**Steps to reproduce Figure 10 of main manuscript.**

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

**For Figure 10(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’. Store it in a vector P. Set P(17)=100
3. Set the initial condition (y\_0) for simulation as

y\_0=[22.0447; 6.1926; 17.8158; 201.5737; 5.0551; 6.3483; 59.8564; 7.3397; 0; 8.5270; 4.4444; 0.8939; 52.8060; 15.4442; 18.1709; 13.8821; 4.8854; 19.5717; 13.3581; 10.6108; 12.2203; 10.1635; 16.770; 13.7578];

1. Simulate the HNSCC model with for the following values of killer T cell cytotoxicity cells(P(16))

P(16)[ 10 300 600 900 1200 1500 1800 2100 2400 2700 3000 3500 4000 4500 5000]

1. Plot the steady state value of PDL1+ tumor cells/ PDL1- tumor cells with respect to Killer T cell cytotoxicity.
2. Fix P(16)=1500. Simulate the HNSCC model with anti-PD1= 1 and plot time profiles for total tumor cells.
3. Repeat 4-6 for the following Lactate clearance rate (C\_LAC)

C\_LAC

**For Figure 10(c)**

1. Load the parameters from the document ‘HNSCC\_parameters’ for the following values of alpha.

alpha

1. Set the initial condition (y\_0) for simulation as

y\_0=[1089.2; 4820.3; 3302.5; 4106.2; 2576.4; 0990.7; 1340.2; 4718.3; 0; 4673.2; 2045.2; 684.8; 502.5; 797.0; 2504.0; 4912.0; 2114.7; 1753.9; 1601.0; 4659.6; 4097.4; 663.8; 3277.8; 732.9]; for pre-anti-PD1. The initial condition for post-anti-PD1 is the final state of the pre-anti\_PD1 setting.

1. Simulate the HNSCC model with anti-PD1=1 for different alpha, hence immune accessibility
2. Plot the lactate concentration levels vs. the total post-anti-PD1 tumor cell population.