



# CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

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<b>Project Title</b> <b>Predicting and Identifying Forced Human Displacement Hotspots Using Multiple Linear Regression and Neural Networks</b>	
<b>Abstract</b> <b>Objectives/Goals</b> With almost forty million people displaced worldwide, the global refugee crisis has continued to worsen. This situation is further exacerbated by the lack of a coherent system to project the influx of refugee populations to better prepare Non-Governmental Organizations and governments worldwide in responding to the human displacement crisis. This project created a comprehensive model to analyze the factors determining the risk of forced displacement for a population, and based on the determining factors, predict the extent of displacement, allowing governments and NGOs to anticipate future forced displacement. <b>Methods/Materials</b> I used both Multiple Linear Regression analysis and Radial Basis Function neural networks with back propagation to analyze how different factors present in a country affected displacement. I gathered data from several governmental and non governmental sources for my project, and examined both persistent (economic, political, and social status of a country) and precipitating (natural disasters and conflict) factors. Using data from these sources, I developed a mathematical model, using regression analysis software, to predict displacement. I then reinforced the results using an RBF neural network, which I coded in C++ on the basis of a modified Gaussian function. <b>Results</b> The regression analysis was able to predict displacement in accuracy in over 80% of the cases, and the RBF neural network predicted displacement with the same level of accuracy as the MLR model. These models also highlighted the impact that each factor played in displacement, and supported the relationships between the factors and displacement that I had theorized (i.e. conflict was a significant indicator of displacement, and countries with worse economies had higher displacement). <b>Conclusions/Discussion</b> An important part of this project was simply being able to model global displacement. In a field where research has been reactive to displacement, applying both regression and neural networks provides the ability to be proactive, as organizations can easily predict the risk of displacement in a country. This project is unique in its ability to predict global displacement with high accuracy, its large scale coverage of over 150 nations over a five-year period, and its use of two separate modeling techniques, previously unused in analysis of forced migration, to create and validate a displacement prediction model.	
<b>Summary Statement</b> I devised a high-accuracy model for predicting the risk of human displacement in countries across the world.	
<b>Help Received</b> I designed and completed the algorithms in the project myself. I used data from NGOs and UN sources as the data for my algorithms.	