

Table S1: List of datasets.

Datasets types	Accession	Title	Cancer Type	Project (Abbreviations)	Available Cases per Data Category Used in Study	
					No severe irAEs	Severe irAEs
Bulk RNA-seq dataset	GSE186143	T cell characteristics associated with toxicity to immune checkpoint blockade in patients with melanoma [bulk RNA-seq]	Melanoma	SKCM	39	21
TCR scRNA-Seq dataset	GSE189126	T cell characteristics associated with toxicity to immune checkpoint blockade in patients with melanoma [BCR and TCR scRNA-Seq]	Melanoma	SKCM	36	17
scRNA-Seq dataset	GSE210037	Checkpoint blockade-induced dermatitis and colitis dominated by tissue resident memory T cells and Th1/Tc1 cytokines	Melanoma	SKCM	8	11
Clinical autoimmunity datasets	GSE72509	A gene signature in histologically normal surgical margins is predictive of oral carcinoma recurrence	Systemic lupus erythematosus	SLE	-	-
	GSE100833	Molecular Genetic Classification of clear-cell Renal Cell Carcinoma (ccRCC) based on the Gene Expression Profiling of Tumors and Tumorgrafts deficient for BAP1 or PBRM1	Inflammatory bowel disease	IBD	-	-

Table S2: List of antibodies stained for flow cytometry analyses.

Antibody	Company
BV510-CD11b	Biolegend
FITC-CD11b	Biolegend
FITC-CD11c	Biolegend
647-CD206	Biolegend
BV510-CD3	Biolegend
FITC-CD4	Biolegend
APC-CY7-CD44	Biolegend
Percp Cy5.5-CD45	Biolegend
Percp Cy5.5-CD45RO	Biolegend
PE-CD49b	Biolegend
PE-CD62L	Biolegend
APC-CD8	Biolegend
APC-CD80	Biolegend
PE-CD86	Biolegend
BV-421-F4/80	Biolegend

Table S3: List of gene sets.

Cell type	Gene markers
Activated CD4 T cell	AIM2, BIRC3, BRIP1CCL20, CCL4, CCL5, CCNB1, CCR7, DUSP2, ESCO2, ETS1, EXO1, EXOC6, IARS, ITK, KIF11, KNTC1, NUF2, PRC1, PSAT1, RGS1, RTKN2, SAMSN1, SELL, TRAT1
Central memory CD4 T cell	ABHD3, AHNAK, ANXA2P2, AQP3, ATHL1, BMI1, BZW2, CD63, COL4A1, CYLD, ELMO2, FYN, GLIPR1, GSS, IFITM2, ITGB1, ITGB2, KLF5, LSP1, NDUFB9, PKM2, SFXN3, SIRPG, SMAD4, STX4, TRADD, VIM, XRCC6
Effector memory CD4 T cell	ATM, CASP3, CASQ1, CD300E, DARS, DOCK9, EXOSC9, EZH2, GDE1, IL34, NCOA4, NEFL, PDGFRL, PTGS1, REPS1, SCG2, SDPR, SIGLEC14, SIGLEC6, TAL1, TFEC, TIPIN, TPK1, UQCRB, USP9Y, WIPF1, ZCRB1
T follicular helper cell	B3GAT1, CDK5R1, PDCD1, BCL6, CD200, CD83, CD84, FGF2, GPR18, CEBPA, CECR1, CLEC10A, CLEC4A, CSF1R, CTSS, DMN, DPP4, LRRC32, MC5R, MICA, NCAM1, NCR2, NRP1, PDCD1LG2, PDCD6, PRDX1, RAE1, RAET1E, SIGLEC7, SIGLEC9, TYRO3, CHST12, CLIC3, IVNS1ABP, KIR2DL2, LGMN
Gamma delta T cell	ACP5, AQP9, BTN3A2, C1orf54, CARD8, CCL18, CD209, CD33, CD36, CDK5, IL10RB, KLRF1, LGALS1, MAPK7, KLHL7, KRT80, LAMC1, LCORL, LMNB1, MEIS3P1, MPL, FABP1, FABP5, FADD, MFAP3L, MINPP1, RPS24, RPS7, RPS9, DBNL, CCL13
Type 1 T helper cell	CD70, TBX21, ADAM8, AHCYL2, ALCAM, B3GALNT1, BBS12, BST1, CD151, CD47, CD48, CD52, CD53, CD59, CD6, CD68, CD7, CD96, CFHR3, CHRM3, CLEC7A, COL23A1, COL4A4, COL5A3, DAB1, DLEU7, DOC2B, EMP1, F12, FURIN, GAB3, GATM, GFPT2, GPR25, GREM2, HAVCR1, HSD11B1, HUNK, IGF2, RCSD1, RYR1, SAV1, SELE, SELP, SH3KBP1, SIT1, SLC35B3, SIGLEC10, SKAP1, THUMP2, TIGIT, ZEB2, ENC1, FAM134B, FBXO30, FCGR2C, STAC, LTC4S, MAN1B1, MDH1, MMD, RGS16, IL12A, P2RX5, CD97, ITGB4, ICAM3, METRNL, TNFRSF1A, IRF1, HTR2B, CALD1, MOCOS, TRAF3IP2, TLR8, TRAF1, DUSP14
Type 17 T helper cell	IL17A, IL17RA, C2CD4A, C2CD4B, CA2, CCDC65, CEACAM3, IL17C, IL17F, IL17RC, IL17RE, IL23A, ILDR1, LONRF3, SH2D6, TNIP2, ABCA1, ABCB1, ADAMTS12, ANK1, ANKRD22, B3GALT2, CAMTA1, CCR9, CD40, GPR44, IFT80
Type 2 T helper cell	ASB2, CSRP2, DAPK1, DLC1, DNAJC12, DUSP6, GNAI1, LAMP3, NRP2, OSBPL1A, PDE4B, PHLDA1, PLA2G4A, RAB27B, RBMS3, RNF125, TMPRSS3, GATA3, BIRC5, CDC25C, CDC7, CENPF, CXCR6, DHFR, EVI5, GSTA4, HELLS, IL26, LAIR2
Regulatory T cell	CCL3L1, CD72, CLEC5A, FOXP3, ITGA4, L1CAM, LIPA, LRP1, LRRC42, MARCO, MMP12, MNDA, MRC1, MS4A6A, PELO, PLEK, PRSS23, PTGIR, ST8SIA4, STAB1
Type I IFN response	DDX4, IFIT1, IFIT2, IFIT3, IRF7, ISG20, MX1, MX2, RSAD2, TNFSF10
Type II IFN response	GPR146, SELP, AHR
Cytolytic activity	PRF1, GZMA
HLA	HLA-E, HLA-DPB2, HLA-C, HLA-J, HLA-DQB1, HLA-DQB2, HLA-DQA2, HLA-DQA1, HLA-A, HLA-DMA, HLA-DOB, HLA-DRB1, HLA-B, HLA-DRB5, HLA-DOA, HLA-DPB1, HLA-DRA, HLA-DRB6, HLA-F, HLA-G, HLA-DMB, HLA-DPA1
TILs	ITM2C, CD38, THEMIS2, GLYR1, ICOS, F5, TIGIT, KLRD1, IRF4, PRKCQ, FCRL5,

Innate immunity

SIRPG, LPXN, IL2RG, CCL5, LCK, TRAF3IP3, CD86, MAL, LILRB1, DOK2, CD6, PAG1, LAX1, PLEK, PIK3CD, SLAMF1, XCL1, GPR171, XCL2, TBX21, CD2, CD53, KLHL6, SLAMF6, CD40, SIT1, TNFRSF4, CD79A, CD247, LCP2, CD3D, CD27, SH2D1A, FYB, ARHGAP30, ACAP1, CST7, CD3G, IL2RB, CD3E, FCRL3, CORO1A, ITK, TCL1A, CYBB, CSF2RB, IKZF1, NCF4, DOCK2, CCR2, PTPRC, PLAC8, NCKAP1L, IL7R, 43714, CD28, STAT4, CD8A, LY9, CD48, HCST, PTPRCAP, SASH3, ARHGAP25, LAT, TRAT1, IL10RA, PAX5, CCR7, DOCK11, PARVG, SPNS1, CD52, HCLS1, ARHGAP9, GIMAP6, PRKCB, MS4A1, GPR18, TBC1D10C, GVINP1, P2RY8, EVI2B, VAMP5, KLRK1, SELL, MPEG1, MS4A6A, ARHGAP15, MFNG, GZMK, SELPLG, TARP, GIMAP7, FAM65B, INPP5D, ITGA4, MZB1, GPSM3, STK10, CLEC2D, IL16, NLRC3, GIMAP5, GIMAP4, IFFO1, CFH, PVRIG, CFHR1

ABCD1, CIQC, CAPG, CCL3L3, CD207, CD302, ATP5B, ATP5L, ATP6V1A, BCL2L1, CIQB, SNURF, SPCS3, CCNA1, CEACAM8, NOS2, SRA1, TNFRSF6B, TREM1, TREML1, RHOA, SLC25A37, TNFSF14, TREML4, VNN2, XPO6, CLEC4C, TNFAIP2, UBD, ACTR3, RAB1A, SLA, HLA-DQA2, SIGLEC5, SLAMF9, ABAT, C11orf75, C5orf15, CDHR1, DCAF12, DYNLL1, GPR137B, HCP5, HDGFRP2, KRT86, MLST8, ELMOD3, ENTPD5, FAM119A, FAM179A, CLIC2, COX7A2L, CREB3L4, CSF1, CSNK2A2, CSTA, CSTB, CTPS, CTSD, FST, GATA2, GMPR, HDC, HEY1, HOXA1, HS2ST1, HS3ST1, BCL11B, CDH3, MYL6B, NAA16, CIQA, CIQB, CYP27B1, EIF3M, CYP27A1, DDX55, DYRK2, RPL37A, NOTCH3, AKR7A3, GPRC5C, GRIN1, HLA-E, PORCN, PSMC4, UPP1, IL21R, KIR2DS1, KIR2DS2, KIR2DS5, GIPR, KRT18P50, LRMP, FOSB, RRP12, GPR183, NR4A3, ST3GAL6, DEPDC5, PDE6C, PKD2L2, GPR65, IL5RA, P2RY14, DACH1, DAPK2, EMR3, ACADM, AHCYL1, ALDH1A2, ALDH3A2, ALDH9A1, ALOX15, AMT, ARL1, ATIC, ATP5A1, CAPZA1, LILRA5, RDX, RRAGD, TACSTD2, INPP5F, RAB38, PLAU, CSF3R, SLC18A2, AMPD2, CLTB, C1orf162, AIF1, CCL1, CCL14, CCL23, CCL26, CD300LB, CNR1, CNR2, EIF1, EIF4A1, FPR1, FPR2, FRAT2, GPR27, GPR77, RNASE2, MS4A2, BASP1, IGSF6, HK3, VNN1, FES, NPL, FZD2, FAM198B, HNMT, SLC15A3, CD4, TXNDC3, FRMD4A, CRYBB1, HRH1, WNT5B, ADAMTS3, CPA3, CMA1, CTSB, ARHGAP15, CPM, FCN1, FTL, HSPA6, ITGA9, RNASE3, S100A4, SIGLEC8, SLC6A4, PTGS2, EGR3, PILRA, CCR2, CD14, CD2, CD86, CXCR4, FCGR2A, FCGR2B, FCGR3A, FERMT3, GPSM3, IL18BP, IL4R, ITGAL, ITGAM, PARVG, PSAP, PTGER2, PTGES2, S100A8, S100A9, ASGR2, CFP, ASGR1, CD1D, UPK3A, ACTG1, ANXA5, ATP6V1B2, CFL1, DAZAP2, CTBS, EMR4P, HIVEP2, MARCKSL1, MBP, MMP15, PNPLA6, TMBIM6, PQBP1, TEX264, IKZF1, AKT3, AXL, BST2, CDH2, CRTAM, CSF2RA, CTSZ, CXCL1, CYTH1, DAXX, DGKH, DLL4, DPYD, ERBB3, F11R, FAM27A, FAM49A, FASLG, FCGR1A, FN1, FSTL1, FUCA1, GBP3, GLS2, GRB2, LST1, BCL2, CDC5L, FGF18, FUT5, FZR1, GAGE2, IGFBP5, KANK2, LDB3, BTN2A2, CD101, CD109, CNPY3, CNPY4, CREB1, CRTC2, CRTC3, CSF2, KLRC1, FUT4, ICAM2, IL32, LAMP2, LILRB5, KLRG1, HSPA4, HSPB6, ISM2, ITIH2, KDM4C, KIR2DS4, KIRREL3, SDCBP, NFATC2IP, MICB, KIR2DL1, KIR2DL3, KIR3DL1, KIR3DL2, NCR1, FOSL1, TSLP, SLC7A7, SPP1, TREM2, UBASH3A, YBX2, CCDC88A, CLEC1A, THBD, PDPN, VCAM1, EMR1, CREB5, CDA, CHST15, S100A12, APOBEC3A, CASP5, MMP25, HAL, C1orf183, FFAR2, MAK, CXCR1, STEAP4, MGAM, BTNL8, CXCR2, TNFRSF10C, VNN3, CBX6, DAB2, DDX17,

Adaptive immunity

HIGD1A, IDH3A, IL3RA, MAGED1, NUCB2, OFD1, OGT, PDIA4, SERTAD2, SIRPA, TMED2, ENG, FCAR, IGF1, ITGA2B, GABARAP, GPX1, KRT23, PROK2, RALB, RETNLB, RNF141, SEC14L1, SEPX1, EMP3, CD300LF, ABTB1, KLHL21, PHRF1

ADAM28, CD180, CD79B, BLK, CD19, MS4A1, TNFRSF17, IGHM, GNG7, MICAL3, SPIB, HLA-DOB, IGKC, PNO, FCRL2, BACH2, CR2, TCL1A, AKNA, ARHGAP25, CCL21, CD27, CD38, CLEC17A, CLEC9A, CLECL1, AIM2, BIRC3, BRIPI, CCL20, CCL4, CCL5, CCNB1, CCR7, DUSP2, ESCO2, ETS1, EXO1, EXOC6, IARS, ITK, KIF11, KNTC1, NUF2, PRC1, PSAT1, RGS1, RTKN2, SAMSN1, SELL, TRAT1, ADRM1, AHS1, C1GALT1C1, CCT6B, CD37, CD3D, CD3E, CD3G, CD69, CD8A, CETN3, CSE1L, GEMIN6, GNLY, GPT2, GZMA, GZMH, GZMK, IL2RB, LCK, MPZL1, NKG7, PIK3IP1, PTRH2, TIMM13, ZAP70, ACP5, AQP9, BTN3A2, C1orf54, CARD8, CCL18, CD209, CD33, CD36, CDK5, IL10RB, KLRF1, LGALS1, MAPK7, KLHL7, KRT80, LAMC1, LCORL, LMNB1, MEIS3P1, MPL, FABP1, FABP5, FADD, MFAP3L, MINPP1, RPS24, RPS7, RPS9, DBNL, CCL13, CD22, CYBB, FAM129C, FCRL1, FCRL3, FCRL5, FCRLA, HDAC9, HLA-DQA1, HVCN1, KIAA0226, NCF1, NCF1B, P2RY10, SP100, TXNIP, STAP1, TAGAP, ZCCHC2, CCL3L1, CD72, CLEC5A, FOXP3, ITGA4, L1CAM, LIPA, LRP1, LRRC42, MARCO, MMP12, MNDA, MRC1, MS4A6A, PELO, PLEK, PRSS23, PTGIR, ST8SIA4, STAB1, B3GAT1, CDK5R1, PDCD1, BCL6, CD200, CD83, CD84, FGF2, GPR18, CEBPA, CECR1, CLEC10A, CLEC4A, CSF1R, CTSS, DMN, DPP4, LRRC32, MC5R, MICA, NCAM1, NCR2, NRP1, PDCD1LG2, PDCD6, PRDX1, RAE1, RAET1E, SIGLEC7, SIGLEC9, TYRO3, CHST12, CLIC3, IVNS1ABP, KIR2DL2, LGMN, CD70, TBX21, ADAM8, AHCYL2, ALCAM, B3GALNT1, BBS12, BST1, CD151, CD47, CD48, CD52, CD53, CD59, CD6, CD68, CD7, CD96, CFHR3, CHRM3, CLEC7A, COL23A1, COL4A4, COL5A3, DAB1, DLEU7, DOC2B, EMP1, F12, FURIN, GAB3, GATM, GFPT2, GPR25, GREM2, HAVCR1, HSD11B1, HUNK, IGF2, RCSD1, RYR1, SAV1, SELE, SELP, SH3KBP1, SIT1, SLC35B3, SIGLEC10, SKAP1, THUMP2, TIGIT, ZEB2, ENC1, FAM134B, FBXO30, FCGR2C, STAC, LTC4S, MAN1B1, MDH1, MMD, RGS16, IL12A, P2RX5, CD97, ITGB4, ICAM3, METRNL, TNFRSF1A, IRF1, HTR2B, CALD1, MOCOS, TRAF3IP2, TLR8, TRAF1, DUSP14, IL17A, IL17RA, C2CD4A, C2CD4B, CA2, CCDC65, CEACAM3, IL17C, IL17F, IL17RC, IL17RE, IL23A, ILDR1, LONRF3, SH2D6, TNIP2, ABCA1, ABCB1, ADAMTS12, ANK1, ANKRD22, B3GALT2, CAMTA1, CCR9, CD40, GPR44, IFT80, ASB2, CSRP2, DAPK1, DLC1, DNAJC12, DUSP6, GNAI1, LAMP3, NRP2, OSBPL1A, PDE4B, PHLDA1, PLA2G4A, RAB27B, RBMS3, RNF125, TMPRSS3, GATA3, BIRC5, CDC25C, CDC7, CENPF, CXCR6, DHFR, EVI5, GSTA4, HELLS, IL26, LAIR2

Table S4: List of 61 pro-inflammation cytokines.

Cytokines	χ^2	P
IL1A	2.47084	0.29071
IL1B	1.19554	0.55004
IL2	1.1418	0.56502
IL3	0.30858	0.85702
IL4	2.30875	0.31526
IL5	0.3409	0.84329
IL6	6.13252	0.0466
IL6R	0.06682	0.96714
CXCL8	0.05369	0.97351
IL9	0.17733	0.91515
IL10	2.20224	0.3325
IL11	1.78871	0.40887
IL12B	2.71188	0.25771
IL12A	1.74721	0.41744
IL13	0.26989	0.87376
IL15	5.88347	0.05277
IL16	1.728	0.42147
IL17A	1.48906	0.47496
IL17F	2.17976	0.33626
IL18	3.47544	0.17592
IL19	1.65335	0.4375
IL20	0.14124	0.93182
IL21	0.00341	0.99829
IL22	0.61759	0.73433
IL23A	7.22341	0.02701
IL24	6.19316	0.0452
IL25	3.65621	0.16072
IL26	0.31172	0.85568
IL27	0.02429	0.98793
IFNL3	0.29119	0.86451
IFNL1	2.68268	0.2615
IL31	0.29872	0.86126
IL32	6.29194	0.04303
IL33	1.02116	0.60015
IL34	2.73388	0.25489
IL36G	1.13964	0.56563
IL37	2.99565	0.22362
IL1F10	1.66528	0.4349
TNF	0.00479	0.99761
TNFRSF1A	0.37729	0.82808
TNFRSF1B	2.13767	0.34341

IFNA17	1.81686	0.40316
IFNG	0.28697	0.86633
TGFB1	1.52935	0.46549
SPP1	3.84865	0.14597
OSM	0.49036	0.78256
CSF1	0.26528	0.87578
CSF2	0.32075	0.85183
ICAM1	0.70027	0.70459
CCL1	0.05592	0.97243
CCL2	0.87369	0.64607
CCL8	0.24543	0.88452
CCL3	3.93259	0.13997
CCL4	1.96734	0.37394
CCL15	1.3078	0.52001
CCL5	0.22454	0.8938
CXCL9	2.94892	0.2289
CXCL10	2.35293	0.30837
CXCL13	0.45588	0.79617
TIMP2	1.7465	0.41759
TIMP1	5.39877	0.06725

Table S5: The infiltration difference of immune cells between severe irAEs and no severe irAEs patients.

Immune cell type	Mann-Whitney U	Wilcoxon W	Z score	P-value
B_cell_TIMER	254	920	-1.45145	0.146653
T_cell_CD4_TIMER	117	783	-3.60154	0.000316
T_cell_CD8_TIMER	261	414	-0.85749	0.391173
Neutrophil_TIMER	298	451	-0.15245	0.878835
Macrophage_TIMER	240	906	-1.32036	0.186714
Myeloid_dendritic_cell_TIMER	302	455	-0.07622	0.939243
B_cell_naive_CIBERSORT	261	927	-0.85749	0.391173
B_cell_memory_CIBERSORT	239	905	-1.39607	0.162693
B_cell_plasma_CIBERSORT	261	414	-0.92043	0.357349
T_cell_CD8_CIBERSORT	269.5	935.5	-0.7302	0.465268
T_cell_CD4_naive_CIBERSORT	207	873	-1.88652	0.059225
T_cell_CD4_memory_resting_CIBERSORT	286	952	-0.38126	0.703009
T_cell_CD4_memory_activated_CIBERSORT	144	810	-3.13018	0.001747
T_cell_follicular_helper_CIBERSORT	263.5	416.5	-1.59683	0.110305
T_cell_regulatory_CIBERSORT	306	459	0	1
T_cell_gamma_delta_CIBERSORT	280.5	433.5	-1.2132	0.225054
NK_cell_resting_CIBERSORT	204	870	-1.94365	0.051938
NK_cell_activated_CIBERSORT	246.5	399.5	-1.92675	0.054011
Monocyte_CIBERSORT	187	853	-2.26764	0.023351
Macrophage_M0_CIBERSORT	284	437	-0.45841	0.646657
Macrophage_M1_CIBERSORT	296	962	-0.57713	0.56385
Macrophage_M2_CIBERSORT	294	960	-0.23611	0.813346
Myeloid_dendritic_cell_resting_CIBERSORT	306	459	0	1
Myeloid_dendritic_cell_activated_CIBERSORT	300	966	-0.12084	0.903817
Mast_cell_activated_CIBERSORT	296.5	962.5	-0.35694	0.721139
Mast_cell_resting_CIBERSORT	134	287	-3.31517	0.000916
Eosinophil_CIBERSORT	242.5	395.5	-1.41031	0.158449
Neutrophil_CIBERSORT	237	390	-1.33322	0.182458
B_cell_naive_CIBERSORTABS	221	887	-1.61971	0.105295
B_cell_memory_CIBERSORTABS	229	895	-1.60444	0.108617
B_cell_plasma_CIBERSORTABS	269	422	-0.7568	0.449172
T_cell_CD8_CIBERSORTABS	242.5	908.5	-1.27035	0.203961
T_cell_CD4_naive_CIBERSORTABS	182	848	-2.36292	0.018132
T_cell_CD4_memory_resting_CIBERSORTABS	278	944	-0.53377	0.593503
T_cell_CD4_memory_activated_CIBERSORTABS	121	787	-3.57459	0.000351
T_cell_follicular_helper_CIBERSORTABS	263.5	416.5	-1.59683	0.110305
T_cell_regulatory_Tregs_CIBERSORTABS	306	459	0	1
T_cell_gamma_delta_CIBERSORTABS	280.5	433.5	-1.2132	0.225054
NK_cell_resting_CIBERSORTABS	140	806	-3.1632	0.00156
NK_cell_activated_CIBERSORTABS	246.5	399.5	-1.92675	0.054011
Monocyte_CIBERSORTABS	155	821	-2.87742	0.004009

Macrophage_M0_CIBERSORTABS	293	446	-0.27088	0.786484
Macrophage_M1_CIBERSORTABS	297	963	-0.51942	0.603468
Macrophage_M2_CIBERSORTABS	265	931	-0.80672	0.41983
Myeloid_dendritic_cell_resting_CIBERSORTABS	306	459	0	1
Myeloid_dendritic_cell_activated_CIBERSORTABS	281	947	-0.5035	0.61461
Mast_cell_activated_CIBERSORTABS	296.5	962.5	-0.35694	0.721139
Mast_cell_resting_CIBERSORTABS	163	316	-2.75621	0.005847
Eosinophil_CIBERSORTABS	240.5	393.5	-1.45473	0.145745
Neutrophil_CIBERSORTABS	268	421	-0.73424	0.462803
B_cell_QUANTISEQ	204	870	-1.94365	0.051938
Macrophage_M1_QUANTISEQ	264.5	930.5	-0.842	0.399787
Macrophage_M2_QUANTISEQ	244	910	-1.5231	0.127734
Monocyte_QUANTISEQ	252	918	-1.05349	0.292119
Neutrophil_QUANTISEQ	298	451	-0.15244	0.878837
NK_cell_QUANTISEQ	214	880	-1.7531	0.079585
T_cell_CD4_nonregulatory_QUANTISEQ	171.5	837.5	-2.57786	0.009942
T_cell_CD8_QUANTISEQ	257.5	923.5	-0.92437	0.355292
T_cell_regulatory_Tregs_QUANTISEQ	261	927	-0.85751	0.391163
Myeloid_dendritic_cell_QUANTISEQ	256	922	-1.14972	0.250261
uncharacterized_cell_QUANTISEQ	206	359	-1.90554	0.05671
Myeloid_dendritic_cell_activated_XCELL	287	440	-0.3959	0.692178
B_cell_XCELL	187.5	853.5	-2.25852	0.023913
T_cell_CD4_memory_XCELL	203	869	-1.97727	0.048011
T_cell_CD4_naive_XCELL	125	791	-3.4811	0.000499
T_cell_CD4_nonregulatory_XCELL	261	414	-0.8948	0.370896
T_cell_CD4_central_memory_XCELL	255	408	-0.99496	0.319756
T_cell_CD4_effector_memory_XCELL	272	938	-0.66898	0.503506
T_cell_CD8_naive_XCELL	281	434	-0.47798	0.632666
T_cell_CD8_XCELL	241	907	-1.24274	0.213963
T_cell_CD8_central_memory_XCELL	271.5	937.5	-0.65853	0.510199
T_cell_CD8_effector_memory_XCELL	218	884	-1.69613	0.089861
Classswitched_memory_B_cell_XCELL	214.5	880.5	-1.75371	0.07948
Common_lymphoid_progenitor_XCELL	266	932	-0.76228	0.445894
Common_myeloid_progenitor_XCELL	301	454	-0.09838	0.921631
Myeloid_dendritic_cell_XCELL	289	955	-0.34009	0.733786
Endothelial_cell_XCELL	197	350	-2.08631	0.03695
Eosinophil_XCELL	213	366	-1.77645	0.075658
Cancer_associated_fibroblast_XCELL	298	964	-0.15608	0.875971
Granulocytemonocyte_progenitor_XCELL	297.5	963.5	-0.19545	0.845039
Hematopoietic_stem_cell_XCELL	215	368	-1.73474	0.082787
Macrophage_XCELL	276	942	-0.60421	0.545707
Macrophage_M1_XCELL	289	955	-0.34009	0.733786
Macrophage_M2_XCELL	269.5	935.5	-0.69957	0.484198
Mast_cell_XCELL	214.5	880.5	-1.7436	0.081228

B_cell_memory_XCELL	201	867	-2.00098	0.045395
Monocyte_XCELL	226	892	-1.52474	0.127324
B_cell_naive_XCELL	214.5	880.5	-1.75371	0.07948
Neutrophil_XCELL	256	409	-0.95508	0.339536
NK_cell_XCELL	178.5	844.5	-2.43768	0.014782
T_cell_NK_XCELL	205	358	-1.92927	0.053698
Plasmacytoid_dendritic_cell_XCELL	153.5	819.5	-2.94662	0.003213
B_cell_plasma_XCELL	221.5	887.5	-1.61955	0.10533
T_cell_gamma_delta_XCELL	257	923	-0.99417	0.320139
T_cell_CD4_Th1_XCELL	303	969	-0.05717	0.954409
T_cell_CD4_Th2_XCELL	251	917	-1.06272	0.287911
T_cell_regulatory_Tregs_XCELL	253.5	919.5	-1.00623	0.314307
immune_score_XCELL	242	908	-1.21955	0.222637
stroma_score_XCELL	179	332	-2.42023	0.015511
microenvironment_score_XCELL	247	913	-1.12427	0.260899
B_cell_EPIC	261	927	-0.85749	0.391173
Cancer_associated_fibroblast_EPIC	229	382	-1.46727	0.142304
T_cell_CD4_EPIC	119	785	-3.56336	0.000366
T_cell_CD8_EPIC	263	416	-0.81938	0.412568
Endothelial_cell_EPIC	212	365	-1.79121	0.07326
Macrophage_EPIC	276	942	-0.57166	0.567551
NK_cell_EPIC	292	445	-0.26678	0.789642
uncharacterized_cell_EPIC	105	258	-3.83014	0.000128
T_cell_MCPCOUNTER	242	908	-1.21955	0.222637
T_cell_CD8_MCPCOUNTER	236	902	-1.33388	0.182244
cytotoxicity_score_MCPCOUNTER	194	860	-2.1342	0.032826
NK_cell_MCPCOUNTER	189	855	-2.22948	0.025782
B_cell_MCPCOUNTER	154	820	-2.89642	0.003774
Monocyte_MCPCOUNTER	175	841	-2.49626	0.012551
Macrophage_Monocyte_MCPCOUNTER	175	841	-2.49626	0.012551
Myeloid_dendritic_cell_MCPCOUNTER	204	870	-1.94365	0.051938
Neutrophil_MCPCOUNTER	275	428	-0.59072	0.55471
Endothelial_cell_MCPCOUNTER	260	413	-0.87655	0.380732
Cancer_associated_fibroblast_MCPCOUNTER	297	450	-0.1715	0.863832
DC	272	938	-0.648	0.516984
B_cell	237.5	390.5	-1.30608	0.191524
Monocyte	263	929	-0.81958	0.412455
Macrophage	222	375	-1.60094	0.109389
NK	192.5	858.5	-2.16305	0.030537
Neutrophil	229.5	382.5	-1.45786	0.14488
CD4_T	251.5	917.5	-1.03869	0.29895
CD8_T	195	861	-2.11536	0.034399
NKT	189	342	-2.22998	0.025749
Gamma_delta	225.5	891.5	-1.53455	0.124895

CD4_naive	148	814	-3.07064	0.002136
Tr1	273.5	939.5	-0.62942	0.529076
nTreg	285.5	951.5	-0.40746	0.683671
iTreg	283	949	-0.4424	0.658203
Th1	174.5	327.5	-2.55777	0.010535
Th2	294	447	-0.22968	0.818343
Th17	260.5	926.5	-0.87263	0.382863
Tfh	207	873	-1.89684	0.05785
CD8_naive	238	904	-1.29883	0.194001
Cytotoxic	201	867	-2.00361	0.045112
Exhausted	221	887	-1.62499	0.104164
MAIT	212.5	878.5	-1.78517	0.074233
Central_memory	192	858	-2.17865	0.029358
Effector_memory	222	888	-2.01641	0.043757
InfiltrationScore	286	952	-0.38112	0.703112

Table S6: The immune cell subpopulations associated with severe irAEs using Lasso and SVM algorithm.

Lasso-results	SVM-results
T cell CD4+ naive_CIBERSORT	T cell CD4+ memory activated_CIBERSORT
T cell CD4+ memory activated_CIBERSORT	Mast cell resting_CIBERSORT
NK cell activated_CIBERSORT	T cell CD4+ naive_CIBERSORT
Monocyte_CIBERSORT	NK cell resting_CIBERSORT
Mast cell resting_CIBERSORT	Monocyte_CIBERSORT
B cell naive_CIBERSORT-ABS	B cell naive_CIBERSORT
T cell CD8+_CIBERSORT-ABS	T cell CD8+_CIBERSORT
T cell CD4+ naive_CIBERSORT-ABS	Neutrophil_CIBERSORT
T cell CD4+ memory resting_CIBERSORT-ABS	T cell CD4+ memory resting_CIBERSORT
T cell CD4+ memory activated_CIBERSORT-ABS	B cell memory_CIBERSORT
T cell follicular helper_CIBERSORT-ABS	T cell CD4+ memory activated_CIBERSORT-ABS
NK cell resting_CIBERSORT-ABS	NK cell resting_CIBERSORT-ABS
Monocyte_CIBERSORT-ABS	Monocyte_CIBERSORT-ABS
Macrophage M0_CIBERSORT-ABS	Mast cell resting_CIBERSORT-ABS
Mast cell activated_CIBERSORT-ABS	T cell CD4+ naive_CIBERSORT-ABS
Mast cell resting_CIBERSORT-ABS	B cell naive_CIBERSORT-ABS
T cell CD4+_EPIC	T cell CD4+_EPIC
B_cell_ImmuneCellAI	T cell CD8+_EPIC
Monocyte_ImmuneCellAI	Cancer associated fibroblast_EPIC
NK_ImmuneCellAI	Endothelial cell_EPIC
Gamma_delta_ImmuneCellAI	Macrophage_EPIC
CD4_naive_ImmuneCellAI	B cell_EPIC
Th1_ImmuneCellAI	NKT_ImmuneCellAI
Th17_ImmuneCellAI	Macrophage_ImmuneCellAI
Exhausted_ImmuneCellAI	Cytotoxic_ImmuneCellAI
Effector_memory_ImmuneCellAI	NK_ImmuneCellAI
B_cell_QUANTISEQ	Gamma_delta_ImmuneCellAI
Neutrophil_QUANTISEQ	CD8_T_ImmuneCellAI
NK cell_QUANTISEQ	Central_memory_ImmuneCellAI
T cell CD4+ (non-regulatory)_QUANTISEQ	Monocyte_ImmuneCellAI
T cell CD8+_QUANTISEQ	Exhausted_ImmuneCellAI
T cell regulatory (Tregs)_QUANTISEQ	CD4_naive_ImmuneCellAI
Myeloid dendritic cell_QUANTISEQ	Neutrophil_ImmuneCellAI
B cell_TIMER	Th17_ImmuneCellAI
T cell CD4+_TIMER	B_cell_ImmuneCellAI
	Tfh_ImmuneCellAI
	Th1_ImmuneCellAI
	CD4_T_ImmuneCellAI

B cell_MCPCOUNTER
cytotoxicity score_MCPCOUNTER
Monocyte_MCPCOUNTER
Macrophage/Monocyte_MCPCOUNTER
NK cell_MCPCOUNTER
T cell_MCPCOUNTER
Myeloid dendritic cell_MCPCOUNTER
T cell CD8+_MCPCOUNTER
Cancer associated fibroblast_MCPCOUNTER
Endothelial cell_MCPCOUNTER
Neutrophil_MCPCOUNTER
T cell CD4+ (non-regulatory)_QUANTISEQ
B cell_QUANTISEQ
NK cell_QUANTISEQ
Neutrophil_QUANTISEQ
T cell CD8+_QUANTISEQ
T cell regulatory (Tregs)_QUANTISEQ
Monocyte_QUANTISEQ
Macrophage M1_QUANTISEQ
Macrophage M2_QUANTISEQ
Myeloid dendritic cell_QUANTISEQ
T cell CD4+_TIMER
T cell CD8+_TIMER
Neutrophil_TIMER
Myeloid dendritic cell_TIMER
Macrophage_TIMER
B cell_TIMER
T cell CD4+ naive_XCELL
Plasmacytoid dendritic cell_XCELL
