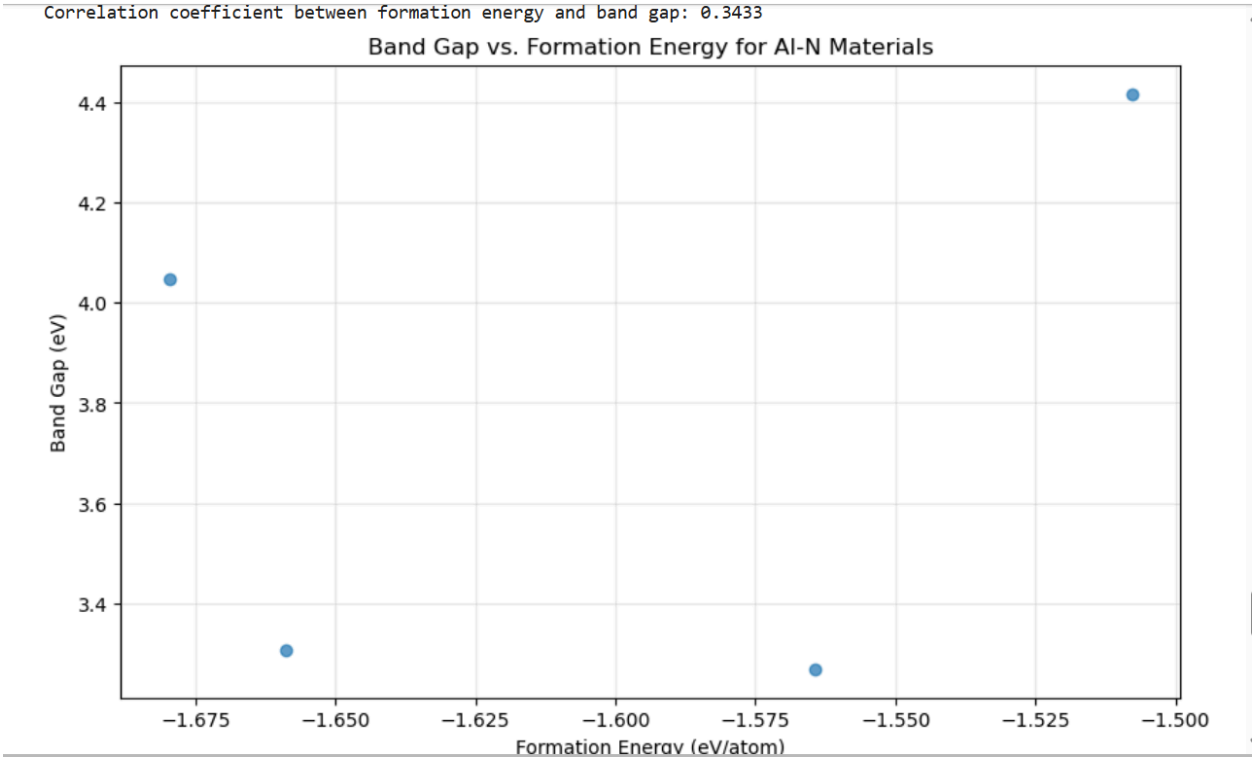
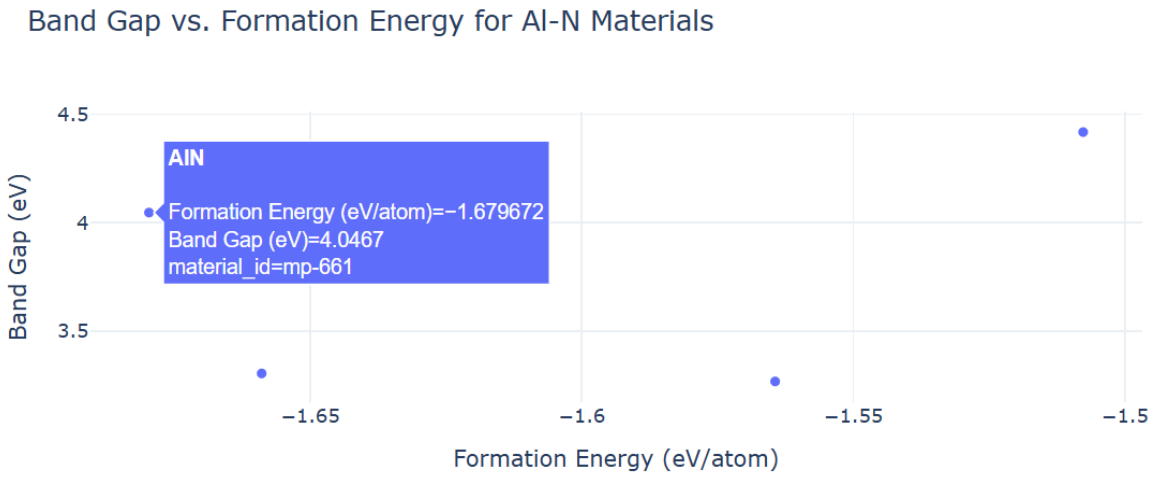
Prompt 3.1:

This code accesses the Materials Project database and plots the formation energy versus band gap of a given material (for example, I used Al-N). It graphs both a regular plot and an interactive one that will display the formation energy, band gap, and material ID if you hover your cursor over a datapoint. It also calculates the correlation coefficient between formation energy and band gap. In the example using Al-N, the correlation coefficient is calculated to be 0.3433, indicating a weak positive correlation. This means that as one variable increases, the other also tends to increase slightly.

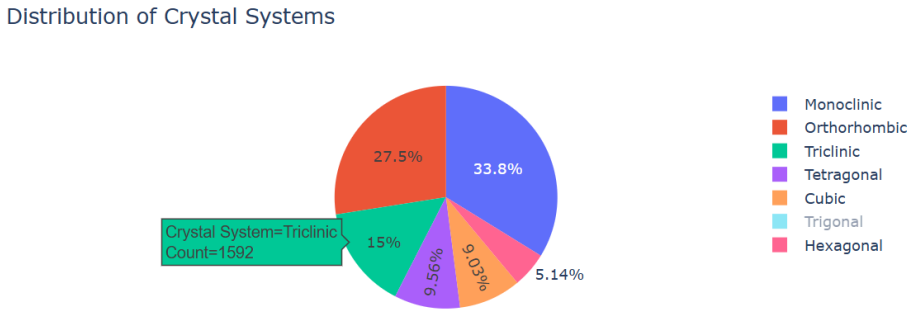
- **Example Outputs:**

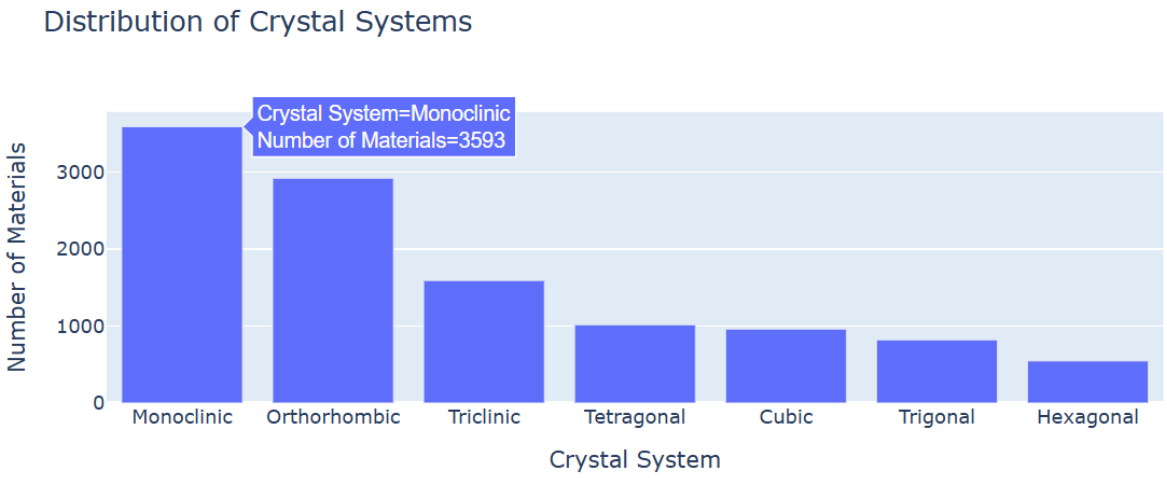




Prompt 3.3:

This code shows the distribution of crystal systems in a specific material family. For the example run, I used nitrides. The program uses the Materials Project database as the source for the information about crystal system distribution. It counts the number of crystal systems in the material family and then displays both a pie and a bar chart. At the bottom of these graphs, it also displays the number of materials in each crystal system in list form. The crystal systems included in the count are: monoclinic, orthorhombic, triclinic, tetragonal, cubic, trigonal, and hexagonal. Both the pie chart and bar chart are interactive, so if you hover your mouse over either one, they will display the crystal system and the number of materials in that system.






```
Crystal System Distribution:
crystal_system
Monoclinic      3593
Orthorhombic    2922
Triclinic       1592
Tetragonal      1016
Cubic            960
Trigonal         820
Hexagonal        546
```