**Steps to reproduce Figure 4 of main manuscript.**

**Construct the HNSCC model from the model equations given in the filename ‘HNSCC\_model\_equation’.**

**For Figure 4(a-b)**

1. Set the value of barrier building CAF proportion (alpha) =0.005
2. Load the parameter set for given alpha and from the document ‘HNSCC\_parameters\_fibro\_desert\_modelling’. Store it in a vector P.
3. Set the initial condition (y\_0) for simulation as
4. y\_0=[2000; 0; 2500; 4000; 0; 0; 59.8564; 50; 0; 40; 20; 30; 150; 150; 18.1709; 13.8821; 4.8854; 19.5717; 13.3581; 10.6108; 12.2203; 10.1635; 0; 13.7578]
5. Simulate the HNSCC model with for the following values of pro-tumor effect of exhausted T cells(P(12))

P(12)[ 500 800 1100 1400]

1. Plot the time profiles of Total tumor cells and Killer T cell populations vs total PDL1- tumor cells normalized by their carrying capacities.

**For Figure 4(c-d)**

1. Set the value of barrier building CAF proportion (alpha) =0.005
2. Load the parameter set for given alpha and from the document ‘HNSCC\_parameters\_fibro\_desert\_modelling’. Store it in a vector P.
3. Set the value P(12)=800.
4. Set the initial condition (y\_0) for simulation as

y\_0=104 \*[0.0087; 0; 0.3607; 0.9997; 0; 0; 0.0001; 0.2776; 0; 0.4957; 0.2000; 0.2223; 0.0000; 0.0000; 0.1368; 0.3543; 0.2313; 1.0268; 0.4479; 1.6104;

0.2456; 0.2776; 0.0148; 0.1368]

1. Simulate the HNSCC model with the following without anti-PD1 and with anti-PD1=2 for the following values of Constant resource supply rate (P(11))

P(11)[10 30 50 70 90];

1. Plot without and with anti-PD1 time profiles for killer and exhausted T cells.
2. Plot the total tumor cells vs. killer T cells.