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# Overview of BakerSCI's RITR & ATLAAS Sensor/Signal Analyses



*an Affinity Intelligence, LLC brand*

## Intelligence Through Relevance™

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***Baker Street Scientific (BakerSCI) (an Affinity Intelligence, LLC brand) is recasting the level of information used to make common and complex decisions. BakerSCI's relevance-driven big data technology identifies and connects known and previously unknown big data relationships across time, industries, and sources so critical decision makers have dynamic, actionable intelligence that can be used confidently on the vital issues that impact economies, time and human lives.***

**Notes:**

**OVERVIEW**

BakerSCI's ATLAAS™ solution, at its basic level, is a revealer of relevant, actionable intelligence within gathered data that presents it in a readily digestible format for the purpose of high-level, critical executive comprehension and decision execution when time is of the essence; and subsequent data scientist deeper dives, interaction, navigation and modeling. ATLAAS is fast, data agnostic and self-improving while allowing for initial unbiased analyses that enable heightened acuity on mission critical decisions, and then enabling users to apply either their own bias or bias suggested by RITR itself.

RITR (the Revealing Intelligence Through Relevance™ system) is an analytics tool that renders intelligence from complex known and previously unknown data relationships for the purposes of identification and analysis of not simply the conventional static connections between data points across x and y axes, but rather the dynamic interaction of both surface-level and deeper data associations across *n-ary* planes. ATLAAS (the Advanced Topographical Layout for Associative Analytic Synthesis™) is the visual presentation of RITR's results in a high-contrast, easy to interpret format.

**BACKGROUND**

It is important to note that conventional algorithmic, statistical, and data analytic methods/systems continue to underperform in vital areas necessary for the gathering of key actionable intelligence, but conventional systems' limitations do not allow that intelligence to ever come to light in a coherent format. In fact, it is not uncommon for significant associations in both like and disparate datasets (read: data types, sets, streams, sources, etc.) to be indiscernible and/or undetectable by these conventional systems. The inability of these systems to elicit such important and relevant intelligence from a solitary dataset, let alone multiple datasets, can give the data owner(s) the impression that their datasets either:

- are irrelevant and as a result should be written off as unimportant or superfluous to overall analytical goals;
- have no inherent significant associations or relationships within/between them and therefore they must be mutually exclusive and processed individually for purposes of analysis; or
- are subordinate to other data which have traditionally provided weak, limited or inconclusive information, but nonetheless provided some information so it is seen as more valuable.

Therefore, in initial foundational analysis, it is mission critical that any current data analysis process which must be deployed across a complex data landscape that may well include both like and disparate datasets employ a mechanism that can, at a minimum, identify the linkage of known and unknown relationships within the datasets. This analysis should be conducted in an unbiased methodology that appreciates the entire dataset as that which should be analyzed, not merely a subset of the overall dataset that was either intentionally or unintentionally scrubbed by conventional system and/or analyst methodologies. Intelligence from big data is due for a mechanism that can provide substantial enhancement, thus this mechanism must be based on a methodology that makes discernable what was once deemed indiscernible by conventional methods while also providing broader and deeper intelligence than what was conventionally narrow and shallow.

## Notes:

When dealing with sensor/signal data, many obstacles can create frustration and even dangerous scenarios that may cause critical setbacks within mission directives that can:

- potentially reduce operational effectiveness,
- prematurely truncate intelligence gathering,
- cause pervasive (and expensive) systemic failures, and/or
- lead to missing unseen or unknown threats.

### **BakerSCI SOLUTIONS**

RITR and ATLAAS (hereafter referred to collectively as BakerSCI's Solution or the Solution) work together to mitigate the aforementioned setbacks. This section provides substantive summary examples on how BakerSCI's Solution addresses and circumvents various stumbling blocks that conventional algorithmic, statistical, and data analytic methods/systems continue to experience.

#### **Data Analysis Latency**

Latency within data analysis can lead to overall slowdowns within data retrieval due to resource collection response time: satellites orbit window may become unavailable, aerial reconnaissance planes/drones leave and must return to targeted areas of interest, deployed human forces may have to shift priorities from data retrieval to engagement due to on-ground situational changes. Delays in initial processing can beget delays in subsequent analyses and therefore lead to longer total analysis times which can lead to quickly outdated intelligence for time-critical situational awareness.

#### ***Solution: BakerSCI's Solution is Fast.***

The Solution was built with speed in mind as it was prototyped to perform within subpar system hardware parameters to emphasize worst case operational speed and still performed with rapid agility. Results of repeated analyses processed on an over-the-counter, single core laptop over a WiFi connection consistently returned results for review within seconds. The Solution, when bolstered by robust infrastructure, becomes lightning fast returning results for very large datasets quickly for timely analysis and decision making.

#### **Data Standards Issues**

Data generated from new sensors and other emerging technologies may not be able to be processed in part or in whole by conventional and/or legacy analytics solutions. These solutions, when presented with new types of incoming information, may force-format the data in such a way that the original raw dataset submitted to the system becomes a wholly different dataset altogether which is then used for intelligence gathering. Lack of data standards, interoperability and cross data type applications result in data analyses that typically beget:

- complex presentations of results often needing analysts to help translate them into layman terms, and
- limited understanding & intelligence from incomplete analytics that often do not make sense, therefore providing an outright lack of intelligence gathered from the data.

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### ***Solution: BakerSCI's Solution is Data Agnostic.***

RITR's core engine is built on a science that is ubiquitous across myriad datasets and industries not only in the way it processes information, but also with what information it can process. RITR enables data agnostic processing inside an auto-adapting, high-density data analytics solution that when presented through the ATLAAS is designed to enable:

- managers to quickly understand their data at an executive overview level for strategic positioning, and
- data scientists, engineers and SMEs to dive deeper into their metadata to better grasp the whys, hows, whats, etc. (Whys+) of its behavior.

It is still the case that input data must undergo prescribed structuring for successful processing and that structuring is designed to maintain dataset integrity so the entire dataset is processed for analysis. Those structures can be industry/sector specific and can be built into ATLAAS to increase analysis speed on familiar types, while also giving the analyst the ability to process on "other" structures to view the data from various perspectives deemed "outside the box" that could provide information in a way that increases understanding.

### **Faulty / Misreporting Sensors**

Sensors can come off the manufacturing line as faulty or can succumb to damage or other environmental impacts. These faulty sensors may report false positives, false negatives or may not report back at all. When this happens, vital information can be lost or become retarded due to the resulting dataset not receiving a full return of signal data. This incomplete dataset may not be usable requiring the data to be recaptured or may be usable but may not be as trustworthy.

### ***Solution: BakerSCI's Solution Allows for Recursive Analysis.***

The Solution can perform in multiple areas simultaneously, one of which is running diagnostics on the sensors themselves. This means that while ATLAAS is rendering the captured signal data for interpretation, RITR can also monitor the performance of the very sensors that are collecting and feeding that signal data to the analyst(s). The ability for the Solution to monitor its own performance as well as the sensors' performance makes it a solid solution for any analyst's toolkit as it can be used to:

- identify sensors that are outside acceptable tolerance levels, and
- mitigate the impact on analyses of faults that fall within acceptable tolerance levels.

### **"Comfort Zone" Analytics**

Gathered data is best in its raw form. Unfortunately, when utilizing typical conventional methods, data passes through a minimum of two bias filters (the system itself and the analyst) before it is deemed ready for the decision maker. Many conventional systems provide minimal modeling capabilities with the known biased outputs generated that often fall prey to "comfort-zone" analytics and analyses. Conventional, even bland, analytics processes, even in robust processing environments, only provide

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snapshots of a datasets at a point in time instead of telling the “story” of the event, transaction, transmission, trip, etc.

### ***Solution: BakerSCI’s Solution Allows Unbiased and Biased Analyses***

The Solution allows performance of both unbiased and biased analyses where analysts may quickly ascertain how to detect the unknown unknowns; understand more about the knowns and what’s influencing them; model varying scenarios; catalyst insertion cause and effect; and view likelihood of assimilation across data intent, among other novel metrics, etc. The platform also enables entities to build an intelligence ATLAAS of past, present and potential future events, transactions, searches, trips, transmissions, etc. creating an understandable presentation of forensic, current and anticipatory/predictive actionable intelligence that is dynamic, rather than static.

### **Signal Reduction / Interference / Artifact**

Many critical sensors and sensitive processing systems operate in challenging conditions, thus they are susceptible to moderate and violent changes in their environments which may cause them to return data that are less than desirable and, in the words of some, “nasty”. Conventional analysis systems may not adapt well to these variances and thusly may have to provide narrowed and even flawed presentations of results. Absent from these problematic results is a way to mitigate the impact of the negative environmental effects on both the data and the dynamic data element interactions for the purpose of better understanding what is still interpretable and viable within the poorer quality data.

### ***Solution: BakerSCI’s Solution Creates Heightened Acuity***

ATLAAS’ broad analytic result sets are based upon “associative relevance” analyses that include unprecedented qualitative and quantitative data metrics within an easily understood, high-contrast presentation which allows analysts to view interaction within not just the superficial data, but also the underlying data, noise and artifact. BakerSCI’s Solution processes through its **n-ary** associative analyses, rather than through conventional independent data response analyses and/or statistical methods, signal reduction, interference and artifact can be mitigated across the analyses.

### **Feature Identification and Specificity**

While pattern recognition has been around for decades, conventional analytics systems still struggle to provide adequate levels of specificity, differentiation, identification, and/or extraction at speeds necessary to support the mission. The impacts of this struggle are compounded by these systems’ poor performance or outright inability to identify/expose the unknown unknowns and provide sufficient differentiation in the features that may be present in the margins. Pattern recognition and custom algorithm-based systems typically use signature-based identification engines where the efficacy, efficiency and value of the signature(s) and/or their individual components are unknown. Furthermore, these systems lack the ability to create beneficial “super signatures” from the aggregation of effective and valuable signatures.

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### ***Solution: BakerSCI's Solution Adds Powerful Capabilities to Pattern Recognition and Feature Extraction***

Inherent within BakerSCI's Solution is its ability to evaluate quantitative and qualitative signature data of conventional systems to aid in identifying modifications to enhance the system's performance. Such enhancements can result in higher specificity, better differentiation, and fewer false positives/negatives, amongst others, in their feature analytics systems. With the refinement of these signatures, the Solution can subsequently assist in the creation of "super signatures", the benefits of which are numerous.

### **Functionality Overview**

The novelty of BakerSCI's Science and Solution is the manner in which it employs novel statistical and non-statistical data analytics in a way that is attuned to the synthesis of analytics as they pertain to associations within data. Associative Analysis is the process of assessing how data behaves, relates, etc. within both known and previously unknown associations, thus providing analysts with additional intelligence of, including but not limited to:

- How's, Why's, What's... of a decision, activity... at a data node and along a data path.
- Identification of tendencies, outliers, anomalies and gaps in relatedness and relevance.
- Likelihood of an assimilation or a divergence.
- Strength, volume, consistency, and homogeneity of data associative attributes.
- Velocity, momentum and trajectory of:
  - decisions, travelers, products, equipment, communication, ideologies, etc. (travelers)
- Catalyst cause and effect in real and model data
- Identification of internal and external influencers.
- Effect of nodes' and travelers' metadata.

The novelty of BakerSCI's Solution is the manner in which it employs a system that is attuned to the synthesis of analytics Relationship of metadata across nodes and travelers.

### **Ubiquitous Science**

The science at the core of BakerSCI's Solutions is ubiquitous in its nature and development. Beyond a sensor and signal implementation, BakerSci's science has broad application for novel, powerful analytics in imagery & hyperspectral data; healthcare diagnostics, genetics, & compliance; financial services trading, research & compliance; logistics; manufacturing; human performance; among many others.

### **FOR MORE INFORMATION**

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