

tag	accuracy	f1 score	accuracy for unknown words	accuracy for known words	number of unknown words	number of known words
A (إسم)	78.46 %	11.95 %	77.76 %	78.41 %	16	208
B (رقم)	98.2 %	45.06 %	93.33 %	98.24 %	6	185
C (إسم معرف)	74.11 %	10.53 %	55.96 %	75.9 %	15	146
D (إضافة)	74.88 %	10.96 %	56.38 %	77.35 %	18	143
E (منعوت)	87.76 %	13.3 %	82.75 %	88.02 %	6	141
F (نعت)	86.84 %	11.72 %	54.59 %	90.19 %	16	151
G (حرف جر)	89.28 %	28.24 %	20.0 %	90.36 %	1	44
H (إسم مجرور)	75.71 %	21.29 %	57.78 %	84.53 %	12	26
I (وحدة قياس)	92.85 %	28.09 %	62.04 %	93.41 %	2	93
J (واو العطف)	88.45 %	26.72 %	NULL	88.45 %	0	33
K (فعل مبني للمجهول)	38.68 %	11.82 %	33.75 %	40.29 %	5	26
L (المفعول المطلق)	0.0 %	0.0 %	0.0 %	0.0 %	1	0
M (أداة عطف غير واو العطف)	34.81 %	13.77 %	NULL	34.81 %	0	8
.	100.0 %	100.0 %	NULL	100.0 %	0	789

Table 1: Average performances for each tag of our ingredient extractor for the first layer using a first order HMM with various accuracies in the first layer

tag	accuracy	f1 score	accuracy for unknown words	accuracy for known words	number of unknown words	number of known words
A (إسم)	94.61 %	56.16 %	83.45 %	95.44 %	16	208
B (رقم)	99.29 %	62.09 %	100.0 %	99.27 %	6	185
C (إسم معرف)	89.77 %	48.07 %	74.83 %	91.37 %	15	146
D (إضافة)	81.85 %	66.91 %	34.87 %	87.68 %	18	143
E (منعوت)	94.61 %	68.59 %	63.17 %	96.23 %	6	141
F (نعت)	83.04 %	49.87 %	50.98 %	86.14 %	16	151
G (حرف جر)	96.28 %	59.18 %	80.0 %	96.44 %	1	44
H (إسم مجرور)	74.74 %	60.13 %	56.09 %	82.78 %	12	26
I (وحدة قياس)	98.32 %	64.6 %	88.89 %	98.42 %	2	93
J (واو العطف)	94.38 %	55.4 %	NULL	94.38 %	0	33
K (فعل مبني للمجهول)	88.57 %	35.49 %	86.39 %	89.57 %	5	26
L (المفعول المطلق)	54.76 %	50.0 %	61.11 %	50.0 %	1	0
M (أداة عطف غير واو العطف)	60.46 %	33.01 %	NULL	60.46 %	0	8
.	99.84 %	61.63 %	NULL	99.84 %	0	789

Table 2: Average performances for each tag of our ingredient extractor for the second layer with $\lambda = 4$ with various accuracies in the first layer

	First Layer first order HMM				Second Layer second order HMM			
Tag	accuracy	f1 score	accuracy unknown words	accuracy known words	accuracy	f1 score	accuracy unknown words	accuracy known words
A (إسم)	78.46 %	11.95 %	77.76 %	78.41 %	94.61 %	56.16 %	83.45 %	95.44 %
B (رقم)	98.2 %	45.06 %	93.33 %	98.24 %	99.29 %	62.09 %	100.0 %	99.27 %
C (إسم معرف)	74.11 %	10.53 %	55.96 %	75.9 %	89.77 %	48.07 %	74.83 %	91.37 %
D (إضافة)	74.88 %	10.96 %	56.38 %	77.35 %	81.85 %	66.91 %	34.87 %	87.68 %
E (منعوت)	87.76 %	13.3 %	82.75 %	88.02 %	94.61 %	68.59 %	63.17 %	96.23 %
F (نعت)	86.84 %	11.72 %	54.59 %	90.19 %	83.04 %	49.87 %	50.98 %	86.14 %
G (حرف جر)	89.28 %	28.24 %	20.0 %	90.36 %	96.28 %	59.18 %	80.0 %	96.44 %
H (إسم مجرور)	75.71 %	21.29 %	57.78 %	84.53 %	74.74 %	60.13 %	56.09 %	82.78 %
I (وحدة قياس)	92.85 %	28.09 %	62.04 %	93.41 %	98.32 %	64.6 %	88.89 %	98.42 %
J (واو العطف)	88.45 %	26.72 %	NULL	88.45 %	94.38 %	55.4 %	NULL	94.38 %
K (فعل مبني للمجهول)	38.68 %	11.82 %	33.75 %	40.29 %	88.57 %	35.49 %	86.39 %	89.57 %
L (المفعول المطلق)	0.0 %	0.0 %	0.0 %	0.0 %	54.76 %	50.0 %	61.11 %	50.0 %
M (أداة عطف غير واو العطف)	34.81 %	13.77 %	NULL	34.81 %	60.46 %	33.01 %	NULL	60.46 %
.	100.0 %	100.0 %	NULL	100.0 %	99.84 %	61.63 %	NULL	99.84 %

Table 3: Average performances for each tag of our ingredient extractor for the first and second layer with $\lambda = 4$ with various accuracies in the first layer

	First Layer first order HMM				Second Layer second order HMM			
Fold	accuracy	f1 score	accuracy unknown words	accuracy known words	accuracy	f1 score	accuracy unknown words	accuracy known words
0	90.33 %	70.61 %	50.55 %	92.14 %	95.43 %	66.98 %	61.54 %	96.97 %
1	87.7 %	73.71 %	52.03 %	89.81 %	93.96 %	65.96 %	70.73 %	95.32 %
2	89.07 %	75.34 %	66.99 %	90.26 %	94.54 %	66.97 %	66.02 %	96.07 %
3	87.87 %	72.36 %	67.47 %	88.75 %	94.93 %	66.93 %	63.86 %	96.27 %
4	87.31 %	73.21 %	63.11 %	88.54 %	93.65 %	66.46 %	72.82 %	94.71 %
5	91.23 %	76.51 %	62.92 %	92.47 %	94.82 %	68.17 %	69.66 %	95.92 %
6	90.53 %	73.87 %	59.3 %	91.86 %	93.86 %	65.16 %	54.65 %	95.53 %
7	89.13 %	78.5 %	61.22 %	90.51 %	93.8 %	65.12 %	55.1 %	95.71 %
8	89.28 %	77.76 %	67.86 %	90.16 %	95.01 %	67.84 %	64.29 %	96.28 %
9	89.4 %	77.29 %	65.98 %	90.53 %	93.96 %	64.98 %	60.82 %	95.57 %
Avg	89.19 %	74.92 %	61.74 %	90.5 %	94.4 %	66.46 %	63.95 %	95.83 %

Table 4: Average performances of our ingredient extractor with various accuracy on the first layer and $\lambda = 4$ using 10 fold cross-validation