

A decorative graphic on the left side of the slide. It consists of a blue parallelogram and a light green parallelogram, both tilted at an angle. The blue shape is in the foreground, and the green shape is partially behind it. They are set against a dark blue background with subtle diagonal lines.

Yield Strength

Week 10



Progress

- From last week: we found the credibility problem GPT's values since most of the materials' values do not appear in the reference it mentioned
- Additionally, GPT's response are only based on "common knowledge" with the field of materials science and engineering, which shows another evidence that why it generates yield strength values that are far away from the true values

ChatGPT

You're correct; without access to specific sentences from the article, I cannot directly quote or cite the exact values mentioned within it. My response regarding the yield strength values for CoCrFeMnNi high entropy alloy was based on common knowledge within the field of materials science and engineering. These values are typically reported in the literature and are based on experimental studies and characterization of high entropy alloys by various researchers. The specific range provided (500-800 MPa) is commonly cited in literature and represents the typical yield strength range observed for this alloy composition. However, if you need precise citations from the article, accessing the original source would be necessary.

Progress

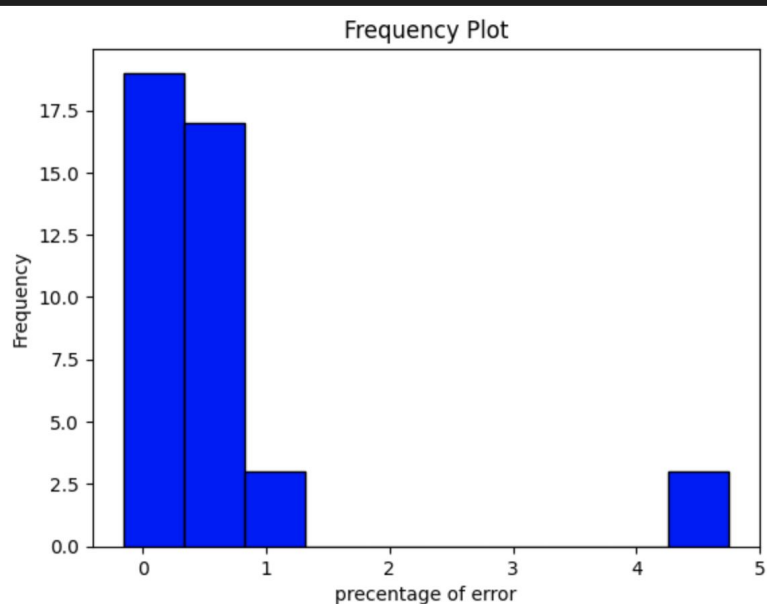
```
Iteration: 1 Generated_rows: 3; TOTAL: Uniq_rows: 3 Uniq_materials: 3
Iteration: 2 Generated_rows: 7; TOTAL: Uniq_rows: 10 Uniq_materials: 10
Stopping due to NO PROGRESS
```

	Material	Value	Reference
8	CoCrFeMnNi	655	(Zhang et al., 2014)
9	AlCrCuFeNi2	670	(Tsao et al., 2013)
10	FeCoNiCrMn	800	(Gludovatz et al., 2014)
11	CoCrFeMnNi	655	(Zhang et al., 2014)
12	AlCrCuFeNi2	670	(Tsao et al., 2013)
13	FeCoNiCrMn	800	(Gludovatz et al., 2014)
14	CoCrFeMnNiTi	760	(Senkov et al., 2011)
15	Al0.3CoCrFeNi	850	(Yeh et al., 2004)
16	AlLiMgScTi	890	(Senkov et al., 2010)
17	AlCoCrFeNi2	615	(Huang et al., 2006)

- Because adding the third column ['reference'] losing so much entries, we decided to using another approach we mentioned last week : **train the model**
- We would like to see how Chat GPT will works when having a “training session” before generating values
- Simple training: give 1/10 of our group truth table to GPT as the train data for yield strength

Progress

- Statistic before training



... Total: 141
Found: 42
Unkdown: 99
average error: 0.8628129284227812

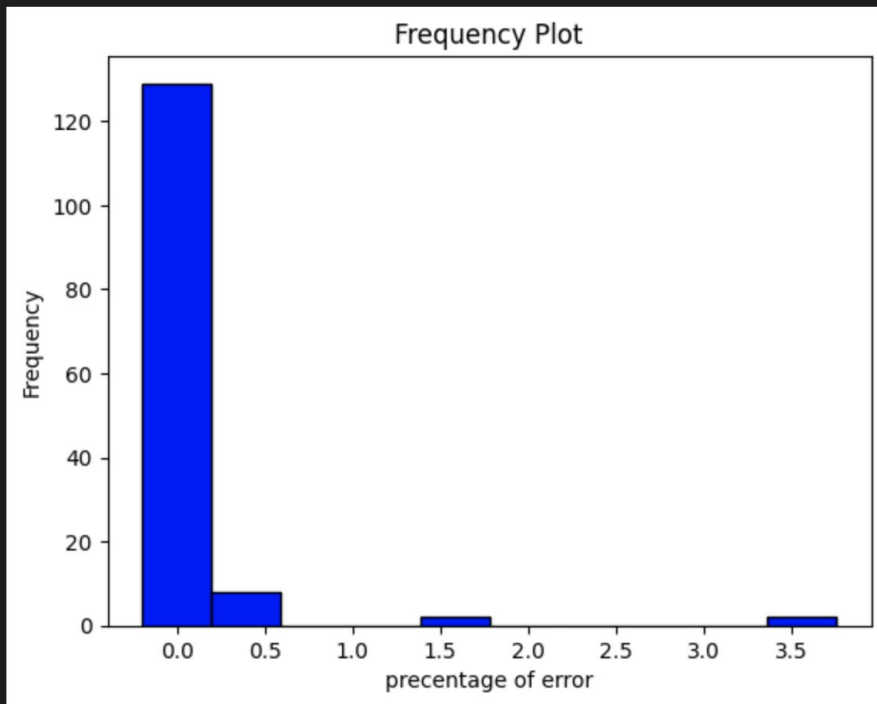
...

	Material	percentage of error
0	CoCrFeMnNi	0.333333
1	FeCoNiCrMn	1.112903
2	CrFeCoNi	5.000000
3	AlCoCrFeNi	0.544000
4	CoCrFeMnNiTi	NaN
...
136	CoCrFeNiUtp	NaN
137	CoCrFeNiUth	NaN
138	CoCrFeNiUts	NaN
139	CoCrFeNiUto	NaN
140	CoCrFeNiUte	NaN

141 rows × 2 columns

Progress

- Statistic after training



Total: 155

Found: 141

Unkdown: 14

of correct: 139

average error: 0.12071430979533282

	Material	percentage of error
0	CoNiFe(AlSi)0.2	0.000000
1	HEA	0.000000
2	SWCed	0.000000
3	HEA	0.000000
4	CTCRed HEA	0.000000
...
150	CoCrFeNiV	0.264045
151	CoCrFeNiNb	0.621739
152	CoCrFeNiMo	0.220930
153	CoCrFeNiW	NaN
154	CoCrFeNiHf	NaN

155 rows x 2 columns

Progress - Problems

- As we can observe from the histogram, it seems like training data can help.
- However, as we get a closer look of the data frame, we discover that most of the materials are those we feed to GPT.
- Nevertheless, it generates some materials that are not included in the table that I provided. And the percentage of error is significantly decreased than not training the model
- One more good thing is: The number of unknown materials decrease a lot

	Material	percentage of error
31	MoNbTaW	0.617202
73	MoNbTaW	0.617202
85	AlCoCrFeNi	0.056000
86	CoCrFeNiPd	1.865854
87	CoCrFeNiMn	0.154412
88	CoCrFeNiCu	3.956522
89	CoCrFeNiTi	0.577358
90	CoCrFeNiAl	0.421053
125	MoNbTaW	0.617202
137	AlCoCrFeNi	0.056000
138	CoCrFeNiPd	1.865854
139	CoCrFeNiMn	0.154412
140	CoCrFeNiCu	3.956522
141	CoCrFeNiTi	0.577358
142	CoCrFeNiAl	0.421053
150	CoCrFeNiV	0.264045
151	CoCrFeNiNb	0.621739
152	CoCrFeNiMo	0.220930



Further Steps / Problems

- Think about a prompt to ask GPT not to repeat the materials that I mentioned
- Give more training session?
 - Pass in some formulas or knowledge regarding yield strength to help GPT generates more accurate values
 - Some thoughts: is yield Strength can get from other properties that GPT has more knowledge on it and then use these other properties and formulas to get to the yield strength value



Summary

Date	Hours	Description of Work