

| tag | accuracy | f1 score | accuracy for unknown words | accuracy for known words | number of unknown words | number of known words |
|----------------------------------|----------|----------|----------------------------------|--------------------------------|-------------------------------|-----------------------------|
| A (إسم) | 94.84 % | 93.22 % | 81.82 % | 95.54 % | 11 | 202 |
| B (رقم) | 100.0 % | 100.0 % | 100.0 % | 100.0 % | 9 | 178 |
| C (إسم معرف) | 94.52 % | 58.09 % | 77.78 % | 95.62 % | 9 | 137 |
| D (إضافة) | 85.61 % | 64.11 % | 21.43 % | 92.8 % | 14 | 125 |
| E (منعوت) | 94.44 % | 93.12 % | 33.33 % | 96.79 % | 6 | 156 |
| F (نعت) | 88.33 % | 83.27 % | 71.43 % | 89.76 % | 14 | 166 |
| G (حرف جر) | 95.45 % | 32.56 % | 100.0 % | 95.35 % | 1 | 43 |
| H (إسم مجرور) | 74.36 % | 50.37 % | 52.63 % | 95.0 % | 19 | 20 |
| I (وحدة قياس) | 98.96 % | 49.74 % | 100.0 % | 98.94 % | 2 | 94 |
| J (واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 26 |
| K (فعل مبني للمجهول) | 88.89 % | 47.06 % | 66.67 % | 93.33 % | 3 | 15 |
| L (المفعول المطلق) | 0.0 % | 0.0 % | 0.0 % | NULL | 2 | 0 |
| M (أداة عطف غير واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 1 |
| . | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 784 |

Table 1: Performances for each tag using our ingredient extractor for fold 0 with $\lambda = 4$ when accuracy is 100% on first layer

| tag | accuracy | f1 score | accuracy for unknown words | accuracy for known words | number of unknown words | number of known words |
|----------------------------------|----------|----------|----------------------------------|--------------------------------|-------------------------------|-----------------------------|
| A (إسم) | 94.84 % | 93.22 % | 81.82 % | 95.54 % | 11 | 202 |
| B (رقم) | 100.0 % | 100.0 % | 100.0 % | 100.0 % | 9 | 178 |
| C (إسم معرف) | 94.52 % | 58.09 % | 77.78 % | 95.62 % | 9 | 137 |
| D (إضافة) | 85.61 % | 64.11 % | 21.43 % | 92.8 % | 14 | 125 |
| E (منعوت) | 94.44 % | 93.12 % | 33.33 % | 96.79 % | 6 | 156 |
| F (نعت) | 88.33 % | 83.27 % | 71.43 % | 89.76 % | 14 | 166 |
| G (حرف جر) | 95.45 % | 32.56 % | 100.0 % | 95.35 % | 1 | 43 |
| H (إسم مجرور) | 74.36 % | 50.37 % | 52.63 % | 95.0 % | 19 | 20 |
| I (وحدة قياس) | 98.96 % | 49.74 % | 100.0 % | 98.94 % | 2 | 94 |
| J (واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 26 |
| K (فعل مبني للمجهول) | 88.89 % | 47.06 % | 66.67 % | 93.33 % | 3 | 15 |
| L (المفعول المطلق) | 0.0 % | 0.0 % | 0.0 % | NULL | 2 | 0 |
| M (أداة عطف غير واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 1 |
| . | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 784 |

Table 2: Performances for each tag using our ingredient extractor for fold 1 with $\lambda = 4$ when accuracy is 100% on first layer

| tag | accuracy | f1 score | accuracy for unknown words | accuracy for known words | number of unknown words | number of known words |
|----------------------------------|----------|----------|----------------------------------|--------------------------------|-------------------------------|-----------------------------|
| A (إسم) | 94.84 % | 93.22 % | 81.82 % | 95.54 % | 11 | 202 |
| B (رقم) | 100.0 % | 100.0 % | 100.0 % | 100.0 % | 9 | 178 |
| C (إسم معرف) | 94.52 % | 58.09 % | 77.78 % | 95.62 % | 9 | 137 |
| D (إضافة) | 85.61 % | 64.11 % | 21.43 % | 92.8 % | 14 | 125 |
| E (منعوت) | 94.44 % | 93.12 % | 33.33 % | 96.79 % | 6 | 156 |
| F (نعت) | 88.33 % | 83.27 % | 71.43 % | 89.76 % | 14 | 166 |
| G (حرف جر) | 95.45 % | 32.56 % | 100.0 % | 95.35 % | 1 | 43 |
| H (إسم مجرور) | 74.36 % | 50.37 % | 52.63 % | 95.0 % | 19 | 20 |
| I (وحدة قياس) | 98.96 % | 49.74 % | 100.0 % | 98.94 % | 2 | 94 |
| J (واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 26 |
| K (فعل مبني للمجهول) | 88.89 % | 47.06 % | 66.67 % | 93.33 % | 3 | 15 |
| L (المفعول المطلق) | 0.0 % | 0.0 % | 0.0 % | NULL | 2 | 0 |
| M (أداة عطف غير واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 1 |
| . | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 784 |

Table 3: Performances for each tag using our ingredient extractor for fold 2 with $\lambda = 4$ when accuracy is 100% on first layer

| tag | accuracy | f1 score | accuracy for unknown words | accuracy for known words | number of unknown words | number of known words |
|----------------------------------|----------|----------|----------------------------------|--------------------------------|-------------------------------|-----------------------------|
| A (إسم) | 94.84 % | 93.22 % | 81.82 % | 95.54 % | 11 | 202 |
| B (رقم) | 100.0 % | 100.0 % | 100.0 % | 100.0 % | 9 | 178 |
| C (إسم معرف) | 94.52 % | 58.09 % | 77.78 % | 95.62 % | 9 | 137 |
| D (إضافة) | 85.61 % | 64.11 % | 21.43 % | 92.8 % | 14 | 125 |
| E (منعوت) | 94.44 % | 93.12 % | 33.33 % | 96.79 % | 6 | 156 |
| F (نعت) | 88.33 % | 83.27 % | 71.43 % | 89.76 % | 14 | 166 |
| G (حرف جر) | 95.45 % | 32.56 % | 100.0 % | 95.35 % | 1 | 43 |
| H (إسم مجرور) | 74.36 % | 50.37 % | 52.63 % | 95.0 % | 19 | 20 |
| I (وحدة قياس) | 98.96 % | 49.74 % | 100.0 % | 98.94 % | 2 | 94 |
| J (واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 26 |
| K (فعل مبني للمجهول) | 88.89 % | 47.06 % | 66.67 % | 93.33 % | 3 | 15 |
| L (المفعول المطلق) | 0.0 % | 0.0 % | 0.0 % | NULL | 2 | 0 |
| M (أداة عطف غير واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 1 |
| . | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 784 |

Table 4: Performances for each tag using our ingredient extractor for fold 3 with $\lambda = 4$ when accuracy is 100% on first layer

| tag | accuracy | f1 score | accuracy for unknown words | accuracy for known words | number of unknown words | number of known words |
|----------------------------------|----------|----------|----------------------------------|--------------------------------|-------------------------------|-----------------------------|
| A (إسم) | 94.84 % | 93.22 % | 81.82 % | 95.54 % | 11 | 202 |
| B (رقم) | 100.0 % | 100.0 % | 100.0 % | 100.0 % | 9 | 178 |
| C (إسم معرف) | 94.52 % | 58.09 % | 77.78 % | 95.62 % | 9 | 137 |
| D (إضافة) | 85.61 % | 64.11 % | 21.43 % | 92.8 % | 14 | 125 |
| E (منعوت) | 94.44 % | 93.12 % | 33.33 % | 96.79 % | 6 | 156 |
| F (نعت) | 88.33 % | 83.27 % | 71.43 % | 89.76 % | 14 | 166 |
| G (حرف جر) | 95.45 % | 32.56 % | 100.0 % | 95.35 % | 1 | 43 |
| H (إسم مجرور) | 74.36 % | 50.37 % | 52.63 % | 95.0 % | 19 | 20 |
| I (وحدة قياس) | 98.96 % | 49.74 % | 100.0 % | 98.94 % | 2 | 94 |
| J (واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 26 |
| K (فعل مبني للمجهول) | 88.89 % | 47.06 % | 66.67 % | 93.33 % | 3 | 15 |
| L (المفعول المطلق) | 0.0 % | 0.0 % | 0.0 % | NULL | 2 | 0 |
| M (أداة عطف غير واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 1 |
| . | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 784 |

Table 5: Performances in predicting ingredients states for fold 4 with $\lambda = 4$ when accuracy is 100% on first layer

| tag | accuracy | f1 score | accuracy for unknown words | accuracy for known words | number of unknown words | number of known words |
|----------------------------------|----------|----------|----------------------------------|--------------------------------|-------------------------------|-----------------------------|
| A (إسم) | 94.84 % | 93.22 % | 81.82 % | 95.54 % | 11 | 202 |
| B (رقم) | 100.0 % | 100.0 % | 100.0 % | 100.0 % | 9 | 178 |
| C (إسم معرف) | 94.52 % | 58.09 % | 77.78 % | 95.62 % | 9 | 137 |
| D (إضافة) | 85.61 % | 64.11 % | 21.43 % | 92.8 % | 14 | 125 |
| E (منعوت) | 94.44 % | 93.12 % | 33.33 % | 96.79 % | 6 | 156 |
| F (نعت) | 88.33 % | 83.27 % | 71.43 % | 89.76 % | 14 | 166 |
| G (حرف جر) | 95.45 % | 32.56 % | 100.0 % | 95.35 % | 1 | 43 |
| H (إسم مجرور) | 74.36 % | 50.37 % | 52.63 % | 95.0 % | 19 | 20 |
| I (وحدة قياس) | 98.96 % | 49.74 % | 100.0 % | 98.94 % | 2 | 94 |
| J (واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 26 |
| K (فعل مبني للمجهول) | 88.89 % | 47.06 % | 66.67 % | 93.33 % | 3 | 15 |
| L (المفعول المطلق) | 0.0 % | 0.0 % | 0.0 % | NULL | 2 | 0 |
| M (أداة عطف غير واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 1 |
| . | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 784 |

Table 6: Performances for each tag using our ingredient extractor for fold 5 with $\lambda = 4$ when accuracy is 100% on first layer

| tag | accuracy | f1 score | accuracy for unknown words | accuracy for known words | number of unknown words | number of known words |
|----------------------------------|----------|----------|----------------------------------|--------------------------------|-------------------------------|-----------------------------|
| A (إسم) | 97.69 % | 96.63 % | 92.31 % | 98.03 % | 13 | 203 |
| B (رقم) | 100.0 % | 100.0 % | 100.0 % | 100.0 % | 2 | 206 |
| C (إسم معرف) | 83.89 % | 50.87 % | 57.14 % | 86.67 % | 14 | 135 |
| D (إضافة) | 74.83 % | 57.31 % | 21.74 % | 84.38 % | 23 | 128 |
| E (منعوت) | 97.96 % | 97.58 % | 60.0 % | 99.3 % | 5 | 142 |
| F (نعت) | 84.18 % | 83.26 % | 60.0 % | 85.81 % | 10 | 148 |
| G (حرف جر) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 51 |
| H (إسم مجرور) | 75.68 % | 73.76 % | 45.45 % | 88.46 % | 11 | 26 |
| I (وحدة قياس) | 100.0 % | 100.0 % | 100.0 % | 100.0 % | 2 | 111 |
| J (واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 37 |
| K (فعل مبني للمجهول) | 83.33 % | 30.7 % | 83.33 % | 83.33 % | 6 | 36 |
| L (المفعول المطلق) | 0.0 % | 0.0 % | NULL | 0.0 % | 0 | 1 |
| M (أداة عطف غير واو العطف) | 85.71 % | 46.15 % | NULL | 85.71 % | 0 | 7 |
| . | 99.49 % | 33.25 % | NULL | 99.49 % | 0 | 784 |

Table 7: Performances for each tag using our ingredient extractor for fold 6 with $\lambda = 4$ when accuracy is 100% on first layer

| tag | accuracy | f1 score | accuracy for unknown words | accuracy for known words | number of unknown words | number of known words |
|----------------------------------|----------|----------|----------------------------------|--------------------------------|-------------------------------|-----------------------------|
| A (إسم) | 94.84 % | 93.22 % | 81.82 % | 95.54 % | 11 | 202 |
| B (رقم) | 100.0 % | 100.0 % | 100.0 % | 100.0 % | 9 | 178 |
| C (إسم معرف) | 94.52 % | 58.09 % | 77.78 % | 95.62 % | 9 | 137 |
| D (إضافة) | 85.61 % | 64.11 % | 21.43 % | 92.8 % | 14 | 125 |
| E (منعوت) | 94.44 % | 93.12 % | 33.33 % | 96.79 % | 6 | 156 |
| F (نعت) | 88.33 % | 83.27 % | 71.43 % | 89.76 % | 14 | 166 |
| G (حرف جر) | 95.45 % | 32.56 % | 100.0 % | 95.35 % | 1 | 43 |
| H (إسم مجرور) | 74.36 % | 50.37 % | 52.63 % | 95.0 % | 19 | 20 |
| I (وحدة قياس) | 98.96 % | 49.74 % | 100.0 % | 98.94 % | 2 | 94 |
| J (واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 26 |
| K (فعل مبني للمجهول) | 88.89 % | 47.06 % | 66.67 % | 93.33 % | 3 | 15 |
| L (المفعول المطلق) | 0.0 % | 0.0 % | 0.0 % | NULL | 2 | 0 |
| M (أداة عطف غير واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 1 |
| . | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 784 |

Table 8: Performances for each tag using our ingredient extractor for fold 7 with $\lambda = 4$ when accuracy is 100% on first layer

| tag | accuracy | f1 score | accuracy for unknown words | accuracy for known words | number of unknown words | number of known words |
|----------------------------------|----------|----------|----------------------------------|--------------------------------|-------------------------------|-----------------------------|
| A (إسم) | 94.84 % | 93.22 % | 81.82 % | 95.54 % | 11 | 202 |
| B (رقم) | 100.0 % | 100.0 % | 100.0 % | 100.0 % | 9 | 178 |
| C (إسم معرف) | 94.52 % | 58.09 % | 77.78 % | 95.62 % | 9 | 137 |
| D (إضافة) | 85.61 % | 64.11 % | 21.43 % | 92.8 % | 14 | 125 |
| E (منعوت) | 94.44 % | 93.12 % | 33.33 % | 96.79 % | 6 | 156 |
| F (نعت) | 88.33 % | 83.27 % | 71.43 % | 89.76 % | 14 | 166 |
| G (حرف جر) | 95.45 % | 32.56 % | 100.0 % | 95.35 % | 1 | 43 |
| H (إسم مجرور) | 74.36 % | 50.37 % | 52.63 % | 95.0 % | 19 | 20 |
| I (وحدة قياس) | 98.96 % | 49.74 % | 100.0 % | 98.94 % | 2 | 94 |
| J (واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 26 |
| K (فعل مبني للمجهول) | 88.89 % | 47.06 % | 66.67 % | 93.33 % | 3 | 15 |
| L (المفعول المطلق) | 0.0 % | 0.0 % | 0.0 % | NULL | 2 | 0 |
| M (أداة عطف غير واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 1 |
| . | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 784 |

Table 9: Performances for each tag using our ingredient extractor for fold 8 with $\lambda = 4$ when accuracy is 100% on first layer

| tag | accuracy | f1 score | accuracy for unknown words | accuracy for known words | number of unknown words | number of known words |
|----------------------------------|----------|----------|----------------------------------|--------------------------------|-------------------------------|-----------------------------|
| A (إسم) | 94.84 % | 93.22 % | 81.82 % | 95.54 % | 11 | 202 |
| B (رقم) | 100.0 % | 100.0 % | 100.0 % | 100.0 % | 9 | 178 |
| C (إسم معرف) | 94.52 % | 58.09 % | 77.78 % | 95.62 % | 9 | 137 |
| D (إضافة) | 85.61 % | 64.11 % | 21.43 % | 92.8 % | 14 | 125 |
| E (منعوت) | 94.44 % | 93.12 % | 33.33 % | 96.79 % | 6 | 156 |
| F (نعت) | 88.33 % | 83.27 % | 71.43 % | 89.76 % | 14 | 166 |
| G (حرف جر) | 95.45 % | 32.56 % | 100.0 % | 95.35 % | 1 | 43 |
| H (إسم مجرور) | 74.36 % | 50.37 % | 52.63 % | 95.0 % | 19 | 20 |
| I (وحدة قياس) | 98.96 % | 49.74 % | 100.0 % | 98.94 % | 2 | 94 |
| J (واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 26 |
| K (فعل مبني للمجهول) | 88.89 % | 47.06 % | 66.67 % | 93.33 % | 3 | 15 |
| L (المفعول المطلق) | 0.0 % | 0.0 % | 0.0 % | NULL | 2 | 0 |
| M (أداة عطف غير واو العطف) | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 1 |
| . | 100.0 % | 100.0 % | NULL | 100.0 % | 0 | 784 |

Table 10: Performances for each tag using our ingredient extractor for fold 9 with $\lambda = 4$ when accuracy is 100% on first layer

| tag | accuracy | f1 score | accuracy for unknown words | accuracy for known words | number of unknown words | number of known words |
|----------------------------------|----------|----------|----------------------------------|--------------------------------|-------------------------------|-----------------------------|
| A (إسم) | 95.58 % | 94.0 % | 84.3 % | 96.39 % | 16 | 208 |
| B (رقم) | 99.76 % | 84.94 % | 100.0 % | 99.75 % | 6 | 185 |
| C (إسم معرف) | 89.19 % | 50.62 % | 67.74 % | 91.47 % | 15 | 146 |
| D (إضافة) | 82.42 % | 71.74 % | 35.18 % | 88.4 % | 18 | 143 |
| E (منعوت) | 95.0 % | 84.37 % | 63.17 % | 96.73 % | 6 | 141 |
| F (نعت) | 86.8 % | 76.32 % | 63.17 % | 89.03 % | 16 | 151 |
| G (حرف جر) | 97.5 % | 71.1 % | NULL | 98.05 % | 1 | 44 |
| H (إسم مجرور) | 72.15 % | 55.42 % | 44.15 % | 84.92 % | 12 | 26 |
| I (وحدة قياس) | 99.68 % | 84.92 % | NULL | 99.68 % | 2 | 93 |
| J (واو العطف) | 98.29 % | 69.57 % | NULL | 98.29 % | 0 | 33 |
| K (فعل مبني للمجهول) | 89.88 % | 54.26 % | 82.36 % | 92.03 % | 5 | 26 |
| L (المفعول المطلق) | NULL | NULL | NULL | NULL | 1 | 0 |
| M (أداة عطف غير واو العطف) | 92.82 % | 73.05 % | NULL | 92.82 % | 0 | 8 |
| . | 99.84 % | 61.63 % | NULL | 99.84 % | 0 | 789 |

Table 11: Average performances for each tag using our ingredient extractor with $\lambda = 4$ when accuracy is 100% on first layer

| tag | accuracy | f1 score | accuracy for unknown words | accuracy for known words | number of unknown words | unknown words percentage |
|-----|----------|----------|----------------------------------|--------------------------------|-------------------------------|--------------------------------|
| 0 | 95.78 % | 67.91 % | 61.11 % | 97.38 % | 78 | 9.67 % |
| 1 | 94.38 % | 66.54 % | 68.85 % | 95.92 % | 107 | 13.26 % |
| 2 | 95.08 % | 67.39 % | 67.96 % | 96.54 % | 88 | 10.9 % |
| 3 | 95.83 % | 67.71 % | 62.65 % | 97.25 % | 75 | 9.29 % |
| 4 | 94.83 % | 67.72 % | 71.84 % | 96.0 % | 92 | 11.4 % |
| 5 | 95.9 % | 69.57 % | 70.79 % | 97.0 % | 83 | 10.29 % |
| 6 | 94.43 % | 65.92 % | 55.81 % | 96.08 % | 80 | 9.91 % |
| 7 | 94.13 % | 65.61 % | 52.04 % | 96.22 % | 90 | 11.15 % |
| 8 | 95.63 % | 68.82 % | 60.71 % | 97.06 % | 77 | 9.54 % |
| 9 | 94.39 % | 65.95 % | 56.7 % | 96.21 % | 88 | 10.9 % |
| Avg | 95.04 % | 67.31 % | 62.85 % | 96.57 % | 86.0 | 10.63 % |

Table 12: Average performances in predicting ingredients states with $\lambda = 4$ when accuracy is 100% on first layer