

# Introduction

## Introduction

These instructions are aimed at people familiar with R and familiar with TCGA/GDC platforms and data types. They are intended to introduce the reader to producing the given assessment. These instructions will only rarely, if ever, touch on the appropriateness of the assessment algorithm or interpretation of output. See MBatch\_01\_InstallLinux for instructions on downloading test data.

## Algorithm

EB with Parametric Priors performs Empirical Bayes correction taking a BEA\_DATA object (with data matrix and batch dataframe) and returning either a corrected matrix or a string containing the path to where the data file was written.

## Output

The primary output method for MBatch is to view results in the Batch Effects Website. Correction algorithms generally do not create graphical output and instead create TSV output files.

## Usage

EB\_withParametricPriors(theBeaData, theBatchIdsNotToCorrect, theDoCheckPlotsFlag, theBatchType, theThreads = 1, thePath = NULL, theWriteToFile = FALSE)

## Arguments

### **theBeaData**

BEA\_DATA objects can be created by calls of the form `new("BEA_DATA", theData, theBatches, theCovariates)`. If you have no covariate data, use an empty `data.frame` created with `data.frame()`

**mData:** Object of class "matrix" A matrix where the colnames are sample ids and the rownames are gene equivalents. All names should be strings, not factors.

**mBatches:** Object of class "data.frame" A `data.frame` where the column "names" are batch types. The first batch "type" is "Sample". All names and values should be strings, not factors or numeric.

**mCovariates:** Object of class "data.frame" A `data.frame` where the column "names" are covariate types. The first covariate "type" is "Sample". All names and values should be strings, not factors or numeric.

### **theBatchIdsNotToCorrect**

A vector of strings giving batch names/ids within the batch type that should not be corrected

### **theDoCheckPlotsFlag**

Defaults to FALSE. TRUE indicates a prior plots image should be created.

### **theBatchType**

A string identifying the batch type to correct.

### **theThreads**

Integer defaulting to 1. Number of threads to use for calculating priors.

### **thePath**

Output path for any files.

### **theWriteToFile**

TRUE to write the corrected data to file and return the file pathname instead of the corrected matrix.

## Example Call

The following code is adapted from the tests/EB\_withNonParametricPriors.R file. Data used is from the testing data as per the MBatch\_01\_InstallLinux document. In the future, we plan to make the output from MBatch more user friendly, but currently, this produces the following output at the command line.

```
{
  library(MBatch)

  inputDir <- getTestInputDir()
  outputDir <- getTestOutputDir()
  compareDir <- getTestCompareDir()

  # set the paths
  theGeneFile=file.path(inputDir, "matrix_data-Tumor.tsv")
  theBatchFile=file.path(inputDir, "batches-Tumor.tsv")
  theOutputDir=file.path(outputDir, "EB_withParametricPriors")
  theRandomSeed=314
  theBatchType="TSS"

  # make sure the output dir exists and is empty
  unlink(theOutputDir, recursive=TRUE)
  dir.create(theOutputDir, showWarnings=FALSE, recursive=TRUE)
  # load data
  myData <- mbatchLoadFiles(theGeneFile, theBatchFile)
  myData@mData <- mbatchTrimData(myData@mData, 100000)
  # call
  outputFile <- EB_withParametricPriors(theBeaData=myData,
                                       theBatchIdsNotToCorrect=c(""),
                                       theDoCheckPlotsFlag=TRUE,
                                       theBatchType=theBatchType,
                                       theThreads=1,
                                       thePath=theOutputDir,
                                       theWriteToFile=TRUE)
  correctedMatrix <- readAsGenericMatrix(outputFile)
  print(correctedMatrix[1:4, 1:4])
}

## 2020 11 18 16:19:29.804 DEBUG ab7c64738d52 Changing LC_COLLATE to C for duration of run
## 2020 11 18 16:19:29.805 INFO ab7c64738d52 \ / \ / \ / \ / \ / \ / \ / \ / \ /
## 2020 11 18 16:19:29.805 INFO ab7c64738d52 Starting mbatchLoadFiles
## 2020 11 18 16:19:29.805 INFO ab7c64738d52 MBatch Version: BEA_VERSION_TIMESTAMP
## 2020 11 18 16:19:29.805 INFO ab7c64738d52 read batch file= /builds/BatchEffects_clean/Bat
## 2020 11 18 16:19:29.806 INFO ab7c64738d52 read gene file= /builds/BatchEffects_clean/Bat
## 2020 11 18 16:19:31.913 INFO ab7c64738d52 filter samples in batches using gene samples
## 2020 11 18 16:19:31.914 INFO ab7c64738d52 sort batches by gene file samples
```

```
## 2020 11 18 16:19:32.033 INFO ab7c64738d52 Finishing mbatchLoadFiles
## 2020 11 18 16:19:32.033 INFO ab7c64738d52 ~~~~~
## 2020 11 18 16:19:32.034 DEBUG ab7c64738d52 Changing LC_COLLATE to C for duration of run
## 2020 11 18 16:19:32.034 INFO ab7c64738d52 \ / \ / \ / \ / \ / \ / \ / \ / \ / \ / \ /
## 2020 11 18 16:19:32.034 INFO ab7c64738d52 mbatchTrimData Starting
## 2020 11 18 16:19:32.034 INFO ab7c64738d52 MBatch Version: BEA_VERSION_TIMESTAMP
## 2020 11 18 16:19:39.301 INFO ab7c64738d52 mbatchTrimData theMaxSize= 1e+05
## 2020 11 18 16:19:39.302 INFO ab7c64738d52 mbatchTrimData ncol(theMatrix)= 80
## 2020 11 18 16:19:39.302 INFO ab7c64738d52 mbatchTrimData nrow(theMatrix)= 1250
## 2020 11 18 16:19:39.302 INFO ab7c64738d52 mbatchTrimData Finishing
## 2020 11 18 16:19:39.302 INFO ab7c64738d52 ~~~~~
## 2020 11 18 16:19:39.302 INFO ab7c64738d52 EB_internal - starting
## 2020 11 18 16:19:39.303 DEBUG ab7c64738d52 checkCreateDir: /builds/BatchEffects_clean/Bat
## 2020 11 18 16:19:39.578 DEBUG ab7c64738d52 starting BeaEB
## 2020 11 18 16:19:39.579 DEBUG ab7c64738d52 EB start
## 2020 11 18 16:19:39.579 DEBUG ab7c64738d52 convertDataFrameToSi start
## 2020 11 18 16:19:39.580 DEBUG ab7c64738d52 convertDataFrameToSi asmatrixWithIssues
## 2020 11 18 16:19:39.580 DEBUG ab7c64738d52 convertDataFrameToSi rownames
## 2020 11 18 16:19:39.580 DEBUG ab7c64738d52 convertDataFrameToSi colnames
## 2020 11 18 16:19:39.580 DEBUG ab7c64738d52 convertDataFrameToSi done
## 2020 11 18 16:19:39.583 DEBUG ab7c64738d52 EB check number of batches
## 2020 11 18 16:19:39.583 DEBUG ab7c64738d52 EB Check for missing values
## 2020 11 18 16:19:39.584 DEBUG ab7c64738d52 Check for genes with whole batch missing or no
## 2020 11 18 16:19:39.724 DEBUG ab7c64738d52 Standardizing Data across genes
## 2020 11 18 16:19:39.779 DEBUG ab7c64738d52 Standarization Model
## 2020 11 18 16:19:39.808 DEBUG ab7c64738d52 stand.mean
## 2020 11 18 16:19:39.809 DEBUG ab7c64738d52 Fitting L/S model and finding priors
## 2020 11 18 16:19:39.810 DEBUG ab7c64738d52 with NAs
## 2020 11 18 16:19:39.927 DEBUG ab7c64738d52 Find priors
## 2020 11 18 16:19:39.929 DEBUG ab7c64738d52 Plot empirical and parametric priors
## 2020 11 18 16:19:39.929 DEBUG ab7c64738d52 Print prior plots at /builds/BatchEffects_cle
## 2020 11 18 16:19:39.990 DEBUG ab7c64738d52 finished prior plots
## 2020 11 18 16:19:40.092 DEBUG ab7c64738d52 Find EB batch adjustments
## 2020 11 18 16:19:40.092 DEBUG ab7c64738d52 Finding parametric adjustments
## 2020 11 18 16:19:40.166 DEBUG ab7c64738d52 Adjusting the Data
## 2020 11 18 16:19:40.169 DEBUG ab7c64738d52 add back the removed genes with missing data i
## 2020 11 18 16:19:40.169 DEBUG ab7c64738d52 EB done
## 2020 11 18 16:19:40.170 DEBUG ab7c64738d52 finishing BeaEB
## 2020 11 18 16:19:40.170 TIMING ab7c64738d52 0.5909999999999994 0.5919999999999999 EB
## 2020 11 18 16:19:40.170 DEBUG ab7c64738d52 Write to file /builds/BatchEffects_clean/Bat
## 2020 11 18 16:19:40.274 DEBUG ab7c64738d52 Finished write to file /builds/BatchEffects_c
## 2020 11 18 16:19:40.274 INFO ab7c64738d52 EB_internal - completed
## TCGA-OR-A5J1-01A-11D-A29J-Q5
## ABR-cg06968724-17-1012579 0.02849061
## ABR-cg23568341-17-1011974 0.03145030
```

```

## ABR-cg24479027-17-1012576 0.03469008
## ACOT7-cg16034168-1-6336711 0.94492167
## TCGA-OR-A5J2-01A-11D-A29J-05
## ABR-cg06968724-17-1012579 0.03034156
## ABR-cg23568341-17-1011974 0.03843565
## ABR-cg24479027-17-1012576 0.03859779
## ACOT7-cg16034168-1-6336711 0.08647875
## TCGA-OR-A5J3-01A-11D-A29J-05
## ABR-cg06968724-17-1012579 0.8772416
## ABR-cg23568341-17-1011974 0.8141922
## ABR-cg24479027-17-1012576 0.8943430
## ACOT7-cg16034168-1-6336711 0.0887355
## TCGA-OR-A5J4-01A-11D-A29J-05
## ABR-cg06968724-17-1012579 0.9017516
## ABR-cg23568341-17-1011974 0.8916133
## ABR-cg24479027-17-1012576 0.9017020
## ACOT7-cg16034168-1-6336711 0.9089891

```

## Example File Output

The above code creates the following output file. File is named using the following naming convention: ANY\_Corrections-EBwithParametricPriors.tsv The TSV file with the corrected dataset is written by the MBatch package. The end of the output shows a snippet from the corrected matrix.