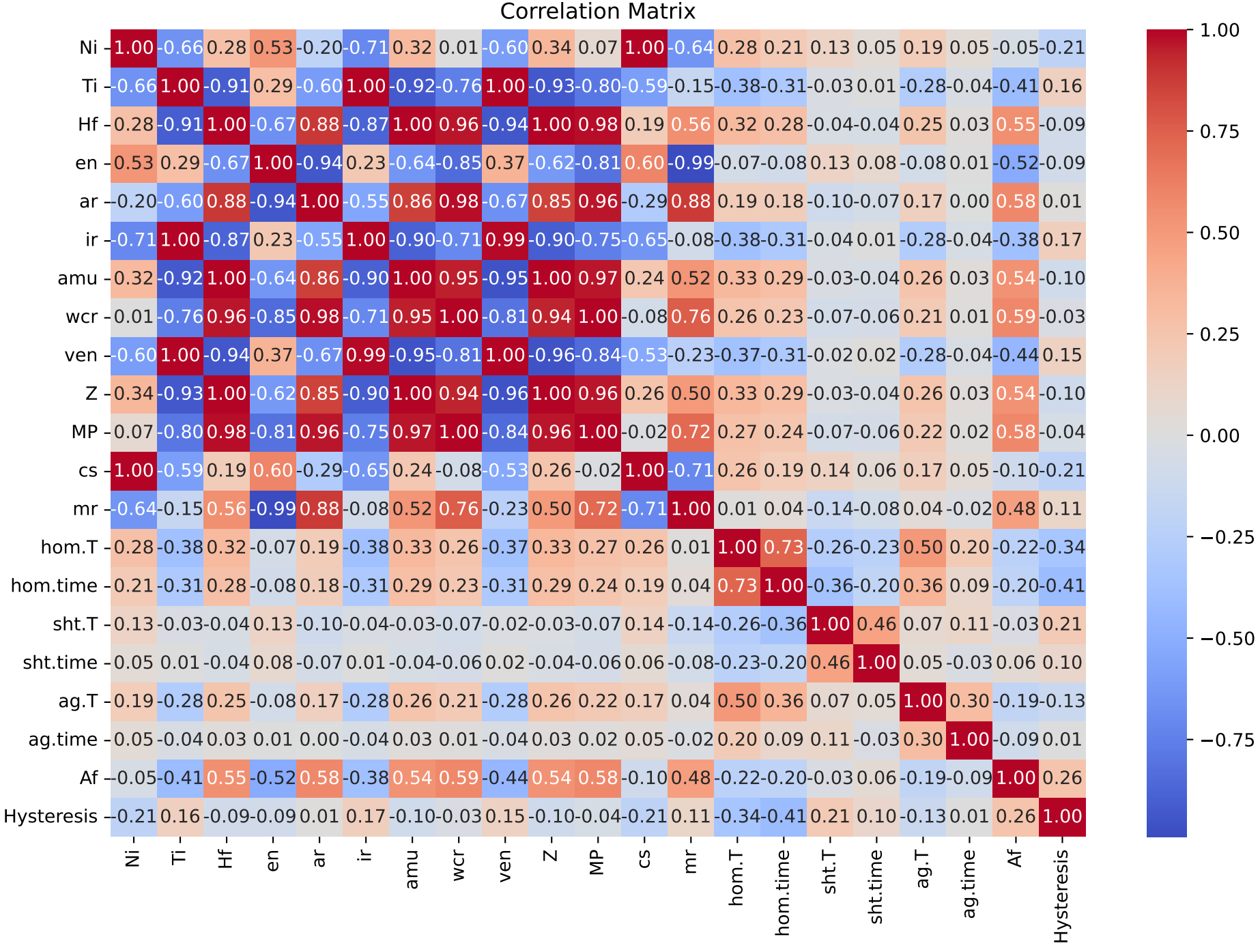
EDA on the Hesma Data

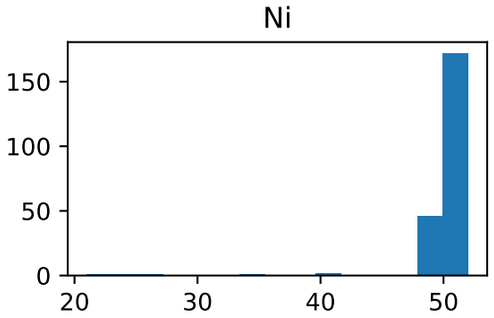
Summary Statistics

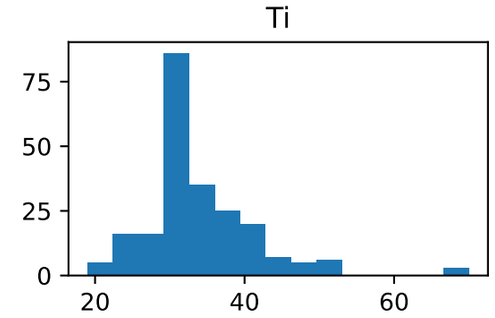
	Ni	Ti	Hf	en	ar	ir	amu	wcr	ven	Z	MP
count	224.000000	224.000000	224.000000	224.000000	224.000000	224.000000	224.000000	224.000000	224.000000	224.000000	224
mean	49.746964	33.586830	16.666205	1.684065	1.679015	0.075210	75.022019	0.464080			
std	3.371594	7.624387	5.961310	0.016144	0.018702	0.001137	7.896318	0.019462			
min	21.000000	19.000000	0.000000	1.596100	1.622300	0.073130	53.258360	0.405360			
25%	50.000000	29.400000	14.472500	1.678110	1.672190	0.074598	71.487600	0.457345			
50%	50.300000	29.900000	20.000000	1.679960	1.686570	0.074683	79.414820	0.473524			
75%	50.600000	36.275000	20.000000	1.690110	1.688190	0.075573	79.468920	0.474508			
max	52.000000	70.000000	30.000000	1.728700	1.732100	0.081170	92.574200	0.509328			

Missing Values per Column

Ni	0
Ti	0
Hf	0
en	0
ar	0
ir	0
amu	0
wcr	0
ven	0
Z	0
MP	0
cs	0
mr	0
hom.T	0
hom.time	0
sht.T	0
sht.time	0
ag.T	0
ag.time	0
Af	0
Hysteresis	0


Correlation Matrix
Ni 1.00 -0.66 0.28 0.53 -0.20 -0.71 0.32 0.01 -0.60 0.34 0.07 1.00 -0.64 0.28 0.21 0.13 0.05 0.19 0.05 -0.05 -0.21
Ti -0.66 1.00 -0.91 0.29 -0.60 1.00 -0.92 -0.76 1.00 -0.93 -0.80 -0.59 -0.15 -0.38 -0.31 -0.03 0.01 -0.28 -0.04 -0.41 0.16
Hf 0.28 -0.91 1.00 -0.67 0.88 -0.87 1.00 0.96 -0.94 1.00 0.98 0.19 0.56 0.32 0.28 -0.04 -0.04 0.25 0.03 0.55 -0.09
en 0.53 0.29 -0.67 1.00 -0.94 0.23 -0.64 -0.85 0.37 -0.62 -0.81 0.60 -0.99 -0.07 -0.08 0.13 0.08 -0.08 0.01 -0.52 -0.09
ar -0.20 -0.60 0.88 -0.94 1.00 -0.55 0.86 0.98 -0.67 0.85 0.96 -0.29 0.88 0.19 0.18 -0.10 -0.07 0.17 0.00 0.58 0.01
ir -0.71 1.00 -0.87 0.23 -0.55 1.00 -0.90 -0.71 0.99 -0.90 -0.75 -0.65 -0.08 -0.38 -0.31 -0.04 0.01 -0.28 -0.04 -0.38 0.17
amu 0.32 -0.92 1.00 -0.64 0.86 -0.90 1.00 0.95 -0.95 1.00 0.97 0.24 0.52 0.33 0.29 -0.03 -0.04 0.26 0.03 0.54 -0.10
wcr 0.01 -0.76 0.96 -0.85 0.98 -0.71 0.95 1.00 -0.81 0.94 1.00 -0.08 0.76 0.26 0.23 -0.07 -0.06 0.21 0.01 0.59 -0.03
ven -0.60 1.00 -0.94 0.37 -0.67 0.99 -0.95 -0.81 1.00 -0.96 -0.84 -0.53 -0.23 -0.37 -0.31 -0.02 0.02 -0.28 -0.04 -0.44 0.15
Z 0.34 -0.93 1.00 -0.62 0.85 -0.90 1.00 0.94 -0.96 1.00 0.96 0.26 0.50 0.33 0.29 -0.03 -0.04 0.26 0.03 0.54 -0.10
MP 0.07 -0.80 0.98 -0.81 0.96 -0.75 0.97 1.00 -0.84 0.96 1.00 -0.02 0.72 0.27 0.24 -0.07 -0.06 0.22 0.02 0.58 -0.04
cs 1.00 -0.59 0.19 0.60 -0.29 -0.65 0.24 -0.08 -0.53 0.26 -0.02 1.00 -0.71 0.26 0.19 0.14 0.06 0.17 0.05 -0.10 -0.21
mr -0.64 -0.15 0.56 -0.99 0.88 -0.08 0.52 0.76 -0.23 0.50 0.72 -0.71 1.00 0.01 0.04 -0.14 -0.08 0.04 -0.02 0.48 0.11
hom.T 0.28 -0.38 0.32 -0.07 0.19 -0.38 0.33 0.26 -0.37 0.33 0.27 0.26 0.01 1.00 0.73 -0.26 -0.23 0.50 0.20 -0.22 -0.34
hom.time 0.21 -0.31 0.28 -0.08 0.18 -0.31 0.29 0.23 -0.31 0.29 0.24 0.19 0.04 0.73 1.00 -0.36 -0.20 0.36 0.09 -0.20 -0.41
sht.T 0.13 -0.03 -0.04 0.13 -0.10 -0.04 -0.03 -0.07 -0.02 -0.03 -0.07 0.14 -0.14 -0.26 -0.36 1.00 0.46 0.07 0.11 -0.03 0.21
sht.time 0.05 0.01 -0.04 0.08 -0.07 0.01 -0.04 -0.06 0.02 -0.04 -0.06 0.06 -0.08 -0.23 -0.20 0.46 1.00 0.05 -0.03 0.06 0.10
ag.T 0.19 -0.28 0.25 -0.08 0.17 -0.28 0.26 0.21 -0.28 0.26 0.22 0.17 0.04 0.50 0.36 0.07 0.05 1.00 0.30 -0.19 -0.13
ag.time 0.05 -0.04 0.03 0.01 0.00 -0.04 0.03 0.01 -0.04 0.03 0.02 0.05 -0.02 0.20 0.09 0.11 -0.03 0.30 1.00 -0.09 0.01
Af -0.05 -0.41 0.55 -0.52 0.58 -0.38 0.54 0.59 -0.44 0.54 0.58 -0.10 0.48 -0.22 -0.20 -0.03 0.06 -0.19 -0.09 1.00 0.26
Hysteresis -0.21 0.16 -0.09 -0.09 0.01 0.17 -0.10 -0.03 0.15 -0.10 -0.04 -0.21 0.11 -0.34 -0.41 0.21 0.10 -0.13 0.01 0.26 1.00
Ni Ti Hf en ar ir amu wcr ven Z MP cs mr hom.T hom.time sht.T sht.time ag.T ag.time Af Hysteresis
1.00 0.75 0.50 0.25 0.00 −0.25 −0.50 −0.75


Ni
150
100
50
0
20
30
40
50


Ti
75
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25
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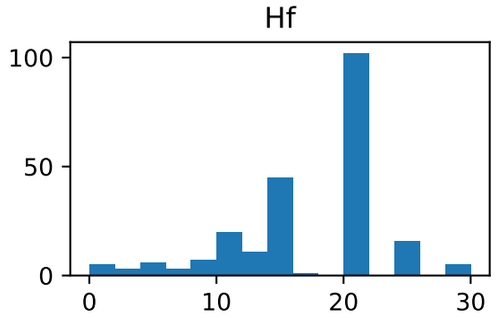
20
40
60


Hf
100
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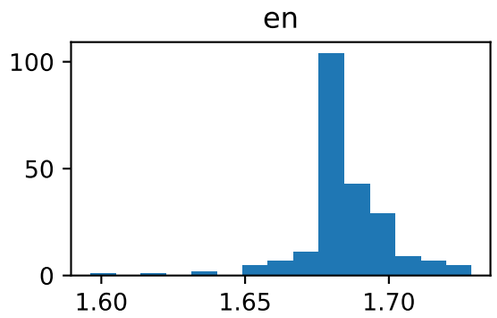
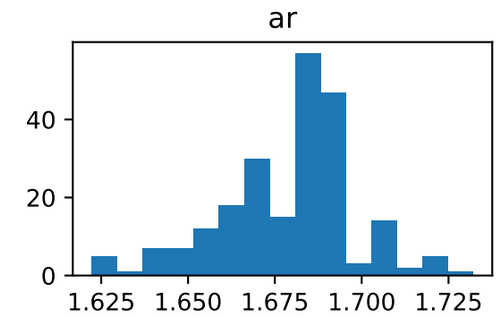
0
10
20
30


en
100
50
0
1.60
1.65
1.70


ar
40
20
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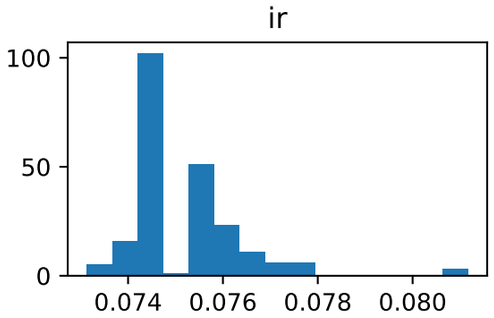
1.625
1.650
1.675
1.700
1.725


ir
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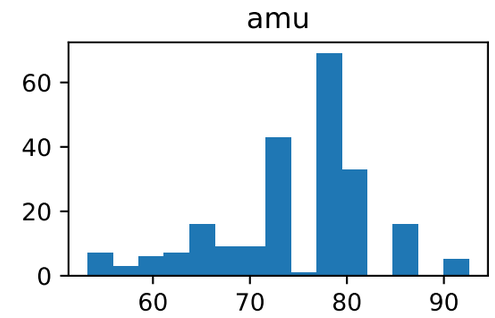
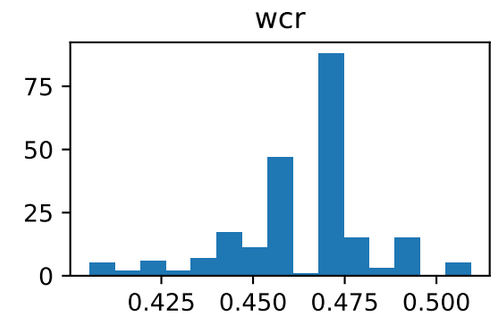
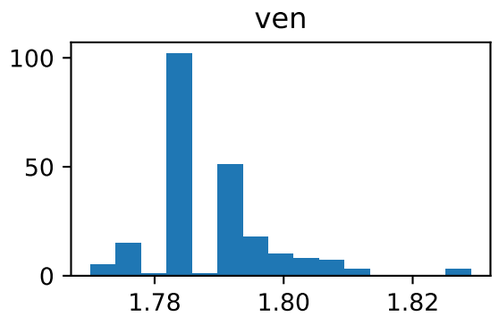
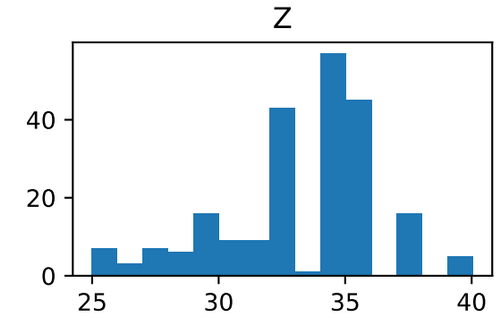
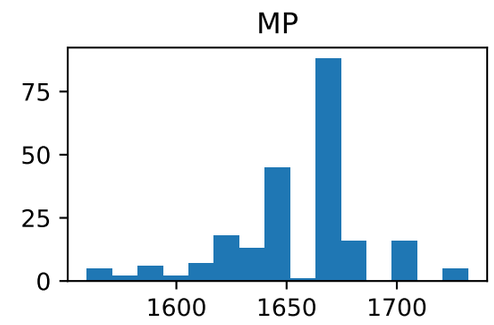
0.074
0.076
0.078
0.080

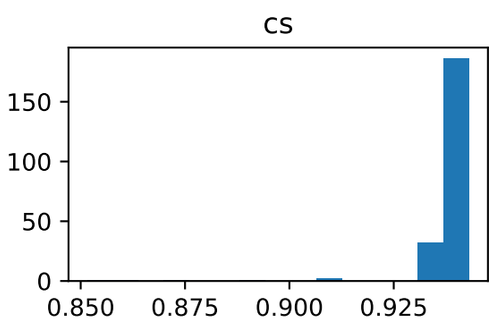

amu
60
40
20
0
60
70
80
90

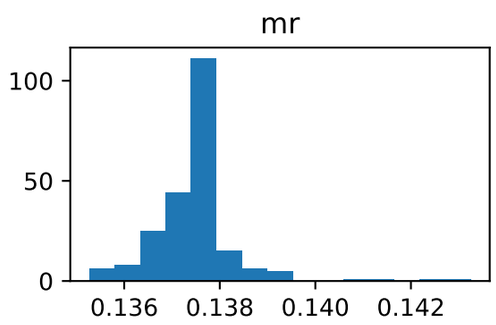

wcr
75
50
25
0
0.425
0.450
0.475
0.500

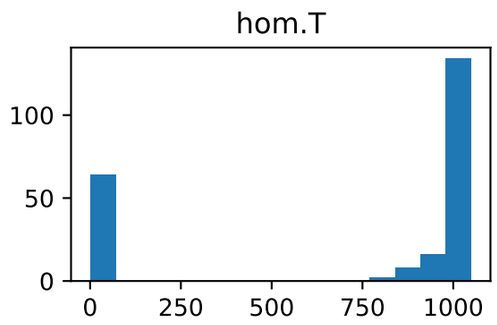

ven
100
50
0
1.78
1.80
1.82

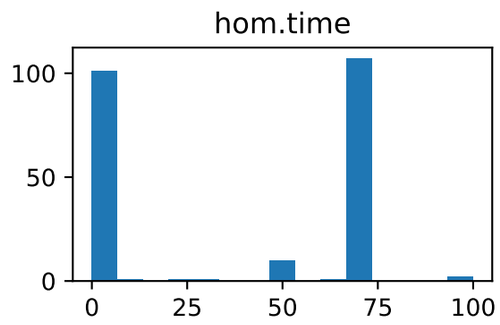

Z
40
20
0
25
30
35
40

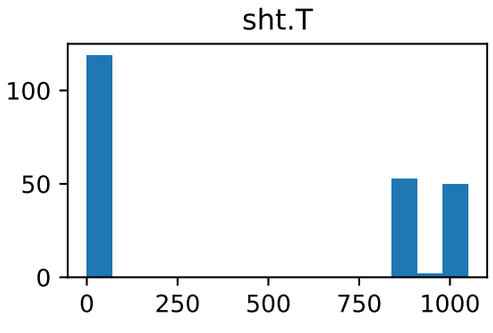

MP
75
50
25
0
1600
1650
1700

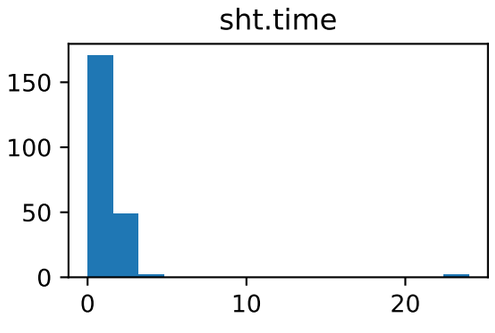

cs
150
100
50
0
0.850
0.875
0.900
0.925

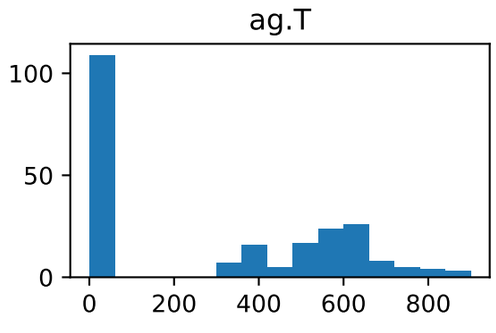

mr
100
50
0
0.136
0.138
0.140
0.142


hom.T
100
50
0
0
250
500
750
1000


hom.time
100
50
0
0
25
50
75
100


sht.T
100
50
0
0
250
500
750
1000


sht.time
150
100
50
0
0
10
20


ag.T
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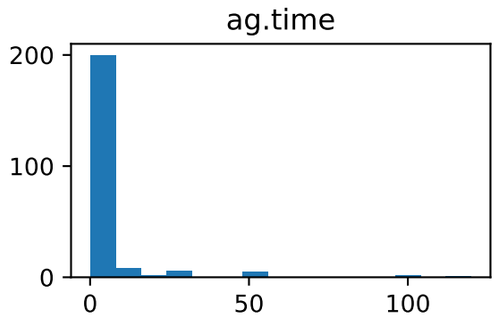
50
0
0
200
400
600
800


ag.time
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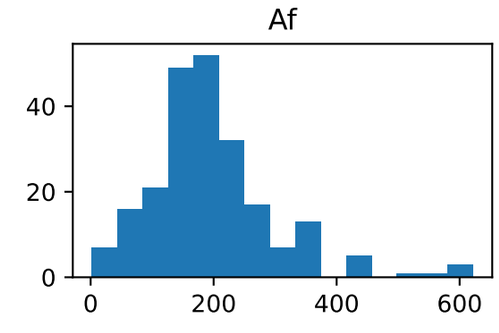
100
0
0
50
100


Af
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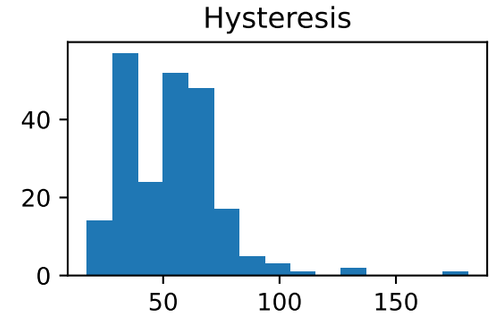
0
200
400
600


Hysteresis
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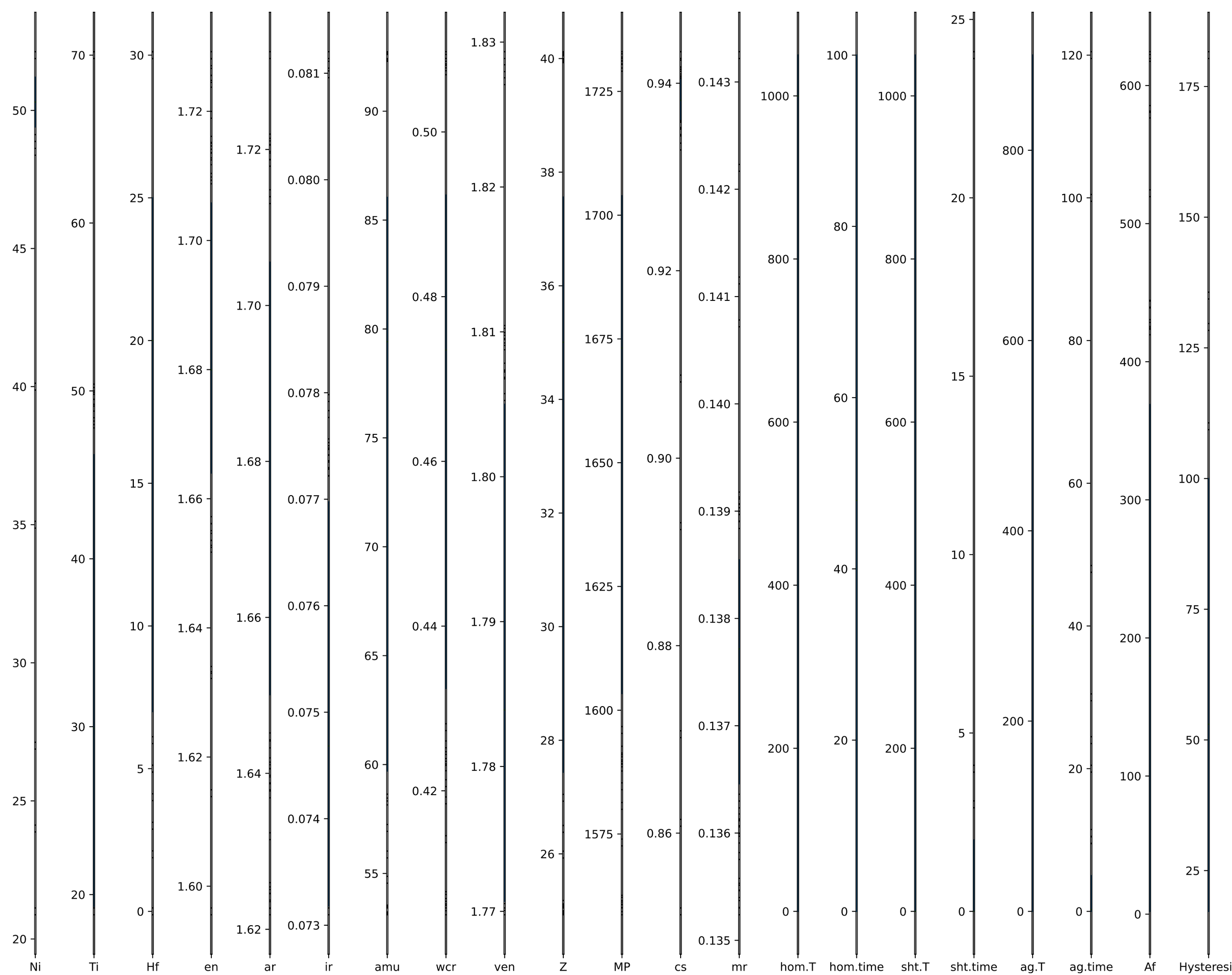
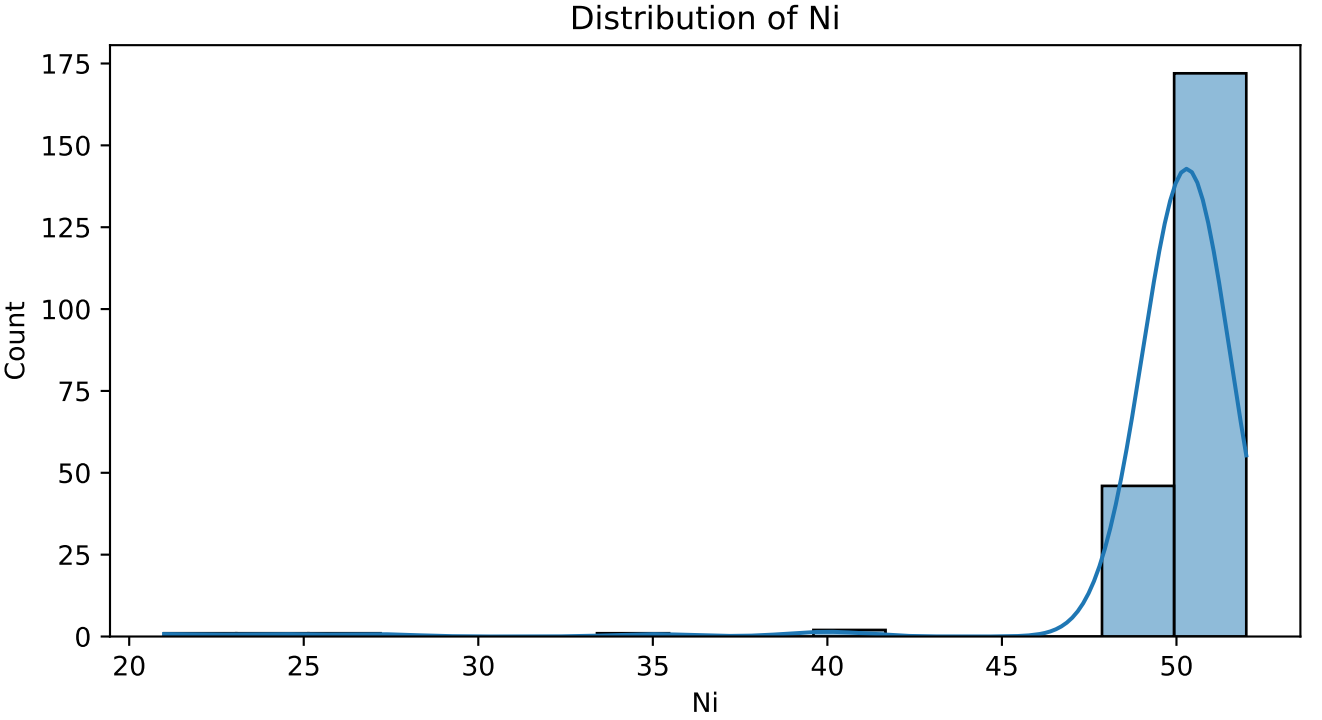
20
0
50
100
150


Ni
Ti
Hf
en
ar
ir
amu
wcr
ven
Z
MP
cs
mr
hom.T
hom.time
sht.T
sht.time
ag.T
ag.time
Af
Hysteresi


Distribution of Ni
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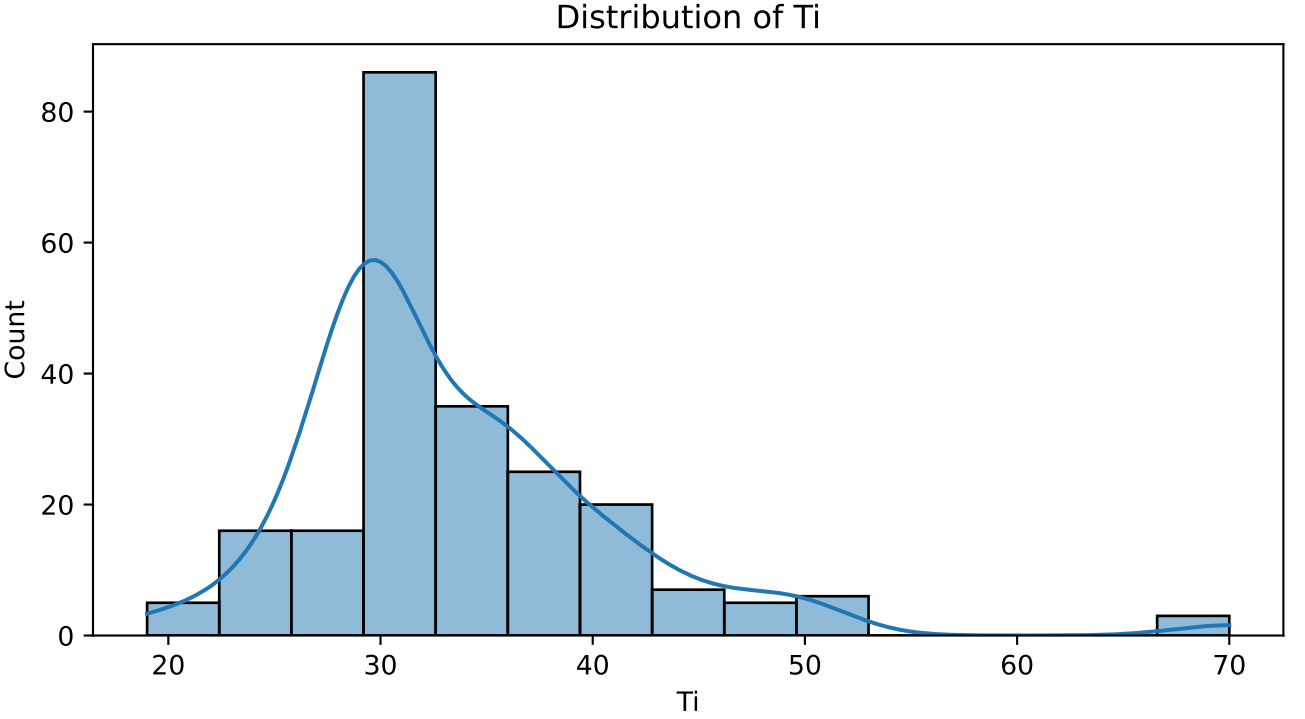
50
75
100
125
150
175
20
25
30
35
40
45
50


Distribution of Ti
Count
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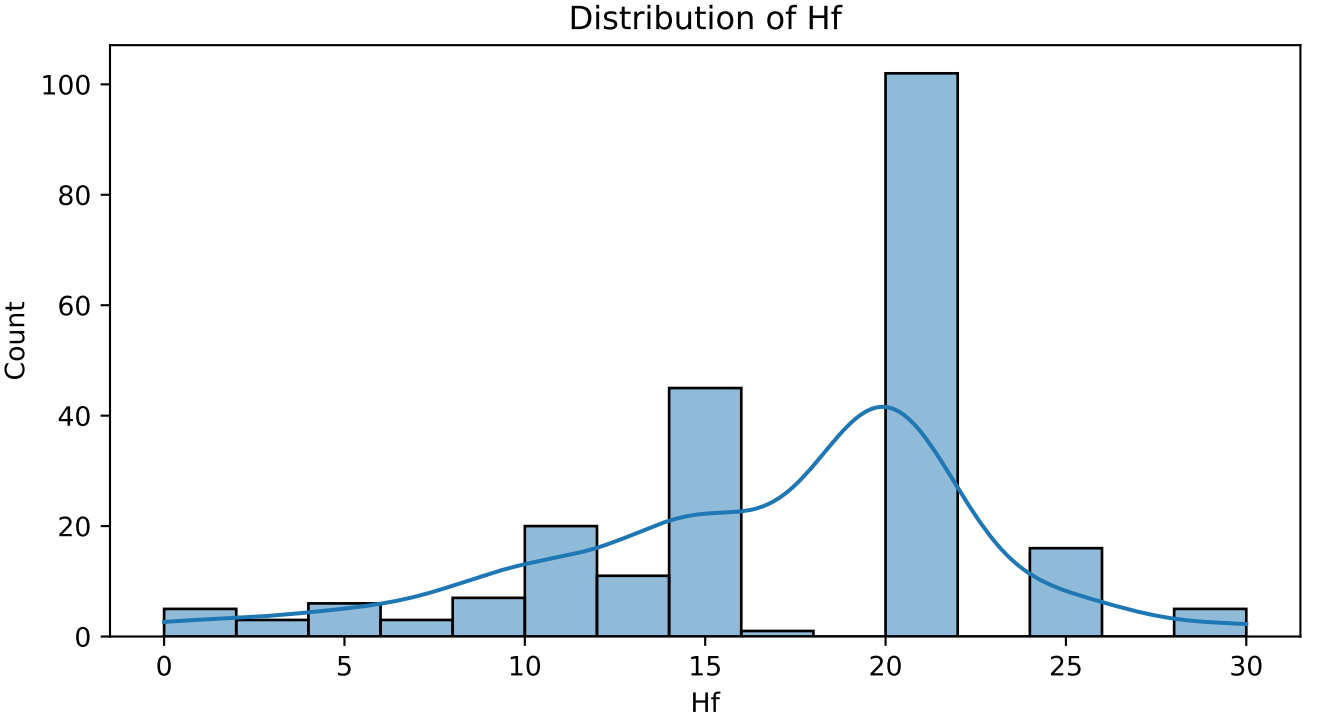
20
40
60
80
20
30
40
50
60
70
Ti


Distribution of Hf
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Hf
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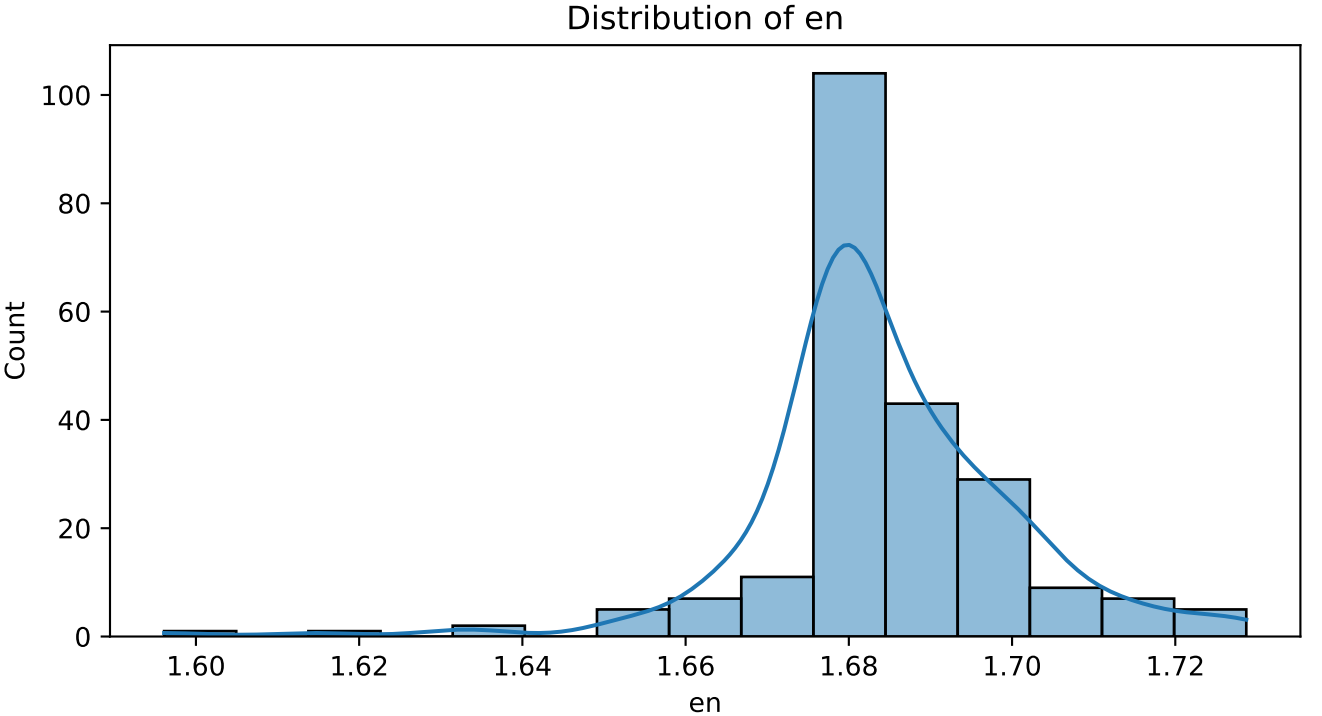
60
80
100
0
5
10
15
20
25
30


Distribution of en
Count
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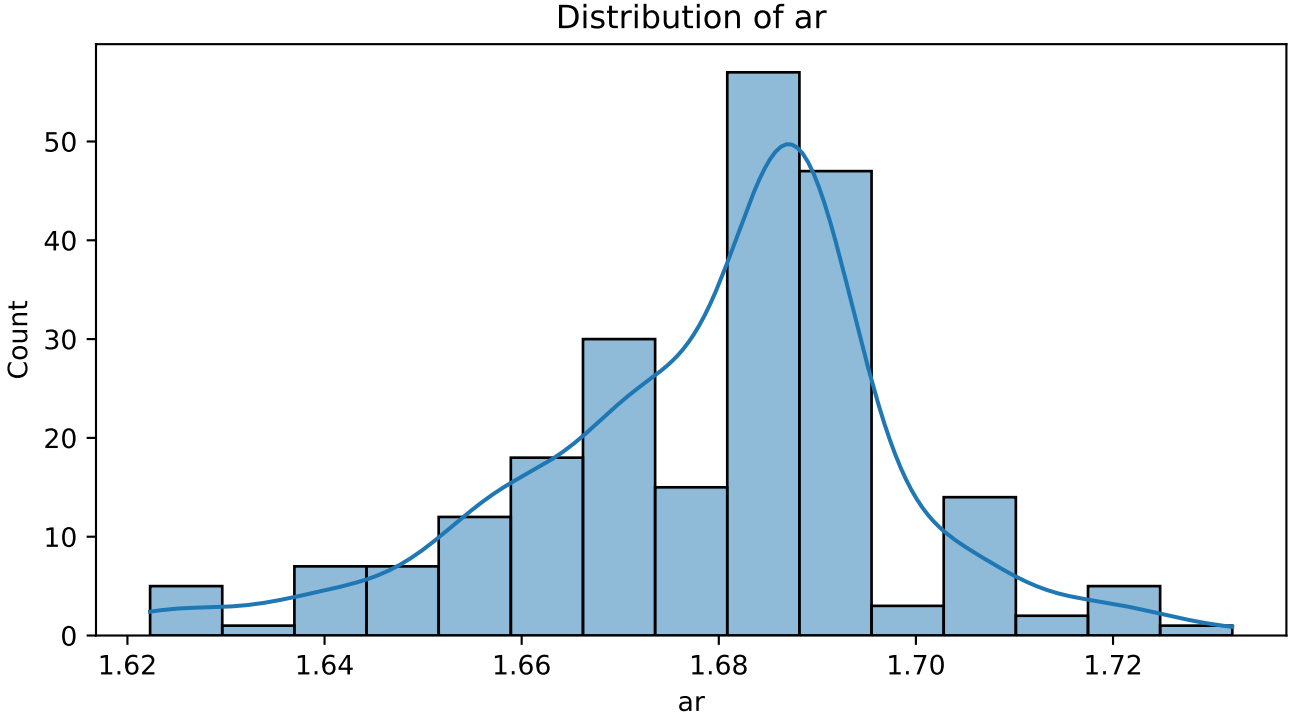
60
80
100
1.60
1.62
1.64
1.66
1.68
1.70
1.72
en


Distribution of ar
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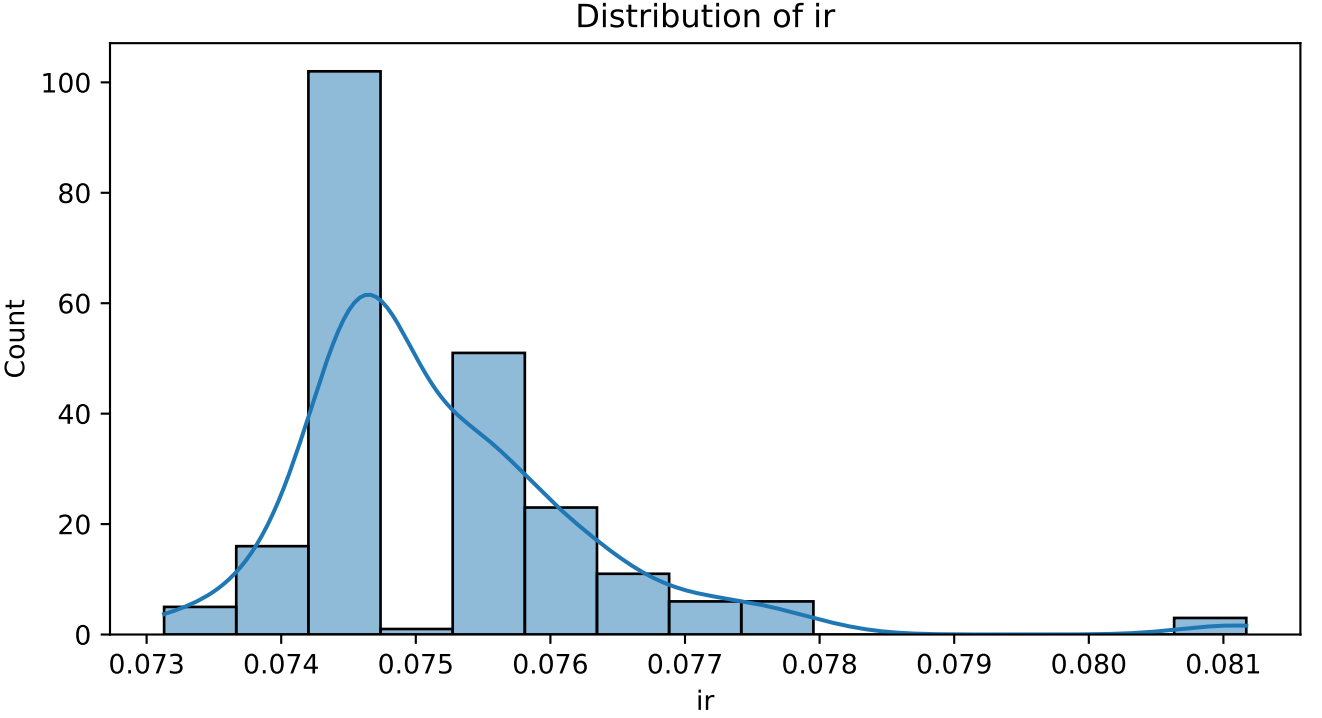
30
40
50
1.62
1.64
1.66
1.68
1.70
1.72
ar


Distribution of ir
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ir
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0.075
0.076
0.077
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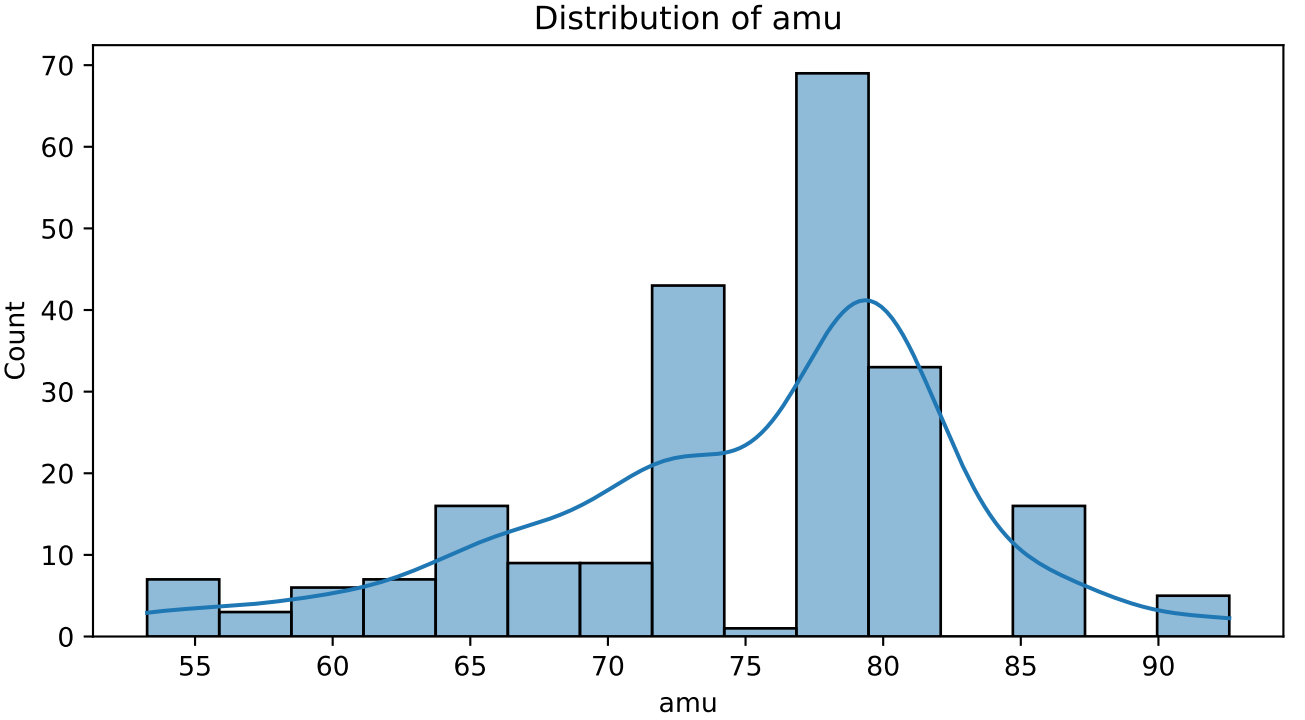
0.080
0.081


Distribution of amu
Count
amu
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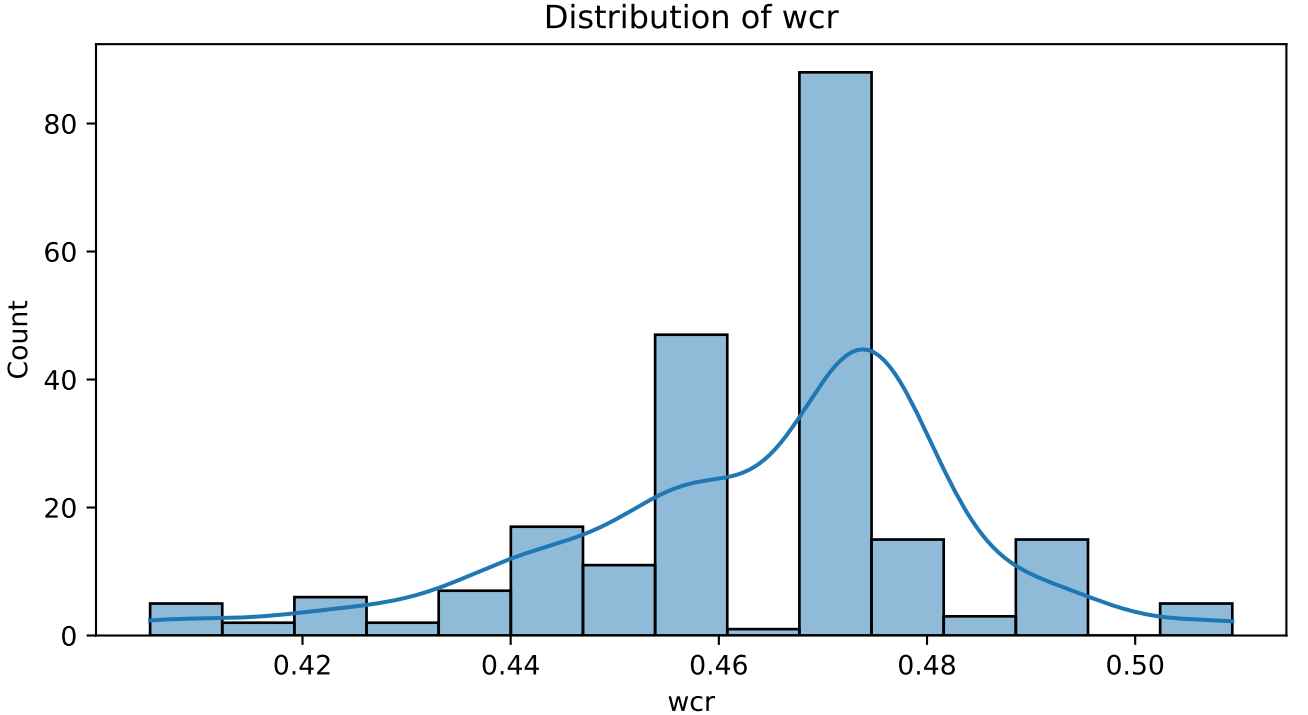
40
50
60
70
55
60
65
70
75
80
85
90


Distribution of wcr
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60
80
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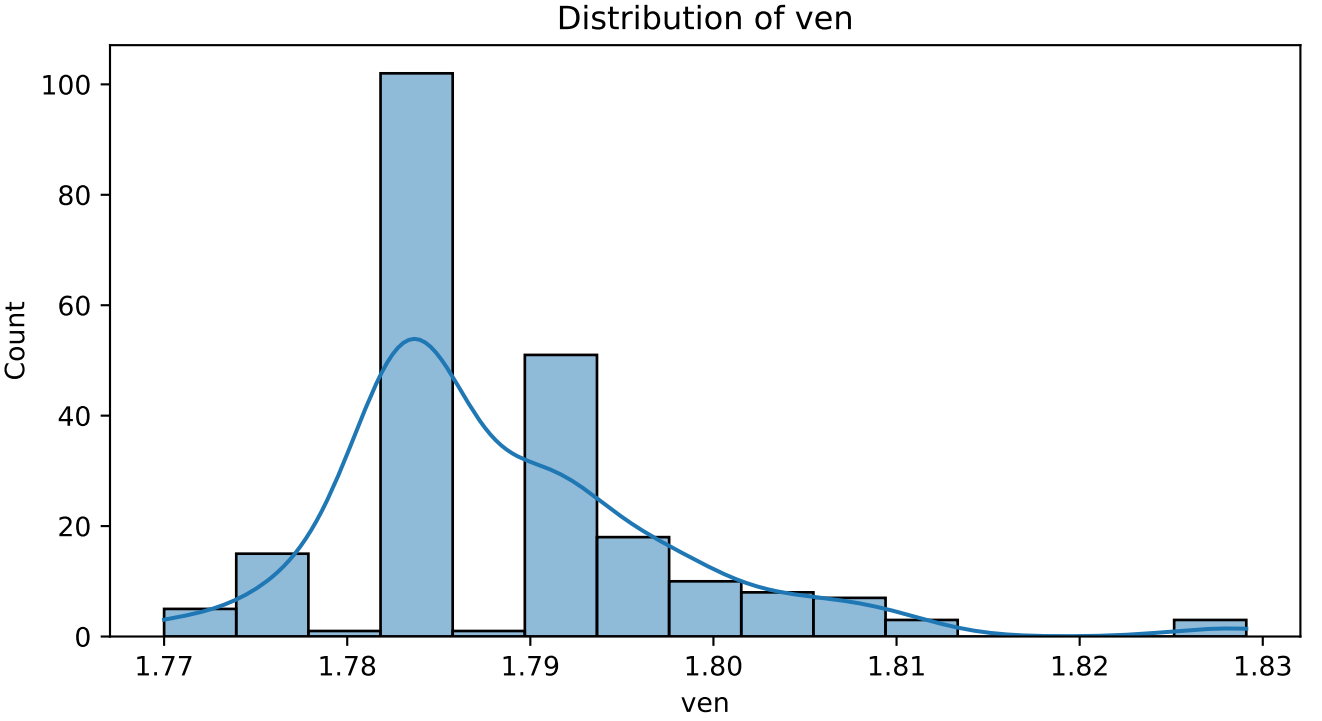
0.44
0.46
0.48
0.50
wcr


Distribution of ven
Count
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40
60
80
100
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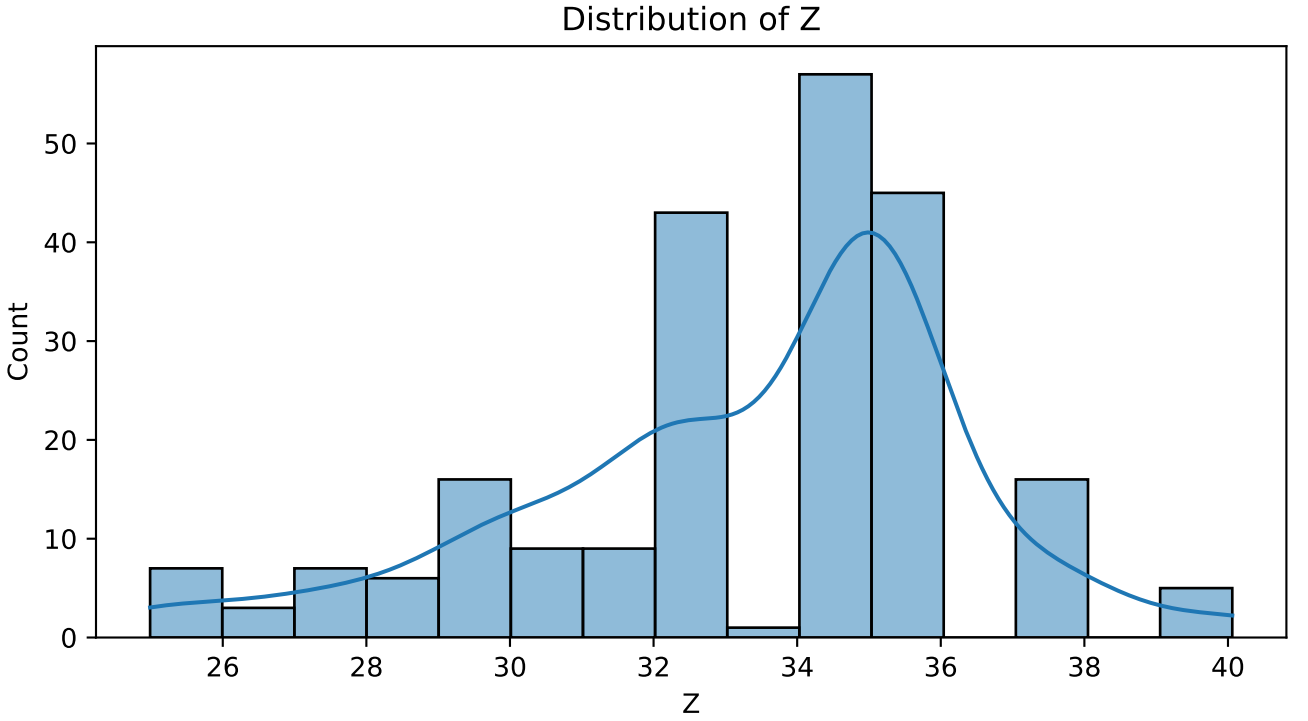
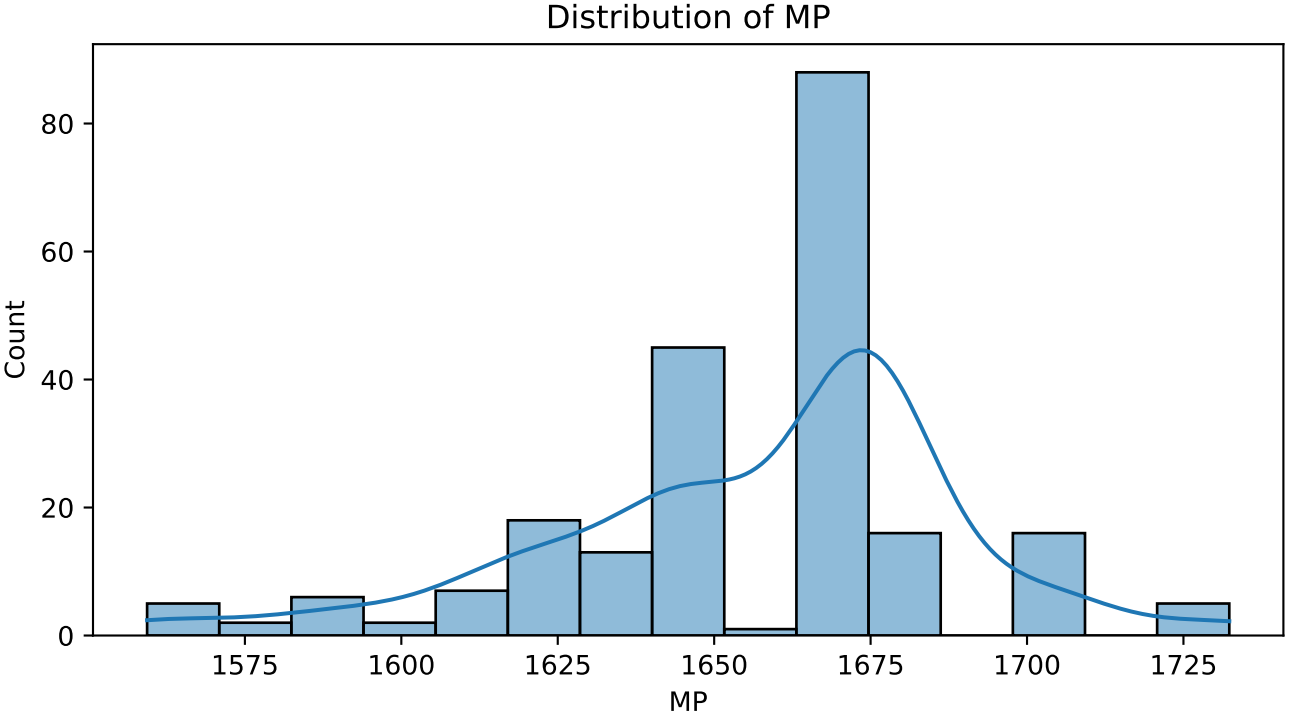
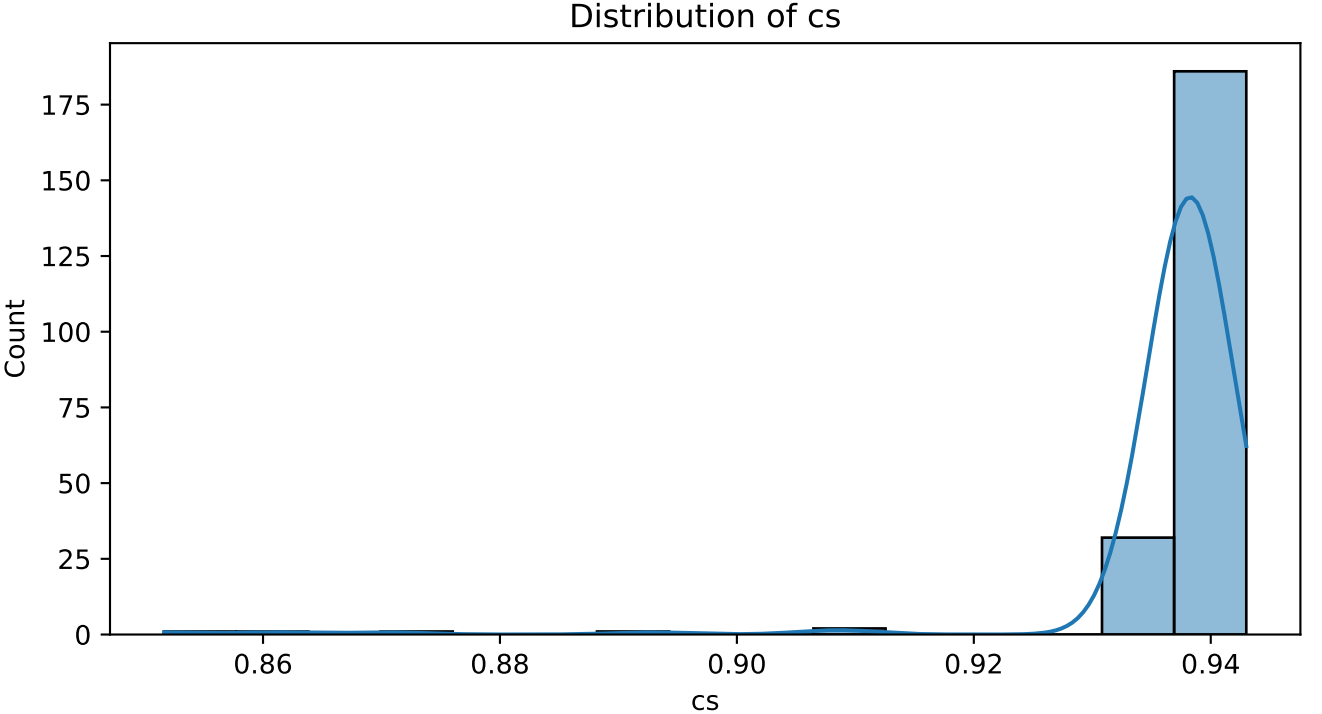
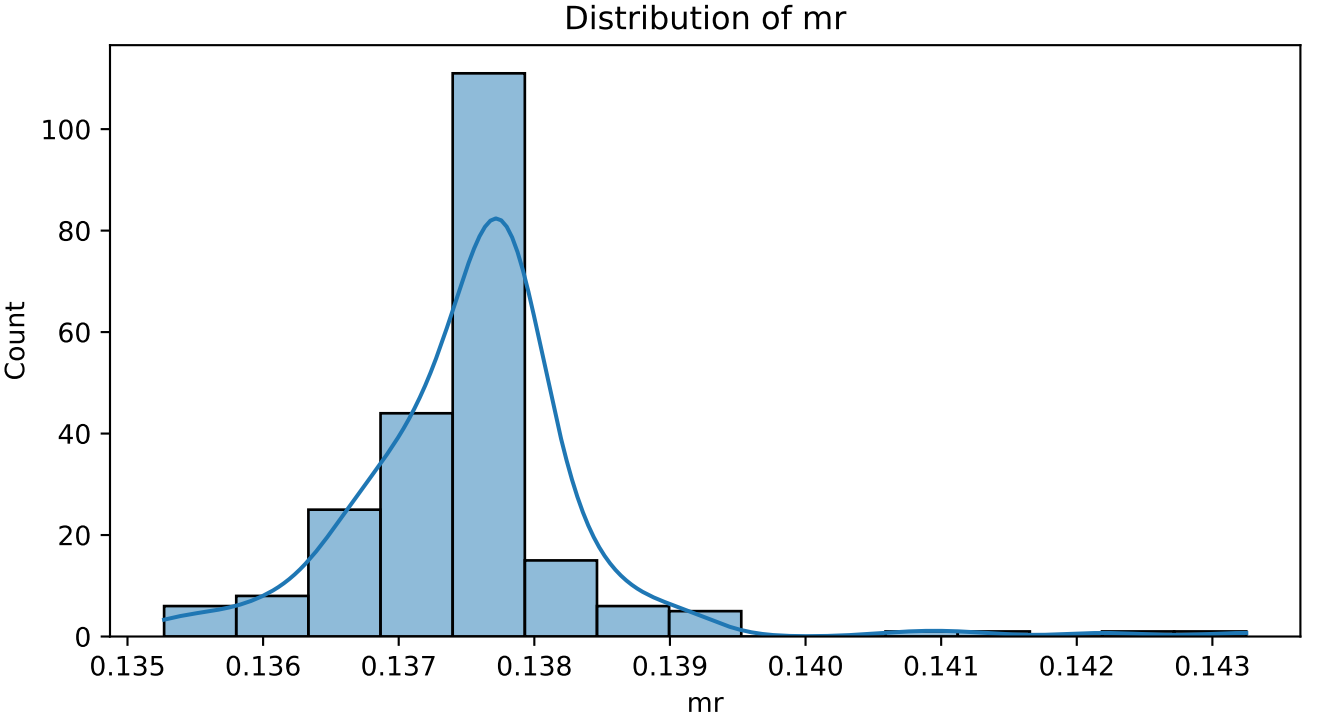
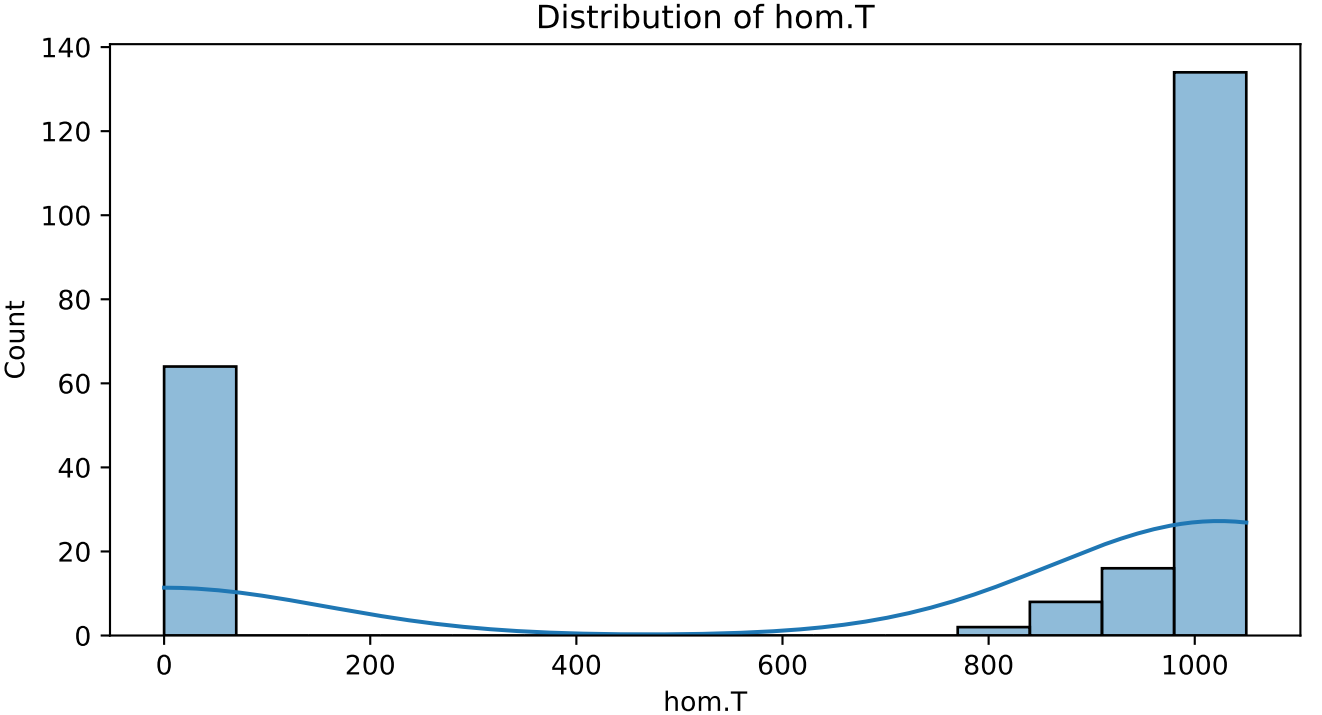
1.78
1.79
1.80
1.81
1.82
1.83

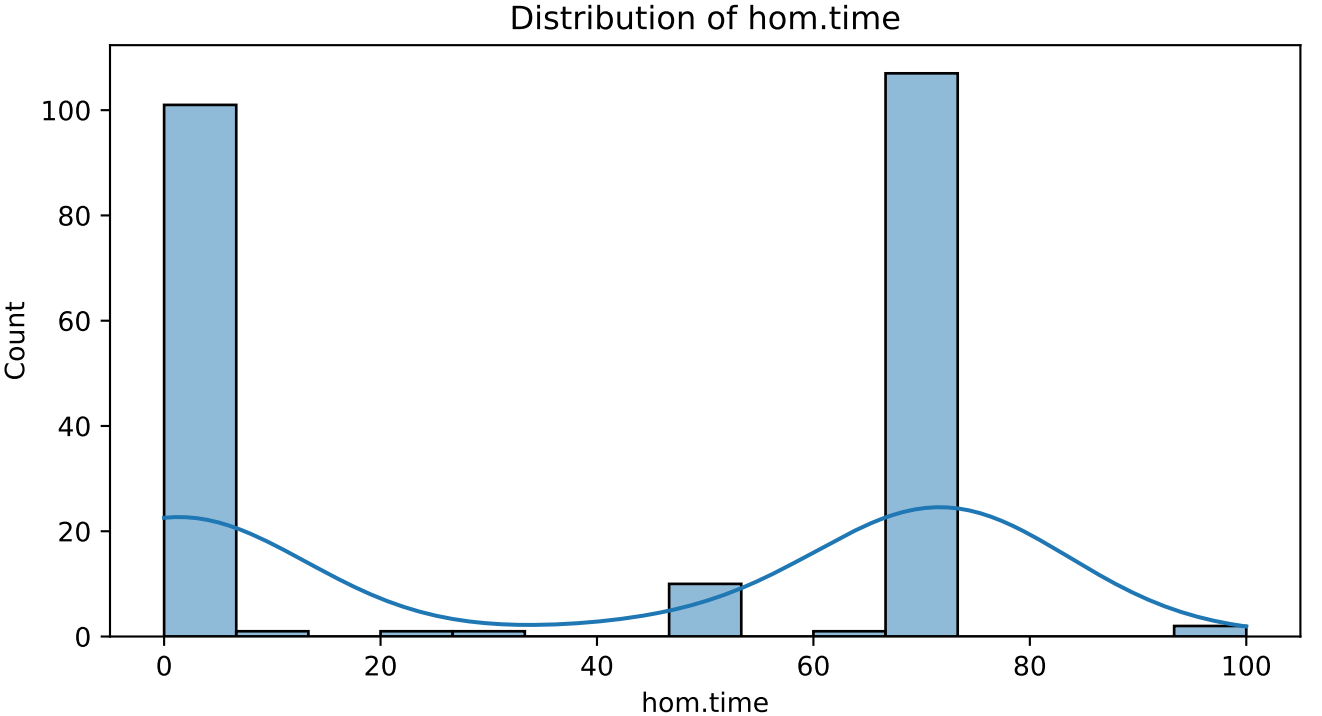

Distribution of Z
Count
0
10
20
30
40
50
26
28
30
32
34
36
38
40
Z

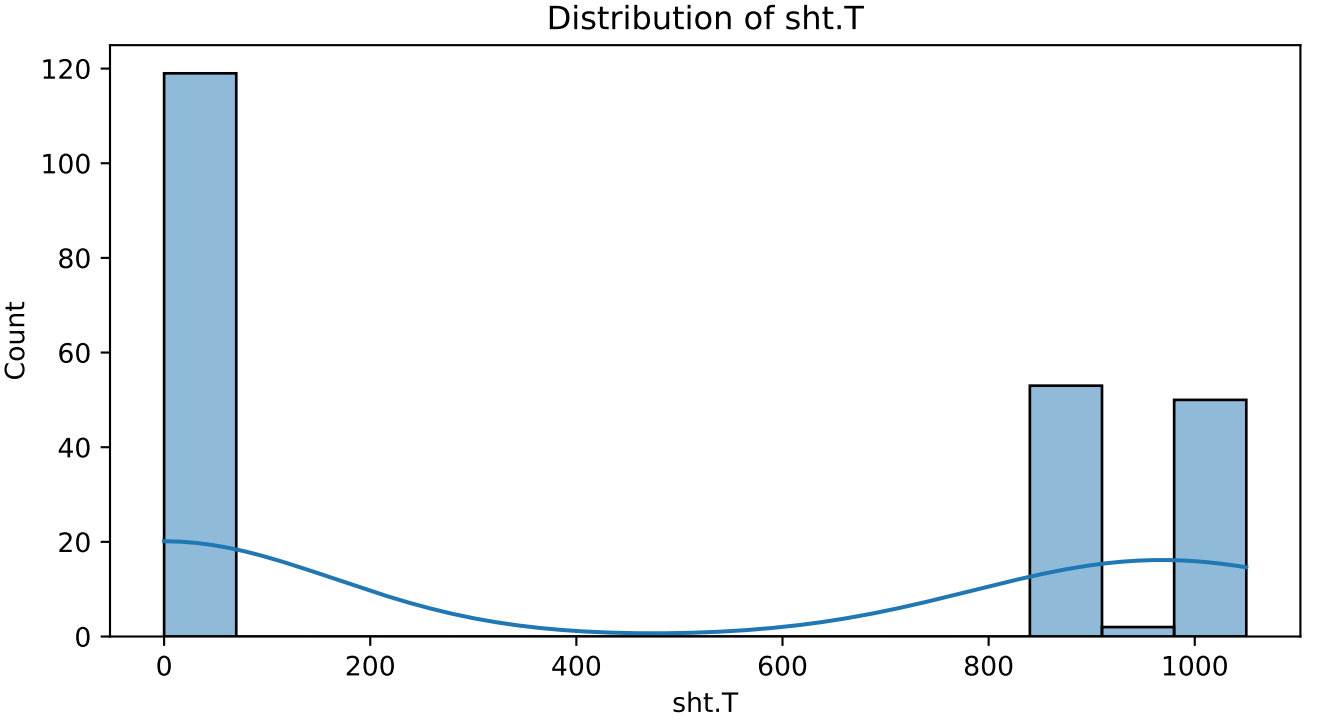

Distribution of MP
Count
0
20
40
60
80
1575
1600
1625
1650
1675
1700
1725
MP

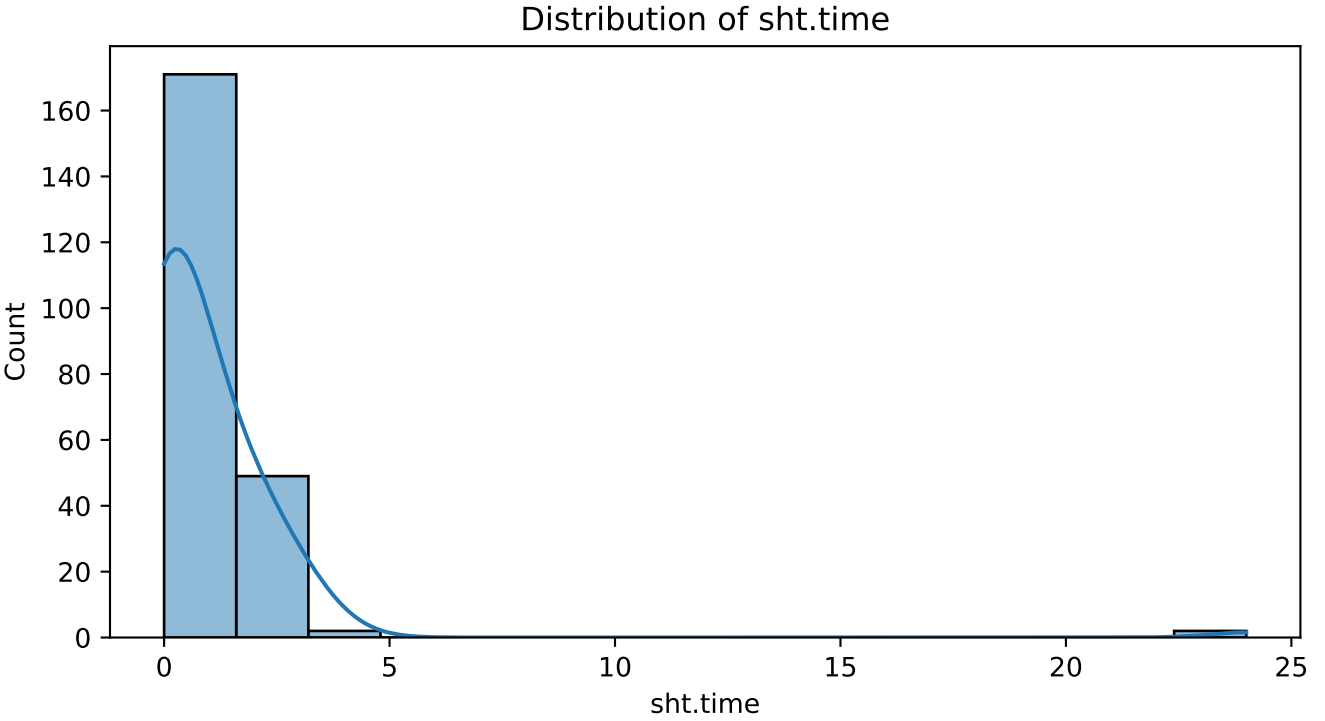

Distribution of cs
Count
175
150
125
100
75
50
25
0
0.86
0.88
0.90
0.92
0.94
cs

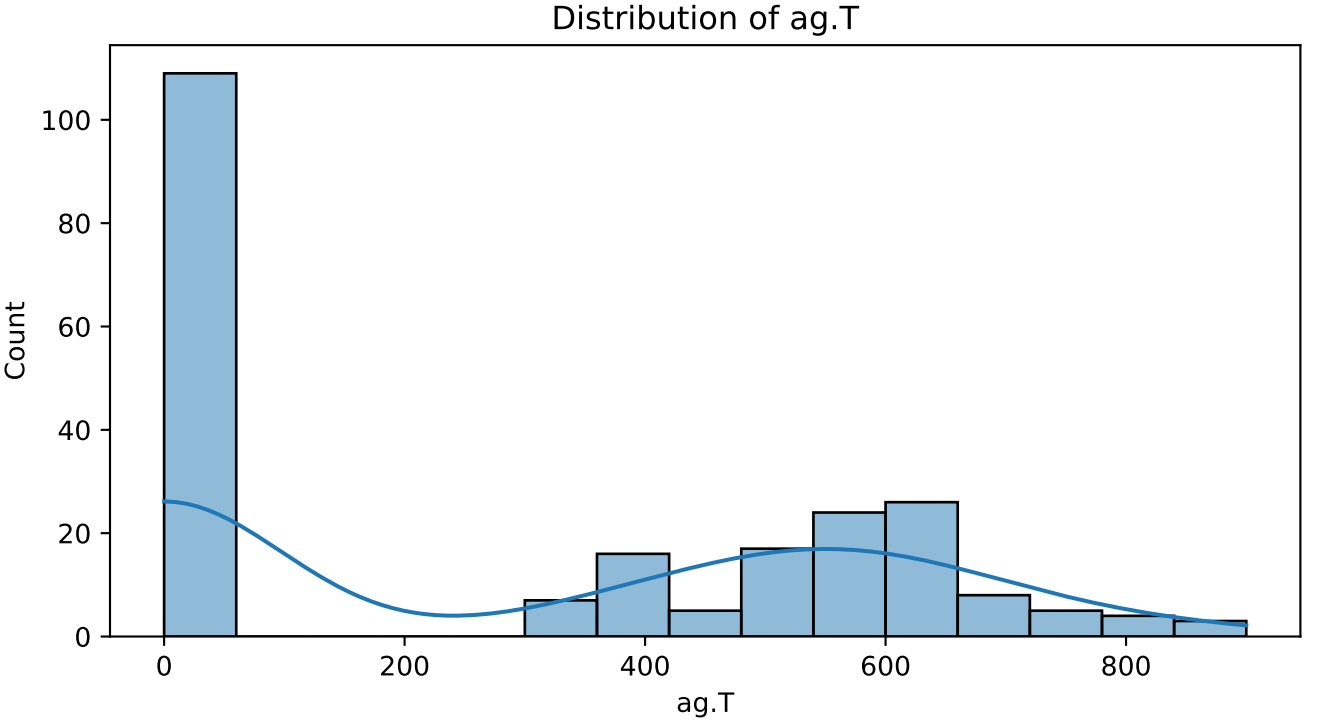

Distribution of mr
Count
0
20
40
60
80
100
0.135
0.136
0.137
0.138
0.139
0.140
0.141
0.142
0.143
mr

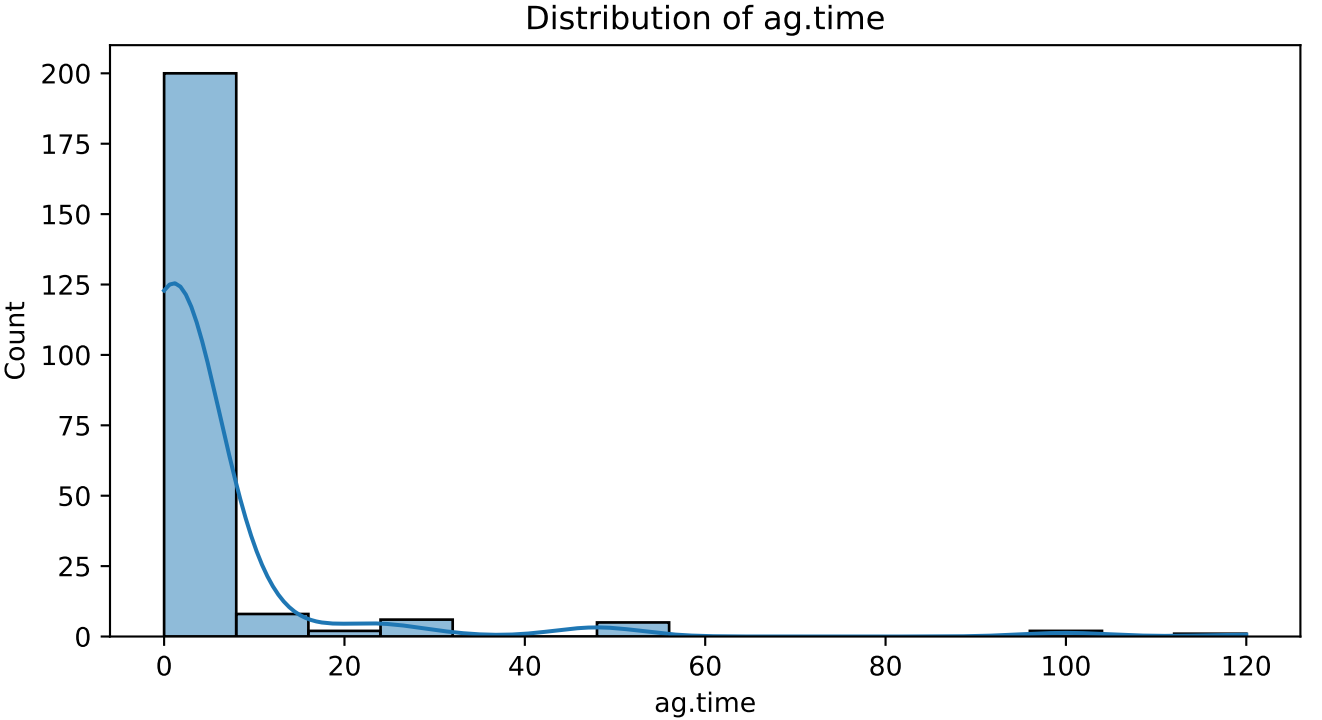

Distribution of hom.T
Count
hom.T
0
20
40
60
80
100
120
140
0
200
400
600
800
1000

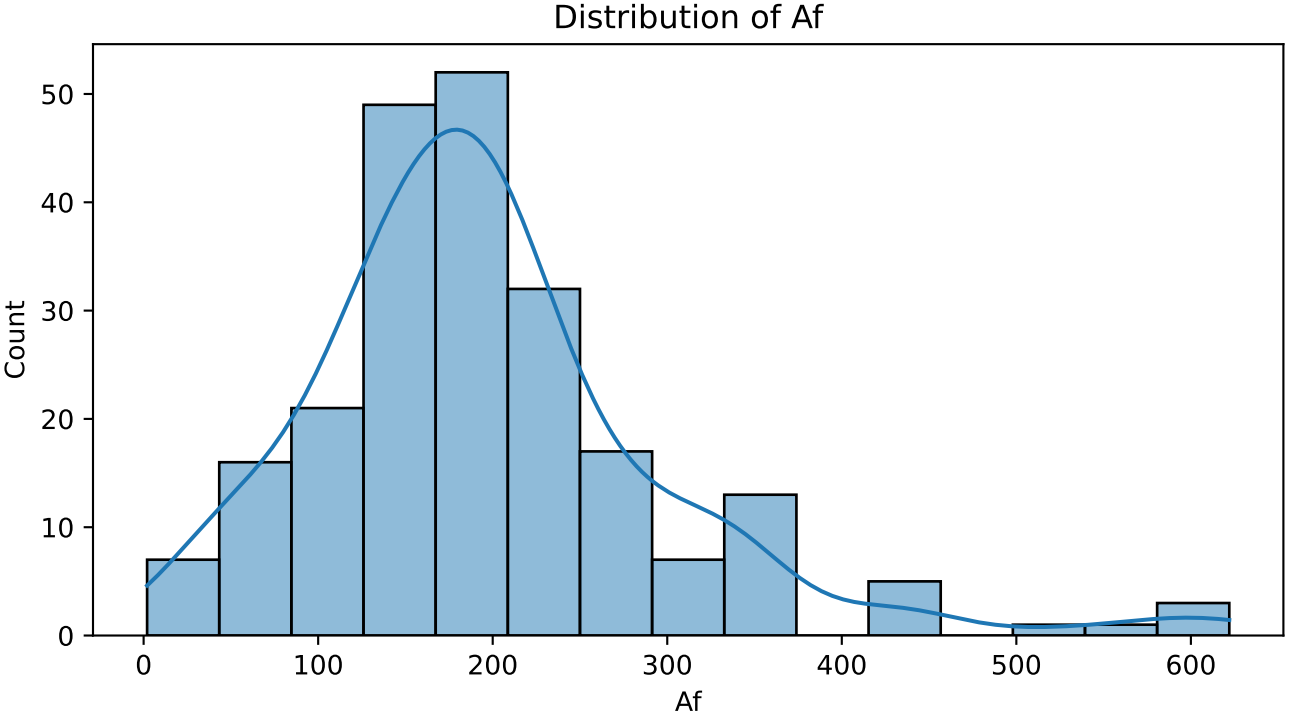

Distribution of hom.time
Count
hom.time
0
20
40
60
80
100
0
20
40
60
80
100

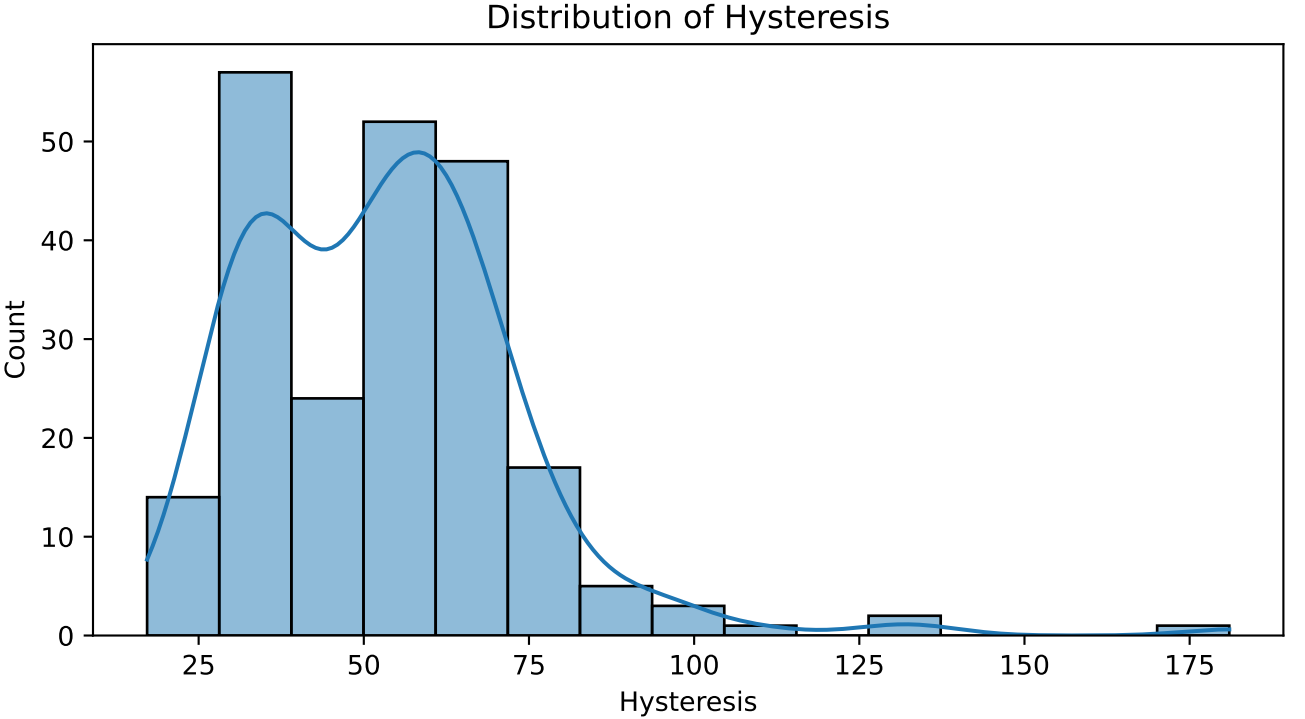

Distribution of sht.T
Count
sht.T
0
20
40
60
80
100
120
0
200
400
600
800
1000

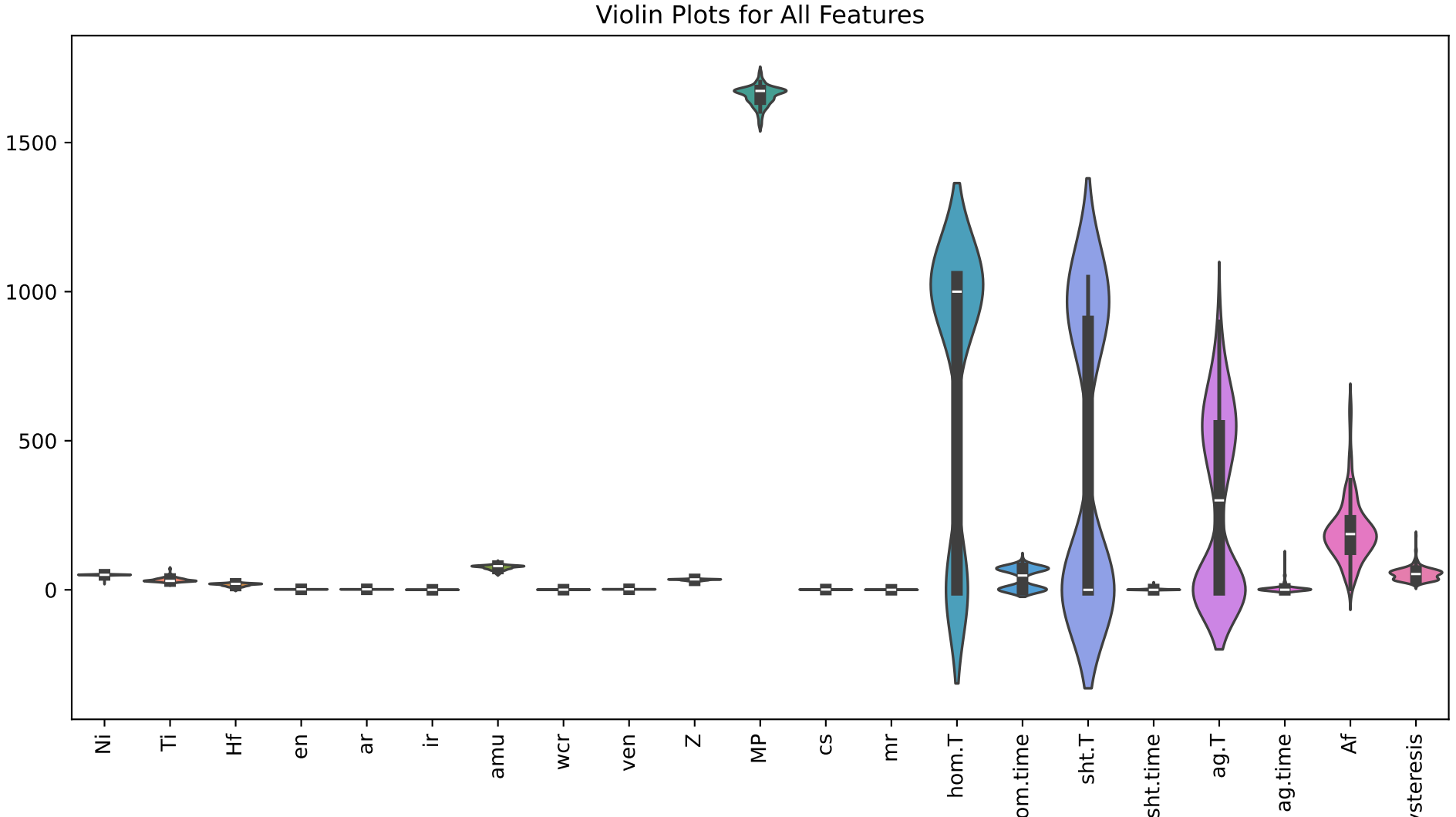

Distribution of sht.time
Count
sht.time
0
20
40
60
80
100
120
140
160
0
5
10
15
20
25

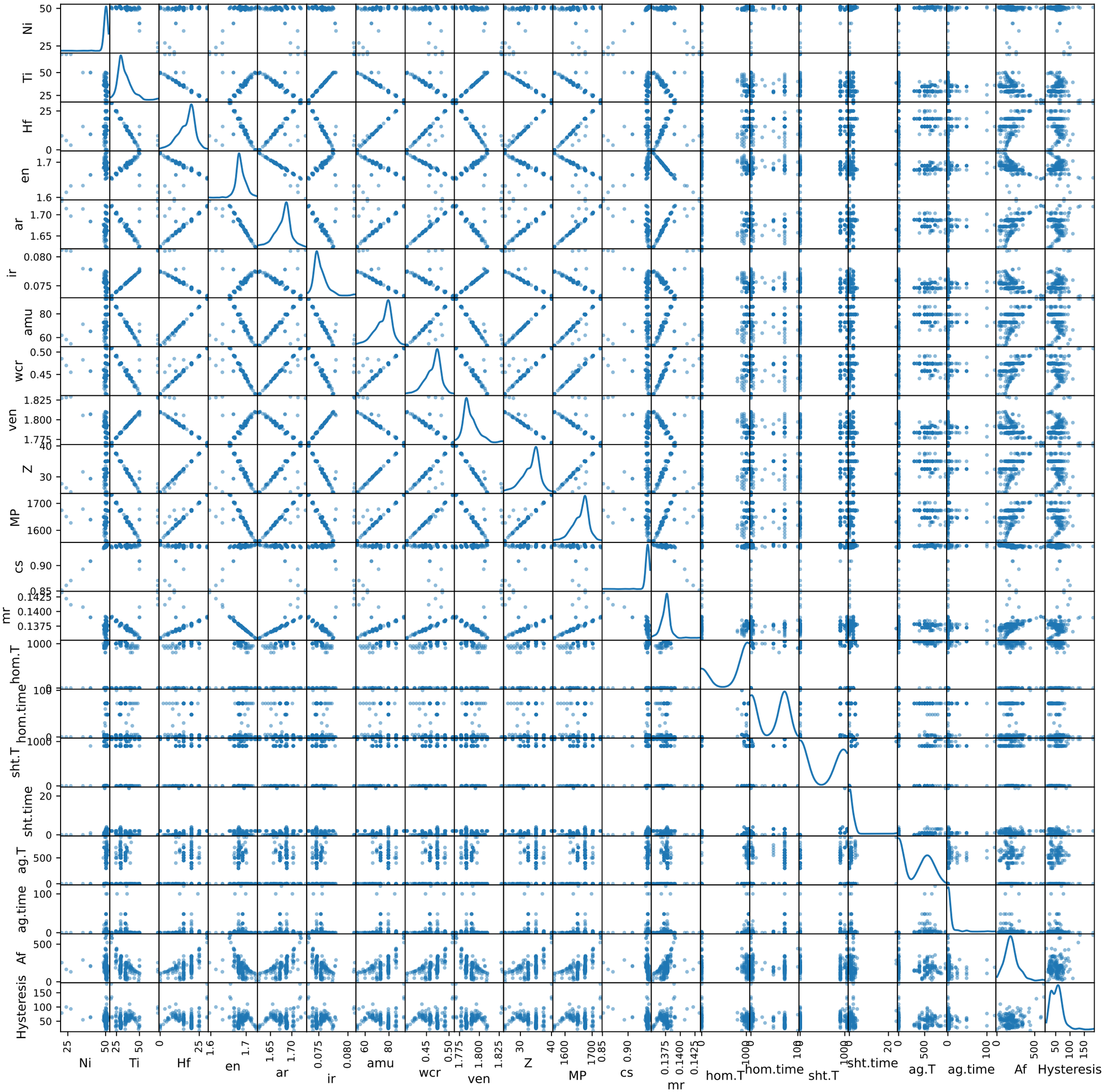

Distribution of ag.T
Count
ag.T
0
20
40
60
80
100
0
200
400
600
800

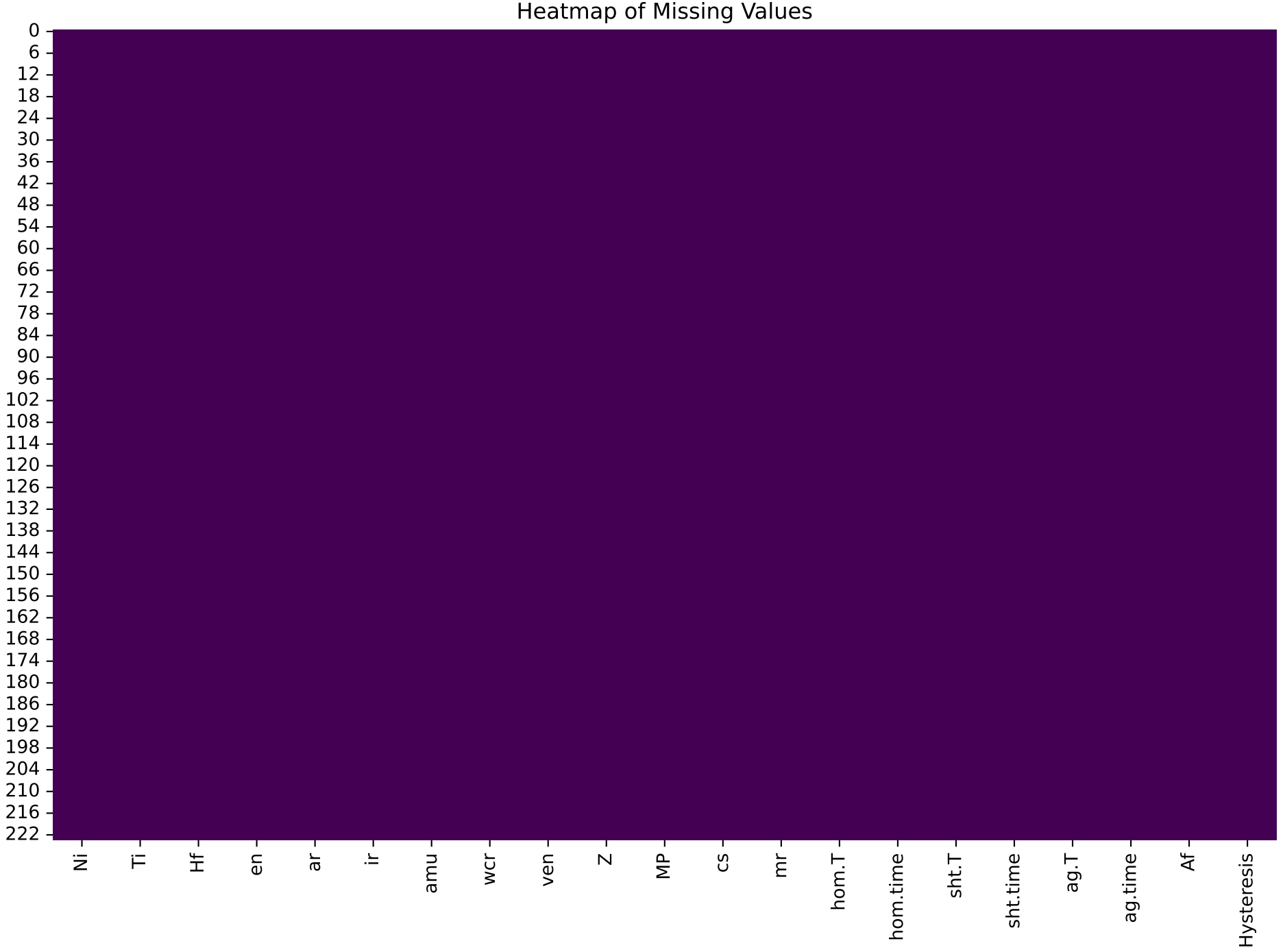

Distribution of ag.time
Count
200
175
150
125
100
75
50
25
0
0
20
40
60
80
100
120
ag.time


Distribution of Af
Count
Af
0
10
20
30
40
50
0
100
200
300
400
500
600


Distribution of Hysteresis
Count
0
10
20
30
40
50
25
50
75
100
125
150
175
Hysteresis


Violin Plots for All Features
1500
1000
500
0
Ni
Ti
Hf
en
ar
ir
amu
wcr
ven
Z
MP
cs
mr
hom.T
om.time
sht.T
sht.time
ag.T
ag.time
Af
ysteresis


Ni
Ti
Hf
en
ar
ir
amu
wcr
ven
Z
MP
cs
mr
hom.T
hom.time
sht.T
sht.time
ag.T
ag.time
Af
Hysteresis


Heatmap of Missing Values
0
6
12
18
24
30
36
42
48
54
60
66
72
78
84
90
96
102
108
114
120
126
132
138
144
150
156
162
168
174
180
186
192
198
204
210
216
222
Ni
Ti
Hf
en
ar
ir
amu
wcr
ven
Z
MP
cs
mr
hom.T
hom.time
sht.T
sht.time
ag.T
ag.time
Af
Hysteresis