In [1]: #install.packages("MDMR") In [2]: library(MDMR) library(qvalue) In [3]: BRAY<-read.delim("/Users/dagmarschierova/MEGA/MBÚ/swabs_ZS/outputs/qiime2_results_290230/diversity-D_UST/beta/bray_curtis_distance_matrix_patients.tsv") JACC<-read.delim("/Users/dagmarschierova/MEGA/MBÚ/swabs ZS/outputs/qiime2 results 290230/diversity-D UST/beta/jaccard distance matrix patients.tsv") U.UNIFRAC<-read.delim("/Users/dagmarschierova/MEGA/MBÚ/swabs ZS/outputs/qiime2 results 290230/diversity-D UST/beta/unweighted unifrac distance matrix patients.tsv") W.UNIFRAC<-read.delim("/Users/dagmarschierova/MEGA/MBÚ/swabs ZS/outputs/qiime2 results 290230/diversity-D UST/beta/weighted unifrac distance matrix patients.tsv") BRAY40<-read.delim("/Users/dagmarschierova/MEGA/MBÚ/swabs_ZS/outputs/qiime2_results_290230/diversity-D_UST/beta/bray_curtis_distance_matrix_patients040.tsv") JACC40<-read.delim("/Users/dagmarschierova/MEGA/MBÚ/swabs_ZS/outputs/qiime2_results_290230/diversity-D_UST/beta/jaccard_distance_matrix_patients040.tsv") U.UNIFRAC40<-read.delim("/Users/dagmarschierova/MEGA/MBÚ/swabs ZS/outputs/qiime2 results 290230/diversity-D UST/beta/unweighted unifrac distance matrix patients040.tsv") W.UNIFRAC40<-read.delim("/Users/dagmarschierova/MEGA/MBÚ/swabs_ZS/outputs/qiime2_results_290230/diversity-D_UST/beta/weighted_unifrac_distance_matrix_patients040.tsv") In [4]: TO_DIST<-function(x){ x < -x[,2:ncol(x)]rownames(x) < -colnames(x)x < -as.matrix(x)as.dist(x) BRAY.DIST<-TO_DIST(BRAY) JACC.DIST<-TO_DIST(JACC)</pre> U.UNIFRAC.DIST<-TO_DIST(U.UNIFRAC)</pre> W.UNIFRAC.DIST<-TO_DIST(W.UNIFRAC)</pre> BRAY40.DIST<-TO DIST(BRAY40)</pre> JACC40.DIST<-TO DIST(JACC40)</pre> U.UNIFRAC40.DIST<-TO DIST(U.UNIFRAC40)</pre> W.UNIFRAC40.DIST<-TO_DIST(W.UNIFRAC40)</pre> In [5]: meta<-read.delim("/Users/dagmarschierova/MEGA/MBÚ/swabs_ZS/inputs/metadata_swabs_cut.tsv")</pre> In [6]: meta.ordered<-meta[match(attributes(BRAY.DIST)\$Labels, meta\$SampleID),]</pre> meta.ordered40<-meta[match(attributes(BRAY40.DIST)\$Labels, meta\$SampleID),]</pre> #FILTER<-meta.ordered\$Drug=="UST"</pre> #meta.ordered.sub<-meta.ordered[FILTER,]</pre> In [7]: mdmr.res.bray <- MDMR::mixed.mdmr(~Week_num+(1 | Patient), data=meta.ordered, D=BRAY.DIST)</pre> mdmr.res.bray Omnibus: 1.80937630969158 (Intercept): 0.690875327364348 Week_num: 1.8883733906159 \$stat Omnibus: 0.0566151952070968 (Intercept): 0.742763308241948 Week_num: 0.0467261822875573 \$pv Omnibus: 1e-14 (Intercept): 1e-14 Week_num: 1e-14 \$p.prec Omnibus: 1 (Intercept): 1 Week_num: 1 \$df \$ssd.used In [8]: mdmr.res.jacc <- MDMR::mixed.mdmr(~Week_num+(1 | Patient), data=meta.ordered, D=JACC.DIST)</pre> mdmr.res.jacc Omnibus: 1.38219299710885 (Intercept): 0.788010239656286 Week_num: 1.46535706729267 \$stat Omnibus: 0.0735663473356241 (Intercept): 0.801533660166608 Week_num: 0.0451192874612321 \$pv Omnibus: 1e-14 (Intercept): 1e-14 Week_num: 1e-14 \$p.prec Omnibus: 1 (Intercept): 1 Week_num: 1 \$df \$ssd.used In [9]: mdmr.res.jacc <- MDMR::mixed.mdmr(~Past_biological_therapy+(1 | Patient), data=meta.ordered, D=JACC.DIST) mdmr.res.jacc Omnibus: 1.29684807602079 (Intercept): 1.18044497735285 Past_biological_therapy: 1.66365821729658 \$stat Omnibus: 0.118337164028541 (Intercept): 0.214297745010336 Past_biological_therapy: 0.0130746605055259 \$pv Omnibus: 1e-14 (Intercept): 1e-14 Past_biological_therapy: 1e-14 \$p.prec Omnibus: 1 (Intercept): 1 Past_biological_therapy: 1 \$df \$ssd.used In [10]: mdmr.res.uunifrac <- MDMR::mixed.mdmr(~Week_num+(1 | Patient), data=meta.ordered, D=U.UNIFRAC.DIST) mdmr.res.uunifrac Omnibus: 1.22175329873634 (Intercept): 0.649228407863456 Week_num: 1.30676979635733 \$stat Omnibus: 0.193575397157982 (Intercept): 0.919737136298732 Week_num: 0.135008341532958 \$pv Omnibus: 1e-14 (Intercept): 1e-14 Week_num: 1e-14 \$p.prec Omnibus: 1 (Intercept): 1 Week_num: 1 \$df \$ssd.used In [11]: mdmr.res.wunifrac <- MDMR::mixed.mdmr(~Week_num+(1 | Patient), data=meta.ordered, D=W.UNIFRAC.DIST) mdmr.res.wunifrac Omnibus: 1.33047856888663 (Intercept): 0.80939310522497 Week_num: 1.38387436138499 \$stat Omnibus: 0.223508940035793 (Intercept): 0.534506493316593 Week_num: 0.203622325903462 \$pv Omnibus: 1e-14 (Intercept): 1e-14 Week_num: 1e-14 \$p.prec Omnibus: 1 (Intercept): 1 Week_num: 1 \$df \$ssd.used In [12]: mdmr.res.brayc <- MDMR::mixed.mdmr(~Week+(1 | Patient), data=meta.ordered, D=BRAY.DIST)</pre> mdmr.res.brayc Omnibus: 7.65964445372501 (Intercept): 0.643272037526729 Week: 8.66970742310063 \$stat Omnibus: 0.014680490708143 (Intercept): 0.795309813953724 Week: 0.00289427869845937 \$pv Omnibus: 1e-14 (Intercept): 1e-14 Week: 1e-14 \$p.prec Omnibus: 5 (Intercept): 1 Week: 5 \$df \$ssd.used In [13]: mdmr.res.jaccc <- MDMR::mixed.mdmr(~Week+(1 | Patient), data=meta.ordered, D=JACC.DIST)</pre> mdmr.res.jaccc Omnibus: 5.86960443576682 (Intercept): 0.895072657338486 Week: 6.48354987369469 \$stat Omnibus: 0.0663659218452244 (Intercept): 0.633370045520014 Week: 0.00799145645948962 \$pv Omnibus: 1e-14 (Intercept): 1e-14 Week: 1e-14 \$p.prec Omnibus: 5 (Intercept): 1 Week: 5 \$df \$ssd.used In [14]: mdmr.res.uunifracc <- MDMR::mixed.mdmr(~Week+(1 | Patient), data=meta.ordered, D=U.UNIFRAC.DIST) mdmr.res.uunifracc Omnibus: 5.89759816117092 (Intercept): 1.04460756630605 Week: 6.68880013724839 \$stat Omnibus: 0.0886046477044529 (Intercept): 0.38092992554953 Week: 0.0107860706952503 \$pv Omnibus: 1e-14 (Intercept): 1e-14 Week: 1e-14 \$p.prec \$df Omnibus: 5 (Intercept): 1 Week: 5 \$ssd.used In [15]: mdmr.res.wunifracc <- MDMR::mixed.mdmr(~Week+(1 | Patient), data=meta.ordered, D=W.UNIFRAC.DIST) mdmr.res.wunifracc Omnibus: 4.90138516253913 (Intercept): 1.03285719790923 Week: 5.39172364079273 \$stat Omnibus: 0.477175479671097 (Intercept): 0.372525340484623 Week: 0.3424496564844 \$pv Omnibus: 1e-14 (Intercept): 1e-14 Week: 1e-14 \$p.prec \$df Omnibus: 5 (Intercept): 1 Week: 5 \$ssd.used In [16]: mdmr.res.bray40 <- MDMR::mixed.mdmr(~Week+(1 | Patient), data=meta.ordered40, D=BRAY40.DIST) mdmr.res.bray40 Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Omnibus: 0.848001635937611 (Intercept): 0.433012362290559 Week: 1.03279622431162 \$stat \$pv Omnibus: 0.510077794434749 (Intercept): 0.853045076031984 Week: 0.382901186416719 Omnibus: 1e-14 (Intercept): 1e-14 Week: 1e-14 \$p.prec \$df Omnibus: 1 (Intercept): 1 Week: 1 \$ssd.used In [17]: mdmr.res.jacc40 <- MDMR::mixed.mdmr(~Week+(1 | Patient), data=meta.ordered40, D=JACC40.DIST) mdmr.res.jacc40 Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." \$stat Omnibus: 1.99873547343603 (Intercept): 1.21445724512887 Week: 7.20533080516181 \$pv Omnibus: 0.0392652123813919 (Intercept): 0.280395185851893 Week: 2.88882551213732e-09 \$p.prec Omnibus: 1e-14 (Intercept): 1e-14 Week: 1e-14 \$df Omnibus: 1 (Intercept): 1 Week: 1 \$ssd.used mdmr.res.uunifrac40 <- MDMR::mixed.mdmr(~Week+(1 | Patient), data=meta.ordered40, D=U.UNIFRAC40.DIST) mdmr.res.uunifrac40 Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." \$stat Omnibus: 1.83878818806588 (Intercept): 1.35123796233881 Week: 2.81039853104852 \$pv Omnibus: 0.0684760752620812 (Intercept): 0.210285087926095 Week: 0.00595080108891244 \$p.prec Omnibus: 1e-14 (Intercept): 1e-14 Week: 1e-14 \$df Omnibus: 1 (Intercept): 1 Week: 1 \$ssd.used In [19]: mdmr.res.wunifrac40 <- MDMR::mixed.mdmr(~Week+(1 | Patient), data=meta.ordered40, D=W.UNIFRAC40.DIST) mdmr.res.wunifrac40 Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." Warning message in CompQuadForm::davies(tilde.l[k], lambda = lambda, h = rep(df, : "Consider playing with 'lim' or 'acc'." \$stat Omnibus: 0.603191813458899 (Intercept): 0.325945527071528 Week: 0.670582630568353 Omnibus: 0.598482163432821 (Intercept): 0.837523941332894 Week: 0.547974705771931 \$pv Omnibus: 1e-12 (Intercept): 1e-12 Week: 1e-12 \$p.prec \$df Omnibus: 1 (Intercept): 1 Week: 1 \$ssd.used In [20]: # tabulate the model results mdmr.res.brayt<-do.call("rbind", mdmr.res.bray)[c(4,1:2),]</pre> mdmr.res.jacct<-do.call("rbind", mdmr.res.jacc)[c(4,1:2),]</pre> mdmr.res.uunifract<-do.call("rbind", mdmr.res.uunifrac)[c(4,1:2),]</pre> mdmr.res.wunifract<-do.call("rbind", mdmr.res.wunifrac)[c(4,1:2),]</pre> mdmr.res.braytc<-do.call("rbind", mdmr.res.brayc)[c(4,1:2),]</pre> mdmr.res.jacctc<-do.call("rbind",mdmr.res.jaccc)[c(4,1:2),]</pre> mdmr.res.uunifractc<-do.call("rbind", mdmr.res.uunifracc)[c(4,1:2),]</pre> mdmr.res.wunifractc<-do.call("rbind", mdmr.res.wunifracc)[c(4,1:2),]</pre> mdmr.res.bray40t<-do.call("rbind",mdmr.res.bray40)[c(4,1:2),]</pre> mdmr.res.jacc40t<-do.call("rbind",mdmr.res.jacc40)[c(4,1:2),]</pre> mdmr.res.uunifrac40t<-do.call("rbind",mdmr.res.uunifrac40)[c(4,1:2),]</pre> mdmr.res.wunifrac40t<-do.call("rbind",mdmr.res.wunifrac40)[c(4,1:2),]</pre> In [21]: # adjust p values for model where week is continous variable PVALS<-as.numeric()</pre> PVALS[1]<-mdmr.res.brayt[c(3),3]</pre> PVALS[2]<-mdmr.res.jacct[c(3),3]</pre> PVALS[3]<-mdmr.res.uunifract[c(3),3]</pre> PVALS[4]<-mdmr.res.wunifract[c(3),3]</pre> #QVAL<-qvalue(PVALS, lambda = seq(0, max(PVALS), 0.05))\$qvalues FDR<-p.adjust(PVALS, "fdr")</pre> FDR $0.0934523645751146 \cdot 0.0522986420221034 \cdot 0.180011122043945 \cdot 0.203622325903462$ In [22]: # adjust p values for model where week is categorical variable PVALSC<-as.numeric()</pre> PVALSC[1]<-mdmr.res.braytc[c(3),3]</pre> PVALSC[2]<-mdmr.res.jacctc[c(3),3]</pre> PVALSC[3]<-mdmr.res.uunifractc[c(3),3]</pre> PVALSC[4]<-mdmr.res.wunifractc[c(3),3]</pre> #QVAL < -qvalue(PVALS, lambda = seq(0, max(PVALS), 0.05))\$qvalues FDRC<-p.adjust(PVALSC, "fdr")</pre> FDRC $0.0115771147938375 \cdot 0.014381427593667 \cdot 0.014381427593667 \cdot 0.3424496564844$ In [23]: # adjust p values for model where we compare week 0 and week 40 PVALS40<-as.numeric()</pre> PVALS40[1]<-mdmr.res.bray40t[c(3),3]</pre> PVALS40[2]<-mdmr.res.jacc40t[c(3),3]</pre> PVALS40[3]<-mdmr.res.uunifrac40t[c(3),3]</pre> PVALS40[4]<-mdmr.res.wunifrac40t[c(3),3]</pre> #QVAL<-qvalue(PVALS, lambda = seq(0, max(PVALS), 0.05))\$qvalues FDR40<-p.adjust(PVALS40, "fdr")</pre> FDR40 0.510534915222292 · 1.15553020485493e-08 · 0.0119016021778249 · 0.547974705771931 In []: