A Large and Diverse Arabic Corpus for Language Modeling

I. INTRODUCTION

Large Language Models (LLMs) have introduced a major shift in the Natural Language Processing (NLP) paradigm where large pre-trained Language models (LMs) became a fundamental component of many NLP tasks. The LLMs are intelligent enough to find relevant and meaningful representations of a language without any supervision. Perhaps, these models are used to fine-tune typical NLP tasks with substantially higher precision than conventional shallow learning techniques. In contrast, training these models requires a massively large corpus that adequately represents a language. Due to the availability of enormous corpora, English LLMs typically perform better than their counterparts.

This effort focuses on the design and development of a large Arabic corpus. The corpus comprises over 500 GB of Arabic cleaned text intended to improve cross-domain knowledge and down-stream generalization capability of LLMs. The corpus was employed in the training of a large Arabic LM. In order to assess the efficacy of the LLM, a variety of typical NLP tasks were fine-tuned. The fine-tuned tasks exhibited a significant boost in accuracy ranging between 4.5 to 8.5% when compared to the ones down-streamed from multi-lingual BERT (mBERT). To the best of our knowledge, this is currently the largest clean and diverse Arabic corpus ever assembled.

Index Terms—Arabic Corpus, GPT-3, Language Model, Transformers, NLP

In order to overcome the issue, this work presents the design and development of a 500 GB high-quality Arabic corpus that may use to train the large Language models (LMs). The corpus comprised 20 diverse data-sources, including both existing and newly developed. The LLMs trained on this corpus greatly elevated the accuracy of a variety of down-stream tasks, which are detailed in the following sections.

The paradigm shift began with the introduction of Bidirectional Encoder Representations from Transformers (BERT) in 2018 by Google [20]. Google’s BERT outperformed the previous state-of-the-art Long-Short Term Memory (LSTM) based Recurrent Neural Network (RNN) models with a significant improvement of up to 7.7% on typical NLP tasks. In fact, the major credit goes to a powerful state-of-the-art neural architecture known as Transformer with an attention mechanism [47]. BERT has another variant which is trained in 104 different languages, including Arabic, known as multi-lingual BERT (mBERT). Moreover, the individual BERT models are only available for the English and Chinese languages. The Arabic model is trained on a small corpus and only validated on the sentence contradiction task. Though, Arabic mBERT was able to achieve state-of-the-art results in 6 text classification tasks with a few-short task-specific fine-tuning.

A year later, [23] proposed the first Arabic Universal Language Model, referred to as hULMonA, and exhibited its use for Arabic Text classification tasks. The experimental results demonstrate that hULMonA generalizes well to diverse Arabic tasks and has obtained state-of-the-art performance on Arabic Sentiment Analysis. Consequently, AraBERT [13] and GigaBERT [35] are two LLMs trained on a reasonably large Arabic corpus which primarily consists of Modern Standard Arabic (MSA) dialect. On the majority of down-stream tasks, both LLMs produced better results compared to mBERT.

An effort similar to this work has been made for the English language with the introduction of Pile in 2020 [30]. The Pile is an 825 GB large and diverse corpus composed of 22 smaller and high-quality sources. Pile encompasses broad knowledge and reasoning abilities in a number of different disciplines, making it a robust benchmark for general text modeling ability for LLMs. The proposed Arabic corpus effort was inspired by Pile.

The notable contributions of this work are listed as follows:
### Table I

| Grapheme | Arpabet Description | Grapheme | Arpabet Description | Grapheme | Arpabet Description |
|----------|---------------------|----------|---------------------|----------|---------------------|
| ت | hamza               | ح | kha                 | ل | lam                 |
| أ | AE/E alif           | د | dal                 | م | meem                |
| أ | AE: alif maddah     | ذ | DH                  | ن | noon                |
| أ | E alef + hamza above| ر | R                   | ه | HH                  |
| أ | E waw + hamza above | ز | Z                   | و | W                   |
| أ | E alef + hamza below| س | S                   | ي | AE alif maksura     |
| أ | E ya + hamza above  | ش | SH                  | ي | Y                   |
| أ | E waw + hamza above | ص | SS                  | أ | AE fathah           |
| أ | E alef + hamza below| ض | DD                  | إ | IH                  |
| أ | E ya + hamza above  | ط | TT                  | إ | UH damma            |
| ب | B                   | ط | DH2                 | أ | AE N fathathan      |
| ة | T/H ta marbuta      | ع | AI                  | إ | IH N kasrathan      |
| ت | T/H ta              | غ | GH                  | أ | UH N dammathan      |
| ث | TH tha              | ف | F                   | إ | -                   |
| ج | ZH                  | ق | Q                   | إ | -                   |
| ح | HH                  | ك | KH                  | ك | kaf                 |

1) The design and development of over 500 GB of Arabic corpus comprising of 20 distinct new and current sources.

2) Training an Arabic LLM on the proposed corpus on 2.7 billion parameters Generative Pre-trained Transformer 3 (GPT-3) architecture.

3) A comprehensive evaluation of the LLM’s performance on 5 typical supervised NLP tasks.

### II. Corpora

The proposed Arabic corpus consists of 20 constituent data-sources, which are listed in Table VIII and their statistics are reported in Table IX. The sources belong to news, academic, social, religious, cultural, and other related domains. These sources represent a sizeable proportion of most widely spoken Arabic dialects, such as MSA, Egyptian, Gulf, Levant & North African (MEGLN) along with Classical Arabic (CA).

The raw corpus is compiled from diverse sources that possess different character-sets. Hence, a common character-set was defined to standardize all the sources, which are shown in Table I. The character-set included 3 short vowels namely fathah, kasra, and damma; 3 long vowels, known as alef, waw, and ya; 5 Arabic diacritical marks comprising fathatan, kasratan, dammatan, shadda, and sukun along with 36 standard consonants of Arabic. The diacritical marks are crucial to the Arabic pronunciation. The inclusion of diacritical marks in the corpus may lead to the zero-short diacritization generation which is regarded as essential for nearly all speech-processing tasks [4], [7], [9]. The following sections briefly summarize all the sources.

#### A. ArabicWeb16

ArabicWeb16 is a web crawl of a large number of Arabic web-pages with extensive coverage of both MSA and Dialectal Arabic (DA) [45]. The corpus consists of more than 150 million web-pages crawled during the month of January 2016 and spans a wide range of disciplines and dialects. It has several forums, including seeded question-answer sites, and numerous informational pages, such as Wikipedia, that can be used to promote questions-answering research. Table IX depicts the distribution of dialects and domains used in this corpus.

#### B. OSCAR

The Open Super-large Crawled ALMANaCH coRpus (OSCAR) is a multi-lingual corpus that was extracted from Common Crawl (CC) using language classification, filtering, and cleaning. The whole collection of CC’s is composed of petabytes of monthly snapshots collected since 2011 [44].
C. Common Crawl (CC)

CC is a collection of 9 billion website crawls from the year 2012 to 2017, comprising raw web-pages, metadata, and text extractions [18]. Due to the raw nature of the corpus, CC covers content from diverse domains at the cost of data of variable quality. Therefore, well-designed extraction and filtering routines were applied to the entire corpus, elaborated in Algorithm[1] resulting in higher-quality output.

D. 1.5 Billion Words Corpus

The corpus is an attempt to build a contemporary linguistic corpus [22]. It contains roughly 1.5 billion words, of which approximately 3 million are unique. The corpus was collected from 5 million newspaper articles from 10 different news sources published in 8 Arab countries spanning 14 years. Table III lists the sources of the corpus, their provenance, the time period, their country of origin, and statistics.

| Source                      | Country     | Period             | Documents | Terms   |
|-----------------------------|-------------|--------------------|-----------|---------|
| Alhilal                      | Emirates    | Jan’08-Jun’14      | 3,489,342 | 932,628 |
| Echorouk Online              | Algeria     | Feb’8-May’14       | 139,732   | 543,799 |
| Alriyadh                     | KSA         | Oct’00-Dec’13      | 858,188   | 1,451,320 |
| Alyaum                       | KSA         | Jul’00-Dec’13      | 888,068   | 1,319,996 |
| Tishreen                     | Syria       | Jan’4-May’14      | 314,597   | 905,169  |
| Alqabas                      | Kuwait      | Jan’6-Apr’14       | 817,274   | 1,260,511 |
| Almustaqbal                  | Lebanon     | Sep’03-Apr’14      | 446,873   | 982,765  |
| Almasry-alayoum              | Egypt       | Dec’15-Jan’14     | 291,723   | 760,511  |
| Youm-7                       | Egypt       | Jan’8-May’13      | 1,025,027 | 1,020,444 |
| Saba News                    | Yemen       | Dec’9-May’14      | 92,149    | 255,098  |
| **Total**                    |             |                    | **5,222,973** | **9,432,241** |

E. OSIAN

The Open Source International Arabic News (OSIAN) corpus is a compilation of 31 international Arabic news broadcasting outlets. The filtered and cleansed data comprises of 3.5 million articles retrieved from 6 million web-pages. These articles include more than 37 million phrases and approximately 1 billion tokens [50]. This effort aimed to build a balanced corpus in which the data was drawn from a wide range of reliable and freely available sources. The crawling was carried out in March 2018. Table IV lists the corpus’ demographic and discipline statistics of the corpus.

| Demography | Web-domain | Articles |
|------------|------------|----------|
| International | un.org, euronews.com, reuters.com, namnewswork.org, sputniknews.com | 693,629 |
| Middle-east | aljazeera.net, alarabiya.net | 366,211 |
| Algeria     | djazaress.com | 585,514 |
| Australia   | eletrelegraph.com | 4,614 |
| Canada      | arabnews.ca, halacanada.ca | 30,135 |
| China       | aracic.cctv.com | 1,365 |
| Egypt       | alwatanalarabi.com | 85,351 |
| France      | france24.com | 74,718 |
| Iran        | alalam.ir | 344,011 |
| Iraq        | iraqkhbar.com | 28,248 |
| Germany     | dw.com | 117,261 |
| Jordon      | sarayanews.com | 49,461 |
| Morocco     | www.maropress.com | 188,045 |
| Palestine   | al-ayyam.ps | 81,495 |
| Qatar       | ray.com | 8,986 |
| Russia      | arabic.rt.com | 57,238 |
| Saudi Arabia | alwatan.com.sa | 1,512 |
| Sweden      | alkomps.se | 33,790 |
| Syria       | syriaNews | 365,42 |
| Tunisia     | www.turess.com | 495,647 |
| Turkey      | turkey-post.net, aa.com.tr | 76,638 |
| UAE         | emaratayoum.com | 25,081 |
| UK          | bbc.com | 10,686 |
| USA         | arabic.cnn.com | 113,557 |
| **Total**   |             | **3,512,762** |

F. Wikipedia and Wiki Books

The Arabic Wikipedia and Arabic translation of English Wikipedia are two distinct sources that were retrieved between January and October 2021 respectively. The Arabic Wikipedia is predominantly written in MSA and Egyptian DA [27]. The English Wikipedia is translated using English-Arabic Machine Translation (MT), whereas the MT was trained on MSA dialect corpus.

Arabic Wiki Books corpus is shard from MSA Arabic Wikipedia [33], which was cleaned and formatted. This source was merged with another Arabic books source known as Al-Shamela [15]. Moreover, several books were excluded from the dataset owing to bad formatting.

G. MGB-2

The Multi-Genre Broadcast-2 (MGB-2) corpus is derived from the second edition of the MGB-2 Challenge [34]. The corpus is composed of the manually captioned recorded programs of Al-Jazeera Satellite Channel (Al-Jazeera) TV spanning over 10 years. The quality of the transcription varies substantially with multiple dialects and overlapping talkers, which is a typical scenario for political debate and talk shows. According to a rough estimation, more than 70% of the speech is in MSA dialect and the rest is in DA.

H. Arabic News and Ajdir Corpus

The Arabic newspaper articles corpus was collected from British Broadcasting Corporation (BBC) Arabic, EuroNews, Al-Jazeera, Cable News Network (CNN) Arabic, and Russia Today (RT) Arabic. These news articles were collected in April 2019 [11]. Table V is reporting the statistics of the 5 different sources.

Ajdir is another multi-source news corpus comprising 113 million tokens [11].

I. OSAC

The Open-Source Arabic Corpora (OSAC) contains a collection of journalistic text corpus that is freely accessible [42].
The corpus is composed of web documents extracted from over 25 Arabic websites, comprising roughly 113 million tokens, that are categorized into 3 distinct sources as shown in Table VI. The BBC and CNN news articles belong to 7 categories including Middle East (ME), world news, business & economy, sports, international press, science & technology, and art & culture. It is assembled from numerous websites belonging to 10 categories including economics, history, education & family, religion & fatwas, sports, health, astronomy, law, stories, and cooking recipes.

| Source        | Documents | Tokens  | Terms   |
|---------------|-----------|---------|---------|
| BBC           | 212,271   | 1,764,796 | 1,076,526 |
| RT            | 368,920   | 3,411,451 | 2,080,985 |
| Al-Jazeera    | 249,106   | 1,525,372 | 930,477  |
| EuroNews      | 46,468    | 517,227  | 315,508  |
| CNN           | 30,338    | 317,260  | 193,529  |
| Total         | 907,103   | 7,536,106 | 4,597,025 |

### Table VI

| Source | Documents | Tokens  | Terms   |
|--------|----------|---------|---------|
| BBC    | 4,763    | 1,860,786 | 106,733  |
| CNN    | 5,070    | 2,234,348 | 144,460  |
| OSAC   | 22,429   | 18,183,311 | 449,600  |
| Total  | 32,262   | 22,285,645 | 700,793  |

### J. Common Crawl 100 (CC-100)

It is a collection of sources comprising mono-lingual data for 100+ languages, notably data for romanized languages [48]. It was constructed using the URLs and paragraph indices from the CC-Net repository of 2018 CC snapshots. Each file comprised of documents separated by double-newlines and paragraphs separated by a single newline.

### K. Tashkeela

Tashkeela is a fully-diacritized Arabic corpus that is commonly used to train NLP tasks such as automatic diacritization and disambiguation resolution [49]. The corpus contains 75.6 million fully-vocalized words mainly collected from 97 books written in the MSA and CA dialects. The sources of the corpus along with their statistics are listed in Table VII. Additionally, a number of modest, fully-diacritized sources pertaining MEGLN dialects were collected [49].

### L. KSUCCA

King Saud University Corpus of Classical Arabic (KSUCCA) is a pioneering 50 million tokens annotated corpus representing CA dialect from the pre-Islamic era to the 4th Hijri [11]. This corpus aims at studying the distributional lexical semantics of The Holy Quran words. However, it can also be used for other NLP tasks, such as Information Retrieval (IR), MT, and Question Answering (QA).

### M. EAPCOUNT and AMARA

English-Arabic Parallel Corpus of the United Nations Texts (EAPCOUNT) is a well-known English-Arabic parallel corpus comprising 5,392,491 words compiled from two sources, including the English original text and its corresponding Arabic translation. The content of the corpus primarily includes resolutions and annual reports issued by different United Nations organizations, along with excerpts from the publications of other international institutions [51]. AMARA is another source of online educational video subtitles that provides multilingual alignment of 20 languages [2].

### N. ArSAS and Arabic Tweets

Arabic Speech-Act and Sentiment (ArSAS) is an annotated Arabic tweets corpus generally used for sentiment analysis task [25]. A vast collection of 21,000 Arabic tweets were collected from a variety of domains. Moreover, the same set of tweets was categorized into 4 classes including positive, negative, neutral, and mixed. This corpus was coupled with another large corpus of sentiment analysis having 4,418,128 tweets known as Arabic Tweets Corpus [43].

### O. OpenITI

Open Islamicate Texts Initiative (OpenITI) is a large-scale, historical corpus of Arabic containing 1 billion words from various epoch periods. The corpus was cleaned and processed with a morphological analyzer. This corpus was combined with the second version of Al-Shamela which contained 6,111 historical Islamic books, accessible until the beginning of the month of Rajab 1433 AH.

### P. Arabic Books Corpus

It is a large Arabic corpus developed as part of a research project namely A New Approach of Semi-Indexing of Text Documents [16]. The corpus comprises of more than 460 Arabic books. It can be used for the development of language engineering applications, IR, and information extraction. The size of the corpus is 137 MB which contains 23,264,785 tokens.

### Q. Hadith Books

It contains Hadith from the 9 sahih books scraped from islambook website. There is a total of 62,169 Hadith where Sahih Bukhari has 7,008, Sahih Muslim has 5,362, Sunan Al-Tirmidhi has 3,891, Sunan al-Nasai has 5,662, Sunan Abu-Dawud has 4,590, Sunan Ibn Maja has 4,332, Musnad Ahmad
TABLE VIII
OVERVIEW OF THE DATA SOURCES USED TO DEVELOP THE PROPOSED CORPUS

| Corpus Name                        | Language           | Dialect               | Domain | Duration | Reference |
|------------------------------------|--------------------|-----------------------|--------|----------|-----------|
| ArabicWeb16                        | Arabic & English   | Multi-dialect         | Cross  | Jan 2016 | [45]      |
| OSCAR                              | Arabic             | MSA & Egyptian        | Cross  | 2011     | [44]      |
| CC                                 | Arabic             | MEGLN                 | Cross  | 2012-2017| [18]      |
| 1.5 Billion Words Corpus           | Arabic             | MEGLN                 | News   | 2000-2014| [22]      |
| OSIAN Corpus                       | Arabic             | Multi-dialect         | News   | Mar 2018 | [50]      |
| Arabic Wikipedia                   | Arabic             | MSA & Egyptian        | Cross  | Feb 2021 | [28]      |
| English Wikipedia (translated)     | Arabic & English   | MSA                   | Cross  | Oct 2020 | [27]      |
| Arabic Wiki Books                  | Arabic             | MSA                   | Education | Feb 2020 | [33]      |
| MGB-2                              | Arabic             | MEGLN                 | News   | 2005-2015| [34]      |
| Arabic News and Ajdir Corpus       | Arabic             | MSA                   | News   | Apr 2019 | [41]      |
| OSAC                               | Arabic             | Multi-dialect         | News   | 2010     | [42]      |
| CC-100                             | Arabic             | MSA                   | Cross  | Jan-Dec 2018 | [48] |
| Tashkeela                          | Arabic             | MEGLN & CA            | Education | - | [46], [49] |
| KSUCCA                             | Arabic             | CA                    | Education | - | [11] |
| EAPCOUNT and Amara                 | Arabic & English   | MSA                   | Cross  | -        | [10], [51] |
| ArSAS and Arabic Tweets Corpus     | Arabic             | MSA                   | Social | -        | [25]      |
| OpenITI                            | Arabic             | CA                    | Religion | - | [14], [15] |
| Arabic Books Corpus                | Arabic             | Multi-dialect         | Education | - | [16] |
| Hadith Books                       | Arabic             | CA                    | Religion | 9th century | [31] |
| Arabic Poetry                      | Arabic             | Multi-dialect         | Culture | till 2019 | [3] [24] |

TABLE IX
THE STATISTICS OF THE RAW AND CLEAN SOURCES WHERE THE TEXT SIZE IS IN GB

| Corpus Name                        | Documents | Raw Text  | Clean Text |
|------------------------------------|-----------|-----------|------------|
| ArabicWeb16                        | 3,005     | 12,000.00 | 99.80      |
| OSCAR                              | 46        | 80.07     | 76.07      |
| CC                                 | 25        | 1,200.00  | 250.00     |
| 1.5 Billion Words Corpus           | 10        | 16.50     | 15.00      |
| OSIAN Corpus                       | 24        | 4.70      | 4.50       |
| Arabic Wikipedia                   | 12        | 21.20     | 6.60       |
| English Wikipedia (translated)     | 112       | 22.00     | 13.00      |
| Arabic Wiki Books                  | 512       | 5.70      | 5.50       |
| MGB-2                              | 1         | 1.30      | 1.20       |
| Arabic News and Ajdir Corpus       | 203       | 1.816     | 1.80       |
| OSAC                               | 32,262    | 0.29      | 0.27       |
| CC-100                             | 1         | 28.00     | 26.00      |
| Tashkeela                          | 397       | 1.493     | 1.34       |
| KSUCCA                             | 410       | 0.44      | 0.44       |
| EAPCOUNT and Amara                 | 17,435    | 9.55      | 9.09       |
| OpenITI                            | 7,145     | 13.85     | 13.00      |
| Arabic Books Corpus                | 462       | 0.234     | 0.22       |
| Hadith Books                       | 18        | 0.10      | 0.90       |
| Arabic Poetry                      | 30,073    | 0.209     | 0.09       |
| Total                              | 92,218    | 13,000    | 500.24     |

ibn Hanbal has 26,363, Malikus Muwatta has 1,594 and Sunan al Darami has 3,367 Hadiths.

R. Arabic Poetry

The Arabic Poetry corpus is the oldest and the most prominent form of Ancient Arabic poetry that is accessible today [3]. The corpus has over 58,000 poems composed in the 6th century. This was combined with a song lyrics corpus, known as Habibi, which is the first Arabic song lyrics corpus collected by [21]. This source comprises more than 30,000 Arabic song lyrics in 6 Arabic dialects by singers from 18 Arab countries. The lyrics were segmented into more than 500,000 verses having 3.5 million words.

III. DATA CLEANSING

The corpus was collected from multiple sources spanning from high-quality to the very noisy corpus. Each source came up with its own character-set, diacritical marks, and other normalization ones. These challenges necessitated the cleansing and normalization of distinct sources possess different rules, into a standardized corpus. The text of the data-sources was standardized according to the character-sets provided in Table I. However, the characters which are not listed in the character-set were regarded to be noisy character. The hamza above diacritical mark was normalized by combining it with its corresponding long vowel instead of separately dealing hamza as diacritical mark. Furthermore, both English and Arabic punctuation marks were found in the raw text which were normalized to Arabic punctuation marks. The punctuation marks other than “! ? .” were removed from the text. For instance, in Arabic, hyphen is used as a sentence marker and also Arabic version of the comma, semi-colon, and question mark was used instead of their English versions. Conversely, the Arabic digits were normalized to their corresponding English digits, since the English digits are frequently occurring in the Arabic text.

In order to further reduce lexical sparsity, all the sources were cleaned by masking the web-links, email addresses, phone numbers, and similar kinds of identification-related
information with their corresponding tags. Sometimes in Arabic, the characters are repeated more than twice in a word either to emphasize or make it the title of the document, known as tatweel. Tatweel was also stripped during the cleansing process. The tokenization was done using Farasa word segmentor and the emojis were preserved in the text. The Arabic word segmentation was applied before byte-pair encoding (BPE) tokenization which was found to be effective for the down-stream tasks. The data cleansing pseudocode is outlined in Algorithm 1.

**Algorithm 1** Corpus cleansing and standardization routine

```plaintext
sentence.replace(URLs, [link]); // replace URLs with tag
sentence.replace(Emails, [mail]); // replace emails with its corresponding tag
sentence.replace(html_markup, ''); // remove html markup
sentence.replace(_, ''); // remove tatweel
sentence = normalize hamza above ٠١٠٢٠٣;
sentence = remove parentheses & content between them;
sentence = standardize Arabic characters;
sentence.replace(punctuation, ''); // remove punctuation
sentence.replace(noisy_characters, ''); // remove noisy characters
```

### IV. LANGUAGE MODELING

The cleaned corpus was used to train a large Arabic LM. The model was trained without any supervision as the next word prediction problem. In order to train the model, a GPT-3 architecture containing 2.7 billion parameters were used. The model consisted of 32 transformer decoder layers, each of which comprised of self-attention and feed-forward sub-layers, containing 32 attention heads per layer having 80 dimensions each. Moreover, a large batch size of 1 million instances was used in conjunction with a learning rate of 1.6x10^-4.

A mesh-Tensorflow implementation was used to train the model due to the unavailability of GPT-3 implementation. The mesh-Tensor flow implementation was used for BPE which converted the text into a series of integers. The input was transformed into BPE before feeding into the model. The model was trained on 128 x Tensor Processing Unit (TPU) v3 for 320 hours.

### V. EVALUATION

The LLM was evaluated by fine-tuning a number of standard NLP tasks, such as Machine Reading Comprehension (MRC), Text Summarization, Diacritics Restoration, Sentiment Analysis, and Part-of-speech (POS) Tagger. Despite the fact that the proposed LLM is a Generative Pre-trained Transformer (GPT) architecture, it was compared to the most popular LM, mBERT. Perhaps, both of them are based on the transformer architecture, however, they are fundamentally different where BERT consists of only encoder blocks, conversely, GPT has decoder blocks.

The MRC task was fine-tuned on the Arabic-translated version of Stanford Question Answering Dataset (SQuAD) comprising 48,344 question-answer pairs. The evaluation was performed using the SQuAD metric, which measures the proportion of correct predictions that fall within the same sentence as the ground truth answer.

Text Summarization was trained on a multi-purpose Arabic corpus of 20,291 articles with respective extractive summaries. The dataset belongs to 6 broad categories including culture, economy, local news, international news, religion, and sports. The quality of summarization was evaluated and compared with the down-stream task from mBERT using Rough measures.

The diacritics restoration task was fine-tuned on the transcript of the widely used Arabic speech recognition corpus, known as King Saud University (KSU). The corpus contains 10,000 rich and balanced sentences that were manually diacritized on the MSA dialect. In order to evaluate this task, Word Error Rate (WER) was computed at the word-level.

The sentiment analysis task was down-streamed on the HARD dataset comprising of 93,700 hotel reviews. The dataset covers both MSA and DA. The reviews were categorized into positive, negative, and neutral reviews. To determine the effectiveness of the fine-tuning, the accuracy metric was adopted.

Penn Arabic Treebank (PATB) is the most commonly used dataset for POS Tagging. It contains approximately 300,000 pairs of Arabic words which are grouped into 33 POS tags. The performance of the POS tagger was tested using the WER measure.

The LLM trained on the proposed corpus has significantly outperformed the multi-lingual mBERT on all the down-stream NLP tasks. The statistics of the few-shot learning on the proposed LLM along with their comparison with the tasks fine-tuned on mBERT are reported in Table X.

### VI. CONCLUSION

This paper details the design and development of the largest clean and most diverse Arabic Corpus, specifically for training large-scale LMs. Although Arabic is the 5th most widely spoken language, the Arabic LLMs are trained on a relatively small corpus which is an insufficient representation of such a rich language. Therefore, the Arabic NLP tasks persistently struggled to perform better than English tasks, emphasizing the need for a diversified Arabic corpus sufficient for training a large Arabic LM.

The proposed corpus is inspired by Pile. It consists of over 500 GB which intends to improve cross-domain knowledge and down-stream generalization capability of Arabic LLMs. Furthermore, the corpus was utilized to train a GPT-3 model having 2.7 billion parameters. This model was evaluated by fine-tuning several supervised learning NLP tasks. The evaluation proved the efficacy of the diverse corpus and LLM trained.
on it. The tasks that were fine-tuned using the proposed LLM significantly outperformed the ones down-stream on mBERT.

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