GLAS: A Global Landslide Analytics System

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Landslides cost billions in damage annually in the U.S. & have affected 4.8 million people over the past 2 decades. Landslide forecasting is therefore a critical task for protecting human life & livelihood in susceptible areas. Existing landslide warning systems are ineffective in accuracy, latency, & scalability. E.g. NASA's LHASA system has a 4-5 hour latency for landslide detection with 8-60% Probability of Detection (POD) & uses a 5-feature, static susceptibility map along with precipitation data. Other research papers collected data for limited regions. In this project, we propose a high-performance landslide forecasting & susceptibility mapping system. For each landslide report in the Global Landslide Catalog (GLC), indicative features (elevation, climate, forest loss, lithology, & road presence data) were collected, with climate data collected over 15 days. Slope & Antecedent Rainfall Index (groundwater accumulation) were calculated from elevation & precipitation. These features were compiled into a first-of-its-kind dataset for landslide/non-landslide events. KNN, SVC, Random Forest (RF) & LSTM models were trained on the dataset to forecast whether there would be a landslide in the next 5 days, with the best model (RF) yielding 92.7% accuracy & 94.3% detection rates, exceeding LHASA's POD of 47% on the same dataset. A terrain susceptibility map was then generated using RF feature importances. An initial series of models were also trained to predict landslide severity and forecast in how many days a landslide would occur, yielding 71.9% accuracy & 67.6% early forecasting rate, respectively. GLAS provides days in advance for civilians to prepare & evacuate, saving lives & livelihoods.

Awards Won:
First Award of $5,000
U.S. Agency for International Development: USAID Science for Development First Award - Working in Crisis and Conflict