**Significant Contribution**

Dr. Samui’s research interest lies in the area of soil mechanics. Soil liquefaction causes lot of damages during an earthquake. He has used different statistical learning algorithms {Artificial Neural Network (ANN), Support Vector Machine (SVM), Least Square Support Vector Machine (LSSVM), and Relevance Vector Machine (RVM)} for prediction of liquefaction susceptibility of soil based on different in situ {Standard Penetration Test(SPT), Cone Penetration Test(CPT) and Shear Wave Velocity(Vs)} data. CPT gives better result than SPT and Vs. The developed models show that only two parameters {cone resistance ($q_c$) and maximum horizontal acceleration ($a_{max}$)} are required for prediction of liquefaction susceptibility of soil. So, the developed model does not require the determination of Cyclic Stress Ratio (CSR) for prediction of liquefaction susceptibility of soil. Equations have been also developed for the prediction of liquefaction susceptibility of soil. He has also developed equations for prediction of lateral spreading of soil due to an earthquake. User can use the developed equation for prediction of lateral spreading due to an earthquake. He has done liquefaction and site response studies at some points in Kolkata. The reclaimed land of Saltlake and Rjarhat are more susceptible to liquefaction than Kolkata itself.

Site characterization is important task in soil mechanics. Geostatistical models {Simple Kriging(SK), Ordinary Kriging(OK), and Disjunctive Kriging(DK)} have been used to develop three dimensional (3D) site characterization model of Bangalore based on large amount of SPT data. A new type cross validation analysis has been done for the developed geostatistical models. The performance of DK is better than SK and OK model. The above mentioned statistical learning algorithms have been also used to develop 3D site characterization model of Bangalore. The developed models have been also used to determine spatial and depth variability of SPT data for Bangalore. Rock depth at any point in a particular site is a key parameter in earthquake geotechnical engineering. Different models (SK, OK, DK, ANN, SVM, RVM, and LSSVM) have been developed for prediction of rock depth at any point in Bangalore. Map of rock depths has been also prepared by developed model for Bangalore. User can use the developed maps for prediction of rock depth at any point in Bangalore.
He has also done experimental works (laboratory as well as field) to study different phenomena in earthquake geotechnical engineering. He determined frequency effects on liquefaction by using Shake Table. The number of cycles to reach either the peak pore water pressure or the final settlement of soil mass increases significantly with an increase in the frequency of the excitation. He has done preliminary liquefaction studies by using piezovibrocone and calibration chamber. The results show that the developed piezovibrocone has the ability to measure pore water pressure during vibration. He has developed correlations between different in situ tests {SPT, CPT and Multi Channel Analysis of Surface Wave (MASW)} for Raichur ash pond. He has done liquefaction studies for Raichur ash pond by Idriss and Boulanger(2004) approach and developed statistical learning algorithms. A comparative study has been also done between Idriss and Boulanger(2004) approach and developed statistical learning algorithms for Raichur ash pond.

Landslides are among the major hydro-geological hazards that affect large parts of India, especially the Himalayas, the Northeastern hill ranges, the Western Ghats, the Nilgiris, the Eastern Ghats and the Vindhyas. He has examined the capability of different statistical learning algorithms (SVM, LSSVM and RVM) for prediction of landslide. Different equations have been also developed for determination of landslide. User can use the developed equations for prediction of landslide. He has used First Order Second Moment Method (FOSM) for slope reliability analysis. The FOSM demands the values and partial derivatives of the performance function with respect to the design random variables. Such calculations could be time-consuming or cumbersome when the performance functions are implicit. The analysis of slope by limit equilibrium method gives implicit performance functions. LSSVM and RVM have been adopted to predict implicit performance function. An example is used to illustrate how the proposed RVM-based FOSM and LSSVM-based FOSM analysis can be carried out. The proposed RVM-based FOSM and LSSVM-based FOSM is not a substitute but may be a viable alternative for slope reliability analysis with implicit and non-linear performance functions.

Based upon the upper bound limit analysis, the stability numbers have been developed for a two layered soil slope both for an associated flow rule material and for a homogeneous slope with non-associated flow rule material. The failure surface was assumed to be an
arc of logarithmic spiral and it automatically ensures the kinematic admissibility of the failure mechanism with respect to the rigid rotation of the soil mass about the focus of the logarithmic spiral. The effect of the pore water pressure and horizontal earthquake body forces was also included in the analysis. For a non-associated flow rule material, the stress distribution along the failure surface was developed with the assumption of interslice forces given by Fellenius and Bishop. The stability numbers have been found to reduce appreciably with increases in the (i) horizontal inclination (β) of slope, (ii) pore water pressure coefficient, r_u and (iii) earthquake acceleration coefficient (k_h). The values of the stability numbers for non-associated flow rule, with dilatancy angle ψ =0, have been found to be considerably lower as compared to the associated flow rule material. For a given height of the slope, with associated flow rule, the values of the stability numbers have been found to increase with increase in the thickness of a layer with greater value of the friction angle φ. The results have been given in the form of non-dimensional stability charts which can be used for readily obtaining either the value of the critical height or the factor of safety.

He has developed equations for prediction of ultimate bearing capacity of shallow foundation and pile foundation. The different statistical learning algorithms have been successfully used for prediction of pullout capacity of small ground anchor. He has also developed different methods for prediction of settlement of shallow foundation on cohesionless soil. He developed different models for determination of compression index of marine clay. He gave a new methodology for prediction of electrical resistivity of soil.