Supplementary Table 2: List of genes in gene sets used for GSVA

pathways	genes for GSVA analysis
GO MHC-	ABCB9,ACE,AZGP1,B2M,BCAP31,CALR,CANX,CD207,CD36,CHUK,CLEC4A,CYBA,CYBB,ERAP1,ERAP2 ,FCER1G,FCGR1A,FCGR1B,HFE,HLA-A,HLA-B,HLA-C,HLA-E,HLA-F,HLA-G,HLA-H,IDE,IFI30,IKBKB,IKBKG ,ITGAV,ITGB5,LNPEP,MFSD6,MR1,NCF1,NCF2,NCF4,PDIA3,PSMA1,PSMA2,PSMA3,PSMA4,PSMA5,PSMA6 ,PSMA7,PSMA8,PSMB1,PSMB10,PSMB11,PSMB2,PSMB3,PSMB4,PSMB5,PSMB6,PSMB7,PSMB8,PSMB9,PSMC1,PSMC2 ,PSMC3,PSMC4,PSMC5,PSMC6,PSMD1,PSMD10,PSMD11,PSMD12,PSMD13,PSMD14,PSMD2,PSMD3,PSMD4,PSMD5,PSMD6 ,PSMD7,PSMD8,PSMD9,PSME1,PSME2,PSME3,PSME4,PSMF1,SAR1B,SEC13,SEC22B,SEC23A,SEC24A,SEC24B,SEC24C ,SEC24D,SEC31A,SNAP23,TAP1,TAP2,TAPBP,TAPBPL,VAMP3,VAMP8
GO MHC-	ACTR10,ACTR1A,ACTR1B,AP1B1,AP1G1,AP1M1,AP1M2,AP1S1,AP1S2,AP1S3,AP2A1,AP2A2,AP2B1,AP2M1,AP2S1 ,ARF1,CANX,CAPZA1,CAPZA2,CAPZA3,CAPZB,CD74,CENPE,CLTA,CLTC,CTSD,CTSE,CTSF,CTSL,CTSS ,CTSV,DCTN1,DCTN2,DCTN3,DCTN4,DCTN5,DCTN6,DNM2,DYNC1H1,DYNC1H2,DYNC1H2,DYNC1L1,DYNC1L12,DYNLL1,DYNLL2 ,FCER1G,FCGR2B,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DOB,HLA-DPA1,HLA-DPB1,HLA-DQA1,HLA-DQA2,HLA-DQB1,HLA-DQB2,HLA-DRA,HLA-DRB1,HLA-DRB3 ,HLA-DRB4,HLA-DRB5,IFI30,KIF11,KIF15,KIF18A,KIF22,KIF23,KIF26A,KIF2A,KIF2B,KIF2C,KIF3A,KIF3B,KIF3C ,KIF4A,KIF4B,KIF5A,KIFAP3,KLC1,KLC2,LAG3,LGMN,MARCHF1,MARCHF8,OSBPL1A,PIKFYVE,PYCARD,RAB7A,RACGAP1 ,RILP,SAR1B,SEC13,SEC23A,SEC24A,SEC24B,SEC24C,SEC24D,SEC31A,SH3GL2,SPTBN2,THBS1,TRAF6,TREM2
REATOME MHC-I	ANAPC1,ANAPC10,ANAPC11,ANAPC13,ANAPC2,ANAPC4,ANAPC5,ANAPC7,AREL1,ARIH2,ASB1,ASB10,ASB11,ASB12,ASB13 ,ASB14,ASB15,ASB16,ASB17,ASB18,ASB2,ASB3,ASB4,ASB5,ASB6,ASB7,ASB8,ASB9,ATG7,B2M ,BCAP31,BLMH,BTBD1,BTBD6,BTK,BTRC,CALR,CANX,CBLB,CBLL2,CCNF,CD14,CCD207,CD36,CDC16 ,CDC20,CDC23,CDC26,CDC27,CDC34,CHUK,CTSL,CTSS,CTSY,CU11,CUL2,CUL3,CUL5,CUL7,CYBA ,CYBB,DCAF1,DET1,DTX3L,DZIP3,ELOB,ELOC,FRAP1,FRAP2,FBXL12,FBXC10,FBXL13,FBXL14,FBXL15,FBXL16,FBXL18 ,FBXL19,FBXL20,FBXL2,FBXL3,FBXL4,FBXL5,FBXC10,FBXC9,FBXC17,FBXC92 ,FBXC97,FBXC90,FBXC9,FBXL3,FBXC9,FBXC9,FBXC94,FBXC94,FBXC96,FBXC97,FBXC99,FBXW11,FBXW21,FBXC92 ,FBXC97,FBXC90,FBXC9,FBXC9,FBXC9,FBXC94,FBXC94,FBXC94,FBXC96,FBXC97,FBXC99,FBXW11,FBXW21,FBXC92 ,FBXW4,FBXW5,FBXW7,FBXW8,FBXW9,FCGR1A,FCGR1B,FGA,FGB,FGG,FZR1,GAN,GLMN,HACE1,HECTD1 ,HECTD2,HECTD3,HECW2,HERC1,HERC2,HERC3,HERC4,HERC5,HERC6,HLA-A,HLA-B,HLA-C,HLA-E,HLA-F,HLA-G ,HMGB1,HSPA5,HUWE1,IKBKB,IKBK6,ITCH,ITGAV,ITGB5,KBTBD13,KBTBD6,KBTBD7,KBTBD8,KCTD7,KEAP1 ,KLHL11,KLHL13,KLHL2,KLHL20,KLHL21,KLHL22,KLH25,KLHL3,KLHL41,KLHL42,KLHL5,KLH19,LMO7,LNPEP,LNX1 ,LONRF1,LRR1,LRRC41,LRSAM1,LTN1,LY96,MEX3C,MGRN1,MIB2,MKRN1,MRC1,MRC2,MYD88,MYLPNCF1 ,NCF2,NCF4,NEDD4,NEDD4L,NPEPPS,PDIA3,PJA1,PJA2,PRKN,PSMA1,PSMA2,PSMA3,PSMA4,PSMA5,PSMA6 ,PSMA7,PSMA8,PSMB1,PSMB10,PSMB11,PSMB2,PSMB3,PSMB4,PSMB5,PSMB6,PSMB7,PSMB8,PSMB9,PSMC1,PSMC2 ,PSMC3,PSMC4,PSMC5,PSMC6,PSMD1,PSMD10,PSMD11,PSMD12,PSMD13,PSMD4,PSMD2,PSMD3,PSMD4,PSMD5,PSMD6 ,PSMD7,PSMD8,PSMD9,PSME1,PSME2,PSMB3,PSME4,PSME1,RSBP6,RBCK1,RBX1,RCHY1,RLIM,RNF111,RNF114 ,RNF115,RNF123,RNF126,RNF130,RNF138,RNF14,RNF144B,RNF182,RNF19A,RNF19B,RNF213,RNF217,RNF220,RNF25,RNF34 ,RNF4,RNF41,RNF6,RNF7,RPS27A,S100A1,S100A9,SAR1B,SEC13,SEC24B,SEC23A,SEC24A,SEC24B,SEC24C ,SEC24D,SEC31A,SEC611A,SEC611A,SEC61B,SEC61G,SEM1,SH3RF1,SH19,ARNF19A,RNF19B,RNF213,RNF217,RNF220,RNF25,RNP23 ,SOC51,SOC53,SPSB1,SPSB2,SPSB4,STUB1,STX4,TAP1,TAP2,TAPBFTHOP1,TIRAPT1R1,TLR2,TLR4 ,TLR6,TPP2,TRAF7,TRAIP,TRIM11,TRIM21,TRIM32,TRIM32,TRIM36,TRIM39,TRIM41,TRIM50,TRIM63,TRIM69 ,TRIM71,TRIM9,TRIP12,UBA1,UBA2,UBR4,UBE21,UBE22,UBE
REATOME MHC-II	ACTR10,ACTR1A,ACTR1B,AP1B1,AP1G1,AP1M1,AP1M2,AP1S1,AP1S2,AP1S3,AP2A1,AP2A2,AP2B1,AP2M1,AP2S1,ARF1,CANX,CAPZA1,CAPZA2,CAPZA3,CAPZB,CD74,CENPE,CLTA,CLTC,CTSA,CTSB,CTSC,CTSD,CTSE,CTSF,CTSH,CTSK,CTSL,CTSO,CTSS,CTSV,DCTN1,DCTN2,DCTN3,DCTN4,DCTN5,DCTN6,DNM1,DNM2,DNM3,DYNC1H1,DYNC1I1,DYNC1I2,DYNC1LI1,DYNC1LI2,DYNLL1,DYNLL2,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DOB,HLA-DPB1,HLA-DQA1,HLA-DQB1,HLA-DQB2,HLA-DRB1,HLA-DRB1,HLA-DRB1,HLA-DRB1,HLA-DRB5,IF130,KIF11,KIF15,KIF18A,KIF20A,KIF22,KIF23,KIF26A,KIF2A,KIF2A,KIF2B,KIF2C,KIF3A,KIF3B,KIF3C,KIF4A,KIF4B,KIF5A,KIF5B,KIFAP3,KLC1,KLC2,KLC3,KLC4,LAG3,LGMN,OSBPL1A,RAB7A,RACGAP1,RILP,SAR1B,SEC13,SEC23A,SEC24A,SEC24B,SEC24C,SEC24D,SEC31A,SH3GL2,SPTBN2,TUBA1A,TUBA1B,TUBA3C,TUBA3C,TUBA3D,TUBA3E,TUBA4A,TUBA4B,TUBA8,TUBA1,TUBB1,TUBB2A,TUBB2B,TUBB83,TUBB4A,TUBB4B,TUBB4B,TUBB8B,TUBB8B