**Additional information:**

The input variables for ensemble learning methods can be written as:

 (1)

Where the *H*, *T* and *Floor* can be obtained from the Table S4. Due the selected area belongs to the same seismic fortification intensity area, the *Tg*, *amax* are the fixed value (i.e. *T*g=0.4, *a*max=0.23). Combined with the determined intensity measure (IM) calculated from the simulated ground motion, the damage can be predicted.