MDS Homework 2
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"Collect data of any engineering materials such as alloys, ceramics, and composites. For example, steel is a very popular alloy of Fe and has wide applications in engineering. Choose a specific material, like Al alloy, steel, or carbon fiber composites, and:

- *Collect data on physical properties of your material. Keep a reference of your collected data.*
- *Identify the available features of data in the database.*
- *Identify the dimensions of the dataset (how many rows and columns, or how many images."*

Data was found on the properties of steel alloys in a database from Kaggle. This dataset can be found here: https://www.kaggle.com/rohannemade/mechanical-properties-of-low-alloy-steels

Available features of the data in database:

- Weight percent of materials C, Si, Mn, P, S, Ni, Cr, Mo, Cu, V, Al, N, (Ceq), and (Nb + Ta)
- Temperature of samples studied
- 0.2% proof stress
- Tensile strength
- % elongation
- % reduction in area

Dimensions of the dataset: 20 cols x 915 rows (915 sample tests, 20 features)
Given each alloy has 10 datapoints at different temperatures, there are approx. 90 different alloys tested in this dataset

I think that there's a lot of interesting details to unpack from this database. First of all, it allows for observations to be made on how the addition of many different materials into a steel alloy may change the material properties of steel. Performance of each metal alloy was evaluated at a variety of temperatures, from room temperature up to 650^{o} Celsius, presumably to observe the properties of molten alloys when being smithed. What's most surprising about the data, without having carried out any thorough analysis, is that some materials had a reduction of cross-sectional area of up to 92%. Perhaps what has happened is that at high temperatures, the material gets molten and allows a beam of the alloy to stretch and become almost "stringy" in nature–giving the material some interesting properties.

One problem that could be solved using this dataset is the question of what conditions make the "best" steel alloy for different applications. By showing curves relating the change in material properties to the composition of the alloys, data scientists can pinpoint the exact compositions of elements that either maximize or minimize properties like tensile strength, elongation, and plastic deformation.