCATS/simulation/replicates4&4\_K8\_con100\_splatter1500&2500para.RData"

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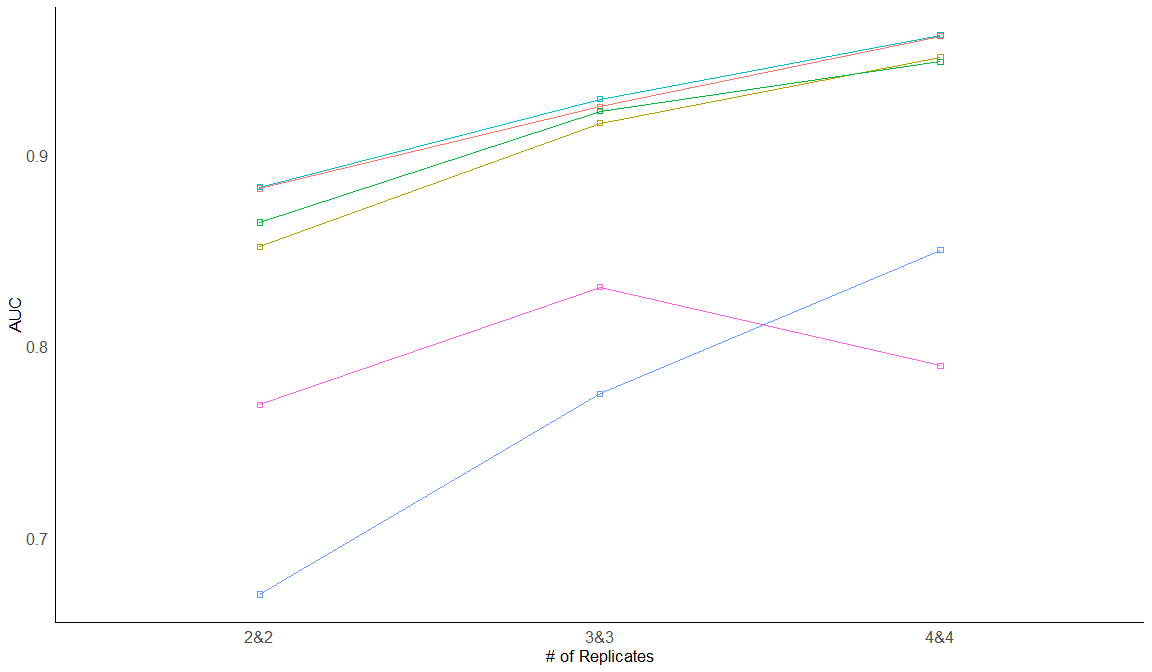
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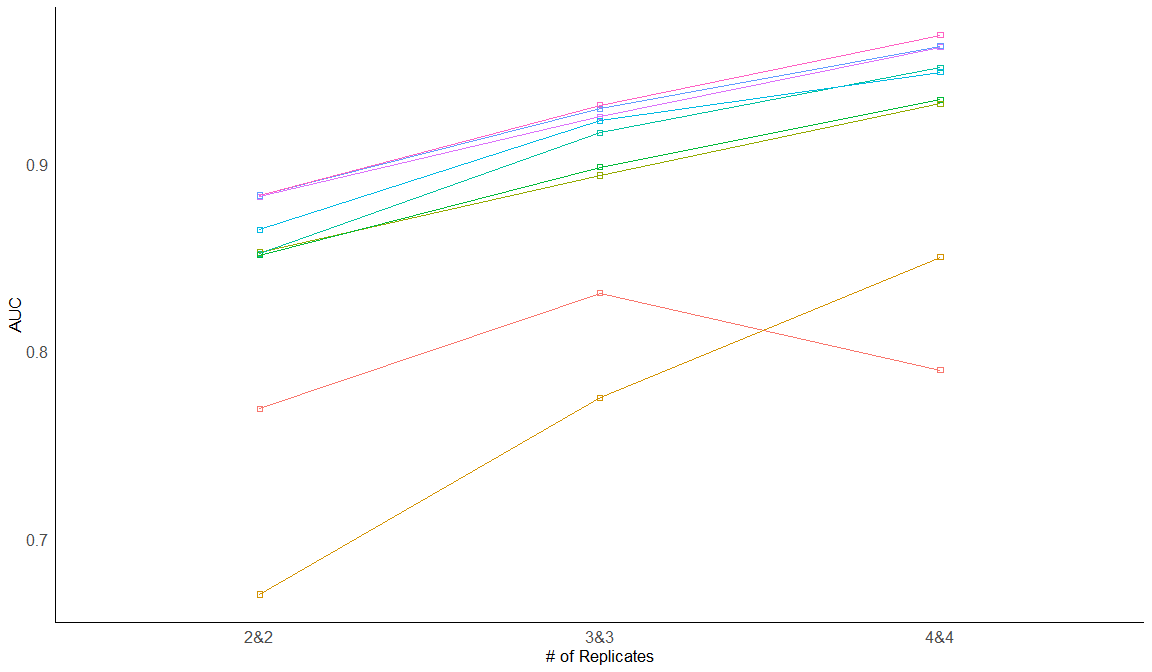
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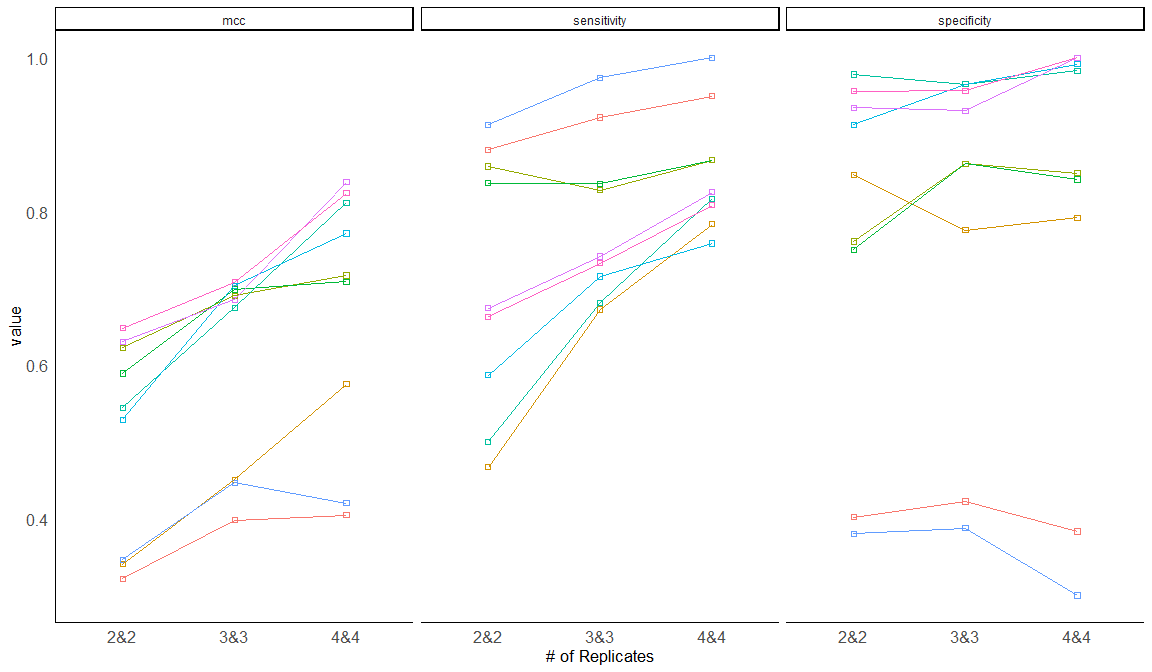
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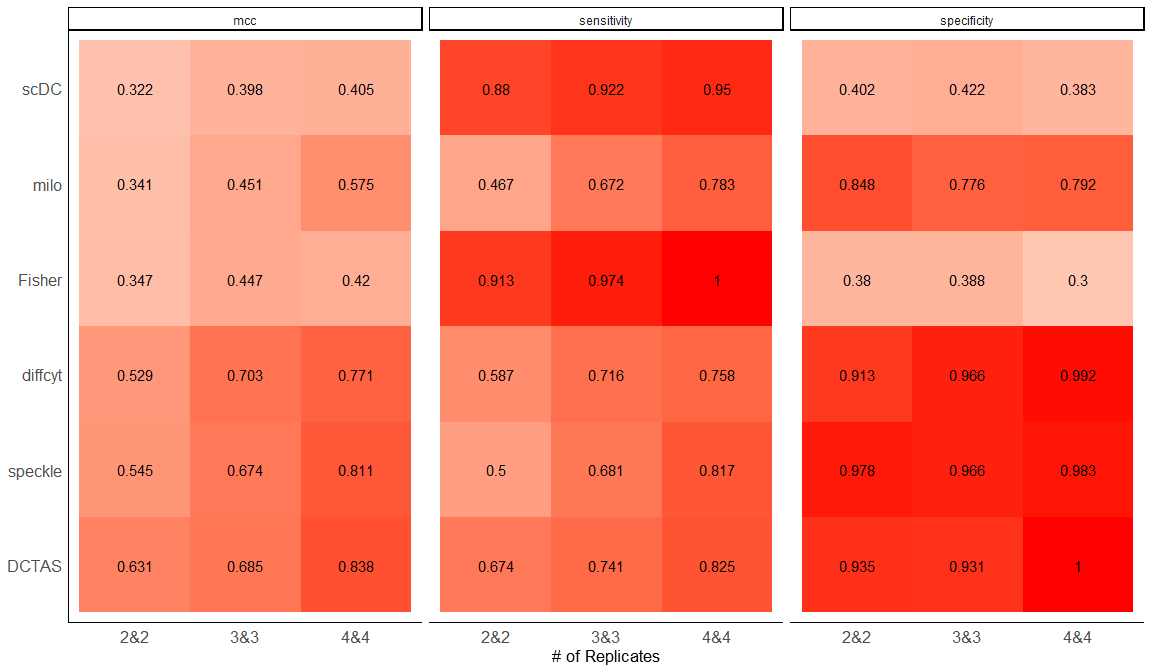
## method mcc auc sensitivity specificity F1 replicates prauc  
## 1 estPhi\_null 0.648 0.8830931 0.663 0.957 0.777 2&2 0.883  
## 2 estPhi\_emK 0.631 0.8824433 0.674 0.935 0.775 2&2 0.882  
## 3 diffcyt 0.529 0.8647212 0.587 0.913 0.701 2&2 0.865  
## 4 speckle 0.545 0.8520203 0.500 0.978 0.657 2&2 0.852  
## 5 wtoPhi\_emK 0.623 0.8526701 0.859 0.761 0.819 2&2 0.853  
## 6 betabin\_null 0.589 0.8511933 0.837 0.750 0.802 2&2 0.851  
## 7 milo 0.341 0.6704868 0.467 0.848 0.577 2&2 0.670  
## 8 scDC 0.322 0.7694943 0.880 0.402 0.711 2&2 0.769  
## 9 fisher 0.347 0.8830931 0.913 0.380 0.721 2&2 0.883  
## 10 estPhi\_null 0.708 0.9311460 0.733 0.957 0.825 3&3 0.931  
## 11 estPhi\_emK 0.685 0.9250520 0.741 0.931 0.819 3&3 0.925  
## 12 diffcyt 0.703 0.9228968 0.716 0.966 0.818 3&3 0.923  
## 13 speckle 0.674 0.9165056 0.681 0.966 0.794 3&3 0.917  
## 14 betabin\_null 0.699 0.8981867 0.836 0.862 0.847 3&3 0.898  
## 15 wtoPhi\_emK 0.690 0.8936905 0.828 0.862 0.842 3&3 0.894  
## 16 milo 0.451 0.7753419 0.672 0.776 0.709 3&3 0.775  
## 17 scDC 0.398 0.8310419 0.922 0.422 0.738 3&3 0.831  
## 18 fisher 0.447 0.9291394 0.974 0.388 0.753 3&3 0.929  
## 19 estPhi\_null 0.824 0.9684028 0.808 1.000 0.894 4&4 0.968  
## 20 estPhi\_emK 0.838 0.9620486 0.825 1.000 0.904 4&4 0.962  
## 21 speckle 0.811 0.9511111 0.817 0.983 0.891 4&4 0.951  
## 22 diffcyt 0.771 0.9486806 0.758 0.992 0.858 4&4 0.949  
## 23 betabin\_null 0.709 0.9340972 0.867 0.842 0.856 4&4 0.934  
## 24 wtoPhi\_emK 0.717 0.9318056 0.867 0.850 0.860 4&4 0.932  
## 25 milo 0.575 0.8501736 0.783 0.792 0.787 4&4 0.850  
## 26 scDC 0.405 0.7898958 0.950 0.383 0.740 4&4 0.790  
## 27 fisher 0.420 0.9625000 1.000 0.300 0.741 4&4 0.962

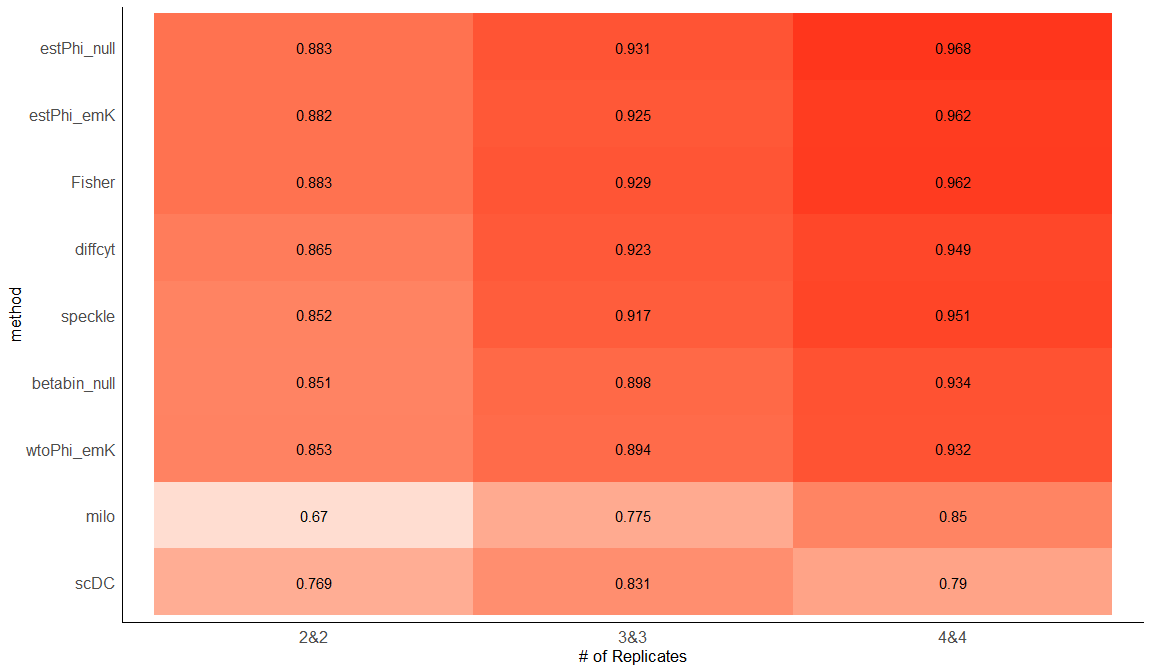






Try to use heatmap

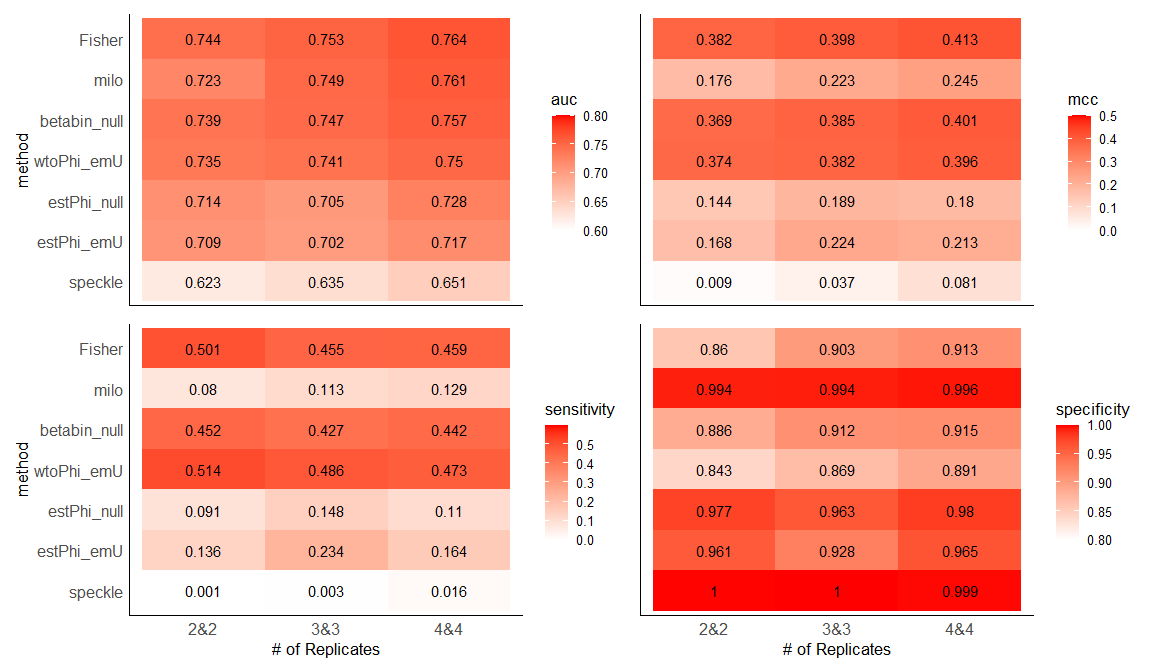




| method | mcc | auc | prauc | sensitivity | specificity | precision | F1 | replicates |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| estPhi\_null | 0.648 | 0.883 | 0.9103840 | 0.663 | 0.957 | 0.9384615 | 0.777 | 2&2 |
| Fisher | 0.347 | 0.883 | 0.6928368 | 0.913 | 0.380 | 0.5957447 | 0.721 | 2&2 |
| estPhi\_emK | 0.631 | 0.882 | 0.9066021 | 0.674 | 0.935 | 0.9117647 | 0.775 | 2&2 |
| diffcyt | 0.529 | 0.865 | 0.8849743 | 0.587 | 0.913 | 0.8709677 | 0.701 | 2&2 |
| wtoPhi\_emK | 0.623 | 0.853 | 0.8618927 | 0.859 | 0.761 | 0.7821782 | 0.819 | 2&2 |
| speckle | 0.545 | 0.852 | 0.8649009 | 0.500 | 0.978 | 0.9583333 | 0.657 | 2&2 |
| betabin\_null | 0.589 | 0.851 | 0.8606524 | 0.837 | 0.750 | 0.7700000 | 0.802 | 2&2 |
| scDC | 0.322 | 0.769 | 0.7048056 | 0.880 | 0.402 | 0.5955882 | 0.711 | 2&2 |
| milo | 0.341 | 0.670 | 0.7555560 | 0.467 | 0.848 | 0.7543860 | 0.577 | 2&2 |
| estPhi\_null | 0.708 | 0.931 | 0.9482853 | 0.733 | 0.957 | 0.9444444 | 0.825 | 3&3 |
| Fisher | 0.447 | 0.929 | 0.7328031 | 0.974 | 0.388 | 0.6141304 | 0.753 | 3&3 |
| estPhi\_emK | 0.685 | 0.925 | 0.9409087 | 0.741 | 0.931 | 0.9148936 | 0.819 | 3&3 |
| diffcyt | 0.703 | 0.923 | 0.9308791 | 0.716 | 0.966 | 0.9540230 | 0.818 | 3&3 |
| speckle | 0.674 | 0.917 | 0.9283935 | 0.681 | 0.966 | 0.9518072 | 0.794 | 3&3 |
| betabin\_null | 0.699 | 0.898 | 0.8939726 | 0.836 | 0.862 | 0.8584071 | 0.847 | 3&3 |
| wtoPhi\_emK | 0.690 | 0.894 | 0.8891503 | 0.828 | 0.862 | 0.8571429 | 0.842 | 3&3 |
| scDC | 0.398 | 0.831 | 0.7648546 | 0.922 | 0.422 | 0.6149425 | 0.738 | 3&3 |
| milo | 0.451 | 0.775 | 0.8322813 | 0.672 | 0.776 | 0.7500000 | 0.709 | 3&3 |
| estPhi\_null | 0.824 | 0.968 | 0.9757400 | 0.808 | 1.000 | 1.0000000 | 0.894 | 4&4 |
| estPhi\_emK | 0.838 | 0.962 | 0.9723782 | 0.825 | 1.000 | 1.0000000 | 0.904 | 4&4 |
| Fisher | 0.420 | 0.962 | 0.6499875 | 1.000 | 0.300 | 0.5882353 | 0.741 | 4&4 |
| speckle | 0.811 | 0.951 | 0.9627830 | 0.817 | 0.983 | 0.9800000 | 0.891 | 4&4 |
| diffcyt | 0.771 | 0.949 | 0.9620828 | 0.758 | 0.992 | 0.9891304 | 0.858 | 4&4 |
| betabin\_null | 0.709 | 0.934 | 0.9417460 | 0.867 | 0.842 | 0.8455285 | 0.856 | 4&4 |
| wtoPhi\_emK | 0.717 | 0.932 | 0.9417193 | 0.867 | 0.850 | 0.8524590 | 0.860 | 4&4 |
| milo | 0.575 | 0.850 | 0.9027443 | 0.783 | 0.792 | 0.7899160 | 0.787 | 4&4 |
| scDC | 0.405 | 0.790 | 0.7231946 | 0.950 | 0.383 | 0.6063830 | 0.740 | 4&4 |

#### nhoods level

## method mcc auc sensitivity specificity F1 replicates prauc  
## 1 fisher 0.382 0.7437816 0.501 0.860 0.617 2&2 0.744  
## 2 betabin\_null 0.369 0.7393733 0.452 0.886 0.582 2&2 0.739  
## 3 wtoPhi\_emU 0.374 0.7352411 0.514 0.843 0.622 2&2 0.735  
## 4 milo 0.176 0.7226327 0.080 0.994 0.147 2&2 0.723  
## 5 estPhi\_null 0.144 0.7137376 0.091 0.977 0.164 2&2 0.714  
## 6 estPhi\_emU 0.168 0.7094104 0.136 0.961 0.233 2&2 0.709  
## 7 speckle 0.009 0.6225402 0.001 1.000 0.002 2&2 0.623  
## 8 fisher 0.398 0.7533036 0.455 0.903 0.589 3&3 0.753  
## 9 milo 0.223 0.7491384 0.113 0.994 0.202 3&3 0.749  
## 10 betabin\_null 0.385 0.7468319 0.427 0.912 0.566 3&3 0.747  
## 11 wtoPhi\_emU 0.382 0.7406314 0.486 0.869 0.604 3&3 0.741  
## 12 estPhi\_null 0.189 0.7045183 0.148 0.963 0.250 3&3 0.705  
## 13 estPhi\_emU 0.224 0.7024078 0.234 0.928 0.360 3&3 0.702  
## 14 speckle 0.037 0.6347988 0.003 1.000 0.006 3&3 0.635  
## 15 fisher 0.413 0.7643348 0.459 0.913 0.597 4&4 0.764  
## 16 milo 0.245 0.7609666 0.129 0.996 0.227 4&4 0.761  
## 17 betabin\_null 0.401 0.7565755 0.442 0.915 0.582 4&4 0.757  
## 18 wtoPhi\_emU 0.396 0.7496565 0.473 0.891 0.602 4&4 0.750  
## 19 estPhi\_null 0.180 0.7276915 0.110 0.980 0.195 4&4 0.728  
## 20 estPhi\_emU 0.213 0.7172674 0.164 0.965 0.274 4&4 0.717  
## 21 speckle 0.081 0.6513827 0.016 0.999 0.032 4&4 0.651



### Different number of cell types

## [1] "D:/Data/DCATS/simulation/replicates3&3\_K10\_con100\_splatter1500&2500para.RData"  
## [2] "D:/Data/DCATS/simulation/replicates3&3\_K12\_con100\_splatter1500&2500para.RData"  
## [3] "D:/Data/DCATS/simulation/replicates3&3\_K8\_con100\_splatter1500&2500para.RData"

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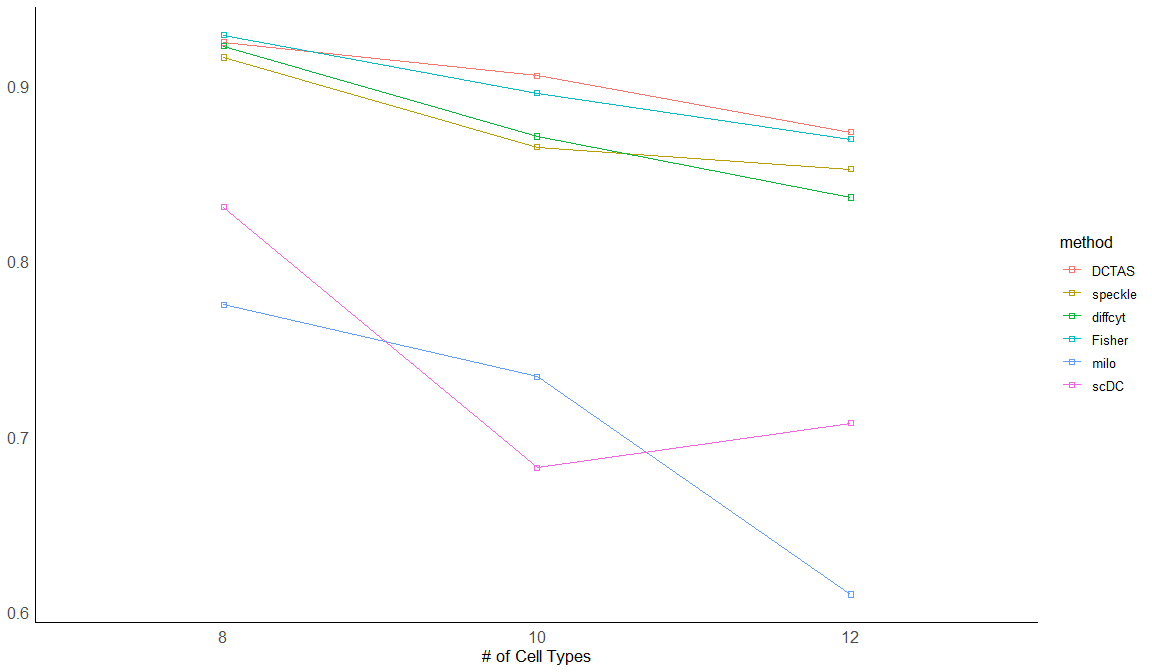
## Warning in if (!is.na(oper[[idx]])) {: the condition has length > 1 and only the  
## first element will be used

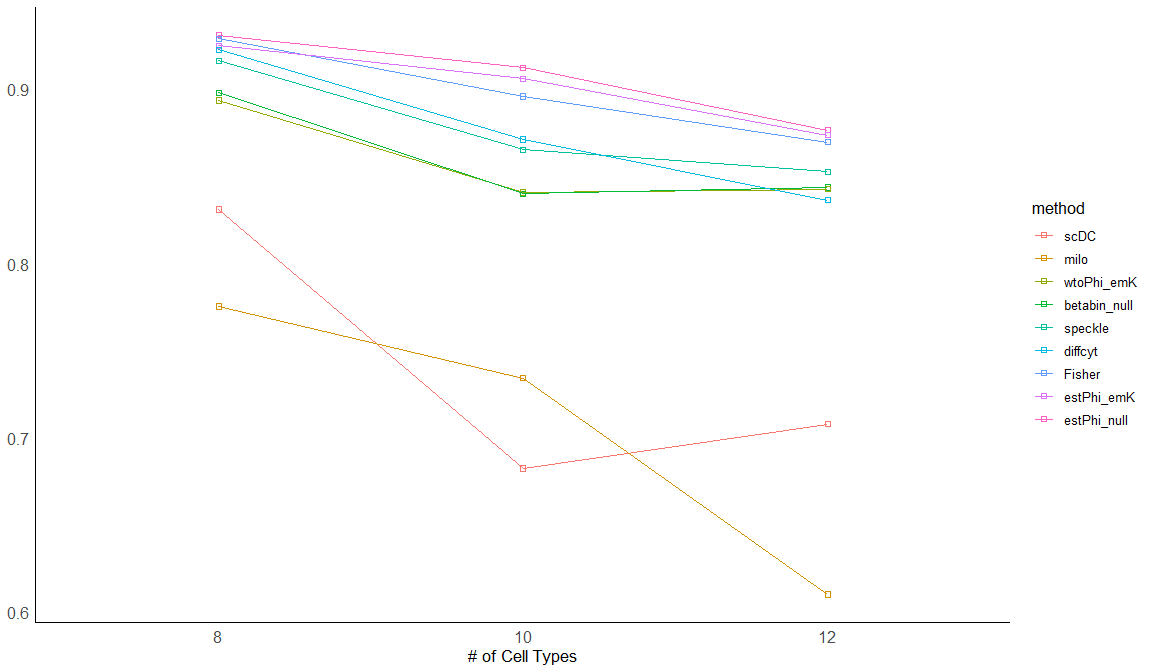
## Warning in if (!is.na(oper[[idx]])) {: the condition has length > 1 and only the  
## first element will be used

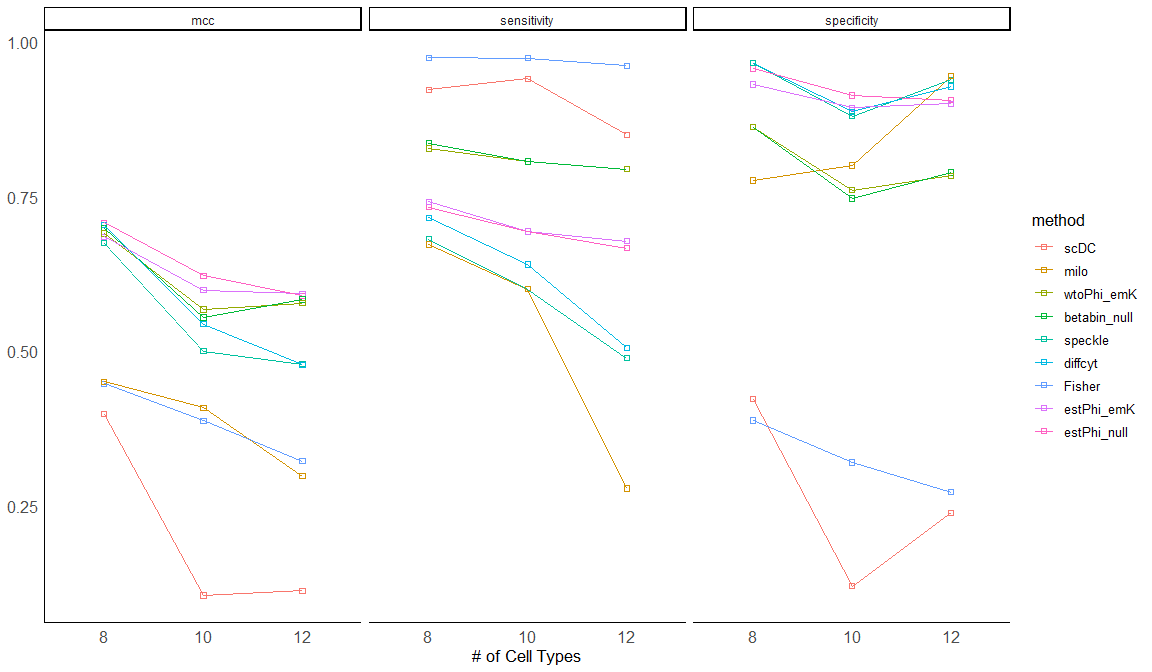
## Warning in if (!is.na(oper[[idx]])) {: the condition has length > 1 and only the  
## first element will be used

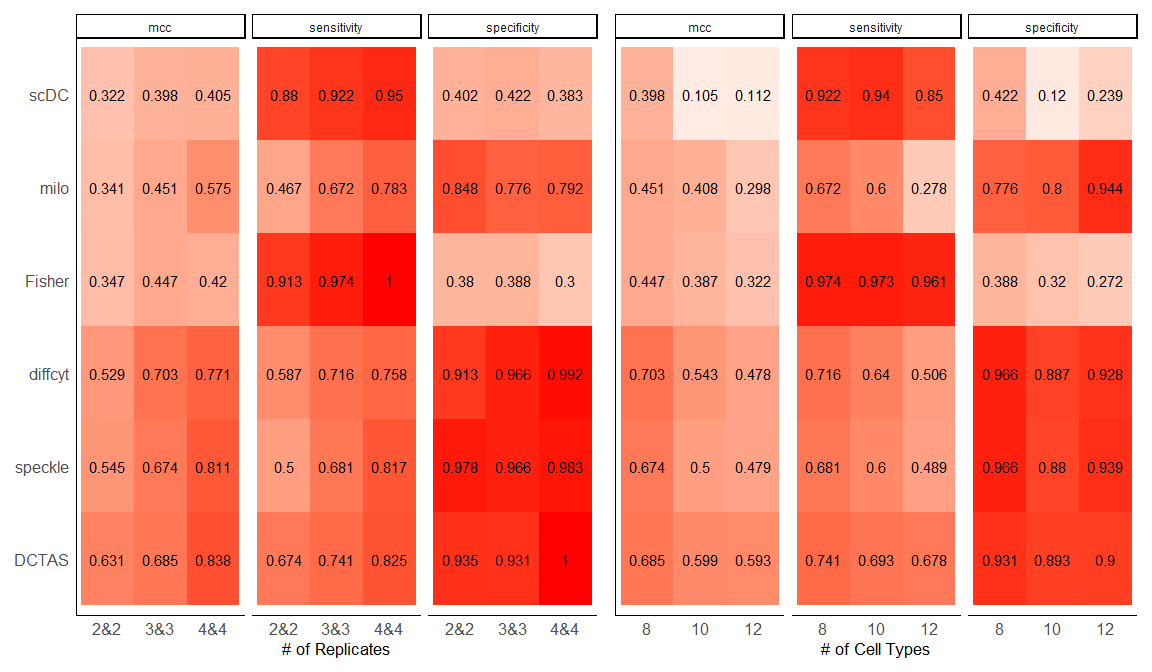
## Warning in if (!is.na(oper[[idx]])) {: the condition has length > 1 and only the  
## first element will be used

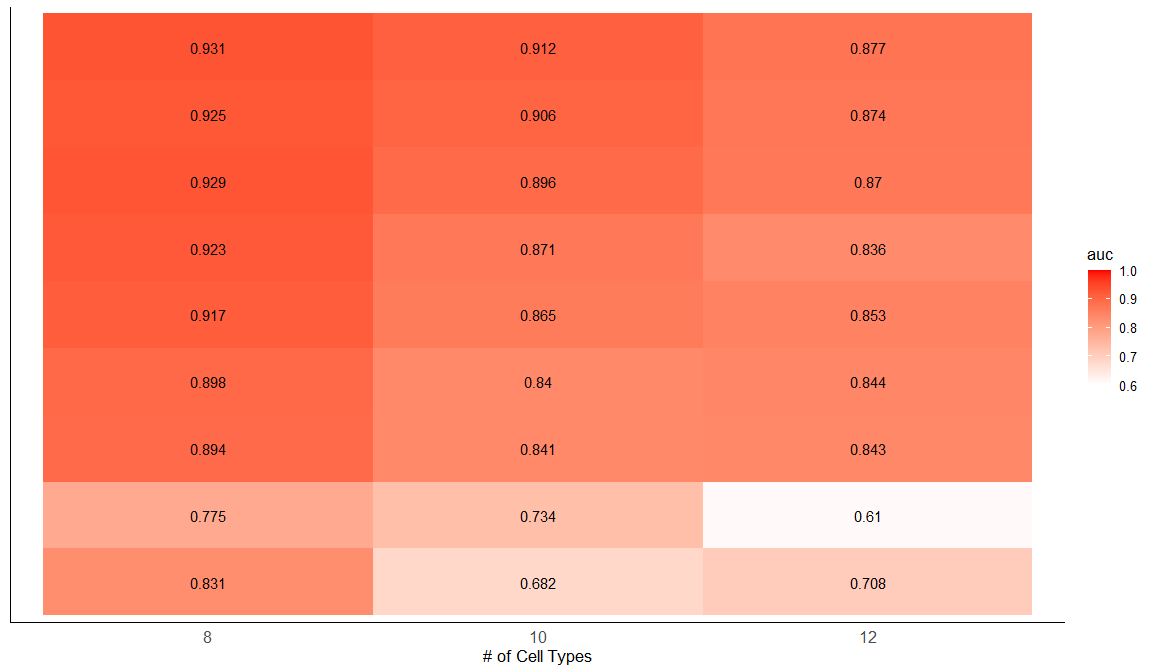
## method mcc auc sensitivity specificity F1 clustersN prauc  
## 1 estPhi\_null 0.708 0.9311460 0.733 0.957 0.825 8 0.931  
## 2 fisher 0.447 0.9291394 0.974 0.388 0.753 8 0.929  
## 3 estPhi\_emK 0.685 0.9250520 0.741 0.931 0.819 8 0.925  
## 4 diffcyt 0.703 0.9228968 0.716 0.966 0.818 8 0.923  
## 5 speckle 0.674 0.9165056 0.681 0.966 0.794 8 0.917  
## 6 betabin\_null 0.699 0.8981867 0.836 0.862 0.847 8 0.898  
## 7 wtoPhi\_emK 0.690 0.8936905 0.828 0.862 0.842 8 0.894  
## 8 scDC 0.398 0.8310419 0.922 0.422 0.738 8 0.831  
## 9 milo 0.451 0.7753419 0.672 0.776 0.709 8 0.775  
## 10 estPhi\_null 0.622 0.9124889 0.693 0.913 0.779 10 0.912  
## 11 estPhi\_emK 0.599 0.9060889 0.693 0.893 0.770 10 0.906  
## 12 fisher 0.387 0.8960000 0.973 0.320 0.734 10 0.896  
## 13 diffcyt 0.543 0.8713111 0.640 0.887 0.730 10 0.871  
## 14 speckle 0.500 0.8653111 0.600 0.880 0.698 10 0.865  
## 15 wtoPhi\_emK 0.567 0.8408667 0.807 0.760 0.788 10 0.841  
## 16 betabin\_null 0.554 0.8399778 0.807 0.747 0.783 10 0.840  
## 17 milo 0.408 0.7341778 0.600 0.800 0.667 10 0.734  
## 18 scDC 0.105 0.6822889 0.940 0.120 0.667 10 0.682  
## 19 estPhi\_null 0.589 0.8765895 0.667 0.906 0.757 12 0.877  
## 20 estPhi\_emK 0.593 0.8737654 0.678 0.900 0.762 12 0.874  
## 21 fisher 0.322 0.8697068 0.961 0.272 0.715 12 0.870  
## 22 speckle 0.479 0.8526698 0.489 0.939 0.631 12 0.853  
## 23 betabin\_null 0.583 0.8437346 0.794 0.789 0.792 12 0.844  
## 24 wtoPhi\_emK 0.578 0.8428086 0.794 0.783 0.790 12 0.843  
## 25 diffcyt 0.478 0.8364815 0.506 0.928 0.641 12 0.836  
## 26 scDC 0.112 0.7076698 0.850 0.239 0.651 12 0.708  
## 27 milo 0.298 0.6098920 0.278 0.944 0.417 12 0.610







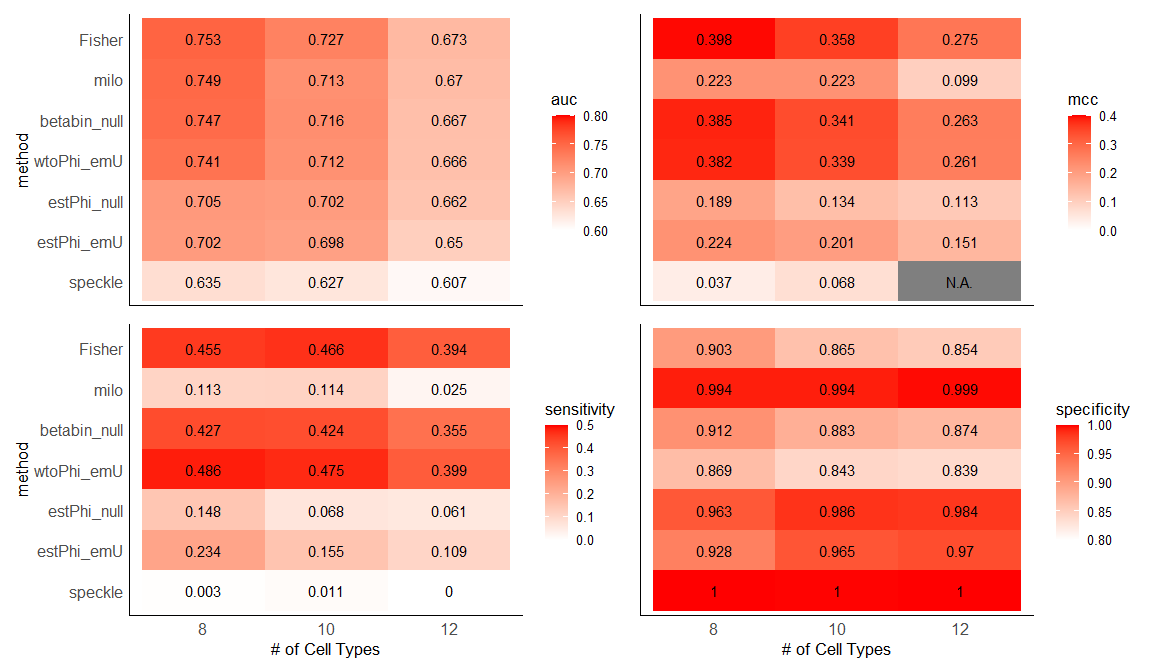


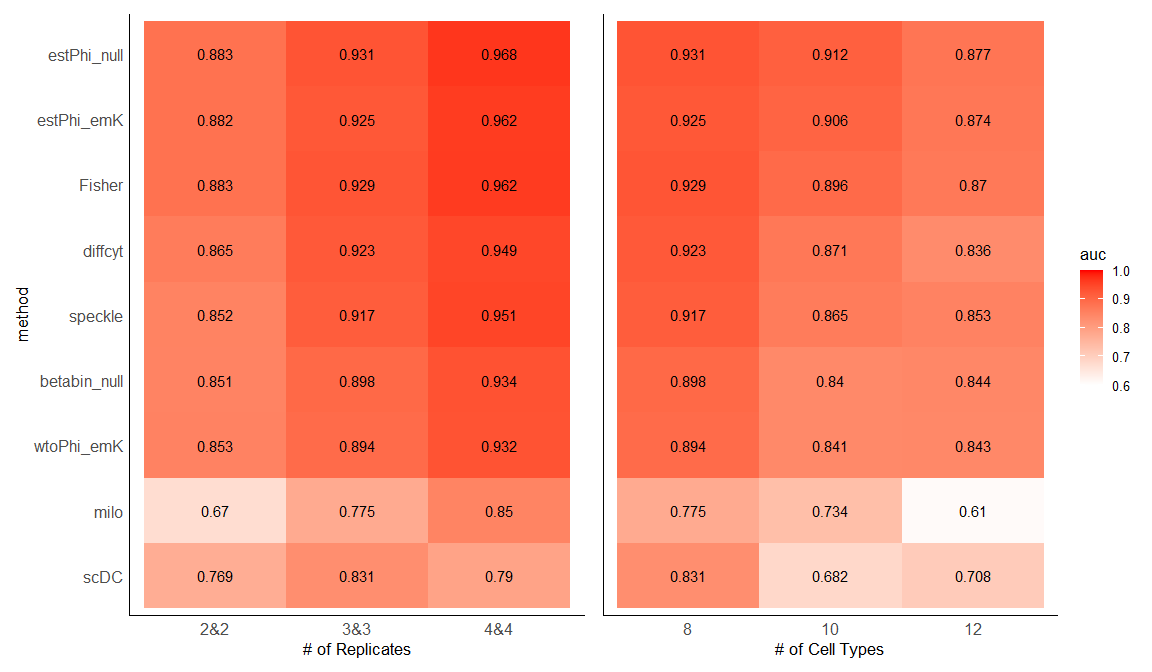
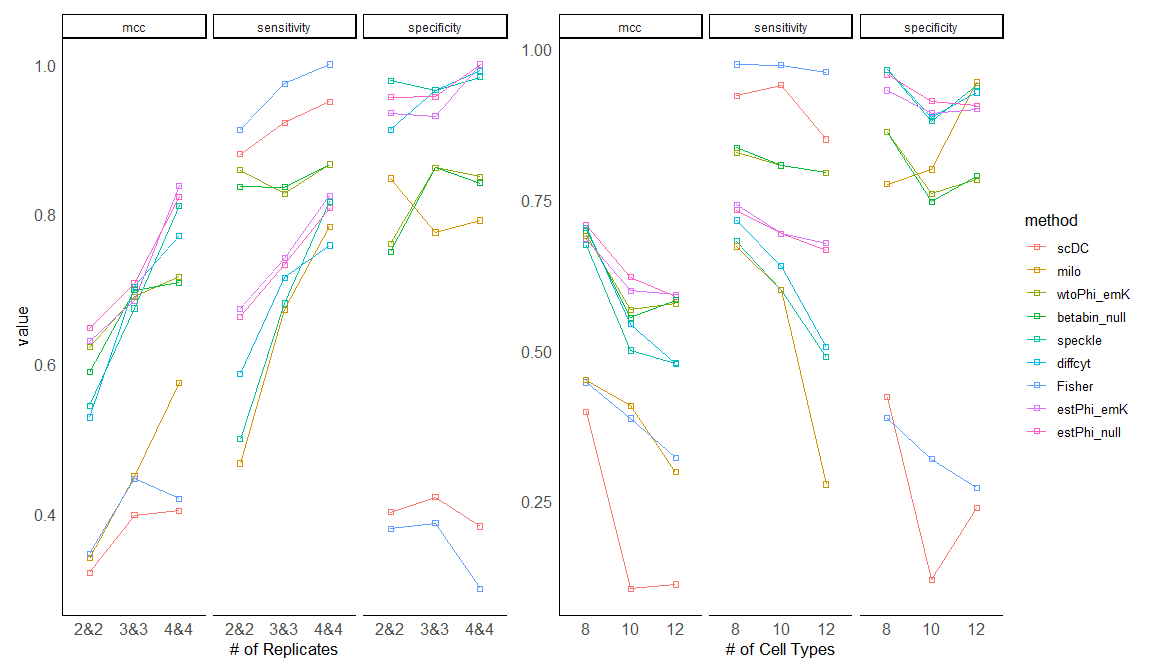
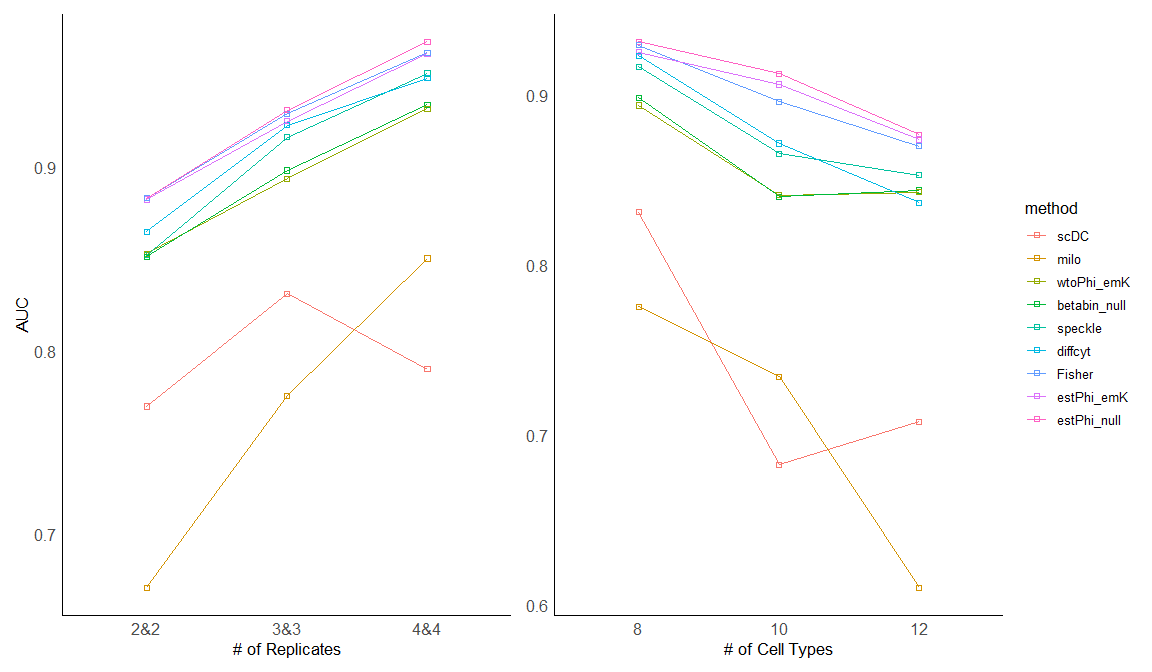
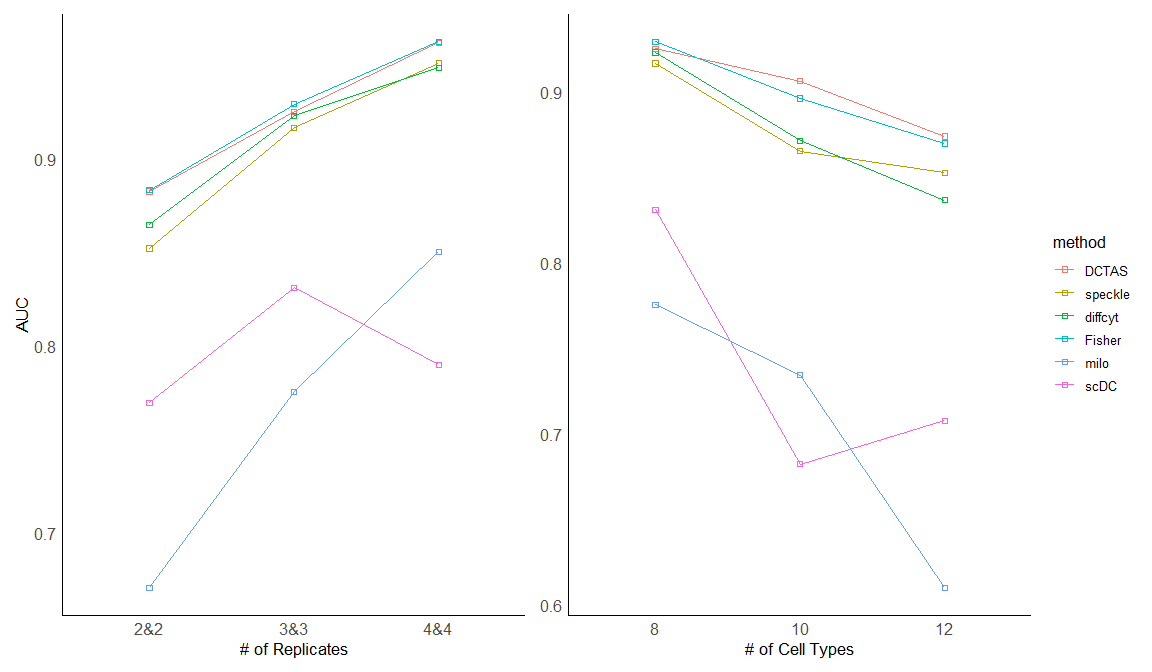


| method | mcc | auc | prauc | sensitivity | specificity | precision | F1 | clustersN |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| estPhi\_null | 0.708 | 0.931 | 0.9482853 | 0.733 | 0.957 | 0.9444444 | 0.825 | 8 |
| Fisher | 0.447 | 0.929 | 0.7328031 | 0.974 | 0.388 | 0.6141304 | 0.753 | 8 |
| estPhi\_emK | 0.685 | 0.925 | 0.9409087 | 0.741 | 0.931 | 0.9148936 | 0.819 | 8 |
| diffcyt | 0.703 | 0.923 | 0.9308791 | 0.716 | 0.966 | 0.9540230 | 0.818 | 8 |
| speckle | 0.674 | 0.917 | 0.9283935 | 0.681 | 0.966 | 0.9518072 | 0.794 | 8 |
| betabin\_null | 0.699 | 0.898 | 0.8939726 | 0.836 | 0.862 | 0.8584071 | 0.847 | 8 |
| wtoPhi\_emK | 0.690 | 0.894 | 0.8891503 | 0.828 | 0.862 | 0.8571429 | 0.842 | 8 |
| scDC | 0.398 | 0.831 | 0.7648546 | 0.922 | 0.422 | 0.6149425 | 0.738 | 8 |
| milo | 0.451 | 0.775 | 0.8322813 | 0.672 | 0.776 | 0.7500000 | 0.709 | 8 |
| estPhi\_null | 0.622 | 0.912 | 0.9266196 | 0.693 | 0.913 | 0.8888889 | 0.779 | 10 |
| estPhi\_emK | 0.599 | 0.906 | 0.9194181 | 0.693 | 0.893 | 0.8666667 | 0.770 | 10 |
| Fisher | 0.387 | 0.896 | 0.6848734 | 0.973 | 0.320 | 0.5887097 | 0.734 | 10 |
| diffcyt | 0.543 | 0.871 | 0.8856439 | 0.640 | 0.887 | 0.8495575 | 0.730 | 10 |
| speckle | 0.500 | 0.865 | 0.8803203 | 0.600 | 0.880 | 0.8333333 | 0.698 | 10 |
| wtoPhi\_emK | 0.567 | 0.841 | 0.8312144 | 0.807 | 0.760 | 0.7707006 | 0.788 | 10 |
| betabin\_null | 0.554 | 0.840 | 0.8309162 | 0.807 | 0.747 | 0.7610063 | 0.783 | 10 |
| milo | 0.408 | 0.734 | 0.8015053 | 0.600 | 0.800 | 0.7500000 | 0.667 | 10 |
| scDC | 0.105 | 0.682 | 0.7616581 | 0.940 | 0.120 | 0.5164835 | 0.667 | 10 |
| estPhi\_null | 0.589 | 0.877 | 0.8877028 | 0.667 | 0.906 | 0.8759124 | 0.757 | 12 |
| estPhi\_emK | 0.593 | 0.874 | 0.8840172 | 0.678 | 0.900 | 0.8714286 | 0.762 | 12 |
| Fisher | 0.322 | 0.870 | 0.6746495 | 0.961 | 0.272 | 0.5690789 | 0.715 | 12 |
| speckle | 0.479 | 0.853 | 0.8726657 | 0.489 | 0.939 | 0.8888889 | 0.631 | 12 |
| betabin\_null | 0.583 | 0.844 | 0.8260441 | 0.794 | 0.789 | 0.7900552 | 0.792 | 12 |
| wtoPhi\_emK | 0.578 | 0.843 | 0.8242507 | 0.794 | 0.783 | 0.7857143 | 0.790 | 12 |
| diffcyt | 0.478 | 0.836 | 0.8470051 | 0.506 | 0.928 | 0.8750000 | 0.641 | 12 |
| scDC | 0.112 | 0.708 | 0.5982251 | 0.850 | 0.239 | 0.5275862 | 0.651 | 12 |
| milo | 0.298 | 0.610 | 0.7308845 | 0.278 | 0.944 | 0.8333333 | 0.417 | 12 |

#### nhoods level

## method mcc auc sensitivity specificity F1 clustersN prauc  
## 1 fisher 0.358 0.7268268 0.466 0.865 0.587 10 0.727  
## 2 milo 0.223 0.7133592 0.114 0.994 0.204 10 0.713  
## 3 betabin\_null 0.341 0.7155346 0.424 0.883 0.554 10 0.716  
## 4 estPhi\_null 0.134 0.7017728 0.068 0.986 0.126 10 0.702  
## 5 speckle 0.068 0.6265743 0.011 1.000 0.021 10 0.627  
## 6 milo 0.099 0.6698016 0.025 0.999 0.049 12 0.670  
## 7 fisher 0.275 0.6732405 0.394 0.854 0.520 12 0.673  
## 8 betabin\_null 0.263 0.6669149 0.355 0.874 0.487 12 0.667  
## 9 estPhi\_null 0.113 0.6620511 0.061 0.984 0.114 12 0.662  
## 10 speckle NaN 0.6071733 0.000 1.000 0.000 12 0.607  
## 11 fisher 0.398 0.7533036 0.455 0.903 0.589 8 0.753  
## 12 milo 0.223 0.7491384 0.113 0.994 0.202 8 0.749  
## 13 betabin\_null 0.385 0.7468319 0.427 0.912 0.566 8 0.747  
## 14 estPhi\_null 0.189 0.7045183 0.148 0.963 0.250 8 0.705  
## 15 speckle 0.037 0.6347988 0.003 1.000 0.006 8 0.635



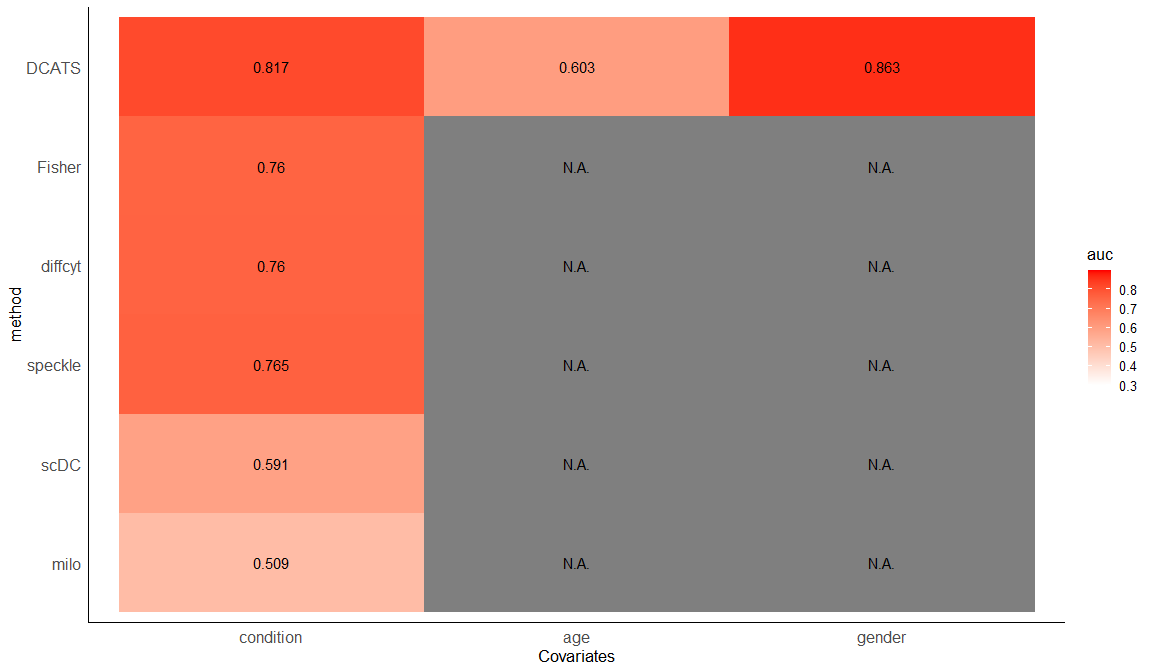


## Saving 12 x 7 in image

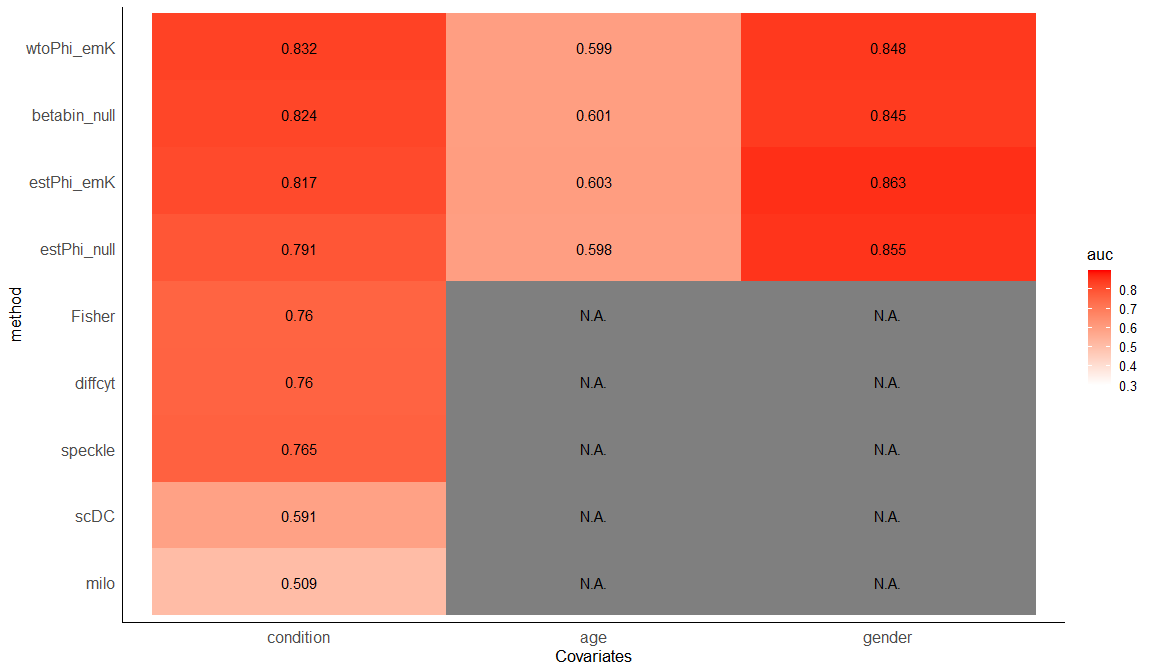
## Figure b2

## Warning in if (!is.na(oper[[idx]])) {: the condition has length > 1 and only the  
## first element will be used  
  
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## first element will be used

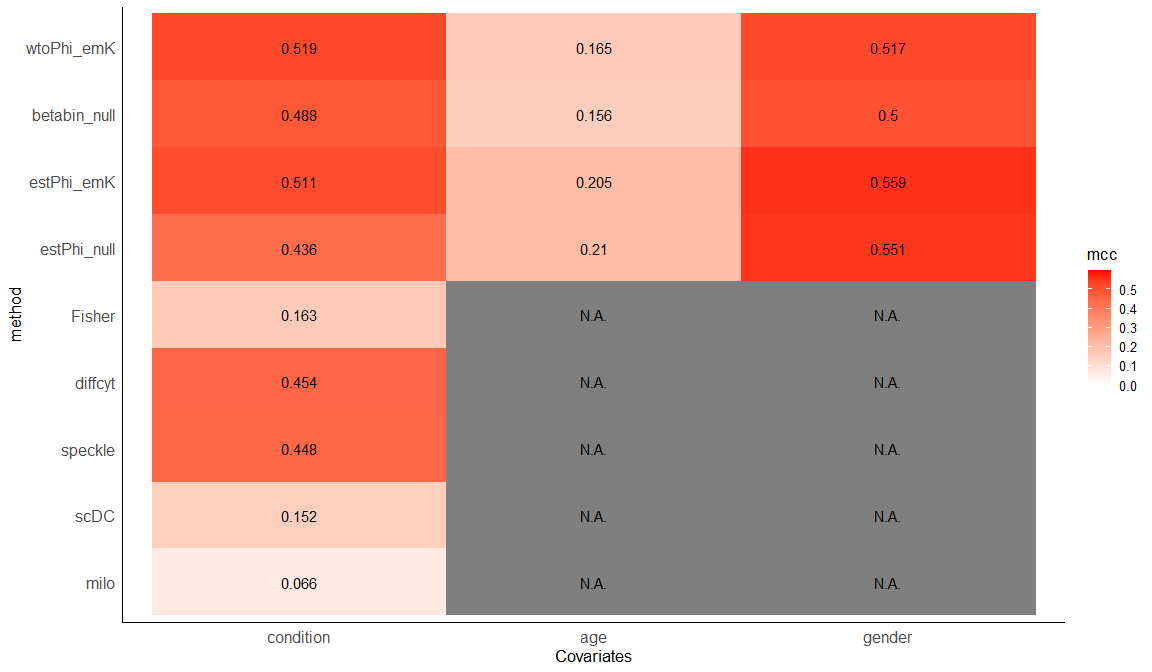
## method mcc auc prauc sensitivity specificity  
## 1 estPhi\_emK 0.51050817 0.8165502 0.8419367 0.55172414 0.9224138  
## 2 wtoPhi\_emK 0.51892326 0.8320452 0.8408372 0.65517241 0.8534483  
## 3 wtoPhi\_emSVM 0.50320460 0.8265458 0.8384214 0.63793103 0.8534483  
## 4 estPhi\_emSVM 0.50311529 0.8084869 0.8370024 0.54310345 0.9224138  
## 5 betabin\_null 0.48752812 0.8241305 0.8350238 0.62068966 0.8534483  
## 6 wtoPhi\_emU 0.49536190 0.8237961 0.8336510 0.62931034 0.8534483  
## 7 estPhi\_emU 0.50493500 0.7943297 0.8192986 0.59482759 0.8879310  
## 8 estPhi\_null 0.43611285 0.7910226 0.8148534 0.46551724 0.9224138  
## 9 wtoPhi\_emT 0.46406380 0.8004608 0.8104003 0.59482759 0.8534483  
## 10 speckle 0.44777366 0.7649376 0.8028349 0.35344828 0.9913793  
## 11 diffcyt 0.45409307 0.7600327 0.8019207 0.39655172 0.9741379  
## 12 estPhi\_emT 0.39626708 0.7646775 0.7555120 0.50862069 0.8620690  
## 13 milo 0.06622662 0.5087322 0.6336207 0.02586207 0.9913793  
## 14 fisher 0.16305547 0.7596240 0.5819575 0.89655172 0.2241379  
## 15 scDC 0.15151080 0.5905916 0.4460766 0.77586207 0.3620690  
## 16 estPhi\_emU 0.17591980 0.6096537 0.6483777 0.25862069 0.8793103  
## 17 wtoPhi\_emT 0.16319735 0.6015904 0.6407866 0.30172414 0.8362069  
## 18 estPhi\_emSVM 0.19500598 0.6044144 0.6399630 0.21551724 0.9224138  
## 19 estPhi\_emK 0.20473014 0.6028166 0.6384089 0.22413793 0.9224138  
## 20 estPhi\_null 0.20978064 0.5983948 0.6381711 0.21551724 0.9310345  
## 21 wtoPhi\_emU 0.15612300 0.6040428 0.6331490 0.28448276 0.8448276  
## 22 wtoPhi\_emK 0.16537965 0.5990265 0.6321348 0.29310345 0.8448276  
## 23 wtoPhi\_emSVM 0.14675988 0.6018133 0.6306124 0.27586207 0.8448276  
## 24 betabin\_null 0.15612300 0.6006243 0.6296939 0.28448276 0.8448276  
## 25 estPhi\_emT 0.20149815 0.5714551 0.6115173 0.25862069 0.8965517  
## 26 estPhi\_emK 0.55903517 0.8631466 0.8859377 0.62068966 0.9137931  
## 27 estPhi\_emSVM 0.56651103 0.8634810 0.8845681 0.62931034 0.9137931  
## 28 estPhi\_emU 0.56011203 0.8611400 0.8831924 0.68965517 0.8620690  
## 29 estPhi\_null 0.55103877 0.8553805 0.8752108 0.58620690 0.9310345  
## 30 wtoPhi\_emK 0.51716595 0.8478002 0.8612641 0.66379310 0.8448276  
## 31 wtoPhi\_emU 0.49963490 0.8449391 0.8584946 0.65517241 0.8362069  
## 32 wtoPhi\_emSVM 0.51558380 0.8462768 0.8579211 0.67241379 0.8362069  
## 33 betabin\_null 0.49963490 0.8446418 0.8577380 0.65517241 0.8362069  
## 34 estPhi\_emT 0.57115544 0.8428954 0.8560983 0.64655172 0.9051724  
## 35 wtoPhi\_emT 0.47412220 0.8311905 0.8499814 0.63793103 0.8275862  
## precision F1 factor  
## 1 0.8767123 0.6772487 condition  
## 2 0.8172043 0.7272727 condition  
## 3 0.8131868 0.7149758 condition  
## 4 0.8750000 0.6702128 condition  
## 5 0.8089888 0.7024390 condition  
## 6 0.8111111 0.7087379 condition  
## 7 0.8414634 0.6969697 condition  
## 8 0.8571429 0.6033520 condition  
## 9 0.8023256 0.6831683 condition  
## 10 0.9761905 0.5189873 condition  
## 11 0.9387755 0.5575758 condition  
## 12 0.7866667 0.6178010 condition  
## 13 0.7500000 0.0500000 condition  
## 14 0.5360825 0.6709677 condition  
## 15 0.5487805 0.6428571 condition  
## 16 0.6818182 0.3750000 age  
## 17 0.6481481 0.4117647 age  
## 18 0.7352941 0.3333333 age  
## 19 0.7428571 0.3443709 age  
## 20 0.7575758 0.3355705 age  
## 21 0.6470588 0.3952096 age  
## 22 0.6538462 0.4047619 age  
## 23 0.6400000 0.3855422 age  
## 24 0.6470588 0.3952096 age  
## 25 0.7142857 0.3797468 age  
## 26 0.8780488 0.7272727 gender  
## 27 0.8795181 0.7336683 gender  
## 28 0.8333333 0.7547170 gender  
## 29 0.8947368 0.7083333 gender  
## 30 0.8105263 0.7298578 gender  
## 31 0.8000000 0.7203791 gender  
## 32 0.8041237 0.7323944 gender  
## 33 0.8000000 0.7203791 gender  
## 34 0.8720930 0.7425743 gender  
## 35 0.7872340 0.7047619 gender



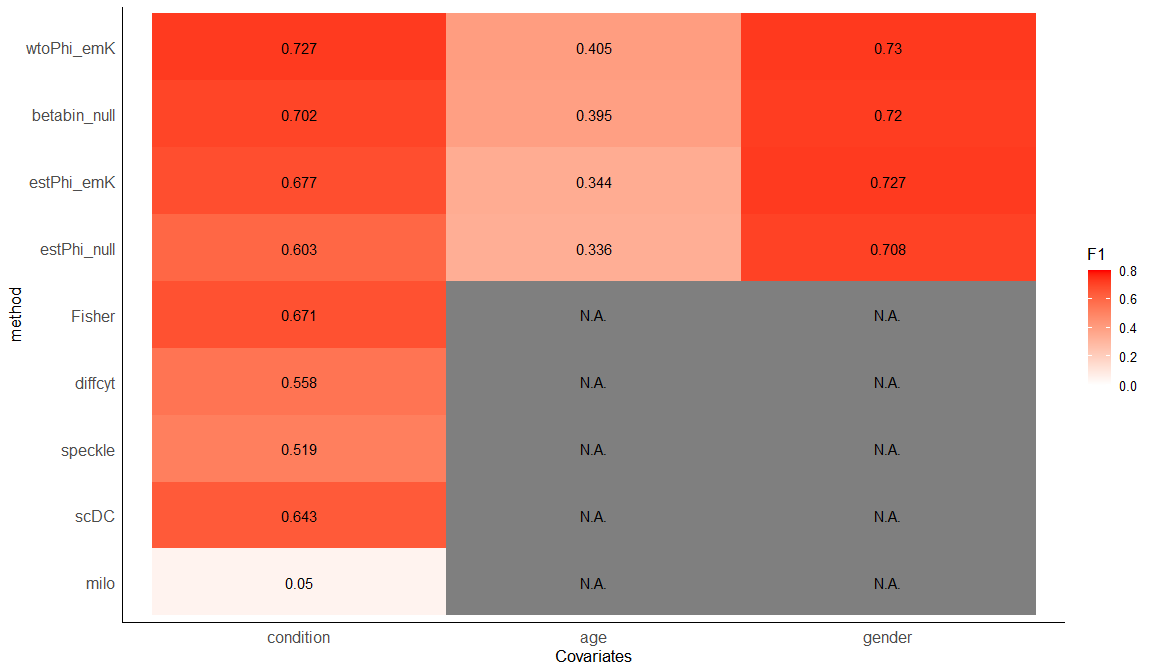
## Saving 12 x 7 in image



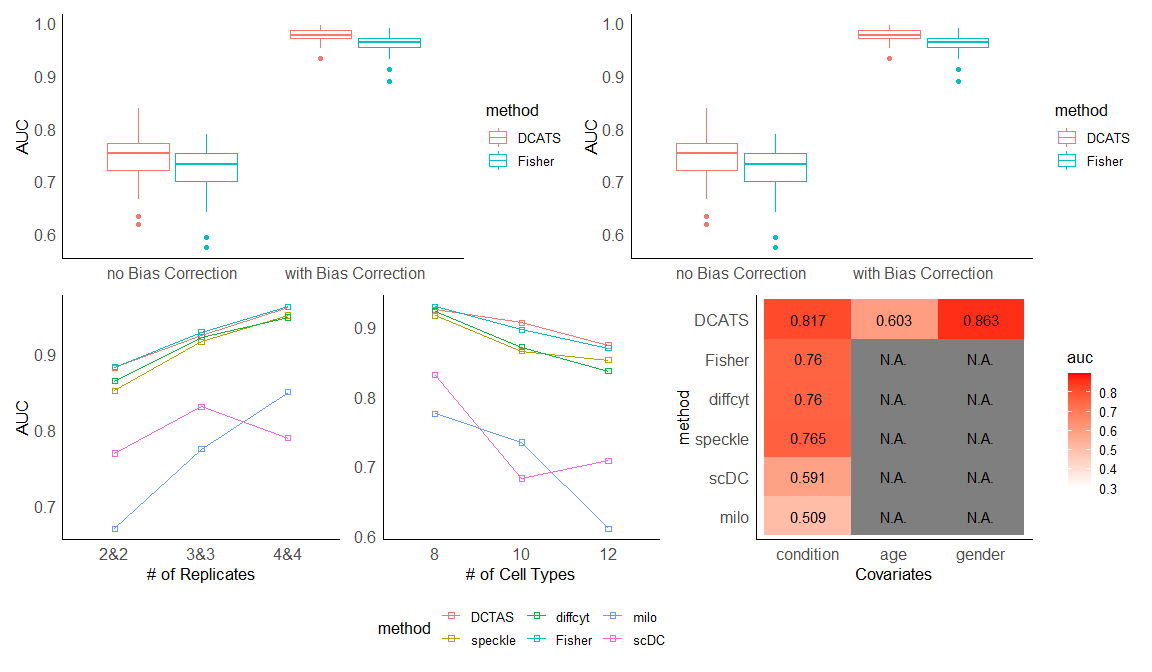
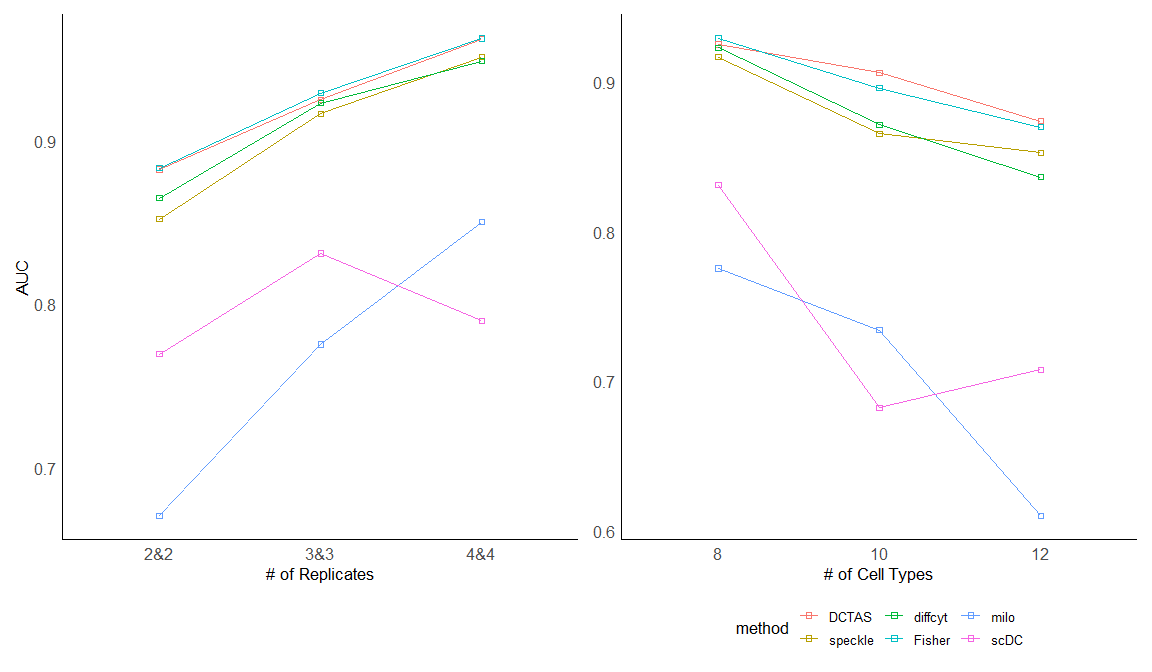
## Saving 12 x 7 in image



## Saving 12 x 7 in image



## Saving 12 x 7 in image



## method mcc auc prauc sensitivity specificity precision  
## 1 wtoPhi\_emK 0.1653796 0.5990265 0.6321348 0.2931034 0.8448276 0.6538462  
## 2 betabin\_null 0.1561230 0.6006243 0.6296939 0.2844828 0.8448276 0.6470588  
## 3 estPhi\_emK 0.2047301 0.6028166 0.6384089 0.2241379 0.9224138 0.7428571  
## 4 estPhi\_null 0.2097806 0.5983948 0.6381711 0.2155172 0.9310345 0.7575758  
## 5 wtoPhi\_emK 0.5189233 0.8320452 0.8408372 0.6551724 0.8534483 0.8172043  
## 6 betabin\_null 0.4875281 0.8241305 0.8350238 0.6206897 0.8534483 0.8089888  
## 7 estPhi\_emK 0.5105082 0.8165502 0.8419367 0.5517241 0.9224138 0.8767123  
## 8 fisher 0.1630555 0.7596240 0.5819575 0.8965517 0.2241379 0.5360825  
## 9 scDC 0.1515108 0.5905916 0.4460766 0.7758621 0.3620690 0.5487805  
## 10 estPhi\_null 0.4361129 0.7910226 0.8148534 0.4655172 0.9224138 0.8571429  
## 11 diffcyt 0.4540931 0.7600327 0.8019207 0.3965517 0.9741379 0.9387755  
## 12 speckle 0.4477737 0.7649376 0.8028349 0.3534483 0.9913793 0.9761905  
## 13 wtoPhi\_emK 0.5171660 0.8478002 0.8612641 0.6637931 0.8448276 0.8105263  
## 14 estPhi\_emK 0.5590352 0.8631466 0.8859377 0.6206897 0.9137931 0.8780488  
## 15 betabin\_null 0.4996349 0.8446418 0.8577380 0.6551724 0.8362069 0.8000000  
## 16 estPhi\_null 0.5510388 0.8553805 0.8752108 0.5862069 0.9310345 0.8947368  
## F1 factor  
## 1 0.4047619 age  
## 2 0.3952096 age  
## 3 0.3443709 age  
## 4 0.3355705 age  
## 5 0.7272727 condition  
## 6 0.7024390 condition  
## 7 0.6772487 condition  
## 8 0.6709677 condition  
## 9 0.6428571 condition  
## 10 0.6033520 condition  
## 11 0.5575758 condition  
## 12 0.5189873 condition  
## 13 0.7298578 gender  
## 14 0.7272727 gender  
## 15 0.7203791 gender  
## 16 0.7083333 gender

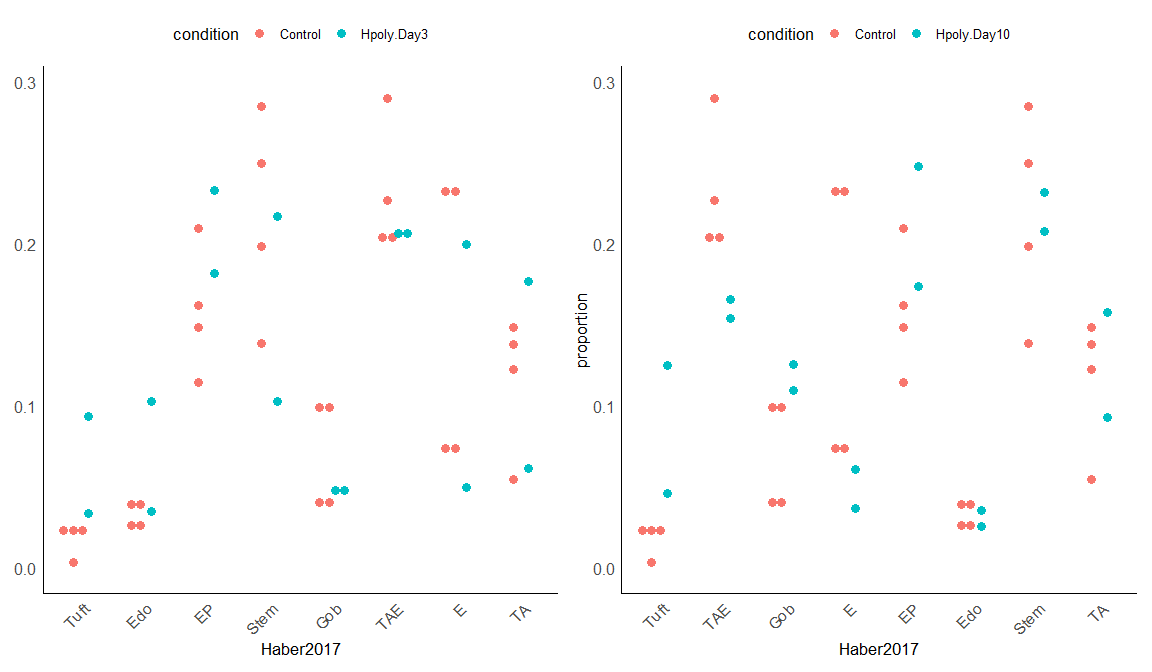
## real-world data 1 - Experiment 7

The ‘group’ column started with ‘B’ is the indicators of replicates

## `summarise()` has grouped output by 'batch', 'condition'. You can override using the `.groups` argument.

## `summarise()` has grouped output by 'condition'. You can override using the `.groups` argument.

## Bin width defaults to 1/30 of the range of the data. Pick better value with `binwidth`.  
## Bin width defaults to 1/30 of the range of the data. Pick better value with `binwidth`.



## Bin width defaults to 1/30 of the range of the data. Pick better value with `binwidth`.  
## Bin width defaults to 1/30 of the range of the data. Pick better value with `binwidth`.

| cluster | truth | betabin\_null | wtoPhi\_emSVM | estPhi\_null | estPhi\_emSVM | fisher | scDC | speckle | milo\_pct | treatment |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Endocrine | N | 0.130 | 0.130 | 0.288 | 0.273 | 0.000 | 0.360 | 0.714 | 0.000 | Hpoly.Day3 |
| Enterocyte | N | 0.641 | 0.641 | 0.448 | 0.410 | 0.000 | 0.002 | 0.748 | 0.071 | Hpoly.Day3 |
| Enterocyte.Progenitor | N | 0.103 | 0.103 | 0.315 | 0.278 | 0.000 | 0.341 | 0.714 | 0.067 | Hpoly.Day3 |
| Goblet | N | 0.437 | 0.437 | 0.589 | 0.571 | 0.002 | 0.003 | 0.748 | 0.000 | Hpoly.Day3 |
| Stem | N | 0.254 | 0.254 | 0.222 | 0.164 | 0.032 | 0.010 | 0.714 | 0.000 | Hpoly.Day3 |
| TA | N | 0.883 | 0.883 | 0.883 | 0.975 | 0.205 | 0.099 | 0.993 | 0.000 | Hpoly.Day3 |
| TA.Early | N | 0.288 | 0.288 | 0.640 | 0.612 | 0.002 | 0.006 | 0.781 | 0.088 | Hpoly.Day3 |
| Tuft | P | 0.040 | 0.040 | 0.070 | 0.061 | 0.000 | 0.069 | 0.714 | 0.000 | Hpoly.Day3 |

| cluster | truth | betabin\_null | wtoPhi\_emSVM | estPhi\_null | estPhi\_emSVM | fisher | scDC | speckle | milo\_pct | treatment |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Endocrine | N | 0.390 | 0.390 | 0.925 | 0.867 | 0.379 | 0.035 | 0.923 | 0.000 | Hpoly.Day10 |
| Enterocyte | P | 0.091 | 0.091 | 0.009 | 0.006 | 0.000 | 0.002 | 0.149 | 0.472 | Hpoly.Day10 |
| Enterocyte.Progenitor | N | 0.132 | 0.132 | 0.285 | 0.233 | 0.000 | 0.103 | 0.349 | 0.162 | Hpoly.Day10 |
| Goblet | P | 0.051 | 0.051 | 0.116 | 0.105 | 0.000 | 0.009 | 0.235 | 0.217 | Hpoly.Day10 |
| Stem | N | 0.824 | 0.824 | 0.865 | 0.830 | 0.279 | 0.406 | 0.923 | 0.096 | Hpoly.Day10 |
| TA | N | 0.852 | 0.852 | 0.836 | 0.592 | 1.000 | 0.572 | 0.923 | 0.647 | Hpoly.Day10 |
| TA.Early | P | 0.015 | 0.015 | 0.132 | 0.083 | 0.000 | 0.224 | 0.235 | 0.266 | Hpoly.Day10 |
| Tuft | P | 0.020 | 0.020 | 0.013 | 0.010 | 0.000 | 0.000 | 0.112 | 0.500 | Hpoly.Day10 |

| cluster | truth | betabin\_null | wtoPhi\_emSVM | estPhi\_null | estPhi\_emSVM | fisher | scDC | speckle | milo\_pct | treatment |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Endocrine | N | 0.426 | 0.426 | 0.798 | 0.784 | 0.429 | 0.840 | 0.761 | 0.308 | Salmonella |
| Enterocyte | P | 0.008 | 0.008 | 0.000 | 0.000 | 0.000 | 0.022 | 0.008 | 0.457 | Salmonella |
| Enterocyte.Progenitor | N | 0.146 | 0.146 | 0.561 | 0.495 | 0.000 | 0.357 | 0.647 | 0.019 | Salmonella |
| Goblet | N | 0.681 | 0.681 | 0.821 | 0.802 | 0.558 | 0.253 | 0.864 | 0.100 | Salmonella |
| Stem | P | 0.031 | 0.031 | 0.059 | 0.046 | 0.000 | 0.080 | 0.094 | 0.320 | Salmonella |
| TA | P | 0.026 | 0.026 | 0.192 | 0.318 | 0.000 | 0.801 | 0.216 | 0.538 | Salmonella |
| TA.Early | P | 0.030 | 0.030 | 0.261 | 0.268 | 0.000 | 0.390 | 0.216 | 0.015 | Salmonella |
| Tuft | N | 0.587 | 0.587 | 0.833 | 0.844 | 0.129 | 0.059 | 0.761 | 0.000 | Salmonella |

|  | Tuft | Endocrine | Enterocyte.Progenitor | Stem | Goblet | TA.Early | Enterocyte | TA |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| origin | P | N | N | N | N | N | N | N |
| DCATS | \* | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. |
| fisher | \*\*\* | \*\*\* | \*\*\* | \*\* | \*\*\* | \*\*\* | \*\*\* | n.s. |
| scDC | \* | n.s. | n.s. | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \* |
| speckle | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. |
| milo | N | N | N | N | N | N | N | N |

|  | Tuft | TA.Early | Goblet | Enterocyte | Enterocyte.Progenitor | Endocrine | Stem | TA |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| origin | P | P | P | P | N | N | N | N |
| DCATS | \*\* | \* | n.s. | \*\*\* | n.s. | n.s. | n.s. | n.s. |
| fisher | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | n.s. | n.s. | n.s. |
| scDC | \*\*\* | n.s. | \*\*\* | \*\*\* | n.s. | \*\* | n.s. | n.s. |
| speckle | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. |
| milo | P | P | P | P | N | N | N | P |

|  | Enterocyte | Stem | TA | TA.Early | Enterocyte.Progenitor | Tuft | Goblet | Endocrine |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| origin | P | P | P | P | N | N | N | N |
| DCATS | \*\*\* | \*\* | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. |
| fisher | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | n.s. | n.s. | n.s. |
| scDC | \*\* | \* | n.s. | n.s. | n.s. | \* | n.s. | n.s. |
| speckle | \*\*\* | \* | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. |
| milo | P | P | P | N | N | N | N | P |

|  | Endocrine | Enterocyte | Enterocyte.Progenitor | Goblet | Stem | TA | TA.Early | Tuft |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Endocrine | 0.9785933 | 0.0006868 | 0.0005495 | 0.0093209 | 0.0102934 | 0.0114537 | 0.0087549 | 0 |
| Enterocyte | 0.0000000 | 0.9800824 | 0.0170330 | 0.0000000 | 0.0000000 | 0.0000000 | 0.0000000 | 0 |
| Enterocyte.Progenitor | 0.0000000 | 0.0185440 | 0.9401099 | 0.0000000 | 0.0005147 | 0.0572687 | 0.0087549 | 0 |
| Goblet | 0.0091743 | 0.0000000 | 0.0000000 | 0.9826897 | 0.0056613 | 0.0017621 | 0.0019455 | 0 |
| Stem | 0.0030581 | 0.0006868 | 0.0000000 | 0.0026631 | 0.8625836 | 0.0933921 | 0.0345331 | 0 |
| TA | 0.0000000 | 0.0000000 | 0.0335165 | 0.0000000 | 0.0761709 | 0.7506608 | 0.0617704 | 0 |
| TA.Early | 0.0000000 | 0.0000000 | 0.0082418 | 0.0039947 | 0.0303654 | 0.0748899 | 0.8793774 | 0 |
| Tuft | 0.0091743 | 0.0000000 | 0.0005495 | 0.0013316 | 0.0144107 | 0.0105727 | 0.0048638 | 1 |

## real-world data2

## cell tsne1 tsne2 ind condition cluster clusterRes  
## 1 AAACATACAATGCC-1 -4.277833 -19.294709 107 ctrl 5 CD4 T cells  
## 2 AAACATACATTTCC-1 -27.640373 14.966629 1016 ctrl 9 CD14+ Monocytes  
## 3 AAACATACCAGAAA-1 -27.493646 28.924885 1256 ctrl 9 CD14+ Monocytes  
## 4 AAACATACCAGCTA-1 -28.132584 24.925484 1256 ctrl 9 CD14+ Monocytes  
## 5 AAACATACCATGCA-1 -10.468194 -5.984389 1488 ctrl 3 CD4 T cells  
## 6 AAACATACCTCGCT-1 -24.367997 20.429285 1256 ctrl 9 CD14+ Monocytes  
## multiplets  
## 1 doublet  
## 2 singlet  
## 3 singlet  
## 4 doublet  
## 5 singlet  
## 6 singlet

## `summarise()` has grouped output by 'condition'. You can override using the `.groups` argument.

## # A tibble: 16 x 3  
## # Groups: condition [2]  
## condition clusterRes n  
## <chr> <chr> <int>  
## 1 ctrl B cells 1488  
## 2 ctrl CD14+ Monocytes 3365  
## 3 ctrl CD4 T cells 6005  
## 4 ctrl CD8 T cells 1409  
## 5 ctrl Dendritic cells 227  
## 6 ctrl FCGR3A+ Monocytes 906  
## 7 ctrl Megakaryocytes 166  
## 8 ctrl NK cells 1051  
## 9 stim B cells 1392  
## 10 stim CD14+ Monocytes 3082  
## 11 stim CD4 T cells 6028  
## 12 stim CD8 T cells 1225  
## 13 stim Dendritic cells 245  
## 14 stim FCGR3A+ Monocytes 1008  
## 15 stim Megakaryocytes 180  
## 16 stim NK cells 1279

## # A tibble: 0 x 2  
## # ... with 2 variables: cell <chr>, n <int>

## BARCODE RD.TOTL RD.PASS RD.UNIQ N.SNP BEST SNG.1ST  
## 1 AAACATACAATGCC-1 5799 280 269 185 DBL-107-1244-0.500 107  
## 2 AAACATACATTTCC-1 5466 592 501 236 SNG-1016 1016  
## 3 AAACATACCAGAAA-1 4337 330 300 154 SNG-1256 1256  
## 4 AAACATACCAGCTA-1 7120 418 338 179 DBL-1256-1244-0.500 1256  
## 5 AAACATACCATGCA-1 2422 86 76 54 SNG-1488 1488  
## 6 AAACATACCTCGCT-1 5312 561 497 207 SNG-1256 1256  
## SNG.LLK1 SNG.2ND SNG.LLK2 SNG.LLK0 DBL.1ST DBL.2ND ALPHA LLK12  
## 1 -78.5388 1244 -92.3864 -75.9878 107 1244 0.5 -62.8745  
## 2 -61.8525 1256 -193.3940 -135.9317 1016 1256 0.5 -93.0213  
## 3 -50.6213 1015 -100.6965 -67.2587 101 1256 0.5 -64.5022  
## 4 -70.2734 1244 -110.3962 -82.1916 1256 1244 0.5 -67.3787  
## 5 -16.1294 1015 -31.7146 -27.0167 1015 1488 0.5 -18.5646  
## 6 -66.3586 1015 -180.3066 -115.0556 1256 101 0.5 -101.4645  
## LLK1 LLK2 LLK10 LLK20 LLK00 PRB.DBL PRB.SNG1  
## 1 -78.5388 -92.3864 -88.6649 -94.1498 -77.4107 1.00e+00 1  
## 2 -61.8525 -193.3940 -103.2284 -168.3927 -132.6010 4.15e-15 1  
## 3 -107.8190 -50.6213 -111.3319 -64.5022 -72.4244 1.95e-07 1  
## 4 -70.2734 -110.3962 -80.3745 -103.1706 -85.1143 7.21e-01 1  
## 5 -31.7146 -16.1294 -30.2045 -22.5295 -28.2980 1.28e-02 1  
## 6 -66.3586 -190.9367 -101.4645 -194.9529 -124.2197 8.42e-17 1

## BARCODE RD.TOTL RD.PASS RD.UNIQ N.SNP BEST SNG.1ST SNG.LLK1  
## 1 AAACATACCAAGCT-1 2491 239 228 141 SNG-101 101 -31.2822  
## 2 AAACATACCCCTAC-1 3747 282 274 173 SNG-1488 1488 -37.4261  
## 3 AAACATACCCGTAA-1 2844 144 133 108 SNG-1244 1244 -35.0043  
## 4 AAACATACCCTCGT-1 3575 199 189 115 SNG-1488 1488 -31.5489  
## 5 AAACATACGAGGTG-1 2649 170 158 99 SNG-1488 1488 -33.2782  
## 6 AAACATACGCGAAG-1 9874 880 822 345 SNG-101 101 -139.7810  
## SNG.2ND SNG.LLK2 SNG.LLK0 DBL.1ST DBL.2ND ALPHA LLK12 LLK1  
## 1 1015 -81.3393 -59.5871 101 1015 0.5 -47.8026 -31.2822  
## 2 1256 -104.7874 -74.9247 1256 1488 0.5 -53.8991 -104.7874  
## 3 1488 -61.5604 -51.6974 1488 1244 0.5 -36.9775 -61.5604  
## 4 1244 -79.8040 -57.9696 1256 1488 0.5 -42.8116 -83.5802  
## 5 1244 -66.4966 -48.9522 101 1488 0.5 -36.4330 -75.8228  
## 6 1256 -266.4763 -170.1924 101 1488 0.5 -154.9333 -139.7810  
## LLK2 LLK10 LLK20 LLK00 PRB.DBL PRB.SNG1  
## 1 -81.3393 -32.1591 -47.8026 -64.9647 1.07e-08 1  
## 2 -37.4261 -101.7666 -64.5707 -79.2115 1.00e-08 1  
## 3 -35.0043 -72.6479 -50.8297 -52.6835 2.03e-02 1  
## 4 -31.5489 -80.4661 -49.8506 -58.0733 2.38e-06 1  
## 5 -33.2782 -72.2344 -36.4330 -48.3017 8.06e-03 1  
## 6 -273.8806 -136.9040 -154.9333 -175.5614 3.82e-08 1

## cell batch  
## 1 AAACATACATTTCC-1 SNG-1016  
## 2 AAACATACCAGAAA-1 SNG-1256  
## 3 AAACATACCATGCA-1 SNG-1488  
## 4 AAACATACCTCGCT-1 SNG-1256  
## 5 AAACATACCTGGTA-1 SNG-1039  
## 6 AAACATACGATGAA-1 SNG-1488

## `summarise()` has grouped output by 'condition', 'clusterRes'. You can override using the `.groups` argument.

| cluster | truth | betabin\_null | wtoPhi\_emSVM | estPhi\_null | estPhi\_emSVM | fisher | scDC | speckle | milo\_pct |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| B cells | N | 0.997 | 0.997 | 0.995 | 0.995 | 0.338 | 0.000 | 0.989 | 0.032 |
| CD14+ Monocytes | N | 0.510 | 0.510 | 0.537 | 0.527 | 0.001 | 0.480 | 0.989 | 0.186 |
| CD4 T cells | N | 0.953 | 0.953 | 0.926 | 0.921 | 0.252 | 0.408 | 0.989 | 0.058 |
| CD8 T cells | N | 0.734 | 0.734 | 0.581 | 0.566 | 0.008 | 0.348 | 0.989 | 0.187 |
| Dendritic cells | N | 0.496 | 0.496 | 0.815 | 0.960 | 0.252 | 0.333 | 0.989 | 0.000 |
| FCGR3A+ Monocytes | N | 0.603 | 0.603 | 0.729 | 0.335 | 0.008 | 0.077 | 0.989 | 0.101 |
| Megakaryocytes | N | 0.738 | 0.738 | 0.820 | 0.364 | 0.862 | 0.761 | 0.989 | 0.167 |
| NK cells | N | 0.244 | 0.244 | 0.514 | 0.508 | 0.000 | 0.018 | 0.989 | 0.071 |

|  | B cells | CD14+ Monocytes | CD4 T cells | CD8 T cells | Dendritic cells | FCGR3A+ Monocytes | Megakaryocytes | NK cells |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| origin | N | N | N | N | N | N | N | N |
| DCATS | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. |
| fisher | n.s. | \*\*\* | n.s. | \*\*\* | n.s. | \*\*\* | n.s. | \*\*\* |
| scDC | \*\*\* | n.s. | n.s. | n.s. | n.s. | \* | n.s. | \*\* |
| speckle | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. |
| milo | N | N | N | N | N | N | N | N |

## real-world data 3

## test between different groups

control vs mild/moderate\_progression

## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).

## Warning in aod::betabin(cbind(n1, total - n1) ~ ., ~1, data = df\_use, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).

## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).

## Warning in aod::betabin(formula\_fm0, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 10 (see ?optim).

## age sex sample\_type state  
## B 1.121563e-02 0.45813642 0.012231697 0.02374658  
## CD4 9.013956e-01 0.45838295 0.023889725 0.07402766  
## CD8 5.674563e-01 0.02389045 0.149538148 0.13690373  
## DC 8.399642e-01 0.29517400 0.903579705 0.15905658  
## Mega 1.000000e+00 1.00000000 1.000000000 1.00000000  
## Mono 1.165702e-03 0.01345738 0.007267228 0.66502392  
## NK 3.618948e-01 0.67064985 0.159068371 0.12509911  
## Macro 1.482920e-01 1.00000000 0.000109959 0.58570557  
## Plasma 9.198973e-05 1.00000000 0.134378559 0.01013985  
## Neu 2.992722e-01 1.00000000 1.000000000 1.00000000

## age sex sample\_type state  
## B 1.051245e-02 4.797111e-01 1.148949e-02 0.02441393  
## CD4 9.139593e-01 5.165930e-01 4.238570e-02 0.11340597  
## CD8 4.728365e-01 4.444510e-03 8.090519e-02 0.06747185  
## DC 9.600450e-01 6.212779e-01 9.582079e-01 0.48602131  
## Mega 9.690127e-01 8.362659e-01 7.720331e-01 0.40621761  
## Mono 2.679082e-07 7.429965e-05 3.305189e-05 0.48462890  
## NK 3.278590e-01 6.546807e-01 1.412285e-01 0.10557027  
## Macro 6.203711e-01 9.950488e-01 7.818968e-01 0.81036221  
## Plasma 5.820957e-01 9.869569e-01 6.782339e-01 0.80385547  
## Neu 7.496649e-01 9.802753e-01 7.746296e-01 0.89473831

control vs severe/critical\_progression

## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).

## Warning in aod::betabin(cbind(n1, total - n1) ~ ., ~1, data = df\_use, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).

## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).

mild/moderate\_convalescence vs mild/moderate\_progression

## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).

## Warning in aod::betabin(cbind(n1, total - n1) ~ ., ~1, data = df\_use, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).

## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
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## B TRUE FALSE TRUE TRUE  
## CD4 TRUE TRUE FALSE FALSE  
## CD8 FALSE FALSE FALSE FALSE  
## DC FALSE FALSE FALSE TRUE  
## Mega FALSE FALSE TRUE TRUE  
## Mono TRUE FALSE TRUE FALSE  
## NK FALSE FALSE FALSE FALSE  
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## Mono TRUE FALSE TRUE TRUE  
## NK FALSE FALSE FALSE FALSE  
## Macro FALSE FALSE FALSE FALSE  
## Plasma FALSE FALSE FALSE FALSE  
## Neu FALSE FALSE FALSE FALSE

## clusterRes group1 group2  
## 1 B mild/moderate (convalescence) mild/moderate (progression)  
## 2 CD4 mild/moderate (convalescence) mild/moderate (progression)  
## 3 CD8 mild/moderate (convalescence) mild/moderate (progression)  
## 4 DC mild/moderate (convalescence) mild/moderate (progression)  
## 5 Mega mild/moderate (convalescence) mild/moderate (progression)  
## 6 Mono mild/moderate (convalescence) mild/moderate (progression)  
## 7 NK mild/moderate (convalescence) mild/moderate (progression)  
## 8 Macro mild/moderate (convalescence) mild/moderate (progression)  
## 9 Plasma mild/moderate (convalescence) mild/moderate (progression)  
## 10 Neu mild/moderate (convalescence) mild/moderate (progression)  
## p  
## 1 0.02075168  
## 2 0.93667153  
## 3 0.34261993  
## 4 0.19112345  
## 5 0.24395930  
## 6 0.01309547  
## 7 0.36744666  
## 8 0.81512318  
## 9 0.84293771  
## 10 0.83527943

severe/critical\_convalescence vs severe/critical\_progression

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## Possible convergence problem. Optimization process code: 1 (see ?optim).

## Warning in aod::betabin(formula\_fm0, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).

## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).  
  
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).

## Warning in aod::betabin(cbind(n1, total - n1) ~ ., ~1, data = df\_use, warnings = FALSE):   
## Possible convergence problem. Optimization process code: 1 (see ?optim).

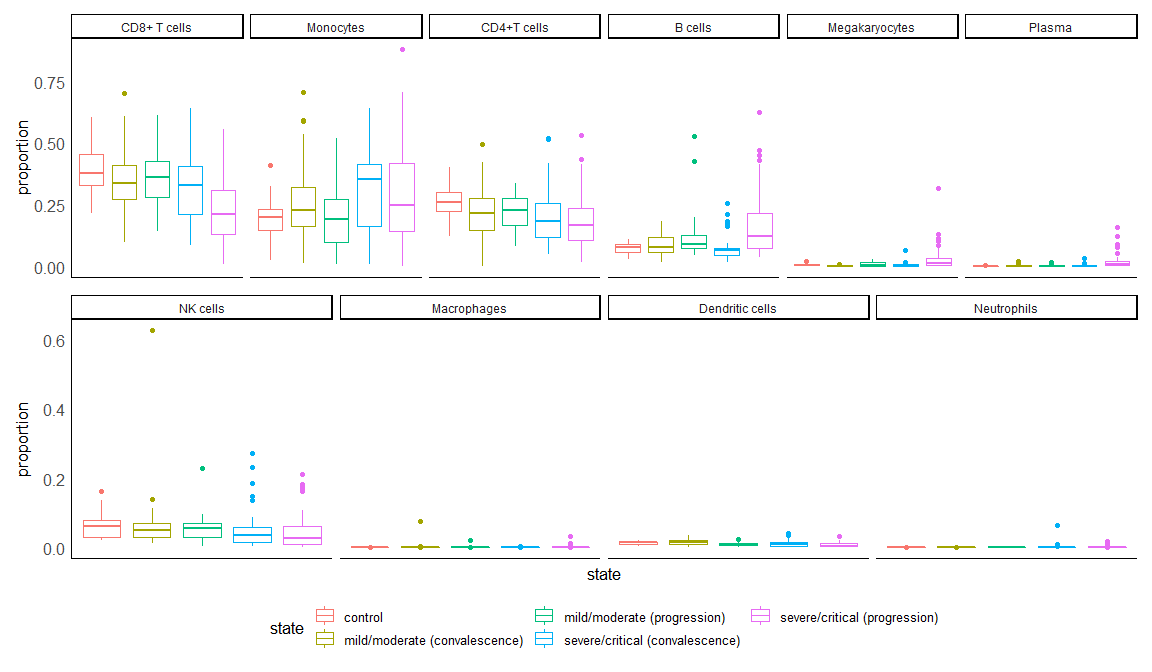
## Warning in aod::betabin(formula\_fm1, ~1, data = df\_tmp, warnings = FALSE):   
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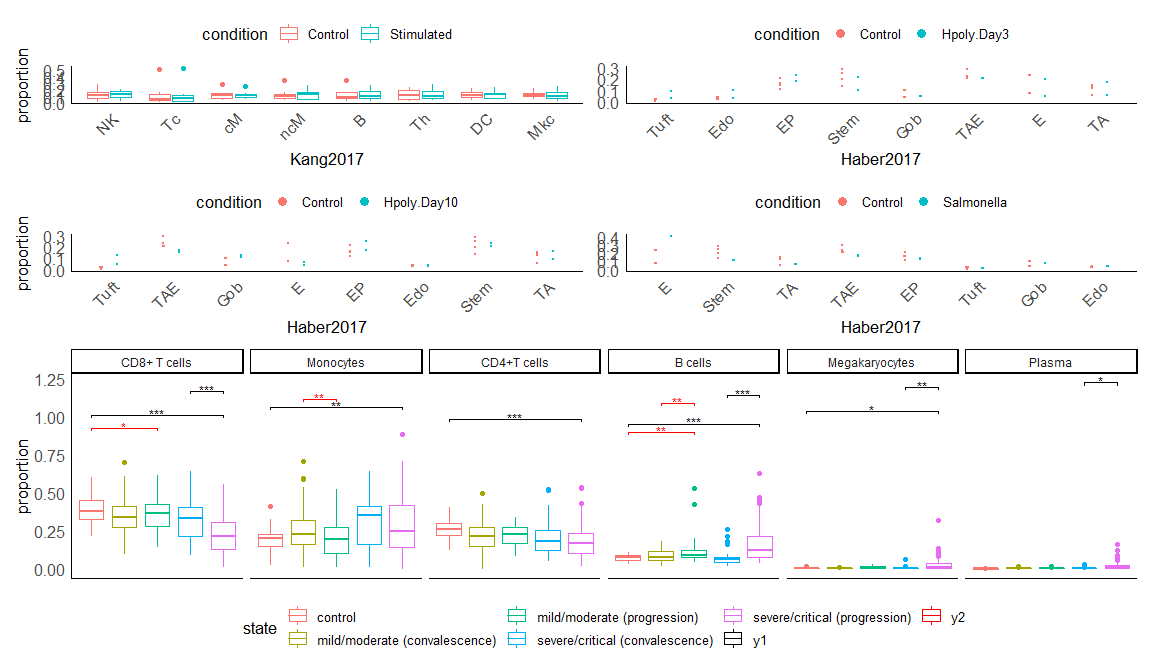
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## Bin width defaults to 1/30 of the range of the data. Pick better value with `binwidth`.  
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