SARAL: A Low-Resource Cross-Lingual Domain-Focused Information Retrieval System for Effective Rapid Document Triage

Elizabeth Boschee, Joel Barry, Jayadev Billa, Marjorie Freedman, Thammy Gowda, Constantine Lignos, Chester Palen-Michel, Michael Pust, Banriskhem Kayang Khonglah, Srikanth Madikeri, Jonathan May, and Scott Miller
University of Southern California Information Sciences Institute, Idiap Research Institute

Goal: Enable English search for text and audio from lower-resourced languages
• Give supporting evidence in English for document relevance to query and domains (topics)
• Provide complete transcriptions and translations
• Models trained on 1.6m words of parallel and 40 hours of transcribed data per language pair

Querying
• Select source language and text/audio/both
• Queries can be morphologically constrained, e.g. to require plural nouns or past tense verbs
• Can filter to select documents estimated to be relevant to pre-specified domains (e.g. health)

Retrieval
• Retrieval matches simultaneously using English via multiple MT outputs, source language via translation tables, and shared embedding space via SEARCHER
• Variety of term expansions used for English retrieval, e.g. stemming, WordNet, paraphrases (PPDB), nearest neighbors in embeddings, etc.
• Can match multi-term queries by using multiple mechanisms simultaneously, e.g. query rainy season might match rainy in MT and xilli (tr: season or time) in source language via translation tables

Speech Recognition (ASR)
• Two Kaldi-based LF-MMI ASR systems, trigram LM rescored with RNN-LM
• Idiap system combines 3 CNN-BLSTM models
• ISI system combines 8 TDNN-F models

Machine Translation
• System combination of Transformer and syntax-based MT, training on <2M parallel words
• Transformer uses additional 14.5M words of backtranslated region-relevant scraped English

SEARCHER
• Maps terms from queries and documents into shared embedding space
• Uses convolutional encoder to contextually encode source terms and attention mechanism to match them to query terms
• Trained using sentence relevance paradigm, where source language sentence is relevant to term t if the parallel English sentence contains t

Domain Classification
• Use NYT Corpus for topic annotations, mapping corpus topics to domains of interest
• Identify uni/bi/tri-grams that are representative of each domain by TF-IDF-like measure

Evidence Generation
• Use document excerpts with highest CLIR scores to concisely highlight why document is relevant
• Use footnotes providing alternate translations for key words to compensate for noisy MT

Demo Capabilities
• Currently loaded indices: Somali and Swahili
• Other tested languages: Bulgarian, Lithuanian, and Tagalog (more to come over time)
• Top end-to-end performance in the most recent IARPA MATERIAL CLIR+summarization evaluations

Adding a New Language
• Add basic support for new language in ~3 days
• Improved system in <10 days, additional time primarily needed for text/audio scraping

Try it out!
• Open https://material.isi.edu/ on a desktop/laptop
• Register using token PpnOMgavHR3j

Contact: boschee@isi.edu

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