Towards Neural Machine Translation for Edoid Languages

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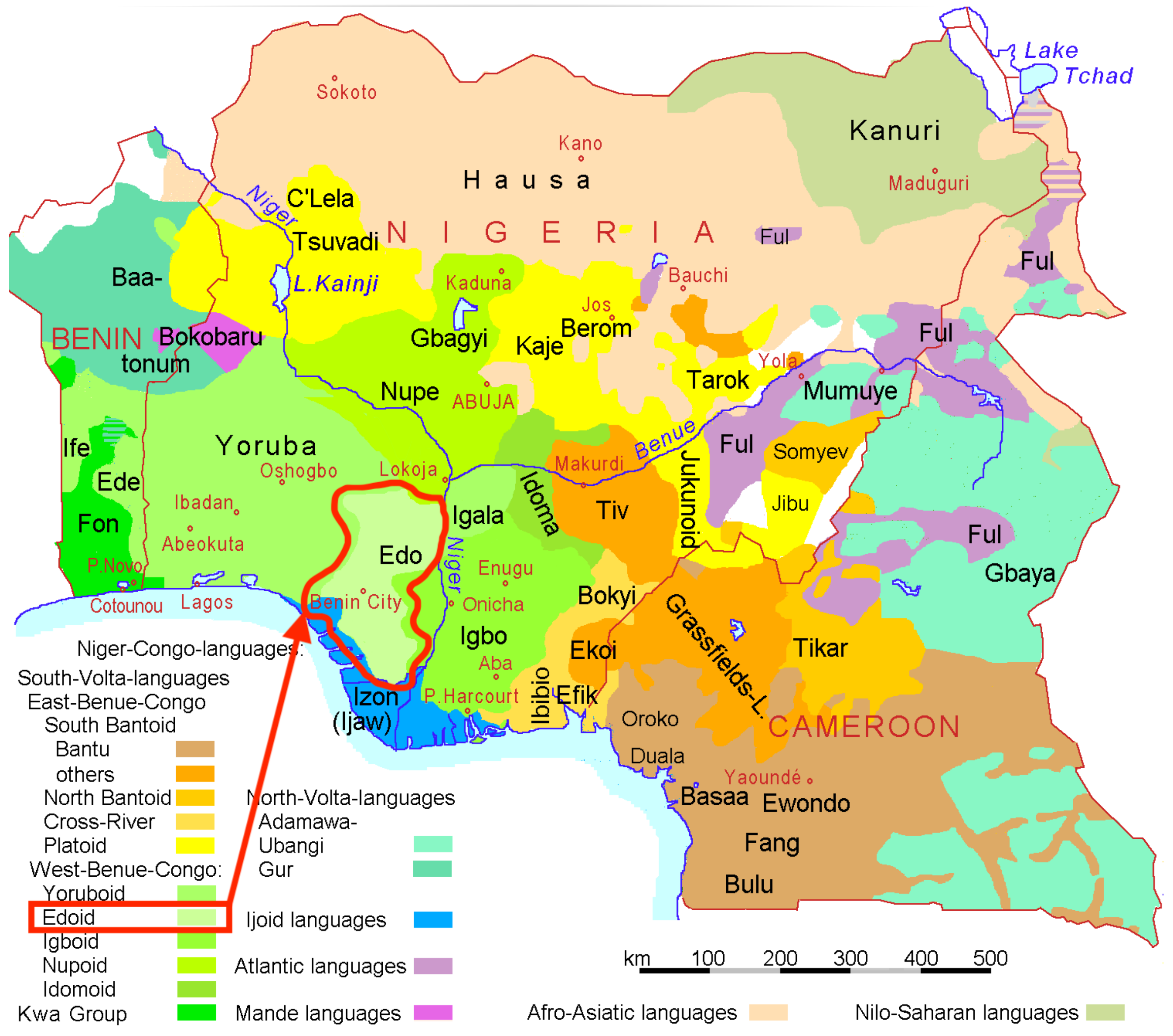
Overview

Many of the 500 plus languages spoken in Nigeria today have relinquished their previous prestige and purpose in modern society to English and Nigerian Pidgin, notably amongst the younger generations.

For tens of millions of speakers, language inequalities manifest themselves as unequal access to information, communications, health care, security along with attenuated participation in political and civic life [Odoje, 2013, Awobuluyi, 2016].



Machine Translation (MT) can facilitate good governance, national development and offers a path for technological, economic, social and political participation and empowerment to those with unequal access.

Paper (arXiv)
2003.10704

This Work

Using the new JW300 public dataset, we trained and evaluated baseline Neural Machine Translation (NMT) models for four widely spoken Edoid languages listed below with their classification from [Elugbe, 1989].

Language	Branch	# Speakers
Ẹ̀dó	North-Central	~1.6 - 2.3M
Ésán	North-Central	~630k
Urhobo	Southwestern	~1 - 1.5M
Isoko	Southwestern	~660k

Dataset: JW300 dataset is a large-scale, parallel corpus comprising more than 300 languages of which 101 are African. JW300 text is drawn from the Watchtower and Awake! religious magazines by Jehovah's Witnesses (JW). The test set contains sentences with the highest coverage across all other languages in the corpus.

Models: The open-source, Python 3 machine translation toolkit **JoeyNMT** was used to train Transformer models [Vaswani et al., 2017]. Our training hardware was the free-tier configuration on Google Colaboratory, a single core Xeon CPU instance and a Tesla K80 GPU.

Experimental Setup

We trained baseline Transformer models for each langauge using:

- Byte Pair Encoding (BPE) subword tokenization
- Word-level tokenization.

For BPE, 4000 BPE tokens were used based on ablation study by Martinus et al. for South African languages [Martinus and Abbott, 2019].

Results

Per-language BLEU scores by BPE or word-level tokenization

Language	BPE		Word		Tokens	Sentences
	dev	test	dev	test		
Ẹ̀dó	7.92	12.49	5.99	8.24	229,307	10,188
Ésán	4.94	6.25	3.39	5.30	87,025	4,128
Urhobo	15.91	28.82	11.80	22.39	519,981	25,610
Isoko	32.58	38.05	32.38	38.91	4,824,998	214,546

Analysis

- Urhobo and Isoko translation quality was generally **satisfactory** when reviewed by L1 speakers, correlating with higher BLEU scores.
- BPE tokenization provided ~**37% boost** for Ẹ̀dó and Ésán, a **32% boost** for Urhobo but was flat to slightly **worse** than word-level tokenization for Isoko.
- The performance of the Isoko models, with BLEU scores in the range $\{32, 39\}$, gives an estimate of how much **additional clean text** is required to achieve a similar performance with Ẹ̀dó and Ésán.
- A full ablation study with different (subword) tokenization approaches is needed to discover a more optimal representation.
- A **human evaluation study** and extensive error analysis will be crucial to better understand the linguistic features where NMT models under-perform.
- Future work include investigations using unsupervised machine translation and back-translation.

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Code (Github)
Niger-Volta-LTI/edoid-nmt