**SUPPLEMENTARY TABLES**

Supplementary Table 1. Functional annotation of the immune-system-related metagene clusters.

| Metagene   | Incorporated genes                                                                 |
|------------|------------------------------------------------------------------------------------|
| LCK        | Genes in this cluster contain ARHGAP15 ARHGAP25 CCL5 CCR2 CCR7 CD2 CD247 CD27 CD3D |
|            | CD48 CD53 CORO1A CSF2RB EVI2B FGL2 GIMAP4 GIMAP5 GMFG GZMA GZMK HCLS1 IL10RA         |
|            | IL2RG IL7R INPP5D IRF8 ITK KLRK1 LCK LCP2 LPXN LTB PIK3CD PLAC8 PRG1 PRKCB1 PTPRC   |
|            | RAC2 SAMSSN1 SCYA5 SELL SD2D1A SLA SLAMF1 STAT4                                    |
|            | TNFRSF7 TRBC1                                                                      |
| Tfh        | This cluster contain CD200 CXCL13 FBLN7 ICOS SGPP2                                 |
|            | SH2D1A TIGIT PDCD1                                                                  |
| Tregs      | This cluster contain FOXP3 C15orf53 IL5 CTLA4 IL32 GPR15 IL4                       |
| Cytolytic  | This cluster contain GIZMA PRF1                                                    |
| MHC2       | This cluster contain HLA-DMA HLA-DQB1 HLA-DRA HLA-DRB4                            |
| NK         | This cluster contain KLRF1 KLRK1                                                   |
| Macrophages| This cluster contain FUCA1 MMP9 LGMN HS3ST2 TM4SF19 CLEC5A GPNMB C11orf45 CD68 CYBB|
| MHC1       | This cluster contain HLA-A HLA-B HLA-C HLA-F                                      |
|            | HLA-G HLA-J                                                                       |
| STAT1      | This cluster contain CXCL10 CXCL11 GBP1 STAT1                                      |
| IFN        | This cluster contain DDX58 HERC6 IFI44 IFI44L IFIT1                                |
|            | IFIT2 MX1 OAS1 OAS3 RSAD2                                                           |
| Co_stimulation | This cluster contain CD2 CD226 CD27 CD28 CD40 CD40LG CD58 CD70 ICOS ICOSLG SLAMF1 |
|            | TNFRSF18 TNFRSF25 TNFRSF4 TNFRSF8 TNFRSF9 TNFSF14 TNFSF15 TNFSF18 TNFSF4 TNFSF8    |
|            | TNFSF9                                                                            |
| Co_inhibition | This cluster contain BTLA C10orf54 CD160 CD244 CD274 CTLA4 HAVCR2 LAG3 LAIR1        |
|            | LGALS9 PDCD1LG2 PVRL3 TIGIT                                                        |

Supplementary Table 2. The number of genes corresponding to 19 module.

| Module     | Number |
|------------|--------|
| Black      | 166    |
| Blue       | 498    |
| Brown      | 241    |
| Cyan       | 74     |
| Green      | 196    |
| Greenyellow| 83     |
| Grey       | 912    |
| Grey-60    | 52     |
| Lightcyan  | 66     |
| Lightgreen | 37     |
| Magenta    | 129    |
| Midnightblue| 73    |
| **Pink**   | **141**|
| Purple     | 86     |
| Red        | 171    |
| Salmon     | 75     |
| Tan        | 77     |
| Turquoise  | 1724   |
| Yellow     | 199    |
Supplementary Table 3. The integration of the 70 selected genes ID.

| ID                      |
|-------------------------|
| ENSG00000008517         |
| ENSG00000011600         |
| ENSG00000019582         |
| ENSG00000025708         |
| ENSG00000028137         |
| ENSG00000066336         |
| ENSG00000090382         |
| ENSG00000100342         |
| ENSG00000100985         |
| ENSG00000102575         |
| ENSG00000104951         |
| ENSG00000106565         |
| ENSG00000111348         |
| ENSG00000122862         |
| ENSG00000125347         |
| ENSG00000125730         |
| ENSG00000128340         |
| ENSG00000130203         |
| ENSG00000130208         |
| ENSG00000131203         |
| ENSG00000132465         |
| ENSG00000133321         |
| ENSG00000136167         |
| ENSG00000141574         |
| ENSG00000143119         |
| ENSG00000158869         |
| ENSG00000159189         |
| ENSG00000162511         |
| ENSG00000163131         |
| ENSG00000165949         |
| ENSG00000166710         |
| ENSG00000168899         |
| ENSG00000169245         |
| ENSG00000169442         |
| ENSG00000170458         |
| ENSG00000173369         |
| ENSG00000173372         |
| ENSG00000173432         |
| ENSG00000177989         |
| ENSG00000179344         |
| ENSG00000182326         |
| ENSG00000196126         |
| ENSG00000198502         |
### Supplementary Table 4. The 58 Common genes ID.

| ID              |
|-----------------|
| ENSG00000019582 |
| ENSG00000166710 |
| ENSG00000196126 |
| ENSG00000211895 |
| ENSG0000130203  |
| ENSG0000211592  |
| ENSG0000211677  |
| ENSG0000165949  |
| ENSG0000211896  |
| ENSG0000125730  |
| ENSG0000159189  |
| ENSG000198502   |
| ENSG000100342   |
| ENSG000173372   |
| ENSG000223865   |
| ENSG000173369   |
| ENSG000133321   |
| ENSG000111600   |
| ENSG000111348   |
Supplementary Table 5. Genes with prognostic value.

| Genes       | Symbol  | HR     | pvalue   | Low 95% CI  | High 95% CI  |
|-------------|---------|--------|----------|-------------|--------------|
| ENSG0000019582 | CD74    | 0.783657 | 0.00074  | 0.680156    | 0.902907     |
| ENSG00000198502 | HLA-DRB5 | 0.83873  | 0.00110  | 0.754685    | 0.932135     |
| ENSG00000169442 | CD52    | 0.815082 | 0.00498  | 0.706682    | 0.94011      |
| ENSG00000223865 | HLA-DPB1 | 0.82427  | 0.00795  | 0.714643    | 0.950714     |
| ENSG00000196126 | HLA-DRB1 | 0.84914  | 0.01448  | 0.744817    | 0.968075     |
| ENSG00000028137 | TNFRSF1B | 0.790104 | 0.01906  | 0.648852    | 0.962106     |
| ENSG00000211895 | IGHA1   | 0.91981  | 0.02056  | 0.856994    | 0.987231     |
| ENSG00000177989 | ODF3B   | 0.880537 | 0.03447  | 0.782588    | 0.990745     |
| ENSG00000102575 | ACP5    | 0.845597 | 0.03732  | 0.722112    | 0.990198     |
| ENSG00000162511 | LAPT M5 | 0.83494  | 0.03744  | 0.704476    | 0.989566     |
| ENSG00000211677 | IGLC2   | 0.931208 | 0.04685  | 0.868008    | 0.999009     |

HR: hazard ratio; CI: confidence interval