En el studio de single-cell transcriptomics hemos considerado los siguientes genes para las firmas proyectadas con el paquete U cell, que si lo creeis oportundo, se pueden cambiar:

signatures <- list(UPS = c("PSMB2", "PSMC3", "RBX1"),

PROTEASOME = c("PSMA1", "PSMA2", "PSMA3", "PSMA4", "PSMA5", "PSMA6", "PSMA7", "PSMB1", "PSMB2", "PSMB3", "PSMB4", "PSMB5", "PSMB6", "PSMB7", "PSMC1", "PSMC2", "PSMC3", "PSMC4", "PSMC5", "PSMC6", "PSMD1", "PSMD2", "PSMD3", "PSMD4", "PSMD6", "PSMD7", "PSMD8", "PSMD11", "PSMD12", "PSMD13", "PSMD14"),

HYPOXIC\_EXHAUSTION = c("PSMC3", "PSMB2", "RBPJ", "RBX1", "PKM", "PGK1", "PSMB8", "ENO1", "LDHA", "CHCHD2"),

CHAPERONAS = c("PSMG1", "PSMG2", "PSMG3", "PSMG4", "POMP", "PSMD9", "PSMD5", "PAAF1"),

TF = c("NRF1", "NFE2L1"),

EXHAUSTION = c("LAG3", "XCL1", "CRTAM", "IFNG", "CCL4", "PDCD1", "DUSP4", "ZEB2", "NR4A2", "SLA", "TIGIT", "TNFRSF9", "TOX", "LYST", "TNFSF4", "CCL3", "RAB27A", "CD70", "PLSCR1", "CXCL13", "HAVCR2", "CTSD", "ID2", "CD63", "RBPJ", "FAM3C", "CSF1", "ENTPD1"),

EFFECTOR\_MEMORY = c("GZMK", "NKG7", "GZMB", "PRF1", "ABI3", "FASLG", "C12orf75", "EOMES", "CHST12", "CCR5", "HCST", "HOPX", "SLAMF7", "CXCR3", "OASL", "F2R", "CXCR6"),

NAIVE = c("CCR7", "IL7R", "SELL", "TCF7", "TXK", "S1PR1", "LEF1", "SATB1"),

EARLY\_ACTIVATED = c("FOS", "CD69", "ZFP36", "FOSB", "CCL5", "GZMM", "DUSP2", "LYAR", "SAMD3", "CXCR4", "CTSW", "CD8A", "ANXA1", "KLRG1", "CD8B", "AOAH", "TAGAP", "KLRD1", "IER2", "GZMA", "CST7", "ITM2C", "PARP8", "BTG2")

)

* GENE NAME (PROTEIN NAME)

**PROTEASOMA 26S**

**Partícula central (CP) 20S**

* Anillo α: Gen (Proteina)
  + PSMA1 (α1)
  + PSMA2 (α2)
  + PSMA3 (α3)
  + PSMA4 (α4)
  + PSMA5 (α5)
  + PSMA6 (α6)
  + PSMA7 (α7)
  + PSAMA8: espermatoproteasoma
* Anillo β:
  + PSMB1 (β1): actividad caspasa
  + PSMB2 (β2): actividad tripsina
  + PSMB3 (β3)
  + PSMB4 (β4)
  + PSMB5 (β5): actividad quimiotripsina
  + PSMB6 (β6)
  + PSMB7 (β7)
  + PSMB8 (β5i o LMP7): inmunoproteasoma: sustituye a PSMB5
  + PSMB9 (β1i o LMP2): inmunoproteasoma: sustituye a PSMB1
  + PSMB10 (β2i o LMP10): inmunoproteasoma: sustituye a PSMB2
  + PSMB11

**Particulas reguladoras (RP) 19S o PA700**

* Actividad ATPasa: desplegamiento proteínas, apertura puerta a CP y translocación
  + PSMC1 (Rpt2)
  + PSMC2 (Rpt1)
  + PSMC3 (Rpt5)
  + PSMC4 (Rpt3)
  + PSMC5 (Rpt6)
  + PSMC5 (Rpt4)
* Sin actividad ATPasa: reconocen sustratos ubiquitinados
  + PSMD1 (Rpn2)
  + PSMD2 (Rpn1)
  + PSMD3 (Rpn3)
  + PSMD4 (Rpn10/Rpn13)
  + PSMD6 (Rpn7)
  + PSMD7 (Rpn8)
  + PSMD8 (Rpn12)
  + PSMD11 (Rpn6)
  + PSMD12 (Rpn5)
  + PSMD13 (Rpn9)
  + PSMD14 (Rpn11)

**Partículas reguladoras inmunoproteasoma 11S o PA28:** sustituyen a 19S

* PSME1 (PA28α): la principal junto a PSME2
* PSME2 (PA28β): la principal junto a PSME1
* PSME3
* PSME4

**Otros**

* PSMF1 (PI31): inhibe el proteasoma
* SEM1

**Chaperonas**

* 20S
  + PSMG1 (PAC1)
  + PSMG2 (PAC2)
  + PSMG3 (PAC3)
  + PSMG4 (PAC4)
  + POMP o UMP1 (POMP)
* 19S
  + PSMD9 (p27)
  + PSMD10 (p28)
  + PSMD5 (S5b)
  + PAAF1 (PAAF)

**Factores de transcripción**

* NRF1 O NFE2L1
* NF-YA, NF-YB, NF-YC: forman el complejo NF-Y
* STAT3
* FOXO4