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Arabic Fine-Grained Entity Recognition

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Abstract

Traditional NER systems are typically trained to recognize coarse-grained entities, and less attention is given to classifying entities into a hierarchy of fine-grained lower-level subtypes. This article aims to advance Arabic NER with fine-grained entities. We chose to extend Wojood (an open-source Nested Arabic Named Entity Corpus) with subtypes. In particular, four main entity types in Wojood, geopolitical entity (GPE), location (LOC), organization (ORG), and facility (FAC), are extended with 31 subtypes. To do this, we first revised Wojood's annotations

ties, such as person (PERS), location (LOC), geopolitical entity (GPE), or organization (ORG). However, less attention is given to classifying entities into a hierarchy of fine-grained lower-level subtypes (Zhu et al., 2020; Desmet and Hoste, 2013). For example, locations (LOC) like Asia and Red Sea could be further classified into Continent and Water-Body, respectively. Similarly, organizations like Amazon, Cairo University, and Sphinx Cure can be classified into commercial, educational, and health entities,

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http://www.jarrar.info/publications/LJKOA23.pdf

Natural Language Understanding Tools and Datasets

Open Source

https://sina.birzeit.edu/resources

SinaLab

News Team Resources

Resources

Download and try NLU datasests, corpora, tools and services

+ Lexicographic Database (150 lexicons)	حوسبة المعاجم
+ Arabic Ontology	الأنطولوجيا العربية
+ Dialect Corpora (Currasat)	كراسات مدونة العاميات
+ Arabic Synonyms	استخراج مترادفات
+ Named Entity Recognition (Wojood)	وجود –لاستخراج أسماء الاعلام
+ Word Sense Disambiguation (Salma)	سلمى – محلل دلالي
+ ArBanking77 Intent Detection	تحديد المقصود في المساعدات الآلية
+ Offensive Language Detection	خطاب الكراهية بالعبرية
+ Lemmatizer	مُعَجِّم
+ NLP Tools	أدوات وبرمجيات أخرى

Contributions

$\text{Wojood}_{\text{Fine}}$

We extended the Wojood NER corpus by adding subtypes of entities for each of {ORG, GPE, LOC,FAC}

$\text{Wojood}_{\text{Fine}}$
Fine-Grain and Nested Arabic Named Entities Corpus

نيامي هي عاصمة نيجيريا

Niamey is the capital of Nigeria

GPE ▸ Country

لتتوافق وأولويات نيجيريا في المنطقة

To align with the Nigeria's priorities in the region

GPE ▸ GPE_ORG

$\text{Wojood}_{\text{Fine}}$
Fine-Grain and Nested Arabic Named Entities Corpus

صورة لبعض المرضى في مستشفى الشفاء

A picture of some patients at Al-Shifa Hospital

ORG ▸ ORG_FAC

Wojood$_{Fine}$

Fine-Grain and Nested Arabic Named Entities Corpus

أعيش في شمال شرق مدينة غزة

I live northeast of Gaza City

GPE ▸ Town

LOC ▸ Region-General

$\text{Wojood}_{\text{Fine}}$
Fine-Grain and Nested Arabic Named Entities Corpus

جامعة بيرزيت تعلن عن مجموعة من المنح لطلبة الدكتوراة

Birzeit University announces a set of scholarships for PhD students

GPE ▸ Town

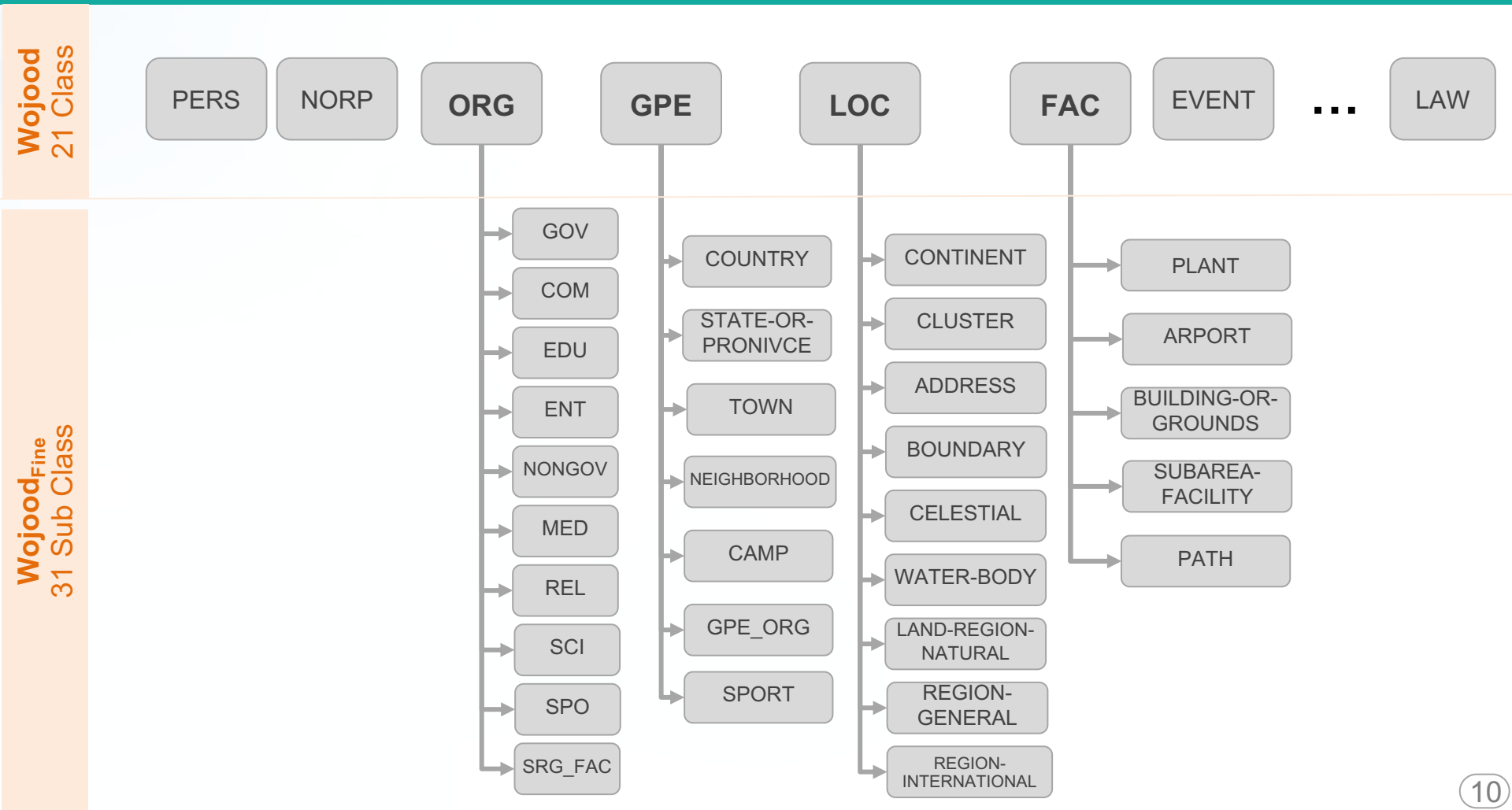
ORG ▸ EDU

Wojood Vs Wojood_Fine Counts

Before adding subtypes, we had to revise the annotations of {GPE,ORG,LOC,FAC} with new guidelines.

Tag	Wojood	Wojood_Fine
GPE	21,780	23,085
ORG	18,785	18,747
LOC	917	1,441
FAC	1,215	1,121
Total	**42,697**	**44,394**

Subtypes


Wojood
21 Class
PERS
NORP
ORG
GPE
LOC
FAC
EVENT
...
LAW
Wojood Fine
31 Sub Class
GOV
COM
EDU
ENT
NONGOV
MED
REL
SCI
SPO
SRG_FAC
COUNTRY
STATE-OR-PRONIVCE
TOWN
NEIGHBORHOOD
CAMP
GPE_ORG
SPORT
CONTINENT
CLUSTER
ADDRESS
BOUNDARY
CELESTIAL
WATER-BODY
LAND-REGION-NATURAL
REGION-GENERAL
REGION-INTERNATIONAL
PLANT
ARPORT
BUILDING-OR-GROUNDS
SUBAREA-FACILITY
PATH

Annotation Guidelines

10 sub-entity classes for **ORG**

GOV	Government organizations.	سفارة، محكمة، وزارة، شرطة.
COM	A commercial organization that is focused primarily upon providing ideas, products, or services for profit.	بنك ، شركة ،مؤسسة ربحية.
EDU	An educational organization that is focused primarily upon the furthering or promulgation of learning/education.	جامعة، مدرسة، معهد.
ENT	Entertainment organizations whose primary activity is entertainment.	فرقة ميامي، مسرح الحكواتي.
NONGOV	Non-governmental organizations that are not a part of a government or commercial organization and whose main role is advocacy, charity or politics (in a broad sense).mentions of the entireties of any of the seven continents.	نقابة العاملين، الأمم المتحدة، الأحزاب السياسية ،أطباء بلا حدود.
MED	Media organizations whose primary interest is the distribution of news or publications.	جريدة الشرق، مجلة الحياة..
REL	Religious organizations that are primarily devoted to issues of religious worship.	الأوقاف ، الأزهر.
SCI	Medical-Science organizations whose primary activity is the application of medical care or the pursuit of scientific research.	مستشفى هداسا ، معهد الدراسات النووية.
SPO	Sports organizations that are primarily concerned with participating in or governing organized sporting events.	الاتحاد السعودي لكرة القدم، لجنة الفلبين الأولومبية.
ORG_FAC	Facilities that have an organizational, legal or social representative.	مظاهرات أمام بنك روما.

Annotation Guidelines

7 sub-entity classes for **GPE**

COUNTRY

Taggable mentions of the entireties of any nation.

فلسطين، مصر، الولايات المتحدة، لبنان..

STATE-OR-PRONIVCE

Taggable mentions of the entireties of any state, province, or canton of any nation.

محافظة القاهرة، قطاع غزة، إقليم كردستان، لواء نابلس.

TOWN

Taggable mentions of any GPE entireties below the level of State-or-Province, including cities, and villages.

العاصمة دبي، قرية بيرزيت.

NEIGHBORHOOD

Taggable mentions of the entireties of units that are smaller than villages.

حي الطيرة، البلدة القديمة، حي المغاربة.

CAMP

Taggable mentions of the entireties of units that are smaller than villages, relating to refugees.

مخيم قلنديا، مخيم نور شمس

GPE_ORG

is used for GPE mentions that refer to the entire governing body of a GPE.

أصدرت الولايات المتحدة تقريرها، قررت فلسطين إعفاء المتضررين.

SPORT

Athletes, Sports Teams.

}مباراة المغرب، الفرق الرياضية، برشلونة، ميلان.

Annotation Guidelines

9 sub-entity classes for **LOC**

CONTINENT	Taggable mentions of the entireties of any of the seven continents. أوروبا، آسيا.
CLUSTER	Named groupings of GPEs that can function as political entities. أوروبا الشرقية، الشرق الأوسط
ADDRESS	A location denoted as a point such as in a postal system ("31° S, 22° W"). 17، شارع فؤاد.
BOUNDARY	A one-dimensional location such as a border between GPE's or other locations. الحدود الشرقية، الحدود السورية التركية.
CELESTIAL	World, earth, globe in addition to all other planets. المريخ، عطارد.
WATER-BODY	Bodies of water, natural or artificial (man-made). البحر الأحمر، الأطلسي.
LAND-REGION-NATURAL	Geologically or ecosystemically designated, non-artificial locations. جبال الألب، الأغوار، السهول.
REGION-GENERAL	Taggable locations that do not cross national borders. شمال الضفة الغربية، شرق سوريا.
REGION-INTERNATIONAL	Taggable locations that cross national borders. آسيا الكبرى، جنوب أفريقيا.

Annotation Guidelines

5 sub-entity classes for **FAC**

PLANT	One or more buildings that are used and/or designed solely for industrial purposes: manufacturing, power generation, etc. مصنع.
AIRPORT	A facility whose primary use is as an airport. مطار.
BUILDING-OR-GROUNDS	Man-made/-maintained buildings, outdoor spaces, and other such facilities. جزء من مبنى، غرفة ،زنزانة.
SUBAREA-FACILITY	Taggable portions of facilities. منزل، مبنى، مستشفى، معبر.
PATH	Streets, canals, and bridges. الشوارع الرئيسية، الخطوط الهاتفية، الحواجز.

NER Results

Task	Model	Dev	Test
Flat	M1	$0.917^{\pm 0.00}$	$\mathbf{0.920}^{\pm 0.00}$
	M2	$0.910^{\pm 0.00}$	$0.913^{\pm 0.01}$
	M3	$0.902^{\pm 0.00}$	$0.907^{\pm 0.01}$
Nested	M1	$0.844^{\pm 0.02}$	$0.845^{\pm 0.01}$
	M2	$0.868^{\pm 0.02}$	$0.861^{\pm 0.02}$
	M3	$0.858^{\pm 0.02}$	$\mathbf{0.866}^{\pm 0.02}$
Nested +subtypes	M1	$0.836^{\pm 0.01}$	$0.837^{\pm 0.01}$
	M2	$0.880^{\pm 0.01}$	$0.883^{\pm 0.01}$
	M3	$0.883^{\pm 0.00}$	$\mathbf{0.885}^{\pm 0.00}$

M1: ARBERTv2 M2: MARBERTv2 M3: ARABERTv2

Results of fine-tuned models on the three different tasks. The results are represented as F1 averaged over 3 runs.

Limitations and Out-of-Domain Performance

- Unseen domains and different time periods
- compiled from Aljazeera news articles published in 2023
- Each domain about 3k tokens

Task	Model	Finance	Science	Politics
Flat	M1	63.7% $^{\pm 0.01}$	0.670$^{\pm 0.02}$	**0.747**$^{\pm 0.02}$
	M2	0.573$^{\pm 0.01}$	**0.677**$^{\pm 0.02}$	0.717$^{\pm 0.01}$
	M3	**0.643**$^{\pm 0.01}$	0.670$^{\pm 0.02}$	0.723$^{\pm 0.01}$
Nested	M1	0.458$^{\pm 0.01}$	0.494$^{\pm 0.02}$	0.557$^{\pm 0.00}$
	M2	0.499$^{\pm 0.05}$	0.554$^{\pm 0.00}$	0.612$^{\pm 0.01}$
	M3	**0.563**$^{\pm 0.02}$	**0.583**$^{\pm 0.02}$	**0.629**$^{\pm 0.03}$
Nested +subtypes	M1	0.449$^{\pm 0.07}$	0.493$^{\pm 0.02}$	0.497$^{\pm 0.01}$
	M2	0.504$^{\pm 0.03}$	0.544$^{\pm 0.06}$	0.575$^{\pm 0.02}$
	M3	**0.553**$^{\pm 0.04}$	**0.545**$^{\pm 0.02}$	**0.593**$^{\pm 0.08}$

M1: ARBERTv2 M2: MARBERTv2 M3: ARABERTv2

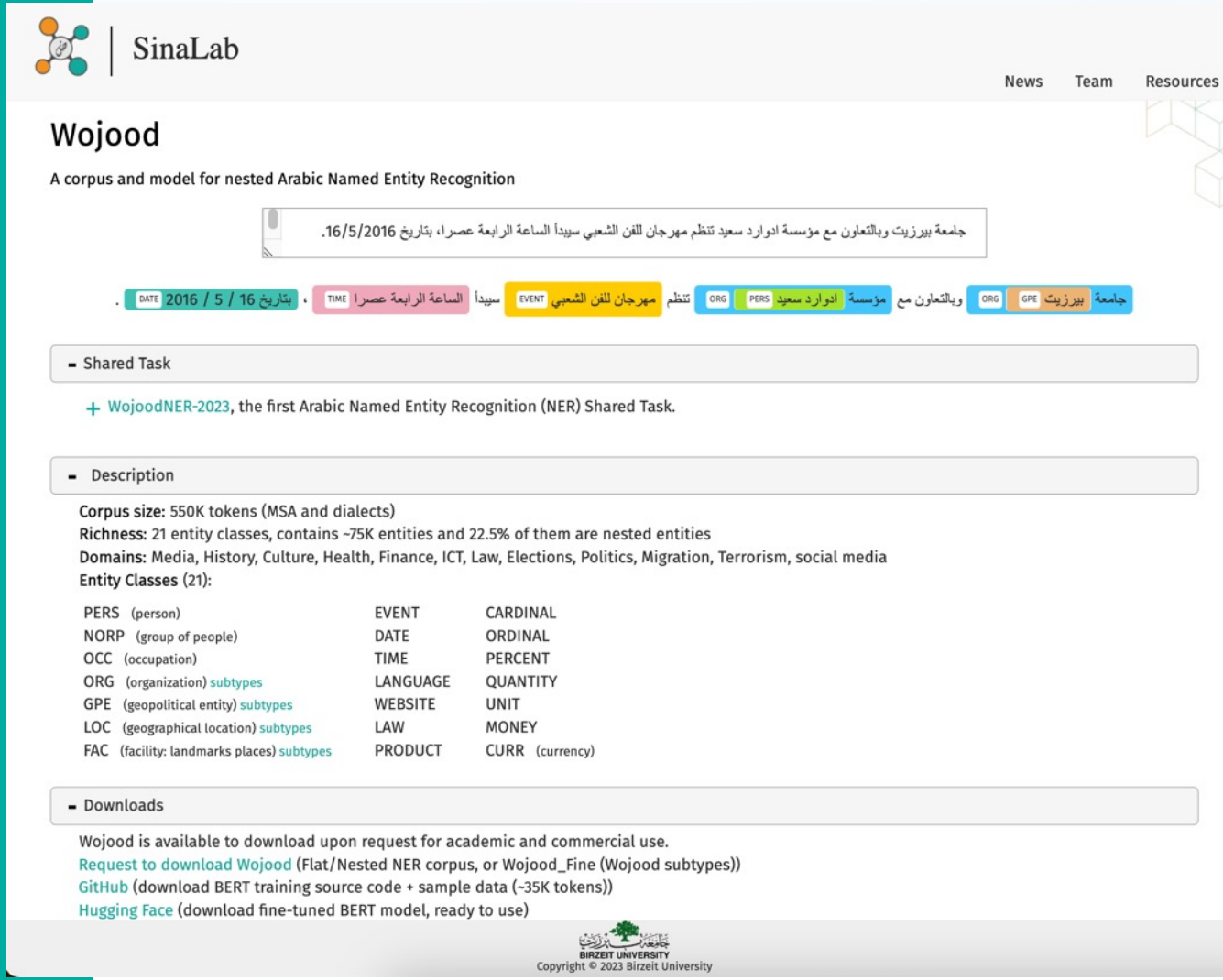
The results are represented as F1 averaged over 3 runs.

Try

ArabicNER

ArabicNER-Wojood

https://ontology.birzeit.edu/wojood



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