Artificial Intelligence (AI) based Exploration Targeting for Small Scale Gold Mining Operations in the Dunkwa Area, Ghana

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About 35 % of Ghana´s annual 142 t gold production is produced by artisanal and small-scale mining (ASM) operations. Thus, they contribute substantially to Ghana´s mining industry generated national income and are an important factor of poverty reduction and national development. Because of declining production figures, exhausting resources, and enormous ASM related environmental damages the Government of Ghana generated the World Bank financed program "Ghana Artisanal and Small-Scale Mining Formalisation Project (GASMFP)" executed under the Management of the National Ministry of Lands and Natural Resources, and accompanied by the Ghana Geological Survey Authority. Among others, the generation of new exploitation targets suitable for ASM activities is one of the key tasks of this program. The here presented methodology and results are thought to be a case study and guideline for further similar activities throughout the country. They can be used as guidelines for similar activities in other countries as well.

Within just 6 months a multicomponent program allowed to evaluate both the placer and the hard rock gold potential in the 115 km2 survey area. Placer occurrences have been evaluated as not economic, while the hard rock gold potential was recommended for further detailed exploration. The prospective mineralisation style was identified as low thickness and high-grade quartz veins hosted by phyllites.

The implemented multistep artificial neural network (ANN) based exploration targeting technology in combination with a streamlined field work program was very successful. It allowed to minimise exploration expenditure and to speed-up the target identification process. The methodology can be recommended for further application throughout the country.