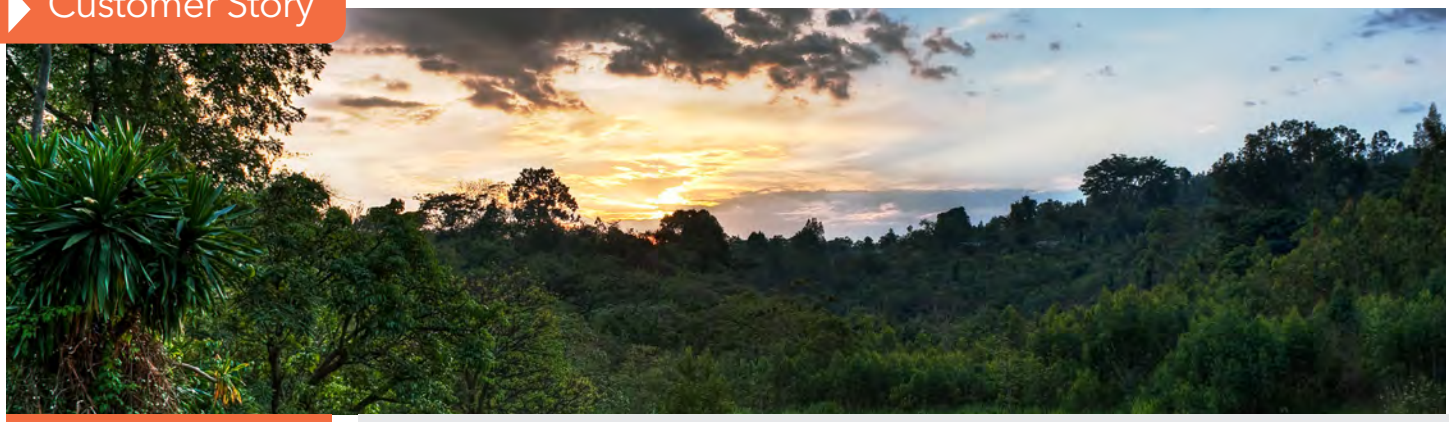
Customer Story



Challenge

Evaluate complex geospatial information to determine opportunities for mineral extraction in Africa.

Pioneering a scientific analysis with interdisciplinary potential

Exploration geologist Steffen Brammer develops a new method for bimodal geostatistical cluster analysis

For untold centuries, mankind has scoured the earth for gold and other precious metals. Some with skill. Some with luck. All with the tools of their times. And all with a spirit of discovery.

One of today's foremost exploration geologists is Steffen Brammer, Senior Resource Geologist at Perseus Mining and independent consultant for Brazca. While his excursions into the field are less arduous than those of his predecessors, his goal is the same: To determine whether an ore deposit is of sufficient quality to warrant the expense of a full-fledged mining operation.

Brammer has spent most of his professional life working in mineral exploration and extraction in Africa. First in Ivory Coast and other parts of the West African region, then in Lubumbashi, a city in the southern part of the Democratic Republic of the Congo. And since 2008, Ghana.

"Twenty years ago, we were always on the road," Brammer recalls. "We'd pack up and just drive down a dusty lane armed with a compass and a satellite phone that we'd use once a week just to let people know we were still alive."

An unusually complicated data set necessitates innovation

But with the advent of new digital technology, mining industry expectations shifted. Exploration geologists like Brammer could now more readily identify deposits, but accessing these often complex bodies presented far greater challenges.

"We made a real discovery in Ivory Coast," Brammer says. "An ore body there exhibited two types of gold mineralization: One was moderately graded and the other was small, but full of gold nuggets. We needed a new method with which to split a bimodal data set. Otherwise, these two different ore shoots would have to have been analyzed together – resulting inevitably in what would have been an inaccurate estimate."

To complicate matters further, Brammer faced a tight deadline: The company needed to go into production within the year.

From field exploration to digital discovery

Fortunately, Brammer is well equipped to handle this sort of challenge.

"In 2005, I was working in the Congo's Copperbelt region. I was sitting in the mine, contemplating how best to do my quality control calculations. But I had no software. All I had gotten from the company was a geological package. Not even Excel.

"When I first came across JMP, I bought it on my own dime. I began using it to run charts and plots – but soon realized that even the table

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> After only a week or so, JMP more than paid for itself because it saved me so much time. I don't even know how my peers are working without JMP. I have an unfair advantage.
>
> Steffen Brammer
> Brazca

options and summaries were a huge help. Today, I use JMP along with a geology software package like AutoCAD. I've written scripts in JMP to get beautiful reports, charts, graphs and analysis."

Brammer says the JMP application he developed with JMP Scripting Language (JSL) is absolutely invaluable in the face of challenging data sets – like the complex bimodal data from his days in Ivory Coast.

Brammer may be the first to have developed a method applicable to 'high-nugget' gold deposits

Applying geostatistical cluster analysis to the decomposition of mixed data with spatial information isn't a novel practice. This approach is not routinely applied, however, as cluster analysis isn't available with any of the usual geological software packages, making it especially difficult for non-statisticians. Various methods do exist for this purpose; however, where individual clusters are intertwined with irregular, discontinuous or complex geometries, conventional methods struggle or fail.

Brammer's new approach was developed in JMP and implemented exclusively with JSL. After an initial estimate of the underlying components' statistical moments, a series of search trees are built through the sample grid. Samples are then allocated to one of the conceptual target populations, depending on their probability density functions. This way, a mixed data set can be split into its components while maintaining the spatial relationship within and across individual clusters.

The goal of this method is for the mining industry to unravel the phases of multistage mineralizing events among complex ore bodies. However, it is applicable to virtually all disciplines in the natural sciences including environmental science, hydrology, biology and agriculture. The method also extends to every discipline where the spatial position of data matters, such as image processing, logistics, marketing and pattern recognition.

There are four benefits of Brammer's method:

1. It is computationally inexpensive.
2. It can be completed without expert assistance, and is thus suitable for universal and routine everyday use.
3. The user maintains editorial control over the final product because the results are not presented as categorical sets of clusters, but rather in the form of probability maps that acknowledge the possibilities of misallocation.
4. The method is easily applicable with commercial off-the-shelf statistical software (such as JMP).

"I've become a diehard fan when it comes to JMP," Brammer says. "I'm an exploration geologist – we're curious about discovery, and so is JMP."

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Mineral Exploration & Analysis

Solution

Use JMP Scripting Language to construct a new method for geostatistical cluster analysis.

Result

A new approach to geostatistical cluster analysis, developed in JMP and implemented exclusively with JMP scripts. Possible fields of application include virtually all disciplines of the natural sciences and every other field in which the spatial position of data matters such as image processing, logistics, marketing and pattern recognition.

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