

Developing Machine Learning Competence in Africa in the Francophone Sahel Region

Anonymous authors
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Abstract

The rationale for a government policy for promoting the development of scientific culture is developed and initiatives in the field of machine learning in the nation of Mali are described. Specific elements of artificial intelligence for Africa are identified.

Mali is a land-locked country with a population of approximately 20 million people on a land mass two times the size of France. Mali is 5th lowest country in the world in the Human Development Index (HDI) ranking and 5th lowest in literacy with only 35% of its population considered literate (Conceição, 2019). Mali is a francophone country in that, as a former colony of France, its official language is French. Only 21% of Malians speak French and only a handful of Malians speak French as their mother tongue (Lafage, 1993). Bambara is the vehicular language, spoken by some 80% of the population. While Bambara has a well-established script and reading and writing of Bambara is taught in many primary schools, French is, by a very wide margin, the dominant written language of Mali (KONATÉ, 2010).

Despite this perhaps unfavorable profile, Mali has a government ministry charged with promoting scientific research, the Ministry of Higher Education and Scientific Research. The rationale of the government, as expressed in national plan for economic development, recognizes a culture of innovation and competence in technologies of scale as necessary preconditions for sustainability in the modern world FINANCES (2019). The government does not accept that there is anything intrinsic that prevents young Malians from achieving high levels of knowledge and competence in sciences and technologies despite the current state of underdevelopment of the country. The nurturing of scientific, technological and entrepreneurial culture and the strengthening of institutions to grow this culture are, therefore, high priority objectives of the national government.

Machine learning is one of the areas of focus in the national program. Mali recognizes that machine learning has become a critical technology of scale for the entire world and that it has significant potential to become an important element in developing the Malian economy. It has been challenging to start a program in machine learning education, research, and entrepreneurship in Mali due to the relative isolation of the country. While all of Africa may be said to be far behind other parts of the world in machine learning, Google, Facebook, Amazon, IBM and many other machine learning powerhouses have been active in many parts of the continent – anglophone countries such as Ghana, Nigeria, Kenya, and South Africa – starting developer’s groups, funding initiatives, creating research centers, and holding conferences. Francophone countries, because of language and possibly for cultural reasons, have been largely left out of the picture, and especially the francophone countries of the Sahel which are relegated to the status of "flyover country". Malians are subjected to extremely restrictive visa regimes and many researchers and students are denied the right to attend scientific conferences which might serve to better connect the country to the rest of the world.

In order to seed efforts in implanting machine learning education in Mali, the Ministry has created a National Collaborative Center of Robotics and Artificial Intelligence Education or "RobotsMali" for short. While Mali lacks the resources at this time to create full programs of study at undergraduate and graduate levels in artificial intelligence, the Center serves as a center of excellence in artificial intelligence, providing classes, supporting research and

entrepreneurial projects, and promoting collaboration between university programs that need machine learning expertise.

Mali sees an opportunity for the emergence of "African AI", that is, AI research and solutions that are specific to the African context and are designed to address African needs. Such opportunities will have a direct and perhaps even profound effect on quality of life in Mali.

RobotsMali is incubating a startup working on a device to help the blind and visually deficit increase their mobility and independence. There are several major design constraints in this project that are common to many African AI solutions.

The first are the specific characteristics of the physical environment in a developing country. Mali is a country lacking completely in adaptations for the needs of people who are blind or have other impairments. Moreover, the environment is replete with numerous hazards that represent significant dangers to sighted people and might be deadly to the blind. Corpora of training data that is available does not reflect the reality of the Malian environment and applications for the visually-impaired useful in developed countries is unlikely to be equally useful in Mali.

The second critical element to RobotsMali's project is the imperative for low cost. In developed countries, handicapped people typically have access to government services and insurance that will subsidize the cost of adaptive technologies and generally have far more household revenue than the Malians. To be accessible in Mali, adaptive technologies may have to be 10 or 20 times cheaper than a product targeting comparable functionality in the developed world.

Other major design constraints include such things as an unreliable power grid, the extremely high cost of internet access relative to incomes, lower bandwidth, and unstable connections where internet access is available.

Another project launched by RobotsMali which aims to have a direct impact on Malian development is the automated translation to the vehicular language of Mali, Bambara. In a country where a minority of people can't understand it's written language, automated machine translation to Bambara will be a powerful tool in accelerating development in education, health care, and the economic activity. A common African specificity in this project is the fact that Bambara is under-resourced in material for training the system. Comparable to the problem with environment-specific image data for the mobility system, a major challenge in this project is in the creation of problem-specific training data.

Malians believe that machine learning applications in other areas of great interest to the country including agriculture, WASH (water, sanitation and hygiene), security, and urban management will have the same characteristics of requiring data that is specific to the African environment, severe cost constraints, and limitations in the availability of connectivity. As our mastery of machine learning grows, Mali intends to venture into these domains and others.

Despite the numerous challenges Mali confronts in developing this competence, machine learning is seen as potentially the easiest path to addressing some of Mali's problems both in terms of cost, time, and feasibility. It will be many years before Mali puts into place the infrastructure that exists in developed countries for making the urban environment more accessible for the handicapped. An AI system could make the present environment friendlier in a very short time. Mali cannot create a large body of up-to-date information resources in Bambara and other national languages but it could create an automated translation system that could render resources that already exist in other languages accessible to its population in a very short time.

Mali is confronted by numerous problems and lacks adequate resources to deal with these challenges. Because of this situation, not despite it, the government has decided to make some investment in the development of national competence in machine learning. Mali does not believe that it is responsible to wait for more prosperous nations to develop the machine learning technology that the African continent needs. The longer Africans wait to develop their own AI technology, the longer Africans will wait for the benefits that AI technology can bring.

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