ABSTRACT
Developing Information Retrieval (IR) tools and techniques in African languages suffers from the dual problems of a lack of algorithms and very small test data collections. This affects the creation of practical IR systems and limits the ability to apply IR to address human and socio-economic problems, which is an urgent need in poor countries. This position paper presents an overview of recent and current work conducted at the University of Cape Town in this area. While many problems have been investigated at an early stage, limited dataset sizes for local African languages still persist as a significant limitation and stumbling block.

CCS CONCEPTS
• Information systems → Document collection models; Search engine indexing; Multilingual and cross-lingual retrieval;

KEYWORDS
African languages, Bantu languages, low-resource, multilingual

1 INTRODUCTION
In countries where English is not the only language spoken, algorithmic support for non-English content varies. In poor African countries, very little is known about searching in local languages. This impacts on the use of local languages for teaching and learning, knowledge discovery and, especially, the addressing of development-centric problems in such countries. Recent research done at the University of Cape Town has centred on the duality of exploring Information Retrieval (IR) in African languages, with a focus on Bantu languages, and the use of IR to explicitly address human and socio-economic development problems in poor countries.

2 RECENT RESEARCH
Early explorations in multilingual document collections made it apparent that there was a miniscule online presence in languages such as isiZulu and isiXhosa (the largest South African language groups, with 8-9 million speakers of each) and creating new document collections was non-trivial [11]. Using Wikipedia as a gross estimate for interest in electronic document creation, most South African languages contain approximately 1000 documents or fewer, as of 2018, and appear in the lowest quartile of languages by content.

Our first major study related to African multilingualism discovered that most commercial search engines make a single language assumption about queries so users who are fluent in multiple languages do not get good results from mixed language queries [7]. This study went on to show how a deeper understanding of queries and documents without single-language assumptions can support a better quality re-ranking of documents. Arabic was the language of this study because of the scarcity of documents in isiXhosa or isiZulu around 2007, and limited interest in corpus development and computational linguistics in Bantu languages at the time.

Being invited to participate in the EU MUMIA Cost Action (2012-2014) made it apparent that low resource languages are, in fact, a common problem internationally. In addition, given renewed interest in local language issues [12] [5], search in African languages seemed more viable.

A case study was then conducted into the feasibility of an isiZulu search engine [4] and it was clear that language preprocessing tools and language identification tools were the key elements needed for basic non-English support. The focus was on algorithms such as stemmers and language detection that used a combination of statistical (e.g., n-gram) and natural language processing (e.g., morphological analysis) techniques. Follow-on projects have considered baseline search engines for isiXhosa [3] and, more recently, cShona.

In parallel with developing IR tools for low-resource Bantu languages, we have also considered how users will access these tools in poor countries. Assuming that such users only have access to mobile devices, the feasibility of a fully-isiXhosa speech-driven interface on a mobile phone was demonstrated [6].

3 ONGOING AND FUTURE WORK
Because of natural similarities between these languages, and the high number of regional languages that are considered low resource languages, a broader project is attempting to build language group-oriented tools (such as stemmers [2]) to exploit similarity of the languages at the processing stages [1] and exploit the fact that users...
who can read one language can often read many related languages as well.

There are ongoing efforts to collect original and translated texts in multiple low-resource local languages, both as an end in itself and to support further research in this area [13]. We are using multiple variations of gamification techniques to develop these corpora for low-resource languages [10], where it seems that gamification for corpus development works somewhat differently in poor communities than has been reported elsewhere.

Finally, assuming that limited test data will always be a constraint, we are considering how language identification in low-resource Bantu languages works as a function of language model scarcity and unidentified text sparsity.

A parallel strand of research is considering information-centric solutions to address human and socio-economic problems. Early work is looking at how users find jobs and how levels of development may be monitored computationally using combinations of IR and data mining approaches [8] [9].

Ultimately, the goal is to develop African language IR in parallel with other information-centric efforts to actively address development-oriented problems in poor countries.

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