**Data Science Challenge:**

The idea behind this challenge is to use data to solve a canonical thermodynamics problem: given a pair of elements, predict the stable binary compounds that form on mixing. Within the attached .zip, we've provided roughly 5000 element pairs as training data. Each of the pure elemental compounds have been expanded into features for you using a naive application of the magpie feature set (<https://bitbucket.org/wolverton/magpie>). Feel free to prune, extend, or otherwise manipulate this feature set in pursuit of a predictive model!

The training labels we've provided are a discretization of the 1D binary phase diagram at 10% intervals. For example, the label for OsTi ([1.0,0.0,0.0,0.0,0.0,1.0,0.0,0.0,0.0,0.0,1.0]) translates into the following stable compounds:  Os, Os{0.5}Ti{0.5} or OsTi, and Ti.

Your task is to compare and contrast a neural network's performance (your design - no depth requirement) on predicting the full stability vector directly to solutions you build using methods such as Random Forest, Logistic Regression, or any other algorithms you think would perform well on this problem. For evaluation, please send us predictions for the test set we've held out, along with your code and a brief writeup explaining the results (what worked/didn't work and why?).