Machine Translation

Natural Language Processing

University of Maryland

Nucleus Sampling

Agenda

The Sentence We Want to Translate

Er sagte mir, 'lass uns blau machen', aber ich verstand nur Bahnhof

- IBM Model 1
- Phrase-based
- Nucleus Decoding

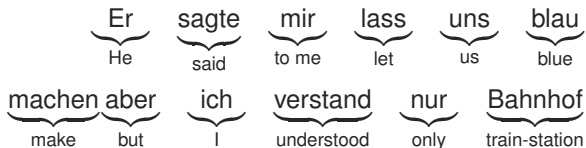# IBM Model 1 Word Translation Probabilities

German Word	Top Translation Candidates $p(e \mid g)$
NULL	—
Er	he (0.70), it (0.10), they (0.08), someone (0.06), that (0.06)
sagte	said (0.55), told (0.20), stated (0.10), mentioned (0.08), spoke (0.07)
mir	me (0.75), myself (0.08), with (0.07), to (0.05), personally (0.05)
lass	let (0.60), allow (0.18), leave (0.10), drop (0.07), permit (0.05)
uns	us (0.80), we (0.07), ourselves (0.06), together (0.04), one (0.03)
blau	blue (0.90), sad (0.08), sea (0.01), sky (0.01), shirk (0.00)
machen	make (0.70), do (0.25), create (0.04), fabricate (0.02), take (0.02)
aber	but (0.70), however (0.15), though (0.08), yet (0.04), nevertheless (0
ich	I (0.90), me (0.05), myself (0.03), one (0.02)
verstand	understood (0.65), got (0.15), grasped (0.10), knew (0.05), followed
nur	only (0.70), just (0.18), merely (0.07), simply (0.05)
Bahnhof	station (0.65), train (0.15), terminal (0.08), rail (0.07), platform (0.05

Phrase-Based Translation: Literal / Small Phrases

German: Er sagte mir, "lass uns blau machen", aber ich verstand nur Bahnhof.

English: He said to me, "let us blue-make," but I understood only train-station.

Word-level Phrase Alignments:

Er	sagte	mir	lass	uns	blau
He	said	to me	let	us	blue

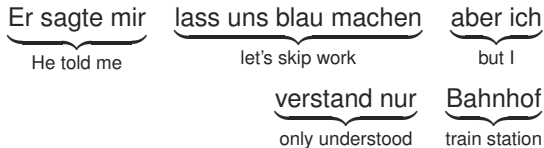| machen	aber	ich	verstand	nur	Bahnhof
make	but	I	understood	only	train-station

Phrase-Based Translation: Medium / Idiomatic Phrases

German: Er sagte mir, "lass uns blau machen", aber ich verstand nur Bahnhof.

English: He told me, "let's skip work," but I didn't understand a thing.

Phrase Alignments:

$$\underbrace{\text{Er sagte mir}}_{\text{He told me}} \quad \underbrace{\text{lass uns blau machen}}_{\text{let's skip work}} \quad \underbrace{\text{aber ich}}_{\text{but I}}$$

$$\underbrace{\text{verstand nur}}_{\text{only understood}} \quad \underbrace{\text{Bahnhof}}_{\text{train station}}$$

Phrase-Based Translation: Longer / Fluent Phrases

German: Er sagte mir, "lass uns blau machen", aber ich verstand nur Bahnhof.

English: He suggested that we skip work, but it all went over my head.

Phrase Alignments:

Er sagte mir
He suggested that

lass uns blau machen
we skip work

aber ich verstand nur Bahnhof
but it went over my head

Step 1 (p=0.20)

Prefix:

Token	Prob.	Cum. Prob.
He	0.21	
She	0.21	
It	0.20	
Someone	0.19	
They	0.16	
Somebody	0.03	

Step 1 (p=0.20)

Prefix:

Token	Prob.	Cum. Prob.
He	0.21	0.21
She	0.21	0.42
It	0.20	0.62
Someone	0.19	0.80
They	0.16	0.97
Somebody	0.03	1.00

Step 1 (p=0.20)

Prefix:

Token	Prob.	Cum. Prob.
He	0.21	0.21
She	0.21	0.42
It	0.20	0.62
Someone	0.19	0.80
They	0.16	0.97
Somebody	0.03	1.00

{He}

Step 1 (p=0.20)

Prefix:

Token	Prob.	Cum. Prob.
He	0.21	0.21
She	0.21	0.42
It	0.20	0.62
Someone	0.19	0.80
They	0.16	0.97
Somebody	0.03	1.00

{He}

Prefix: `He`

Token	Prob.	Cum. Prob.
said	0.25	
told	0.25	
asked	0.24	
mentioned	0.24	
spoke	0.13	
explained	-0.11	

Step 2 (p=0.20)

Prefix: `He`

Token	Prob.	Cum. Prob.
said	0.25	0.25
told	0.25	0.50
asked	0.24	0.74
mentioned	0.24	0.99
spoke	0.13	1.11
explained	-0.11	1.00

Step 2 (p=0.20)

Prefix: `He`

Token	Prob.	Cum. Prob.
said	0.25	0.25
told	0.25	0.50
asked	0.24	0.74
mentioned	0.24	0.99
spoke	0.13	1.11
explained	-0.11	1.00

{said}

Step 2 (p=0.20)

Prefix: `He`

Token	Prob.	Cum. Prob.
said	0.25	0.25
told	0.25	0.50
asked	0.24	0.74
mentioned	0.24	0.99
spoke	0.13	1.11
explained	-0.11	1.00

{said}

Step 3 (p=0.20)

Prefix: He said

Token	Prob.	Cum. Prob.
me	0.30	
him	0.28	
them	0.27	
nobody	0.12	
her	0.03	

Step 3 (p=0.20)

Prefix: `He said`

Token	Prob.	Cum. Prob.
me	0.30	0.30
him	0.28	0.58
them	0.27	0.84
nobody	0.12	0.97
her	0.03	1.00

Step 3 (p=0.20)

Prefix: `He said`

Token	Prob.	Cum. Prob.
me	0.30	0.30
him	0.28	0.58
them	0.27	0.84
nobody	0.12	0.97
her	0.03	1.00

{me}

Step 3 (p=0.20)

Prefix: `He said`

Token	Prob.	Cum. Prob.
me	0.30	0.30
him	0.28	0.58
them	0.27	0.84
nobody	0.12	0.97
her	0.03	1.00

{me}

Step 4 (p=0.20)

Prefix: `He said me`

Token	Prob.	Cum. Prob.
let's	0.19	
let	0.17	
how	0.15	
why	0.14	
maybe	0.13	
'should	0.12	
'we	0.10	

Step 4 (p=0.20)

Prefix: `He said me`

Token	Prob.	Cum. Prob.
let's	0.19	0.19
let	0.17	0.35
how	0.15	0.50
why	0.14	0.64
maybe	0.13	0.77
'should	0.12	0.90
'we	0.10	1.00

Step 4 (p=0.20)

Prefix: `He said me`

Token	Prob.	Cum. Prob.
let's	0.19	0.19
let	0.17	0.35
how	0.15	0.50
why	0.14	0.64
maybe	0.13	0.77
'should	0.12	0.90
'we	0.10	1.00

{let, let's}

Step 4 (p=0.20)

Prefix: He said me

Token	Prob.	Cum. Prob.
let's	0.19	0.19
let	0.17	0.35
how	0.15	0.50
why	0.14	0.64
maybe	0.13	0.77
'should	0.12	0.90
'we	0.10	1.00

{let, let's}

Prefix: He said me let

Token	Prob.	Cum. Prob.
us	0.73	
you	0.13	
everyone	0.07	
them	0.04	
nobody	0.03	

Prefix: He said me let

Token	Prob.	Cum. Prob.
us	0.73	0.73
you	0.13	0.86
everyone	0.07	0.94
them	0.04	0.97
nobody	0.03	1.00

Step 5 (p=0.20)

Prefix: `He said me let`

Token	Prob.	Cum. Prob.
us	0.73	0.73
you	0.13	0.86
everyone	0.07	0.94
them	0.04	0.97
nobody	0.03	1.00

{us}

Step 5 (p=0.20)

Prefix: `He said me let`

Token	Prob.	Cum. Prob.
us	0.73	0.73
you	0.13	0.86
everyone	0.07	0.94
them	0.04	0.97
nobody	0.03	1.00

{us}

Prefix: He said me let us

Token	Prob.	Cum. Prob.
cut	0.20	
skip	0.20	
escape	0.20	
avoid	0.18	
miss	0.16	
ditch	0.05	

Prefix:　He said me let us

Token	Prob.	Cum. Prob.
cut	0.20	0.20
skip	0.20	0.41
escape	0.20	0.60
avoid	0.18	0.78
miss	0.16	0.95
ditch	0.05	1.00

Step 6 (p=0.20)

Prefix: He said me let us

Token	Prob.	Cum. Prob.
cut	0.20	0.20
skip	0.20	0.41
escape	0.20	0.60
avoid	0.18	0.78
miss	0.16	0.95
ditch	0.05	1.00

{skip, cut}

Step 6 (p=0.20)

Prefix: He said me let us

Token	Prob.	Cum. Prob.
cut	0.20	0.20
skip	0.20	0.41
escape	0.20	0.60
avoid	0.18	0.78
miss	0.16	0.95
ditch	0.05	1.00

{skip, cut}

Step 7 (p=0.20)

Prefix: He said me let us cut

Token	Prob.	Cum. Prob.
work	0.91	
today	0.03	
class	0.02	
it	0.02	
school	0.01	

Prefix: He said me let us cut

Token	Prob.	Cum. Prob.
work	0.91	0.91
today	0.03	0.95
class	0.02	0.97
it	0.02	0.99
school	0.01	1.00

Step 7 (p=0.20)

Prefix: He said me let us cut

Token	Prob.	Cum. Prob.
work	0.91	0.91
today	0.03	0.95
class	0.02	0.97
it	0.02	0.99
school	0.01	1.00

{work}

Step 7 (p=0.20)

Prefix: He said me let us cut

Token	Prob.	Cum. Prob.
work	0.91	0.91
today	0.03	0.95
class	0.02	0.97
it	0.02	0.99
school	0.01	1.00

{work}

Prefix: He said me let us cut work

Token	Prob.	Cum. Prob.
but	0.23	
and	0.23	
though	0.21	
because	0.18	
so	0.16	

Prefix: He said me let us cut work

Token	Prob.	Cum. Prob.
but	0.23	0.23
and	0.23	0.45
though	0.21	0.66
because	0.18	0.84
so	0.16	1.00

Prefix: `He said me let us cut work`

Token	Prob.	Cum. Prob.
but	0.23	0.23
and	0.23	0.45
though	0.21	0.66
because	0.18	0.84
so	0.16	1.00

{but}

Step 8 (p=0.20)

Prefix: He said me let us cut work

Token	Prob.	Cum. Prob.
but	0.23	0.23
and	0.23	0.45
though	0.21	0.66
because	0.18	0.84
so	0.16	1.00

{but}

Prefix: He said me let us cut work but

Token	Prob.	Cum. Prob.
I	0.84	
they	0.10	
nobody	0.04	
we	0.01	
someone	0.00	

Prefix: He said me let us cut work but

Token	Prob.	Cum. Prob.
I	0.84	0.84
they	0.10	0.94
nobody	0.04	0.99
we	0.01	1.00
someone	0.00	1.00

Prefix: He said me let us cut work but

Token	Prob.	Cum. Prob.
I	0.84	0.84
they	0.10	0.94
nobody	0.04	0.99
we	0.01	1.00
someone	0.00	1.00

{I}

Prefix: He said me let us cut work but

Token	Prob.	Cum. Prob.
I	0.84	0.84
they	0.10	0.94
nobody	0.04	0.99
we	0.01	1.00
someone	0.00	1.00

{I}

Prefix: He said me let us cut work but I

Token	Prob.	Cum. Prob.
didn't	0.20	
only	0.20	
barely	0.19	
never	0.18	
just	0.18	
hardly	0.05	

Step 10 (p=0.20)

Prefix: He said me let us cut work but I

Token	Prob.	Cum. Prob.
didn't	0.20	0.20
only	0.20	0.41
barely	0.19	0.59
never	0.18	0.77
just	0.18	0.95
hardly	0.05	1.00

Step 10 (p=0.20)

Prefix: He said me let us cut work but I

Token	Prob.	Cum. Prob.
didn't	0.20	0.20
only	0.20	0.41
barely	0.19	0.59
never	0.18	0.77
just	0.18	0.95
hardly	0.05	1.00

{only, didn't}

Prefix: He said me let us cut work but I

Token	Prob.	Cum. Prob.
didn't	0.20	0.20
only	0.20	0.41
barely	0.19	0.59
never	0.18	0.77
just	0.18	0.95
hardly	0.05	1.00

{only, didn't}

Prefix: `He said me let us cut work but I didn't`

Token	Prob.	Cum. Prob.
got	0.20	
understand	0.20	
heard	0.18	
followed	0.17	
caught	0.13	
knew	0.12	

Prefix: `He said me let us cut work but I didn't`

Token	Prob.	Cum. Prob.
got	0.20	0.20
understand	0.20	0.41
heard	0.18	0.58
followed	0.17	0.75
caught	0.13	0.88
knew	0.12	1.00

Prefix: He said me let us cut work but I
didn't

Token	Prob.	Cum. Prob.
got	0.20	0.20
understand	0.20	0.41
heard	0.18	0.58
followed	0.17	0.75
caught	0.13	0.88
knew	0.12	1.00

{understand, got}

Prefix: He said me let us cut work but I didn't

Token	Prob.	Cum. Prob.
got	0.20	0.20
understand	0.20	0.41
heard	0.18	0.58
followed	0.17	0.75
caught	0.13	0.88
knew	0.12	1.00

{understand, got}

Step 12 (p=0.20)

Prefix: `He said me let us cut work but I didn't got`

Token	Prob.	Cum. Prob.
nothing	0.69	
anything	0.16	
something	0.11	
zilch	0.03	
zero	0.00	

Prefix: `He said me let us cut work but I didn't got`

Token	Prob.	Cum. Prob.
nothing	0.69	0.69
anything	0.16	0.86
something	0.11	0.97
zilch	0.03	1.00
zero	0.00	1.00

Prefix: He said me let us cut work but I
didn't got

Token	Prob.	Cum. Prob.
nothing	0.69	0.69
anything	0.16	0.86
something	0.11	0.97
zilch	0.03	1.00
zero	0.00	1.00

{nothing}

Prefix: He said me let us cut work but I didn't got

Token	Prob.	Cum. Prob.
nothing	0.69	0.69
anything	0.16	0.86
something	0.11	0.97
zilch	0.03	1.00
zero	0.00	1.00

{nothing}

Step 1 (p=0.50)

Prefix:

Token	Prob.	Cum. Prob.
Somebody	0.29	
It	0.21	
He	0.17	
This	0.15	
The	0.13	
They	0.05	

Step 1 (p=0.50)

Prefix:

Token	Prob.	Cum. Prob.
Somebody	0.29	0.29
It	0.21	0.50
He	0.17	0.67
This	0.15	0.82
The	0.13	0.95
They	0.05	1.00

Step 1 (p=0.50)

Prefix:

Token	Prob.	Cum. Prob.
Somebody	0.29	0.29
It	0.21	0.50
He	0.17	0.67
This	0.15	0.82
The	0.13	0.95
They	0.05	1.00

{He, It, Somebody}

Step 1 (p=0.50)

Prefix:

Token	Prob.	Cum. Prob.
Somebody	0.29	0.29
It	0.21	0.50
He	0.17	0.67
This	0.15	0.82
The	0.13	0.95
They	0.05	1.00

{He, It, Somebody}

Step 2 (p=0.50)

Prefix: `He`

Token	Prob.	Cum. Prob.
asked	0.33	
said	0.18	
proposed	0.17	
told	0.14	
remarked	0.10	
suggested	0.08	

Step 2 (p=0.50)

Prefix: `He`

Token	Prob.	Cum. Prob.
asked	0.33	0.33
said	0.18	0.50
proposed	0.17	0.67
told	0.14	0.82
remarked	0.10	0.92
suggested	0.08	1.00

Step 2 (p=0.50)

Prefix: `He`

Token	Prob.	Cum. Prob.
asked	0.33	0.33
said	0.18	0.50
proposed	0.17	0.67
told	0.14	0.82
remarked	0.10	0.92
suggested	0.08	1.00

{asked, said, proposed}

Step 2 (p=0.50)

Prefix: `He`

Token	Prob.	Cum. Prob.
asked	0.33	0.33
said	0.18	0.50
proposed	0.17	0.67
told	0.14	0.82
remarked	0.10	0.92
suggested	0.08	1.00

{asked, said, proposed}

Step 3 (p=0.50)

Prefix: `He asked`

Token	Prob.	Cum. Prob.
me	0.33	
how	0.16	
to	0.14	
about	0.12	
if	0.11	
that	0.08	
something	0.06	

Step 3 (p=0.50)

Prefix: `He asked`

Token	Prob.	Cum. Prob.
me	0.33	0.33
how	0.16	0.49
to	0.14	0.63
about	0.12	0.74
if	0.11	0.85
that	0.08	0.94
something	0.06	1.00

Step 3 (p=0.50)

Prefix: `He asked`

Token	Prob.	Cum. Prob.
me	0.33	0.33
how	0.16	0.49
to	0.14	0.63
about	0.12	0.74
if	0.11	0.85
that	0.08	0.94
something	0.06	1.00

{to, me, how}

Step 3 (p=0.50)

Prefix: `He asked`

Token	Prob.	Cum. Prob.
me	0.33	0.33
how	0.16	0.49
to	0.14	0.63
about	0.12	0.74
if	0.11	0.85
that	0.08	0.94
something	0.06	1.00

{to, me, how}

Step 4 (p=0.50)

Prefix: `He asked how`

Token	Prob.	Cum. Prob.
maybe	0.29	
'bout	0.20	
would	0.19	
perhaps	0.15	
sorta	0.14	
kinda	0.04	

Step 4 (p=0.50)

Prefix: `He asked how`

Token	Prob.	Cum. Prob.
maybe	0.29	0.29
'bout	0.20	0.48
would	0.19	0.67
perhaps	0.15	0.82
sorta	0.14	0.96
kinda	0.04	1.00

Step 4 (p=0.50)

Prefix: `He asked how`

Token	Prob.	Cum. Prob.
maybe	0.29	0.29
'bout	0.20	0.48
would	0.19	0.67
perhaps	0.15	0.82
sorta	0.14	0.96
kinda	0.04	1.00

{'bout, would, maybe}

Step 4 (p=0.50)

Prefix: He asked how

Token	Prob.	Cum. Prob.
maybe	0.29	0.29
'bout	0.20	0.48
would	0.19	0.67
perhaps	0.15	0.82
sorta	0.14	0.96
kinda	0.04	1.00

{'bout, would, maybe}

Step 5 (p=0.50)

Prefix: He asked how 'bout

Token	Prob.	Cum. Prob.
playing	0.17	
avoiding	0.17	
skipping	0.17	
shirking	0.17	
cutting	0.16	
ditching	0.13	
bailing	0.04	

Step 5 (p=0.50)

Prefix: `He asked how 'bout`

Token	Prob.	Cum. Prob.
playing	0.17	0.17
avoiding	0.17	0.34
skipping	0.17	0.51
shirking	0.17	0.67
cutting	0.16	0.83
ditching	0.13	0.96
bailing	0.04	1.00

Prefix: He asked how 'bout

Token	Prob.	Cum. Prob.
playing	0.17	0.17
avoiding	0.17	0.34
skipping	0.17	0.51
shirking	0.17	0.67
cutting	0.16	0.83
ditching	0.13	0.96
bailing	0.04	1.00

{playing, skipping, shirking, avoiding}

Step 5 (p=0.50)

Prefix: `He asked how 'bout`

Token	Prob.	Cum. Prob.
playing	0.17	0.17
avoiding	0.17	0.34
skipping	0.17	0.51
shirking	0.17	0.67
cutting	0.16	0.83
ditching	0.13	0.96
bailing	0.04	1.00

{playing, skipping, shirking, avoiding}

Prefix: He asked how 'bout avoiding

Token	Prob.	Cum. Prob.
work	0.23	
seminar	0.17	
class	0.17	
duty	0.16	
responsibility	0.15	
school	0.12	

Prefix: He asked how 'bout avoiding

Token	Prob.	Cum. Prob.
work	0.23	0.23
seminar	0.17	0.40
class	0.17	0.57
duty	0.16	0.74
responsibility	0.15	0.88
school	0.12	1.00

Step 6 (p=0.50)

Prefix: `He asked how 'bout avoiding`

Token	Prob.	Cum. Prob.
work	0.23	0.23
seminar	0.17	0.40
class	0.17	0.57
duty	0.16	0.74
responsibility	0.15	0.88
school	0.12	1.00

{work, class, seminar}

Step 6 (p=0.50)

Prefix: He asked how 'bout avoiding

Token	Prob.	Cum. Prob.
work	0.23	0.23
seminar	0.17	0.40
class	0.17	0.57
duty	0.16	0.74
responsibility	0.15	0.88
school	0.12	1.00

{work, class, seminar}

Step 7 (p=0.50)

Prefix: He asked how 'bout avoiding class

Token	Prob.	Cum. Prob.
but	0.24	
however	0.18	
though	0.17	
except	0.16	
still	0.14	
yet	0.11	

Step 7 (p=0.50)

Prefix: `He asked how 'bout avoiding class`

Token	Prob.	Cum. Prob.
but	0.24	0.24
however	0.18	0.42
though	0.17	0.59
except	0.16	0.75
still	0.14	0.89
yet	0.11	1.00

Step 7 (p=0.50)

Prefix: He asked how 'bout avoiding class

Token	Prob.	Cum. Prob.
but	0.24	0.24
however	0.18	0.42
though	0.17	0.59
except	0.16	0.75
still	0.14	0.89
yet	0.11	1.00

{but, however, though}

Step 7 (p=0.50)

Prefix: `He asked how 'bout avoiding class`

Token	Prob.	Cum. Prob.
but	0.24	0.24
however	0.18	0.42
though	0.17	0.59
except	0.16	0.75
still	0.14	0.89
yet	0.11	1.00

{but, however, though}

Prefix: `He asked how 'bout avoiding class but`

Token	Prob.	Cum. Prob.
seemed	0.36	
it	0.14	
the	0.13	
I	0.12	
he	0.11	
that	0.09	
everything	0.05	

Step 8 (p=0.50)

Prefix: He asked how 'bout avoiding class but

Token	Prob.	Cum. Prob.
seemed	0.36	0.36
it	0.14	0.50
the	0.13	0.63
I	0.12	0.75
he	0.11	0.86
that	0.09	0.95
everything	0.05	1.00

Step 8 (p=0.50)

Prefix: `He asked how 'bout avoiding class but`

Token	Prob.	Cum. Prob.
seemed	0.36	0.36
it	0.14	0.50
the	0.13	0.63
I	0.12	0.75
he	0.11	0.86
that	0.09	0.95
everything	0.05	1.00

{it, the, seemed}

Prefix: `He asked how 'bout avoiding class but`

Token	Prob.	Cum. Prob.
seemed	0.36	0.36
it	0.14	0.50
the	0.13	0.63
I	0.12	0.75
he	0.11	0.86
that	0.09	0.95
everything	0.05	1.00

{it, the, seemed}

Prefix: He asked how 'bout avoiding class but it

Token	Prob.	Cum. Prob.
seemed	0.37	
was	0.30	
felt	0.21	
appeared	0.08	
sounded	0.04	

Prefix: `He asked how 'bout avoiding class but it`

Token	Prob.	Cum. Prob.
seemed	0.37	0.37
was	0.30	0.67
felt	0.21	0.88
appeared	0.08	0.96
sounded	0.04	1.00

Step 9 (p=0.50)

Prefix: He asked how 'bout avoiding class
but it

Token	Prob.	Cum. Prob.
seemed	0.37	0.37
was	0.30	0.67
felt	0.21	0.88
appeared	0.08	0.96
sounded	0.04	1.00

{was, seemed}

Prefix: `He asked how 'bout avoiding class but it`

Token	Prob.	Cum. Prob.
seemed	0.37	0.37
was	0.30	0.67
felt	0.21	0.88
appeared	0.08	0.96
sounded	0.04	1.00

{was, seemed}

Prefix: `He asked how 'bout avoiding class`
`but it seemed`

Token	Prob.	Cum. Prob.
Greek	0.17	
unintelligible	0.17	
lost	0.17	
unclear	0.17	
confusing	0.16	
weird	0.13	
nonsense	0.04	

Prefix: `He asked how 'bout avoiding class`
`but it seemed`

Token	Prob.	Cum. Prob.
Greek	0.17	0.17
unintelligible	0.17	0.34
lost	0.17	0.51
unclear	0.17	0.67
confusing	0.16	0.84
weird	0.13	0.96
nonsense	0.04	1.00

Step 10 (p=0.50)

Prefix: `He asked how 'bout avoiding class but it seemed`

Token	Prob.	Cum. Prob.
Greek	0.17	0.17
unintelligible	0.17	0.34
lost	0.17	0.51
unclear	0.17	0.67
confusing	0.16	0.84
weird	0.13	0.96
nonsense	0.04	1.00

{Greek, unintelligible, lost, unclear}

Step 10 (p=0.50)

Prefix: He asked how 'bout avoiding class
but it seemed

Token	Prob.	Cum. Prob.
Greek	0.17	0.17
unintelligible	0.17	0.34
lost	0.17	0.51
unclear	0.17	0.67
confusing	0.16	0.84
weird	0.13	0.96
nonsense	0.04	1.00

{Greek, unintelligible, lost, unclear}

Prefix: `He asked how 'bout avoiding class but it seemed Greek`

Token	Prob.	Cum. Prob.
to	0.42	
for	0.18	
in front of	0.16	
around	0.13	
with	0.10	

Prefix: `He asked how 'bout avoiding class`
`but it seemed Greek`

Token	Prob.	Cum. Prob.
to	0.42	0.42
for	0.18	0.61
in front of	0.16	0.77
around	0.13	0.90
with	0.10	1.00

Prefix: He asked how 'bout avoiding class but it seemed Greek

Token	Prob.	Cum. Prob.
to	0.42	0.42
for	0.18	0.61
in front of	0.16	0.77
around	0.13	0.90
with	0.10	1.00

{to, for}

Step 11 (p=0.50)

Prefix: He asked how 'bout avoiding class
but it seemed Greek

Token	Prob.	Cum. Prob.
to	0.42	0.42
for	0.18	0.61
in front of	0.16	0.77
around	0.13	0.90
with	0.10	1.00

{to, for}

Prefix: He asked how 'bout avoiding class but it seemed Greek for

Token	Prob.	Cum. Prob.
me	0.50	
her	0.20	
everyone	0.13	
them	0.10	
him	0.07	

Prefix: `He asked how 'bout avoiding class`
`but it seemed Greek for`

Token	Prob.	Cum. Prob.
me	0.50	0.50
her	0.20	0.71
everyone	0.13	0.83
them	0.10	0.93
him	0.07	1.00

Step 12 (p=0.50)

Prefix: He asked how 'bout avoiding class but it seemed Greek for

Token	Prob.	Cum. Prob.
me	0.50	0.50
her	0.20	0.71
everyone	0.13	0.83
them	0.10	0.93
him	0.07	1.00

{me}

Step 12 (p=0.50)

Prefix: `He asked how 'bout avoiding class`
`but it seemed Greek for`

Token	Prob.	Cum. Prob.
me	0.50	0.50
her	0.20	0.71
everyone	0.13	0.83
them	0.10	0.93
him	0.07	1.00

{me}