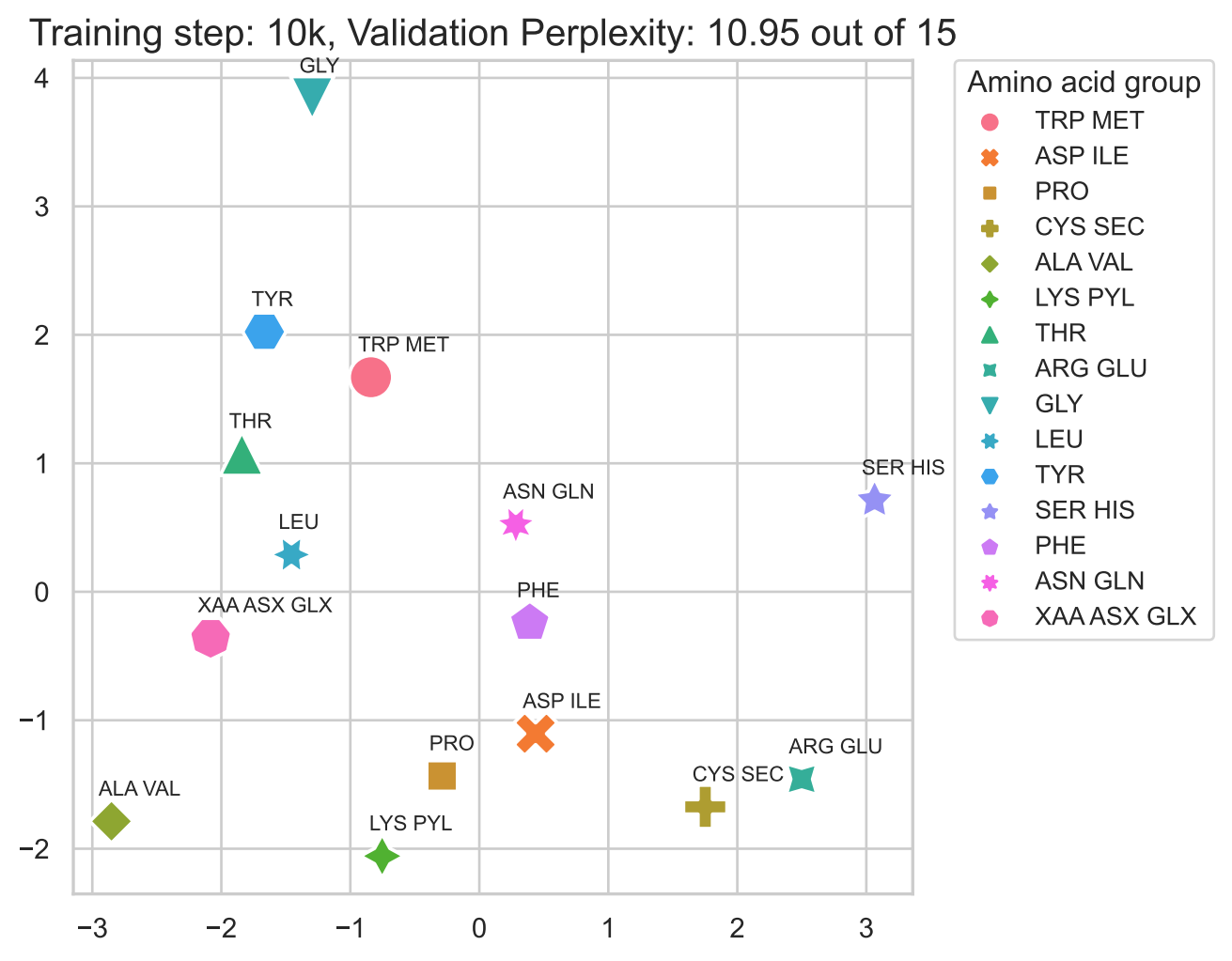
Training step: 10k, Validation Perplexity: 10.95 out of 15
GLY
TYR
TRP MET
THR
LEU
SER HIS
ASN GLN
XAA ASX GLX
PHE
ASP ILE
PRO
ARG GLU
CYS SEC
ALA VAL
LYS PYL
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX
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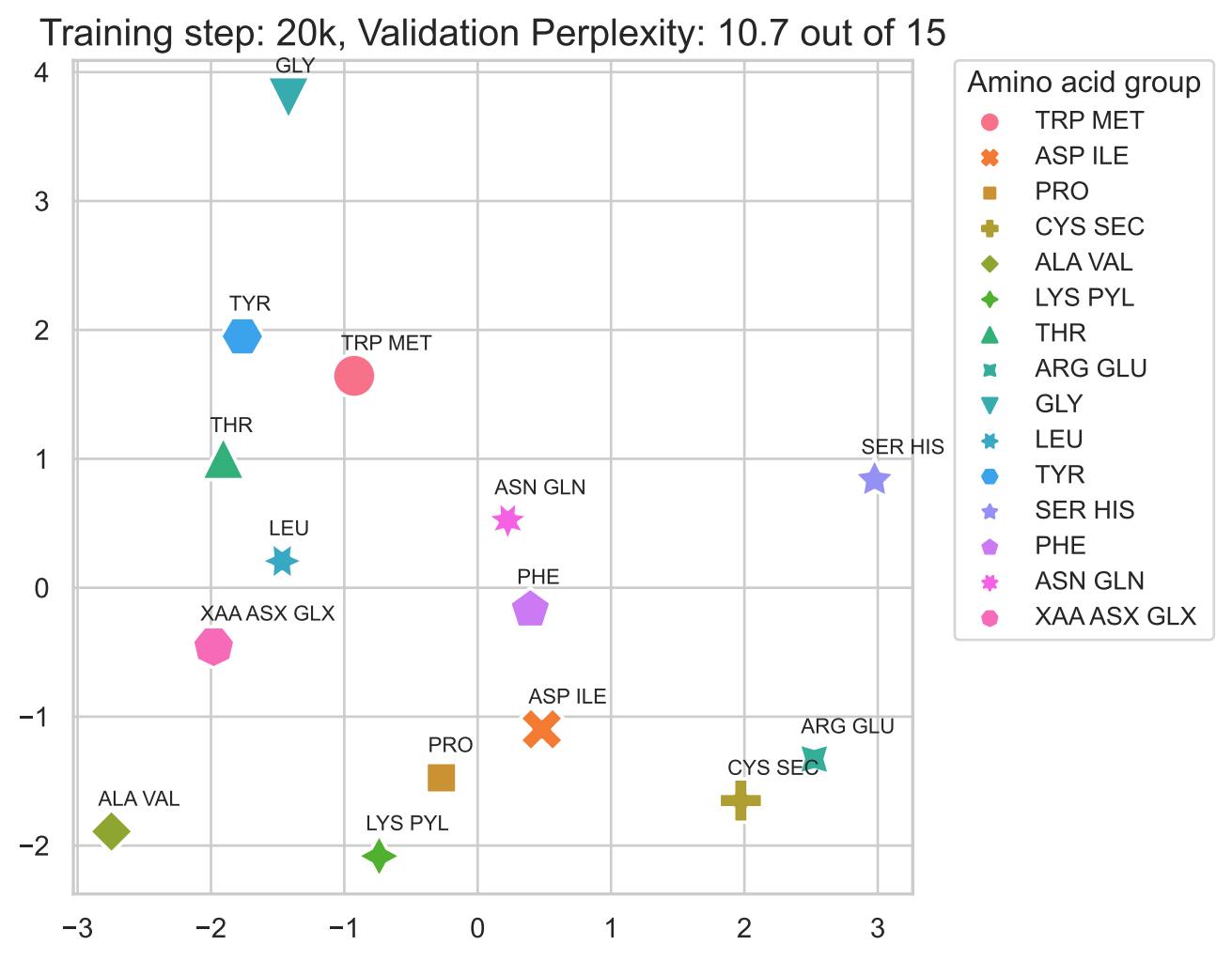
Training step: 20k, Validation Perplexity: 10.7 out of 15
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TYR
TRP MET
THR
SER HIS
ASN GLN
LEU
PHE
XAA ASX GLX
ASP ILE
ARG GLU
PRO
CYS SEC
ALA VAL
LYS PYL
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX
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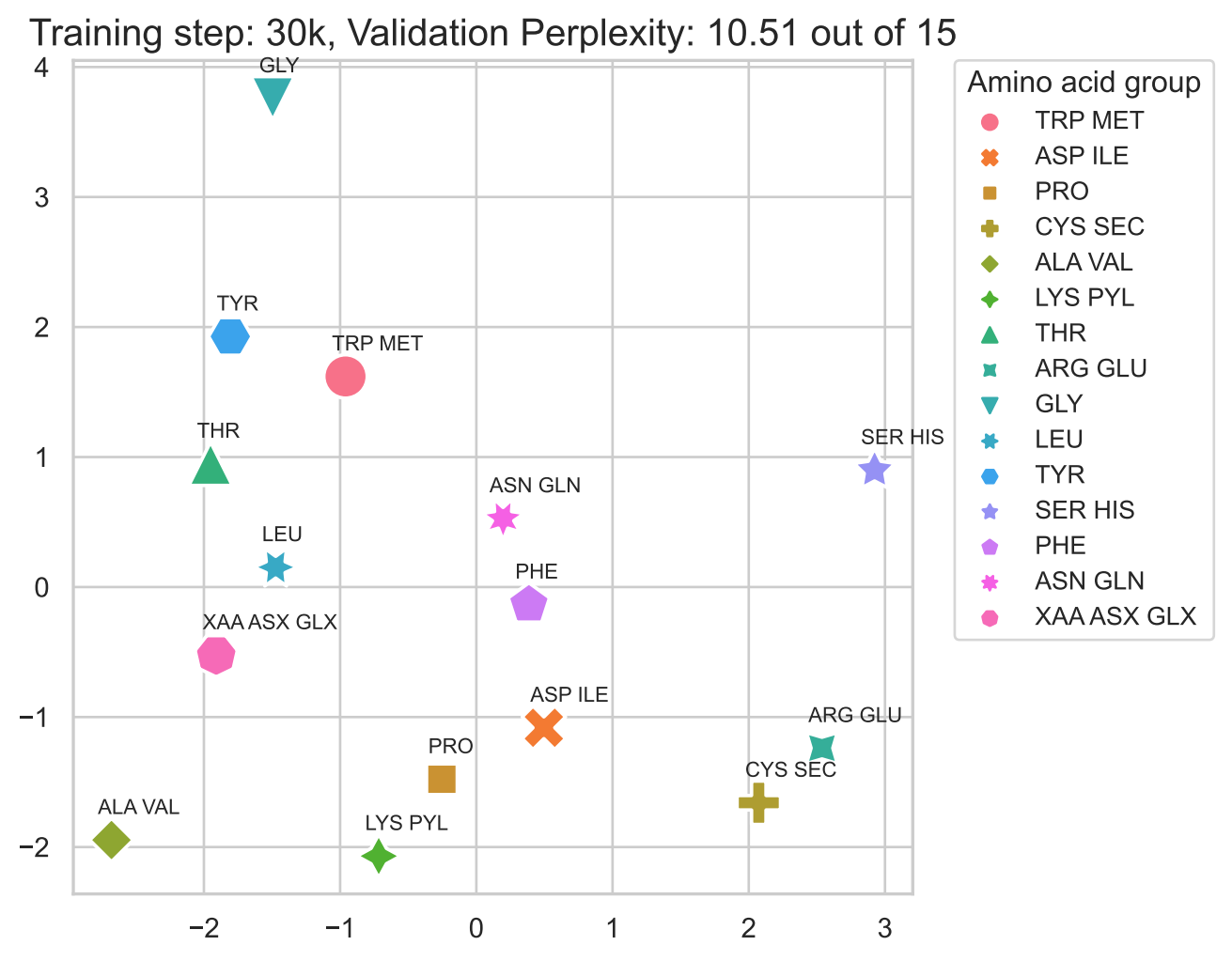
Training step: 30k, Validation Perplexity: 10.51 out of 15
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TYR
TRP MET
THR
SER HIS
ASN GLN
LEU
PHE
XAA ASX GLX
ASP ILE
ARG GLU
PRO
CYS SEC
ALA VAL
LYS PYL
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX
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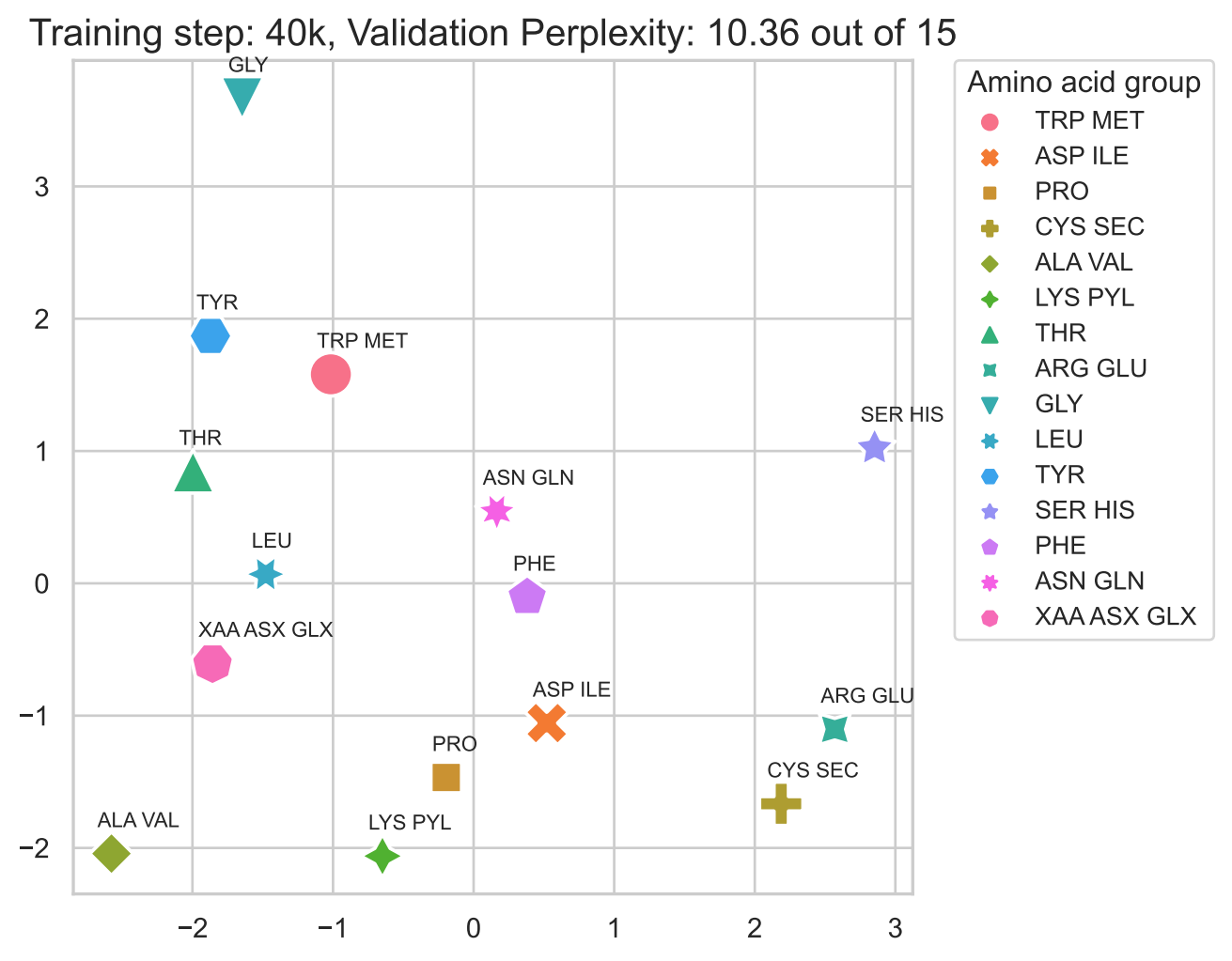
Training step: 40k, Validation Perplexity: 10.36 out of 15
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX
GLY
TYR
TRP MET
THR
SER HIS
ASN GLN
LEU
PHE
XAA ASX GLX
ASP ILE
ARG GLU
PRO
CYS SEC
ALA VAL
LYS PYL
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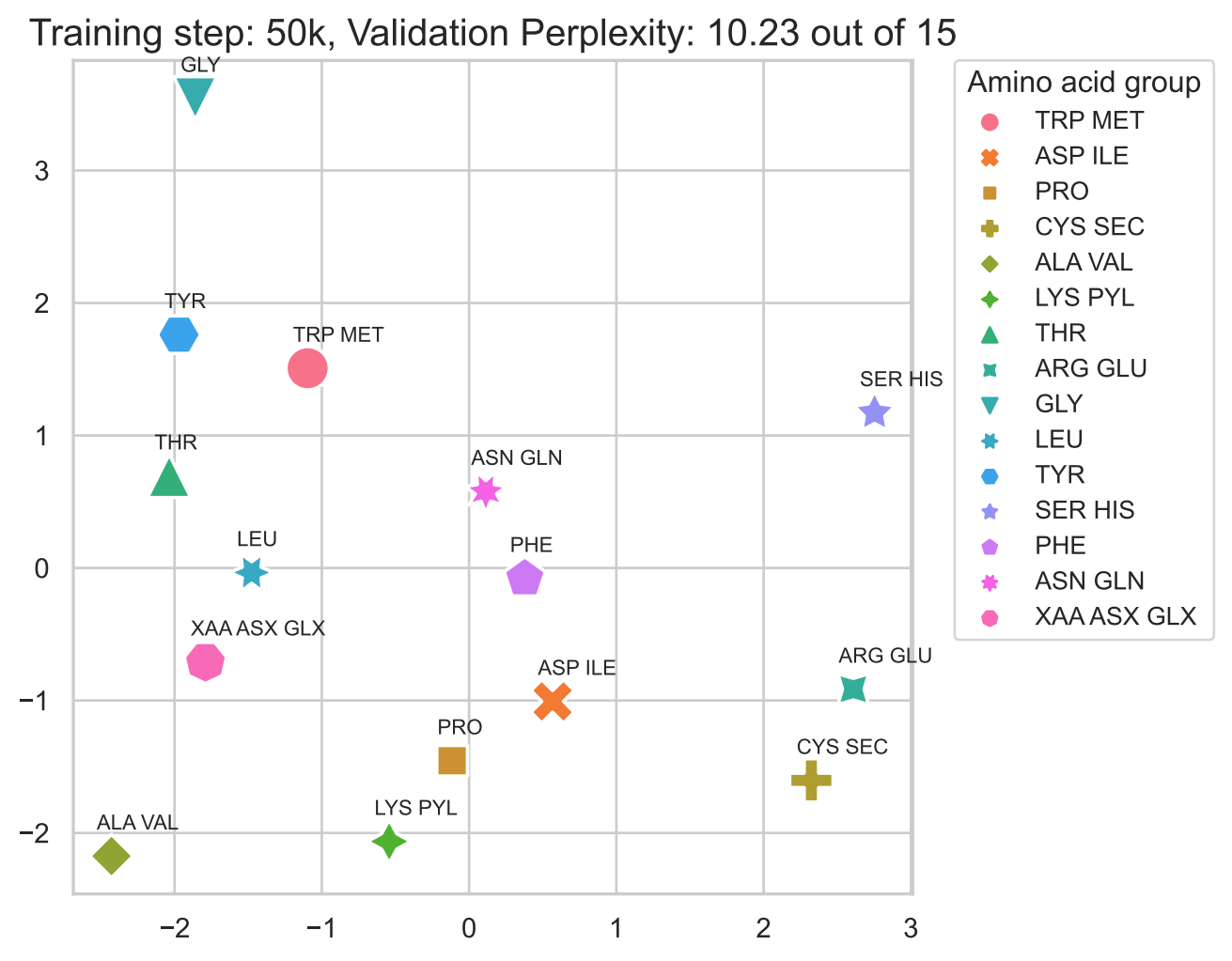
Training step: 50k, Validation Perplexity: 10.23 out of 15
GLY
TYR
TRP MET
SER HIS
THR
ASN GLN
LEU
PHE
XAA ASX GLX
ASP ILE
ARG GLU
PRO
CYS SEC
LYS PYL
ALA VAL
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX
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−2
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2
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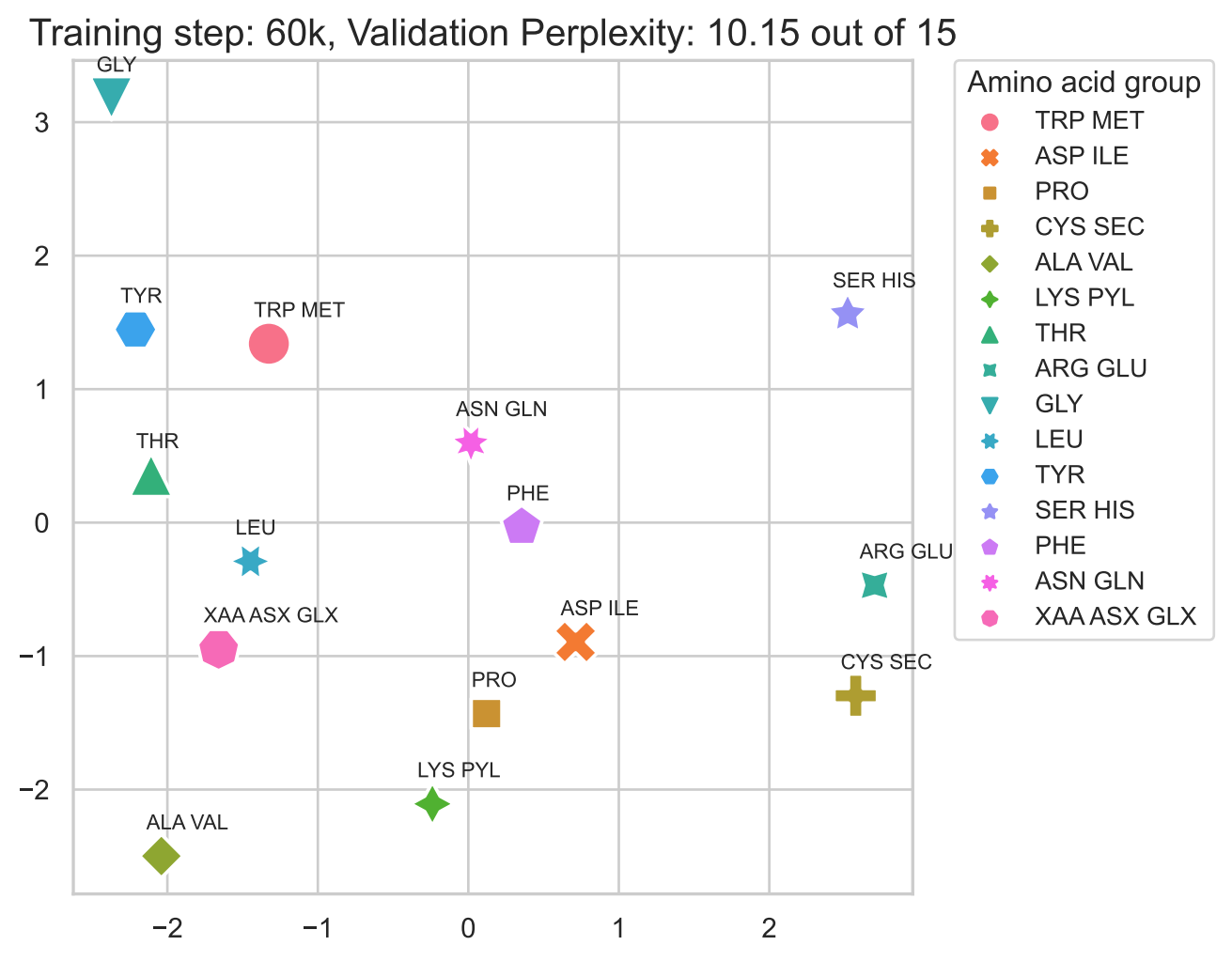
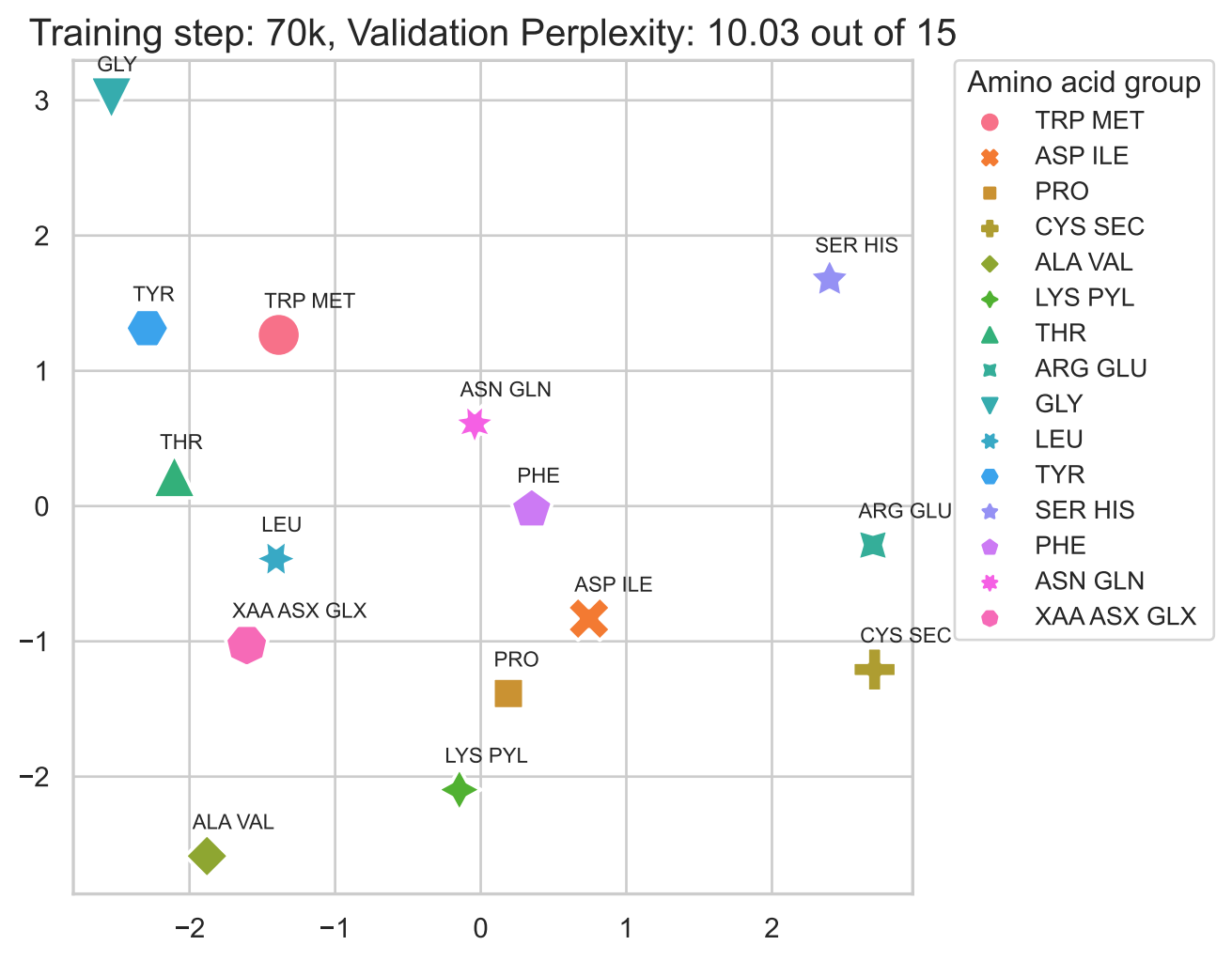

Training step: 60k, Validation Perplexity: 10.15 out of 15
GLY
TYR
TRP MET
SER HIS
ASN GLN
THR
PHE
LEU
ARG GLU
XAA ASX GLX
ASP ILE
CYS SEC
PRO
LYS PYL
ALA VAL
3
2
1
0
−1
−2
−2
−1
0
1
2
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX


Training step: 70k, Validation Perplexity: 10.03 out of 15
GLY
SER HIS
TYR
TRP MET
ASN GLN
THR
PHE
ARG GLU
LEU
ASP ILE
XAA ASX GLX
CYS SEC
PRO
LYS PYL
ALA VAL
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX
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−1
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−1
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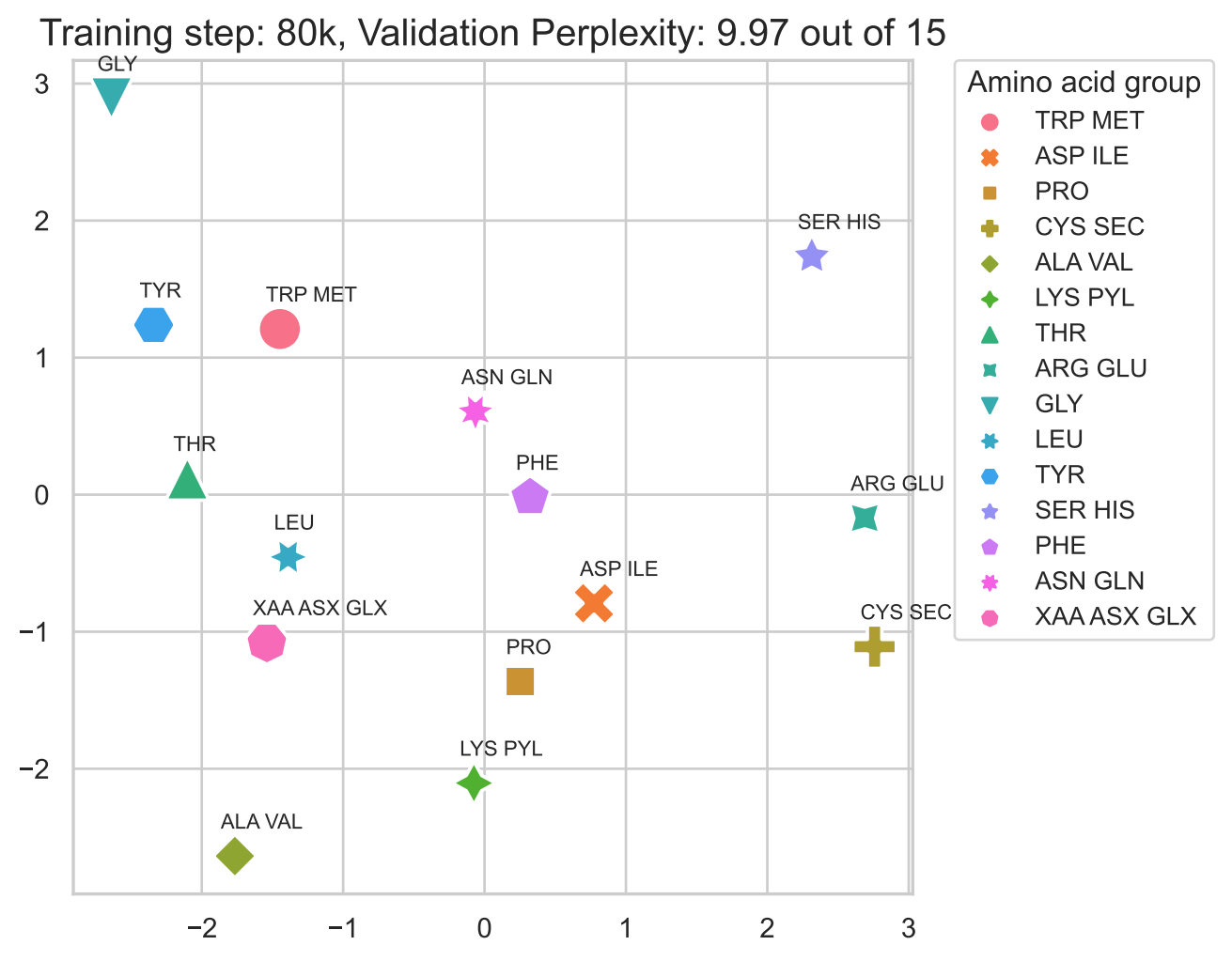
Training step: 80k, Validation Perplexity: 9.97 out of 15
GLY
SER HIS
TYR
TRP MET
ASN GLN
THR
PHE
ARG GLU
LEU
ASP ILE
XAA ASX GLX
CYS SEC
PRO
LYS PYL
ALA VAL
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX
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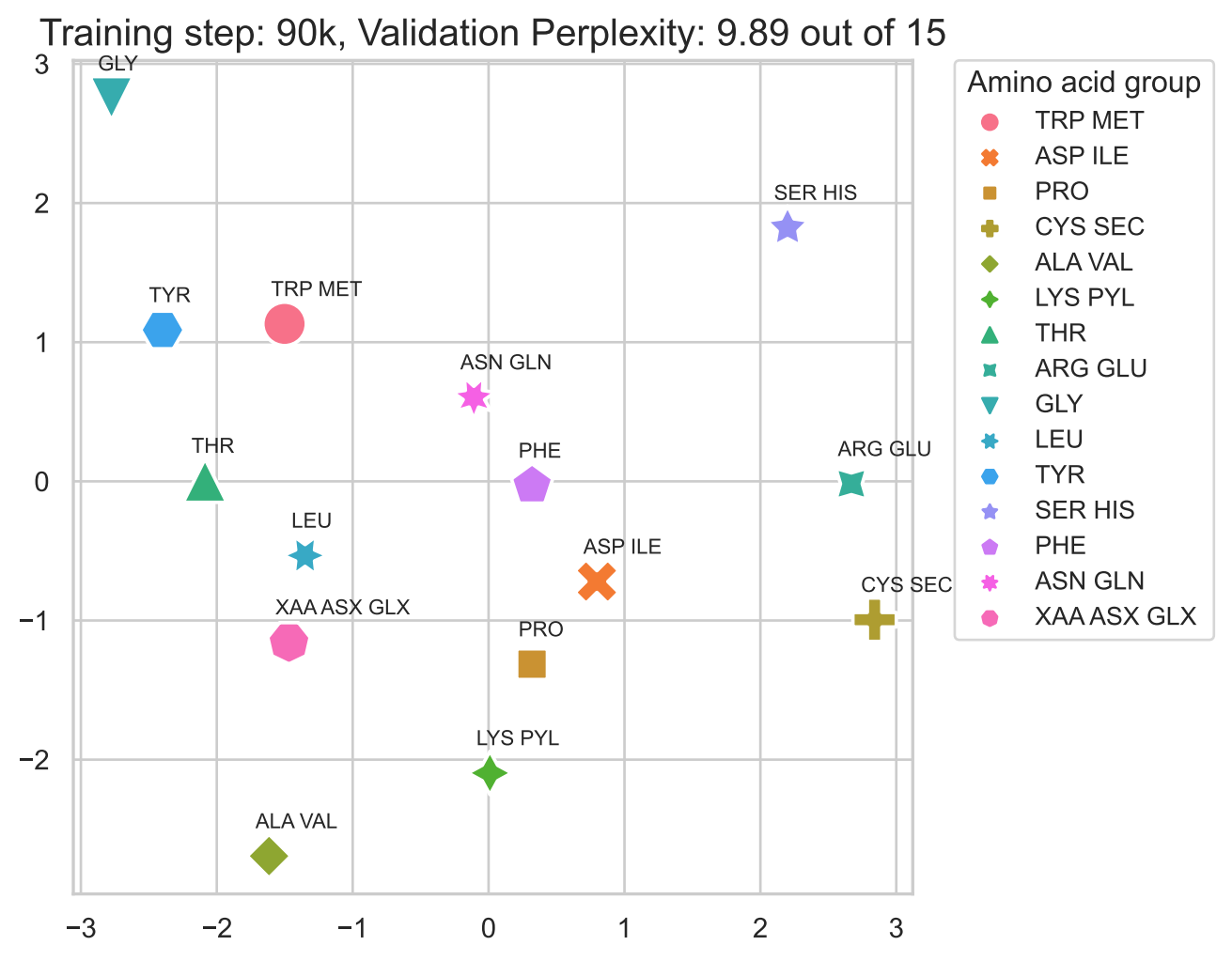
Training step: 90k, Validation Perplexity: 9.89 out of 15
GLY
SER HIS
TYR
TRP MET
ASN GLN
THR
PHE
ARG GLU
LEU
ASP ILE
CYS SEC
XAA ASX GLX
PRO
LYS PYL
ALA VAL
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3
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
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THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
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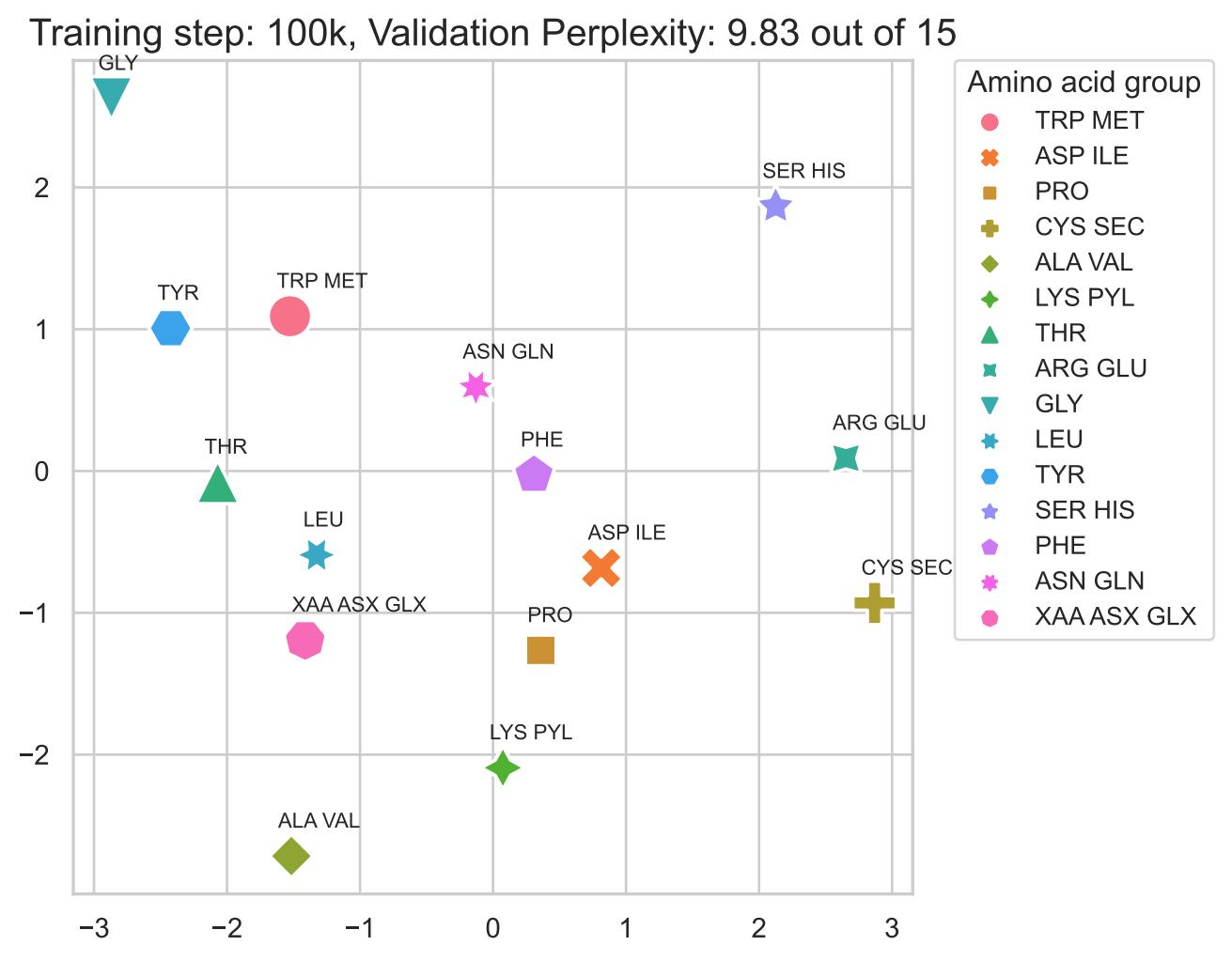
XAA ASX GLX


Training step: 100k, Validation Perplexity: 9.83 out of 15
GLY
SER HIS
TYR
TRP MET
ASN GLN
ARG GLU
THR
PHE
LEU
ASP ILE
CYS SEC
XAA ASX GLX
PRO
LYS PYL
ALA VAL
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
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TYR
SER HIS
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XAA ASX GLX
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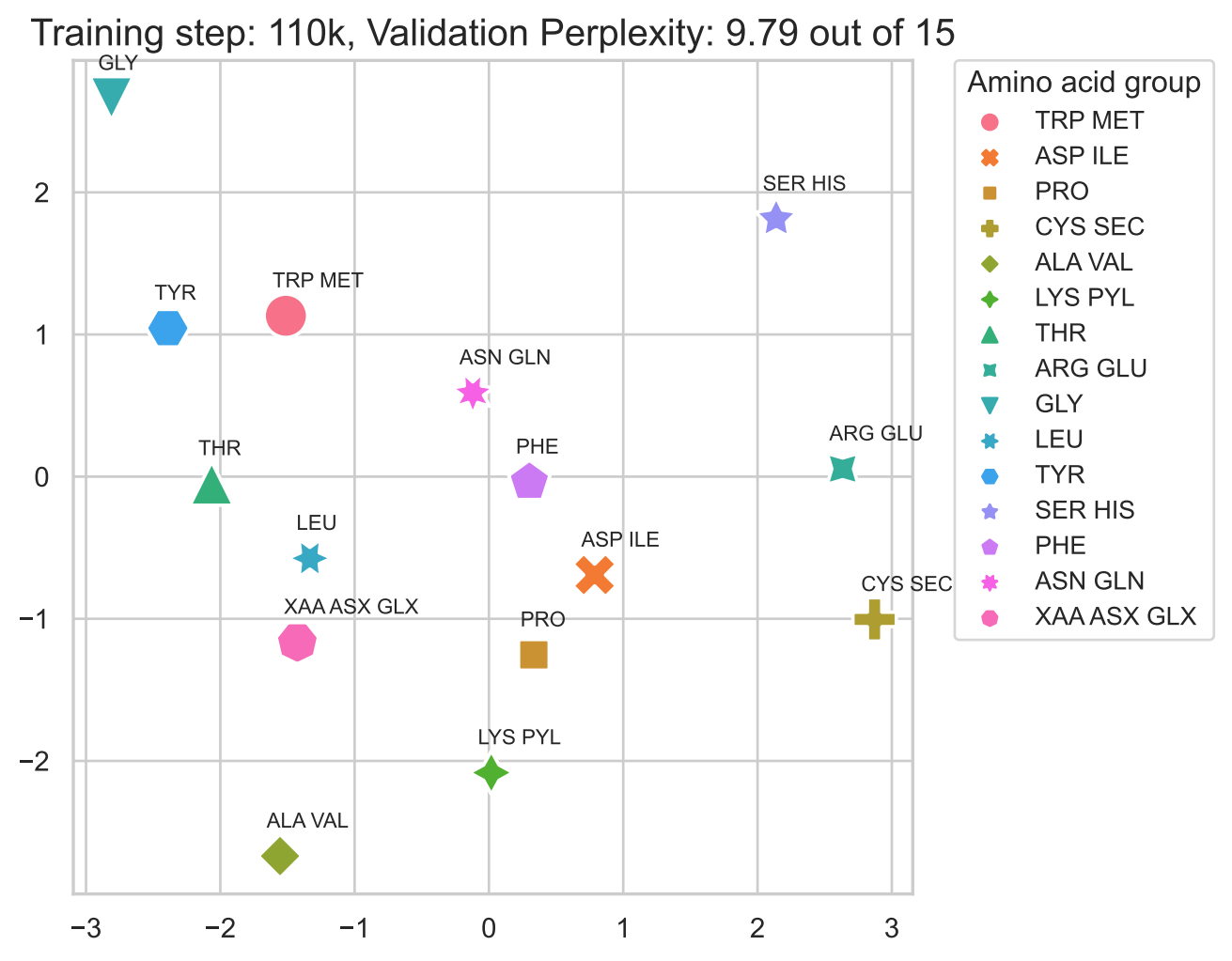
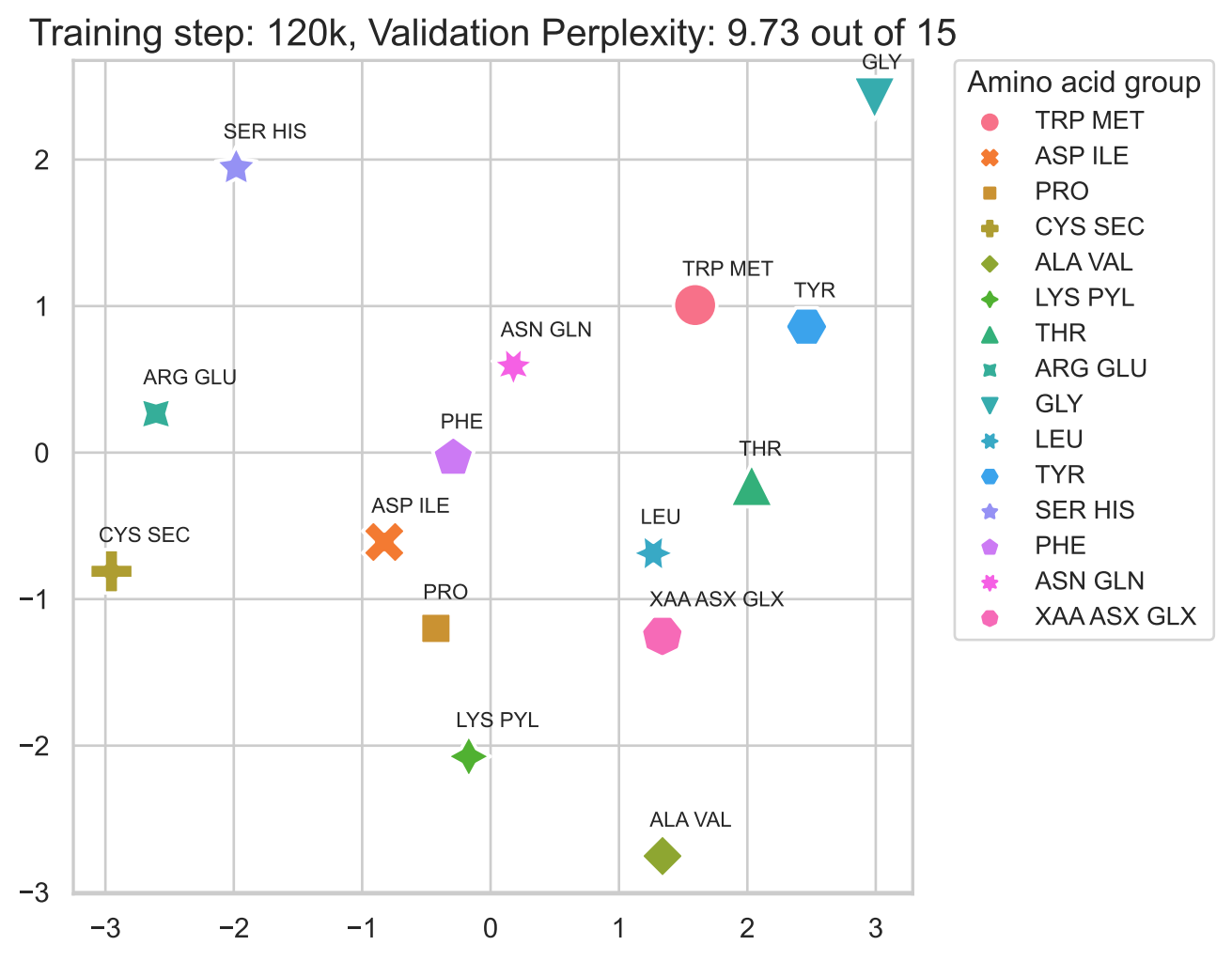

Training step: 110k, Validation Perplexity: 9.79 out of 15
GLY
SER HIS
TYR
TRP MET
ASN GLN
THR
PHE
ARG GLU
LEU
ASP ILE
CYS SEC
XAA ASX GLX
PRO
LYS PYL
ALA VAL
2
1
0
−1
−2
−3
−2
−1
0
1
2
3
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX


Training step: 120k, Validation Perplexity: 9.73 out of 15
GLY
SER HIS
TRP MET
TYR
ASN GLN
ARG GLU
PHE
THR
ASP ILE
LEU
CYS SEC
PRO
XAA ASX GLX
LYS PYL
ALA VAL
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX
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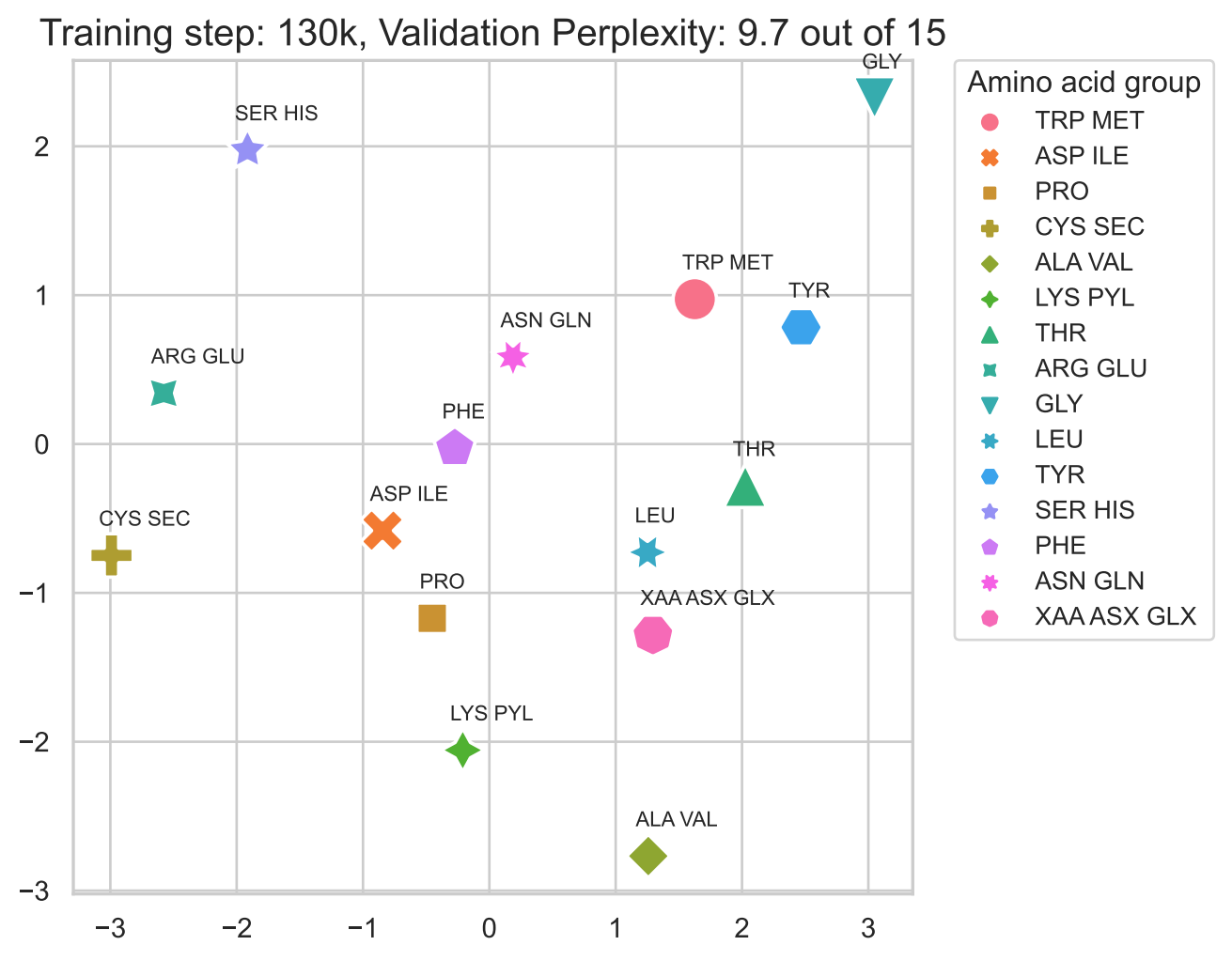
Training step: 130k, Validation Perplexity: 9.7 out of 15
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX
GLY
SER HIS
TRP MET
TYR
ASN GLN
ARG GLU
PHE
THR
ASP ILE
CYS SEC
LEU
PRO
XAA ASX GLX
LYS PYL
ALA VAL
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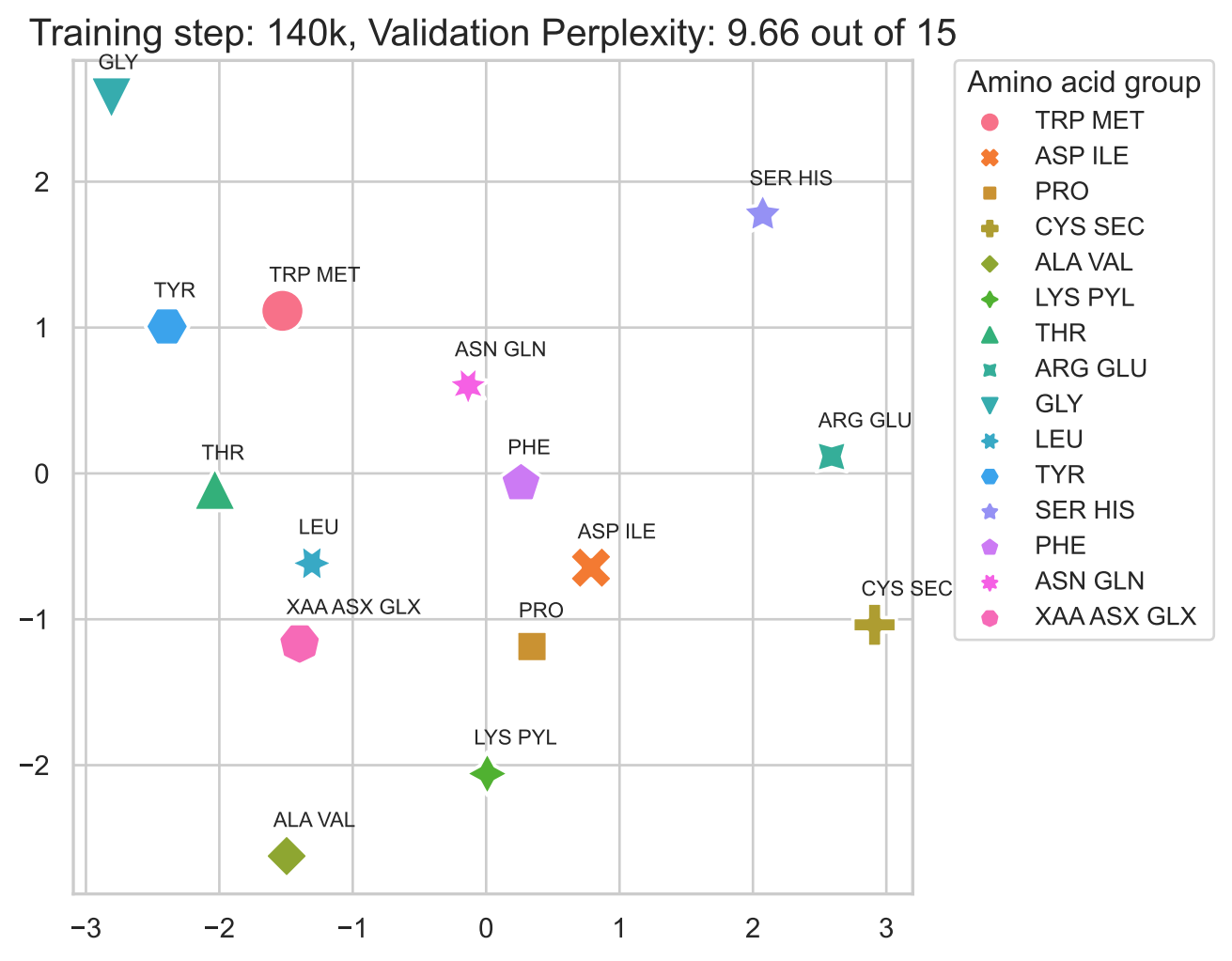
Training step: 140k, Validation Perplexity: 9.66 out of 15
GLY
SER HIS
TYR
TRP MET
ASN GLN
ARG GLU
THR
PHE
LEU
ASP ILE
CYS SEC
XAA ASX GLX
PRO
LYS PYL
ALA VAL
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX
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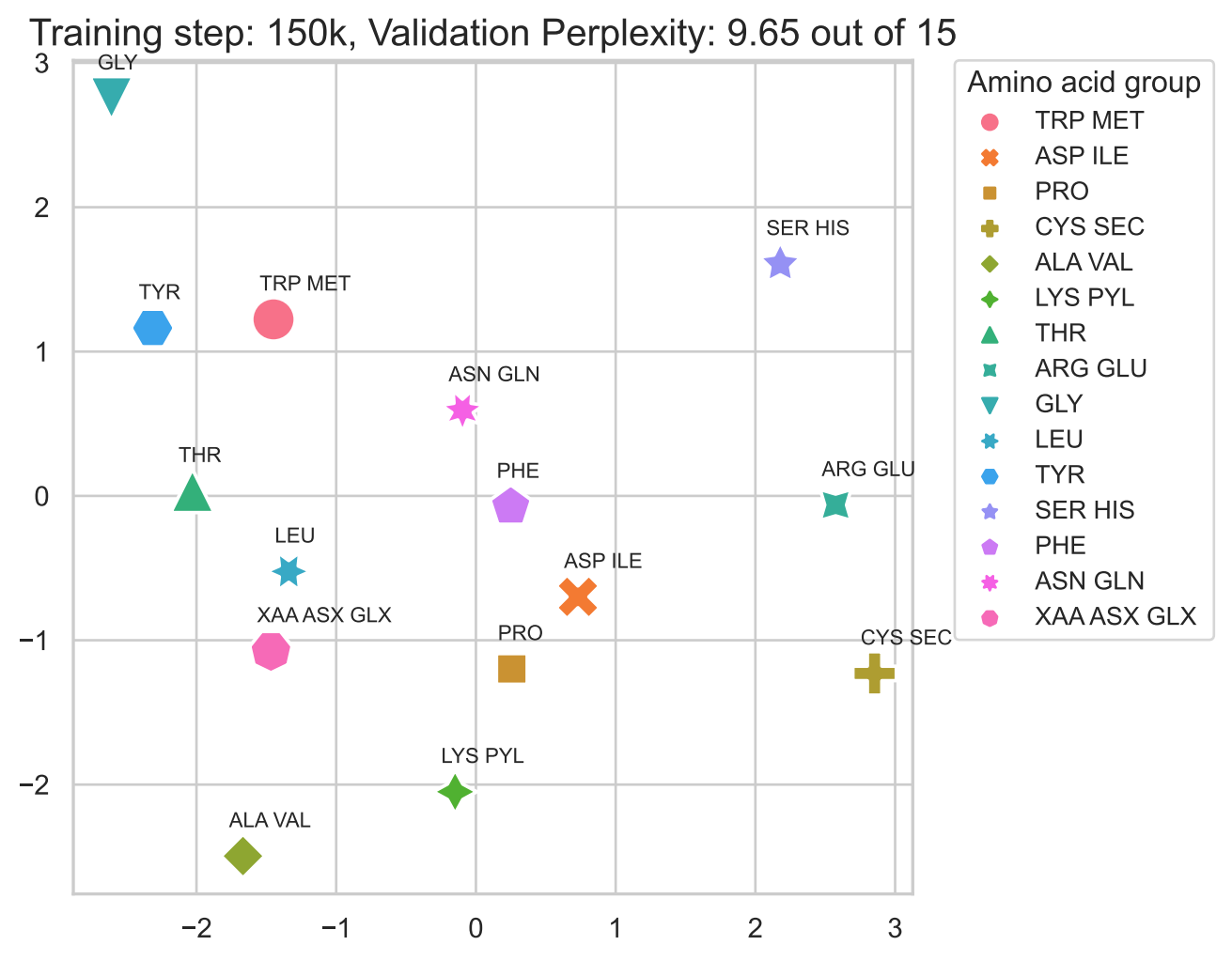
Training step: 150k, Validation Perplexity: 9.65 out of 15
GLY
SER HIS
TYR
TRP MET
ASN GLN
THR
PHE
ARG GLU
LEU
ASP ILE
XAA ASX GLX
PRO
CYS SEC
LYS PYL
ALA VAL
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX
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−2
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2
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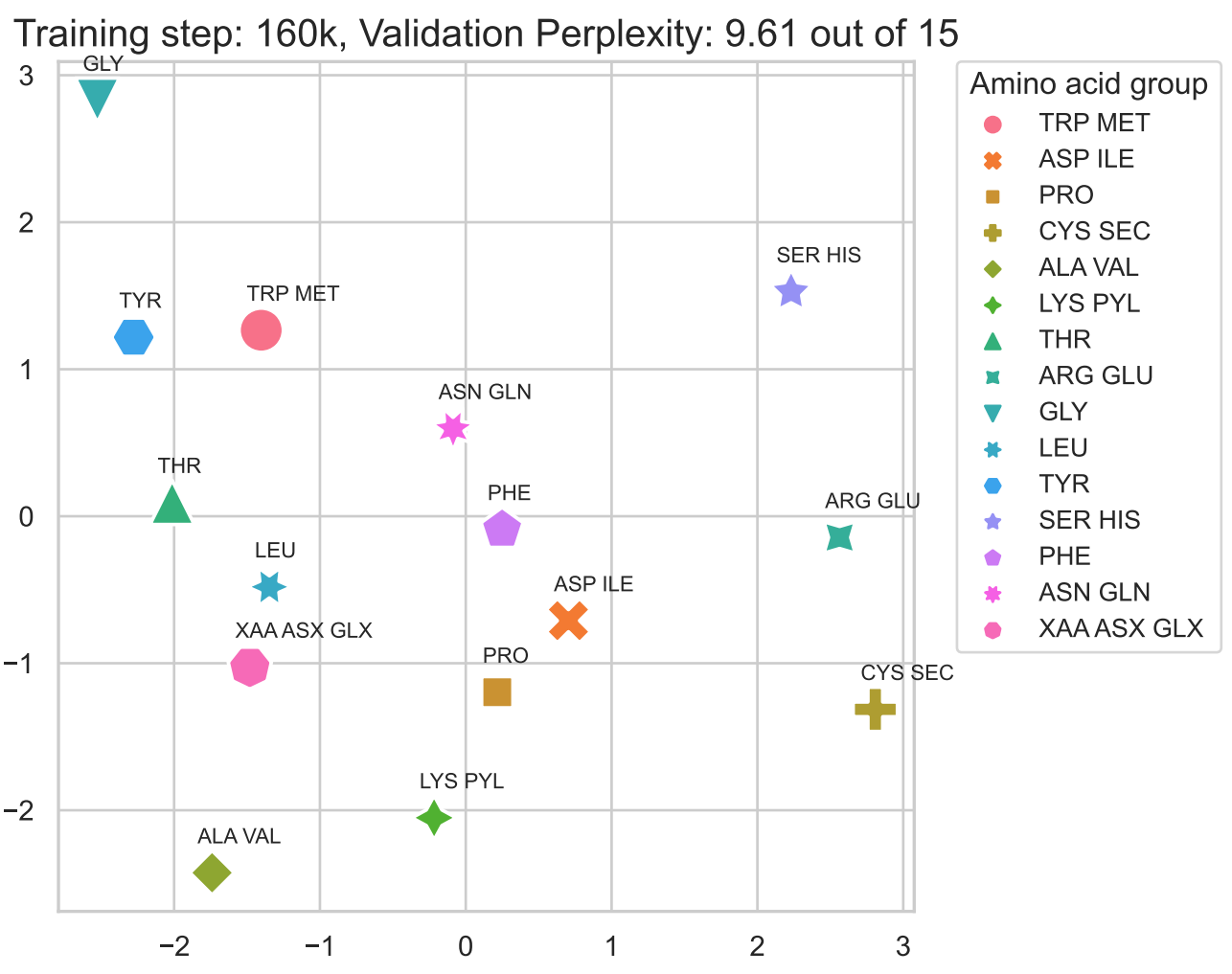
Training step: 160k, Validation Perplexity: 9.61 out of 15
GLY
SER HIS
TYR
TRP MET
ASN GLN
THR
PHE
ARG GLU
LEU
ASP ILE
XAA ASX GLX
PRO
CYS SEC
LYS PYL
ALA VAL
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX
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2
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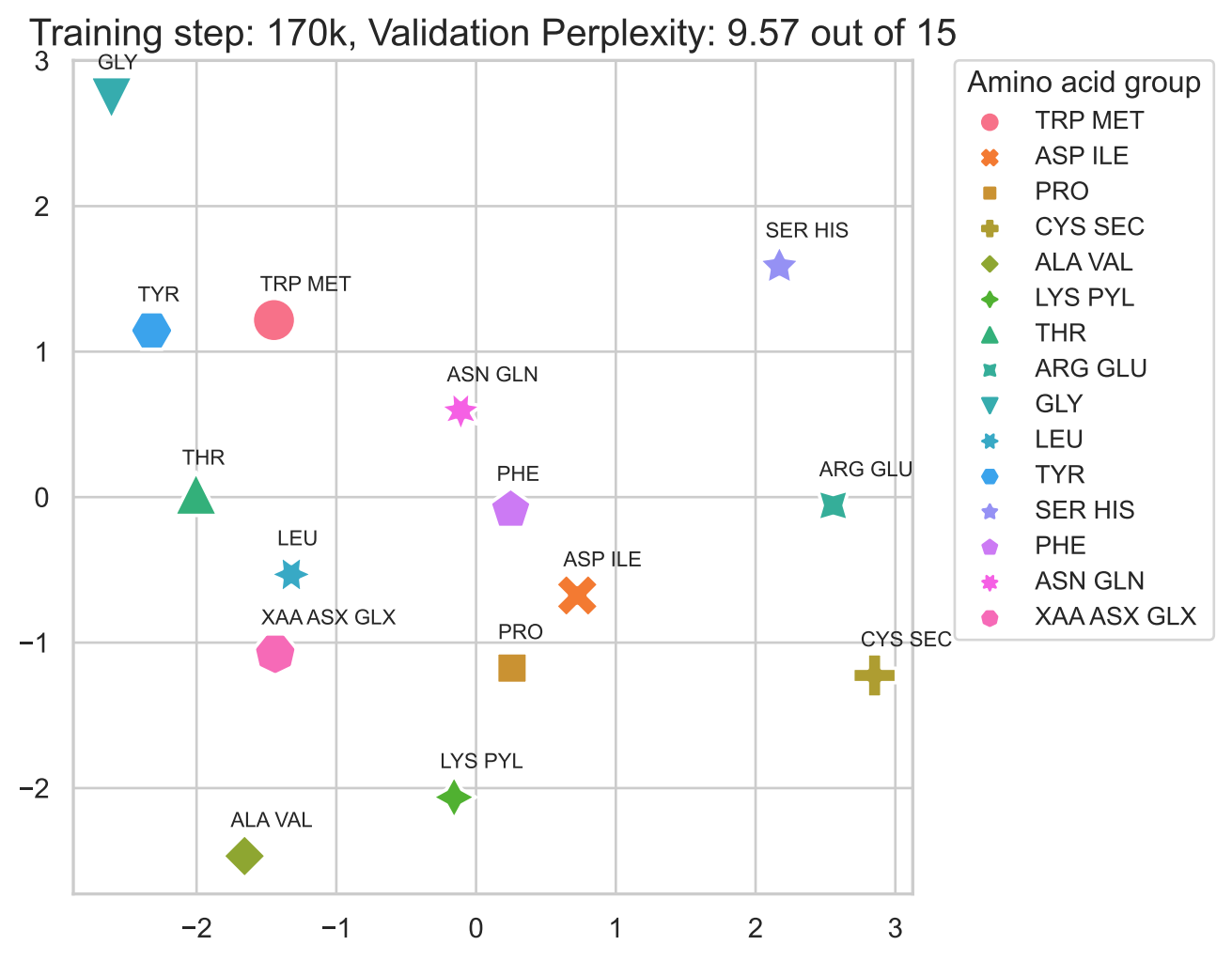
Training step: 170k, Validation Perplexity: 9.57 out of 15
GLY
SER HIS
TYR
TRP MET
ASN GLN
THR
PHE
ARG GLU
LEU
ASP ILE
XAA ASX GLX
PRO
CYS SEC
LYS PYL
ALA VAL
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX
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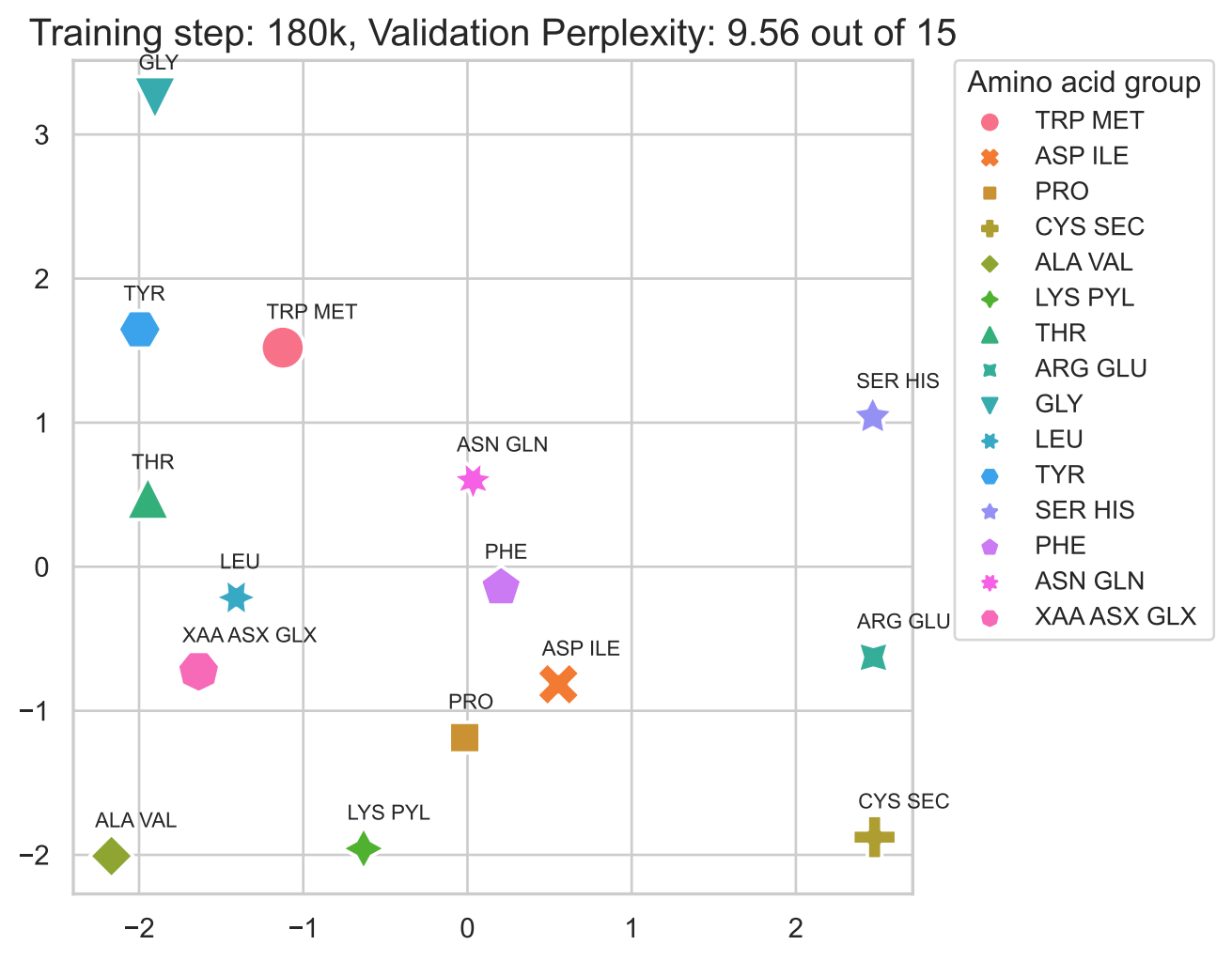
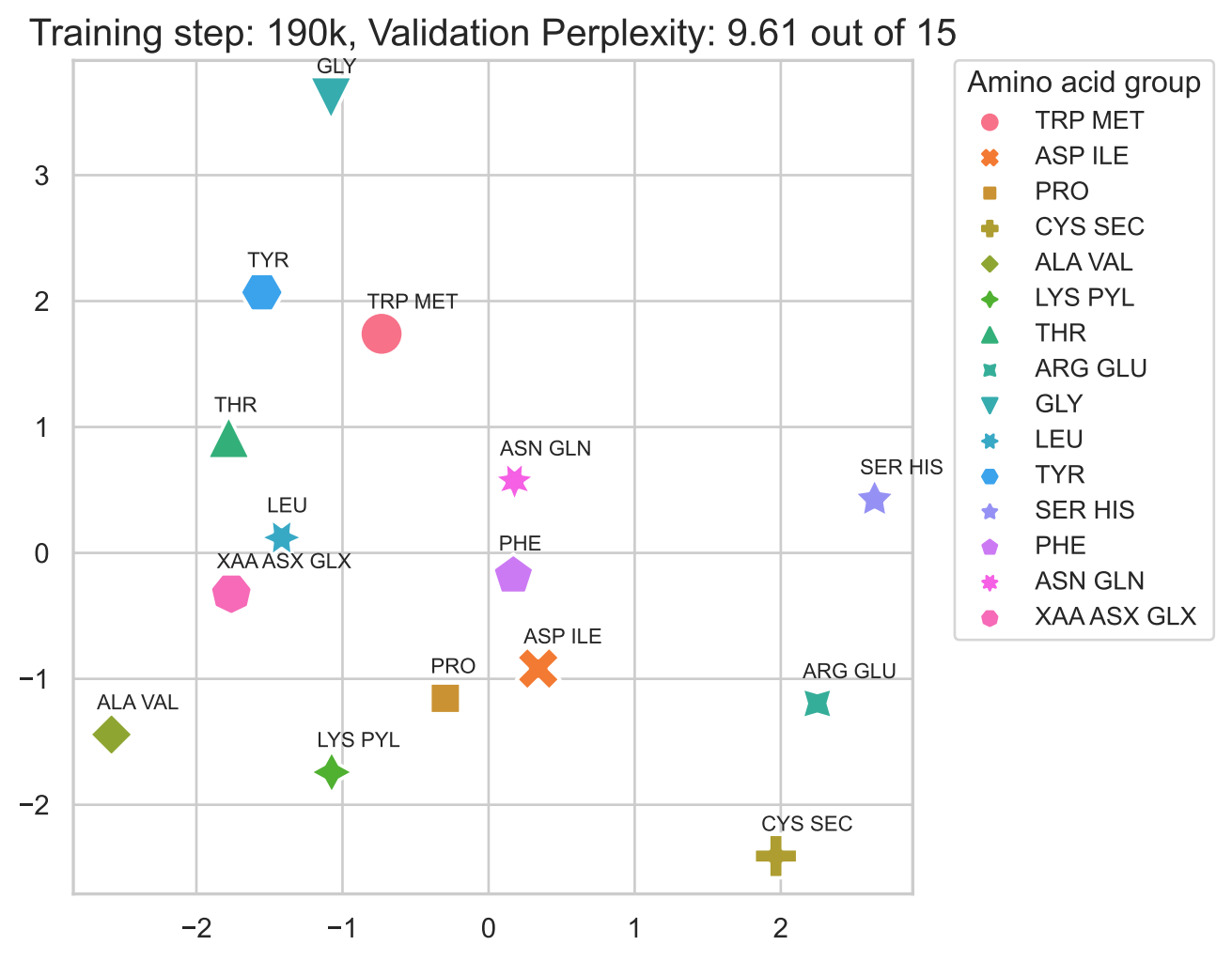

Training step: 180k, Validation Perplexity: 9.56 out of 15
GLY
TYR
TRP MET
SER HIS
ASN GLN
THR
PHE
LEU
ARG GLU
XAA ASX GLX
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
3
2
1
0
−1
−2
−2
−1
0
1
2
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX


Training step: 190k, Validation Perplexity: 9.61 out of 15
GLY
TYR
TRP MET
THR
ASN GLN
SER HIS
LEU
PHE
XAA ASX GLX
ASP ILE
PRO
ARG GLU
ALA VAL
LYS PYL
CYS SEC
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX
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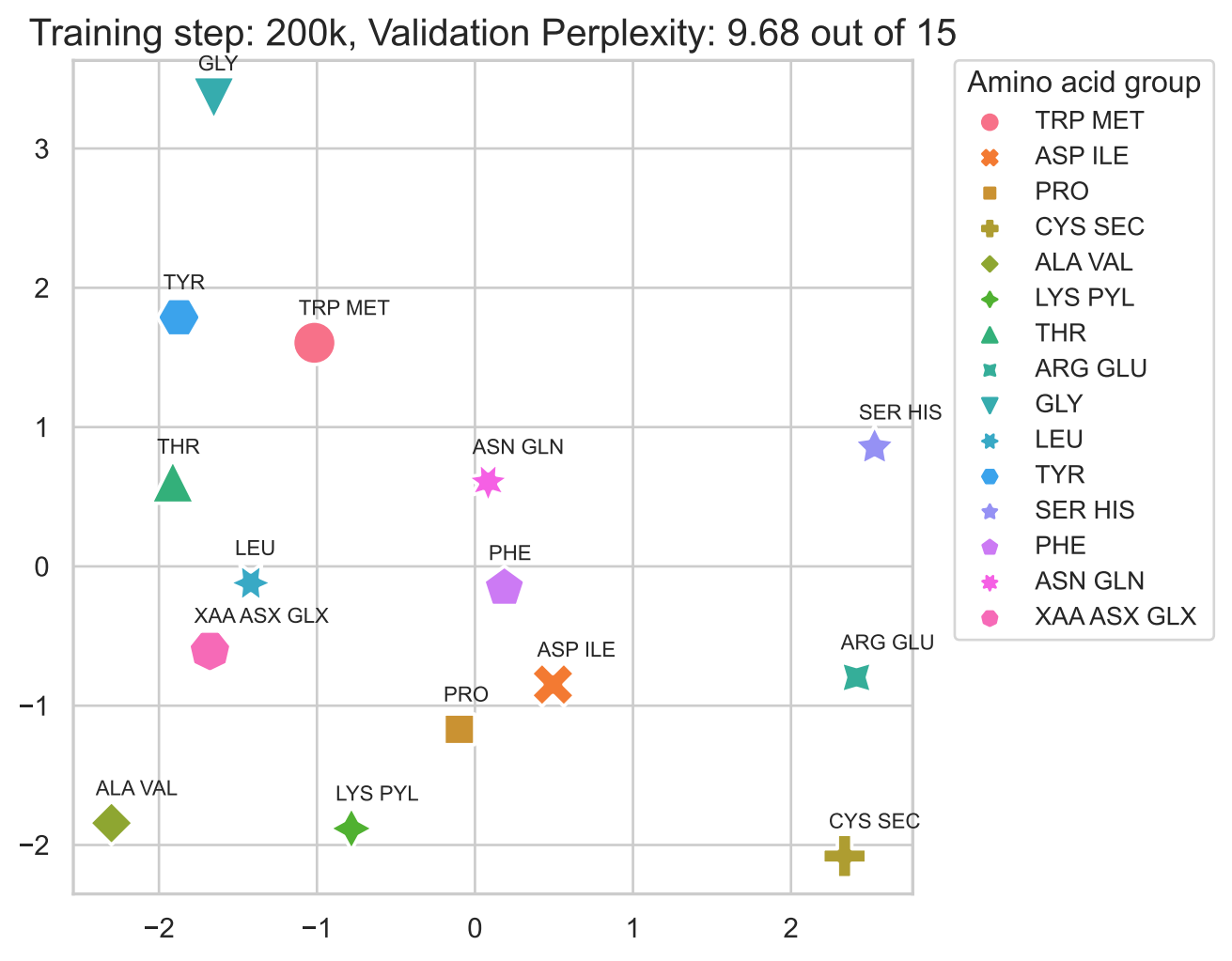
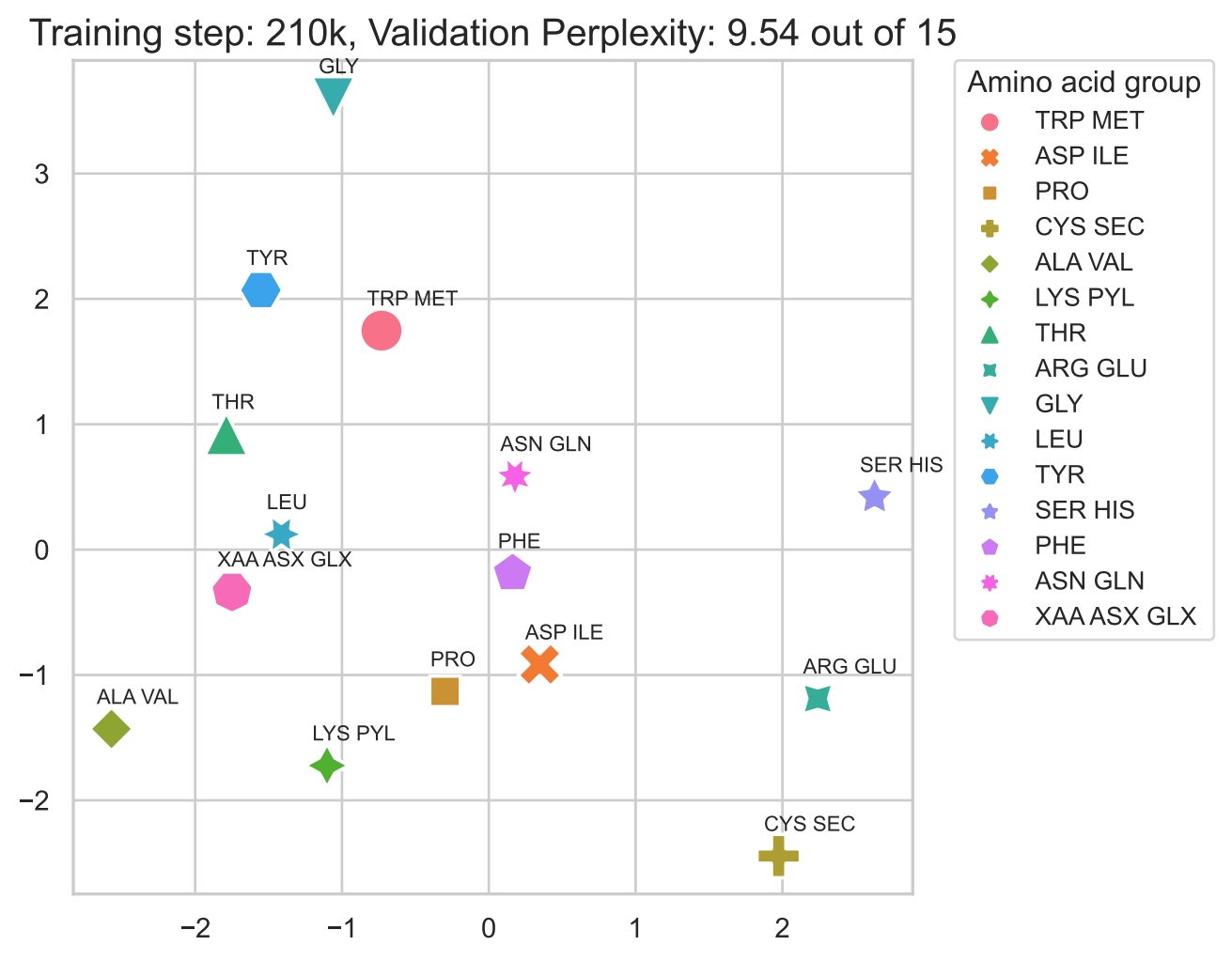
1
2


Training step: 200k, Validation Perplexity: 9.68 out of 15
GLY
TYR
TRP MET
SER HIS
THR
ASN GLN
LEU
PHE
XAA ASX GLX
ASP ILE
ARG GLU
PRO
ALA VAL
LYS PYL
CYS SEC
3
2
1
0
−1
−2
−2
−1
0
1
2
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX


Training step: 210k, Validation Perplexity: 9.54 out of 15
GLY
TYR
TRP MET
THR
ASN GLN
SER HIS
LEU
PHE
XAA ASX GLX
ASP ILE
PRO
ARG GLU
ALA VAL
LYS PYL
CYS SEC
3
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−1
−2
−2
−1
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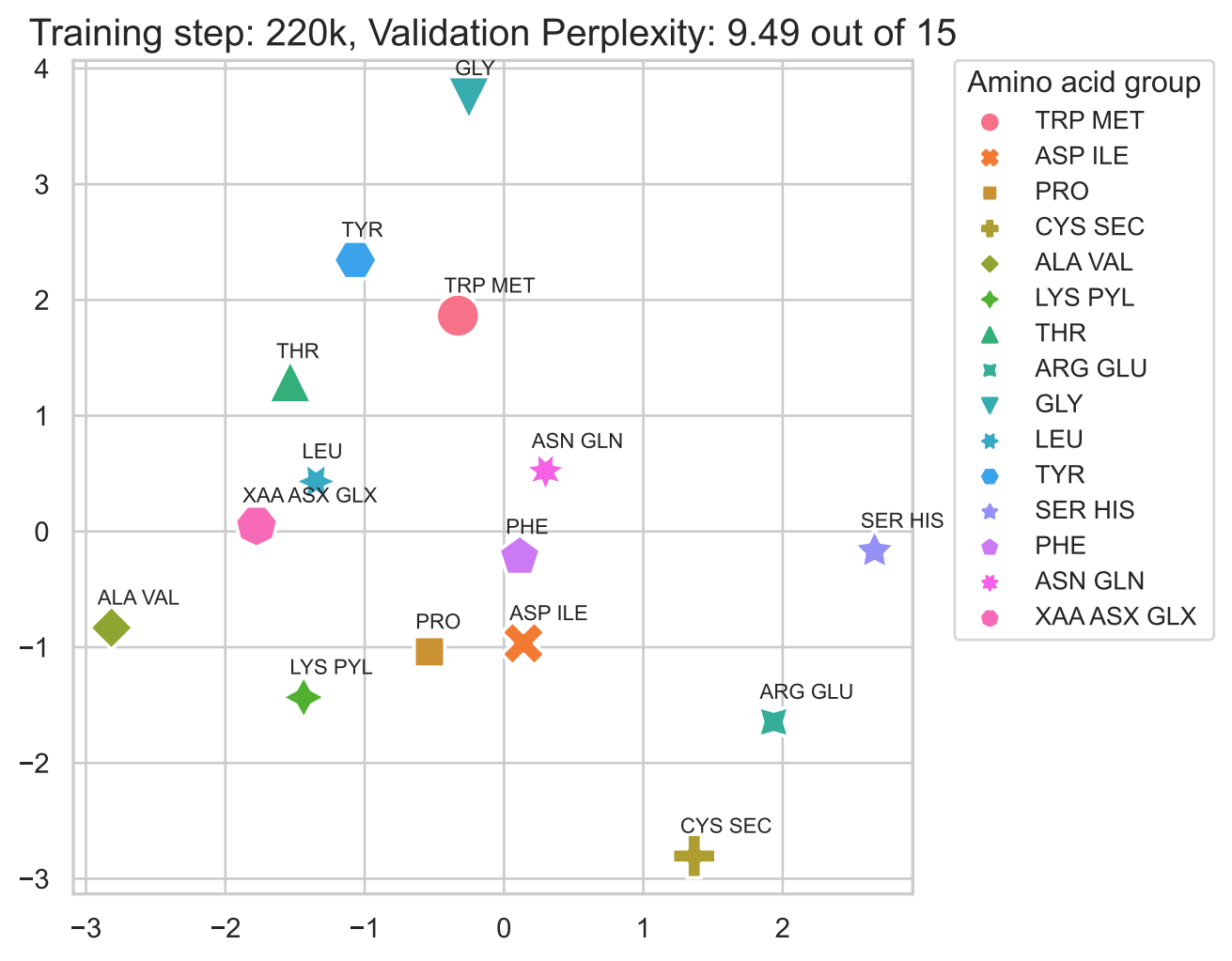
1
2
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX


Training step: 220k, Validation Perplexity: 9.49 out of 15
GLY
TYR
TRP MET
THR
LEU
ASN GLN
XAA ASX GLX
SER HIS
PHE
ALA VAL
PRO
ASP ILE
LYS PYL
ARG GLU
CYS SEC
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
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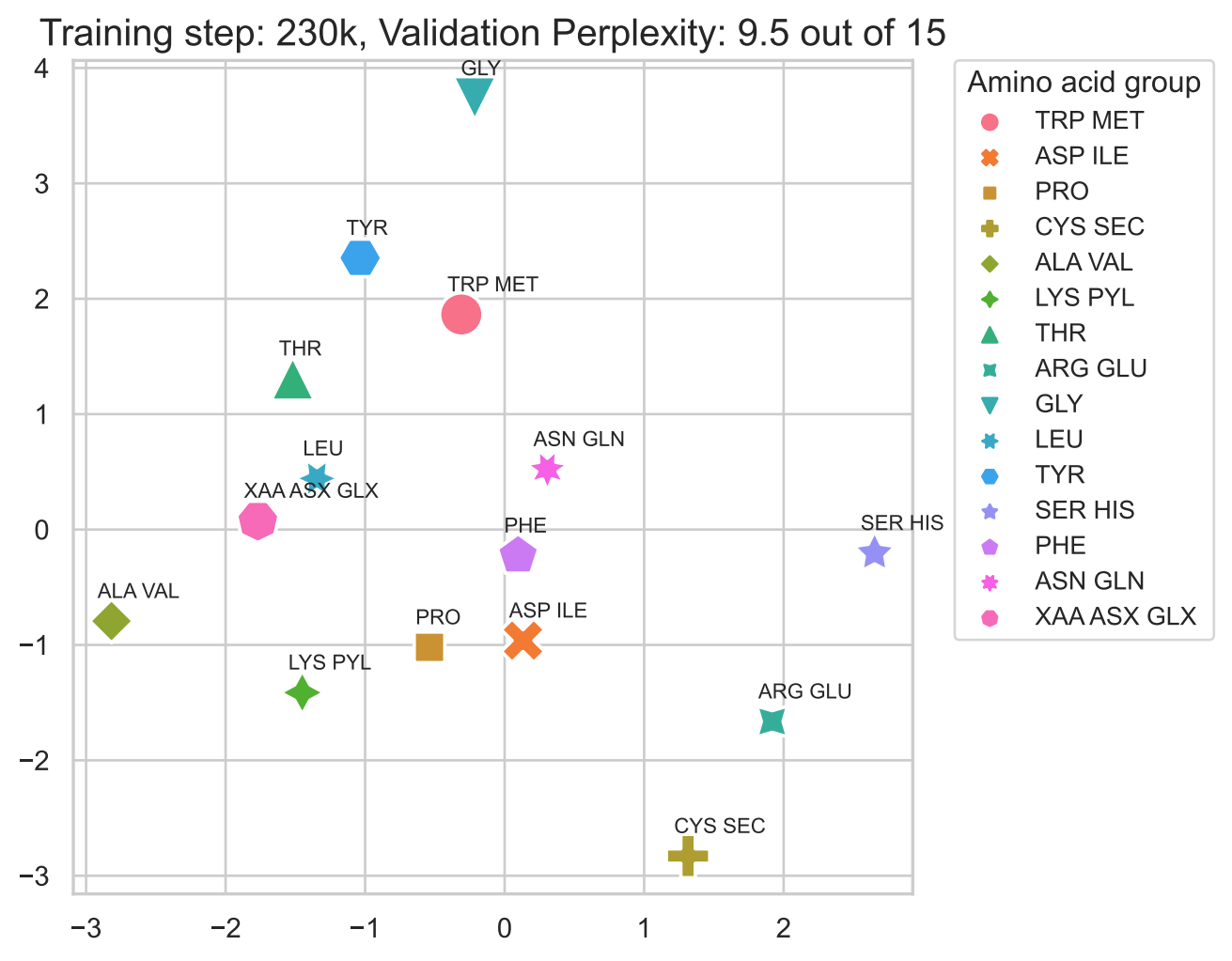
ASN GLN
XAA ASX GLX


Training step: 230k, Validation Perplexity: 9.5 out of 15
GLY
TYR
TRP MET
THR
LEU
ASN GLN
XAA ASX GLX
PHE
SER HIS
ALA VAL
PRO
ASP ILE
LYS PYL
ARG GLU
CYS SEC
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX
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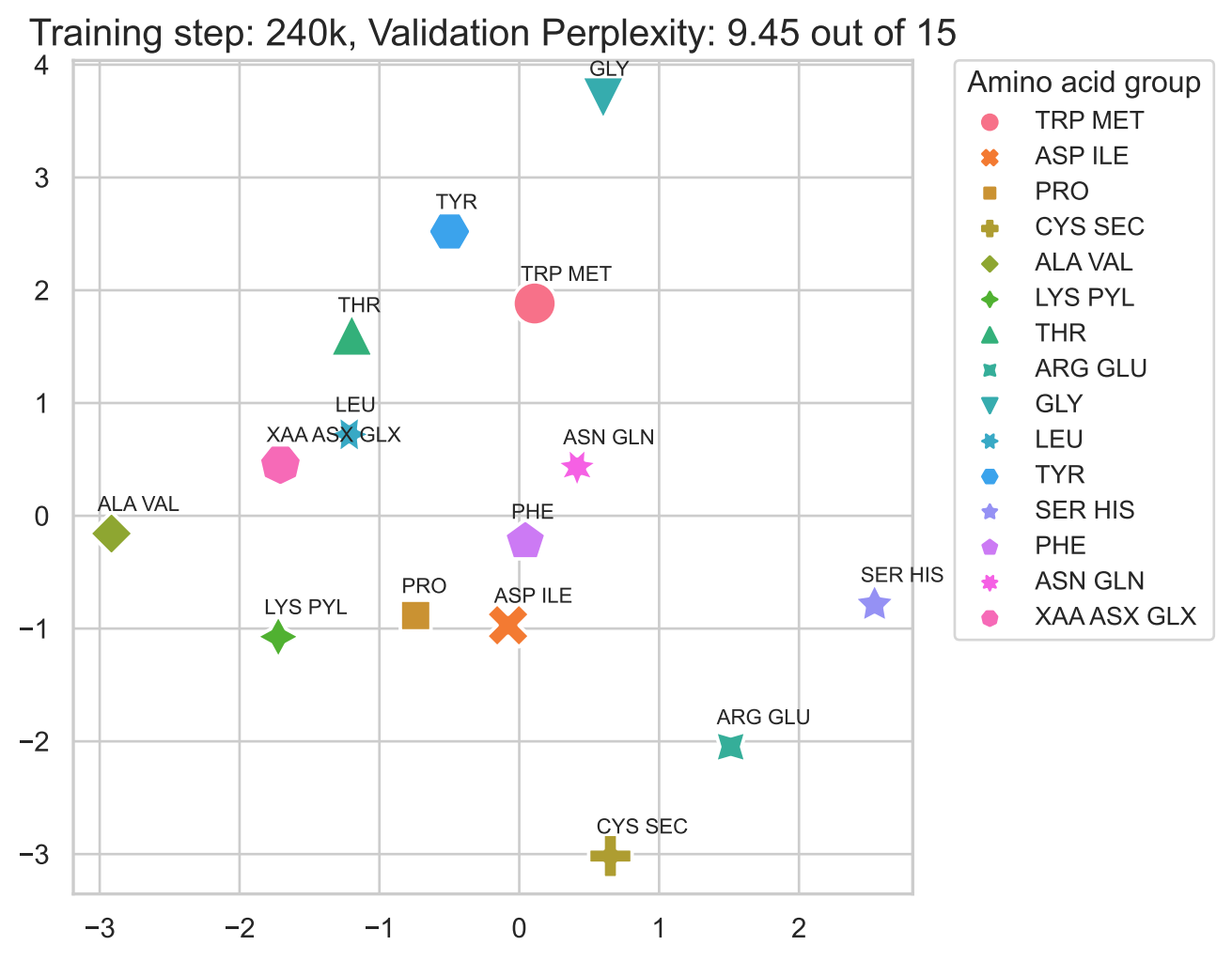
1
2


Training step: 240k, Validation Perplexity: 9.45 out of 15
Amino acid group
TRP MET
ASP ILE
PRO
CYS SEC
ALA VAL
LYS PYL
THR
ARG GLU
GLY
LEU
TYR
SER HIS
PHE
ASN GLN
XAA ASX GLX
GLY
TYR
TRP MET
THR
LEU
XAA ASX GLX
ASN GLN
ALA VAL
PHE
SER HIS
PRO
ASP ILE
LYS PYL
ARG GLU
CYS SEC
4
3
2
1
0
−1
−2
−3
−3
−2
−1
0
1
2