Developing Machine Learning Competence in Africa in the Francophone Sahel Region

Workshop on Practical ML for Developing Countries (PML4DC)
International Conference on Learning Representations (ICLR 2020)
Poster Session – April 26, 2020

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Mali

**At A Glance**

- HDI: 0.427 (2019 184/189 country rank, low human development)
- Population: 19.3M (2018)
- GDP: $2,271 (PPP) $891 (nominal)
- Official Language: French (spoken by 21%)
- Primary National Language: Bambara (spoken by 80%)

**Education Policy and Development**

"The major challenge of higher education is to become and to remain the principal motor of Mali's socio-economic development."

Pr. Mahamoudou Famanta
Minister of National Education, Higher Education and Scientific Research
Scientific Isolation of the Francophone Sahel

- Little Funding in Africa, almost none in the francophone countries
  
  **YARDSTICK**: $1.1B to African start-ups (2018), 4% to francophone countries with 30% of the population
  
  *Partech Venture Partners*

- Silicon Valley focuses on anglophone African countries

- African researchers routinely denied opportunities to study and collaborate

- Sahel countries virtually embargoed by travel advisories due to security issues

- English is a poorly taught and rarely mastered 3rd or 4th language
AI in Mali: A Focused Strategy Adapted to a Low Resources Environment

- The Ministry of Higher Education and Scientific Research created a national center for robotics and artificial intelligence education in 2018

- Lacking professors and researchers in AI, existing academic programs, and funding the program was designed to work collaboratively with all educational institutions to seed education and research programs

- Activities:
  - Courses in AI and NLP with cross-institutional enrollment
  - Educational programs for middle and high school students aimed to interest students in AI studies
  - Public conferences on AI
  - Incubation of research and entrepreneurial projects using AI focused on Mali's social and economic growth
Yelenkoura

- Yelenkoura "new light" in Bambara
- Developed at RobotsMali with the participation of the Malian Union of the Blind
- Start-up spun-off, first prototype in production
- Using object sensors and vibration to communicate environmental information, it does not pollute audio sensory information
- Second prototype will include camera and (tinylm) neural network trained on scene images taken in Mali and communicate using a 3-character dynamic braille pad with a shorthand language designed with blind users
- Primary design objective: low cost
Bayɛlɛmabaga ("Translator" in Bambara)

- Creation of a machine translation system for Bambara, an under-resourced national language spoken by 80% of Malians
- Less than 20% of Malians are fluent in French, advancement of use of national languages as a socio-economic development strategy is national policy
- Bayɛlɛmabaga has been proposed as national project
- Bilingual university students have been recruited to create aligned texts for training. It is planned to do this on a massive scale.
- As Bambara is primarily oral, both oral and written translations will be used.

<table>
<thead>
<tr>
<th>French original</th>
<th>English (for reference)</th>
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<tbody>
<tr>
<td>Objectif réfléchir à de nouvelles stratégies de lutte contre le terrorisme qui continue de faire des victimes dans le sahel.</td>
<td>Objective to reflect on new strategies to fight terrorism which continues to claim victims in the Sahel.</td>
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written Bambara

spoken Bambara

Lajɛ ni kun tun ye ka hakili jakabo kɛ fɛɛɛ kuraw la banbaanciw juguya la miniw bɛ ka ciyɛni kɛ Saheli koɔɔna la

A kun tun ye ka miriya kuraw ta ka banbaanciw kɛɛi sira kan o mun bi ka kɛ sababu ye ka fagali caman kesaheli koɔɔnana
Perspectives, Future of AI in Mali

COMMON ELEMENTS
• Data specific to developing country environment
• Imperative for low-cost solutions
• Limited connectivity

NEXT TARGETS
• Agriculture
• WASH (water, sanitation, hygiene)
• Security
• Urban Management

APPROACH
• Belief the AI can provide best approach in terms of cost, time and feasibility
• An approach to bypassing hard infrastructure limitations
• Need for self-reliance, researchers in rich nations have little incentive to help us and probably won't
• Imperative to do what we can now with what we have
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