

# Got Tourism Data?

How can we leverage real time analytics to begin this conversation?

Let's begin with a preliminary look into the exercise:

The live survey link will be open through the conference

#### https://arcg.is/WyHb4

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THE IMPACT OF DATA SOVEREIGNTY ON MERICA INDIAN SELF-DETERMINATION: USING DATA SCIENCE IN DEVELOPING TRIBAL TOURISM ASSESTS



Joseph C. Robertson, PhD CEO / Chief Data Scientist Mato Ohitika Analytics LLC On behalf of the American Indian Alaska Native Tourism

Association (AIANTA) September 19, 2018

# Outline of Today's Talk

- Joseph at a Glance
- Introduction
- What is the Data Sovereignty Initiative?
- What is Data Science?
- What is Data Sovereignty and Nation Building?
- What is Citizen Science?
- The Data Sovereignty Framework
- Key Indicator Design
- Key Descriptor Design
- Case Study Example Machine Learning and AI
- Real Time Data Science Analytics Exercise

# Joseph at a Glance

Joseph is an enrolled member of the Sisseton Wahpeton Oyate of the Lake Traverse Reservation in northeast South Dakota

Joseph is the CEO & Chief Data Scientist of Mato Ohitika Analytics LLC, a Native startup company working on developing SMART solutions for Tribal communities using machine learning and Al.

# Joseph's Education

- Doctor of Philosophy Computational Science and Statistics, South Dakota State University, 2018
- Master of Science Statistics, South Dakota State University, 2014
- South Dakota Teaching Certificate, Highly Qualified Mathematics, 2008
- Bachelor of Science Mathematics, Colorado State University, 2006
- Associate of Science Lane Community College, 1999

# Introduction

The design of the Data Sovereignty Initiative is to provide an overview of the nature of higher education and academic pedagogy, nation building, citizen science, and data science that establishes a foundation of establishing a new praxis in understanding American Indian tribal sovereignty.

# Introduction

My intent is to also present the *Data Sovereignty Initiative* with already developed foundational theories of tribal governance and tribal sovereignty in the context of the data science.

Strategic planning is synonymous with the SMART solutions framework I have designed. The power lies in my professional goals to unify data in Indian Country by designing data domains that can be shared with other tribes as a matter of nation building.

#### What is the Data Sovereignty Initiative?

It is a native-centric horizontal governance framework designed to create SMART solutions for tribal communities.

The fundamental reason I have pursued this area of study is to provide an ethical, cultural, and community based consultancy that is designed by an American Indian, for nation building to assist tribal communities with economic development, strategic planning, and data driven decisionmaking.

# Goals of Data Sovereignty Initiative

The fundamental goal here is to create a unified system of data analysis, collection and practice that provides many Tribal stakeholders with the necessary tools of empowerment through citizen science.

Citizen science is a community oriented concept concerned with conducting scientific work by members of the general public, often under the direction of a professional scientist or institution.

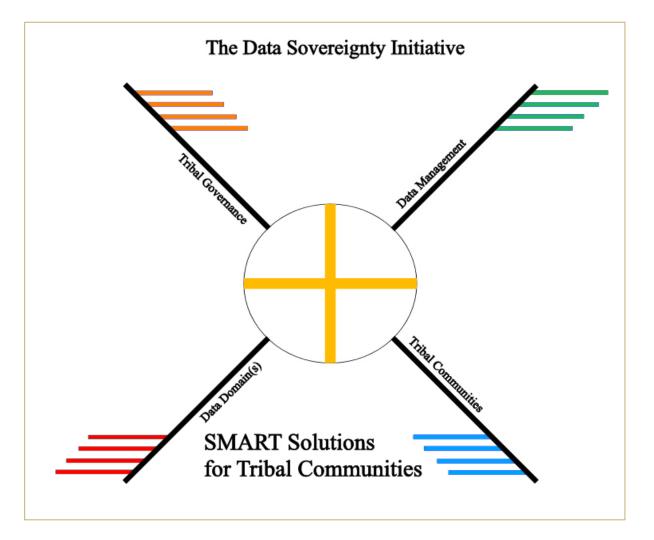
# **Project Overview**

To develop an Indigenous horizontal governance framework using a set of welldefined key indicators and descriptors to achieve parity with not only cultural aspects; but pair them with data-driven metrics to produce a **strategic** act of sovereignty that benefits a Tribe's economic development efforts through data science.

# The Focus of a Native-centric Governance Framework

"The challenge is for indigenous nations to move beyond the rhetoric of nation-building models and find new solutions and tools."

#### The Data Sovereignty Framework Design



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## The Concept of Tribal Sovereignty

Deloria (1976) asserts in moving past legal/political conceptions concerning sovereignty:

"Sovereignty is a useful word to describe the process of growth and awareness that characterizes a group of people working toward and achieving maturity.

If it is restricted to a legal-political context, then it becomes a limiting concept, which serves to prevent solutions. The legal-political context is structured in an adversary situation which precludes both understanding and satisfactory resolution of difficulties and should be considered as a last resort, not as a first instance in which human problems and relationships are to be seen."

## The Concept of Tribal Sovereignty

Kessler-Mata (2014) A Constitutive Theory of Tribal Sovereignty: The Possibilities of Federalism asserts:

To claim that tribal sovereignty embodies a right to self-determination or a right to self-governance is to put forward a concept that does much more in theory that it does in practice. The concept of tribal sovereignty is one that promotes intergovernmental relations with non-tribal governments and which takes the principles of equitable interaction and political coordination as central to its operation.

## So What is Nation Building?

It involves developing the nation's capacity to make timely, strategically informed decisions about its affairs and to implement those decisions. It involves a comprehensive effort to rebuild societies that work.

In other words, a nation-building approach understands that tribes are not merely interest groups, but governing nations confronting classic problems of human societies.

# So What is Data Governance / Sovereignty? Rainie, Rodriguez-LoneBear, & Martinez, (2016)

In the United States, the processes of colonization have led to a state of data dependency in Indian Country. Federal policies of assimilation, forced removal, relocation, residential schooling and other cultural ruptures led many tribes to rely on external sources of information about their communities' economic, environmental, and health status.

This data dependency produces a paradox of scarcity and abundance: extensive data are collected about tribes, but rarely by tribes or for tribal uses.

Source: US Indigenous Data Sovereignty Network Hosted by the Native Nations Institute at the University of Arizona

# So What is Data Governance / Sovereignty?

Rainie, Rodriguez-LoneBear, & Martinez, (2016)

- Existing Indigenous data are inconsistent, inaccurate, or irrelevant to tribal goals;
- The collection, ownership, and application of Indigenous data are controlled by external entities;
- An extensive history of exploitative research and policies has left a Legacy of mistrust of data; and
- A lack of data infrastructure and capability cripples tribal efforts to overcome these obstacles

Indigenous data sovereignty is an aspiration.

## So What is Data Science?

Wikipedia defines data science as:

"Data science, also known as data-driven science, is an interdisciplinary field of scientific methods, processes, algorithms and systems to extract knowledge or insights from data in various forms, either structured or unstructured, similar to data mining.

Data science is a 'concept to unify statistics, data analysis, machine learning and their related methods' in order to 'understand and analyze actual phenomena' with data.

#### The American Statistical Association (ASA) on Data Science

While there is not yet a consensus on what precisely constitutes data science, three professional communities, are emerging as foundational to data science:

- Database Management enables transformation, conglomeration, and organization of data resources;
- Statistics and Machine Learning convert data into knowledge; and
- Distributed and Parallel Systems provide the computational infrastructure to carry out data analysis.

#### So What is Citizen Science?

Citizen Science refers to the general public engagement in scientific research activities when citizens actively contribute to science either with their intellectual effort or surrounding knowledge or with their tools and resources.

#### So What is Citizen Science?

Using this set of guiding principles, the data sovereignty framework will attempt to leverage this concept in the context of empowering tribal citizens to undertake the tasks defined by a given data domain.

In the data domain design process, the digital infrastructure Mato Ohitika Analytics is designing will be open source in nature and the detailed instructions can be constructed to allow for a stakeholder undertake the task, while leaving Dr. Robertson's expertise to interpret and provide guidance.

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# What are Possible Data Science Related Questions?

- So how can we translate data science into the conceptualization of self-determination?
- How do we empower our Tribal communities to undertake data science tasks on their own?
- How do we unify a data platform across all of Indian Country?
- How is this accomplished using nation building?
- How important is higher education in using credible research in not only data analysis, but policy decisions?



# **Research Objectives**

Designing diagnostic tools for evaluation of the Data Sovereignty Initiative rely on the following design metrics:

- Purpose
- Dimension
- Expected Use
- Expected benefit

# **Research Objectives: Purpose**

The framework design is to implement a model allowing more flexibility than previous and well-documented top-down models. In order to construct successful social and economic development systems; we must not exclude individual entrepreneurship and informal systems of government (i.e. clans, societies, etc.) that drive appropriate cultural practice on the local level.

The framework includes global ideas of self-governance but also examines methods practical implementation of diagnostic tools to measure success for each unique tribe through key indicators.

# **Research Objectives: Dimension**

The key to effective framework design is to allow for a multidimensional approach that provides depth in evaluating such a complex set of indicators aimed at not only understanding data management, policy analysis, and any number of associated data domains; but how this applies to the diversity of social, economic, and political structures on American Indian reservations.

The key to applying multidimensionality is to understand the depth of knowledge of the stakeholders at each phase of any analysis to produce an effective design strategy to unify this information strategically.

# Research Objectives: Expected Use

In nation building, we can use a set of established guidelines to delineate administrative (tribal governance) versus local stakeholder interaction using a horizontal approach to design. It is clear designing strategies that do not take into account the dimensionality and complexity of each tribal group is what is at stake here.

The goal is to orient the values and opinions of tribal stakeholders that represent the contingency of individuals that are doing the work, and to work for more effective design strategies that provide an administrative way to incorporate all global and local stakeholders in all levels of governance. It is important to account for all levels of interaction and to build sensible policy from information gathered at all levels to be analyzed for the benefit of the community, not necessarily the individual.

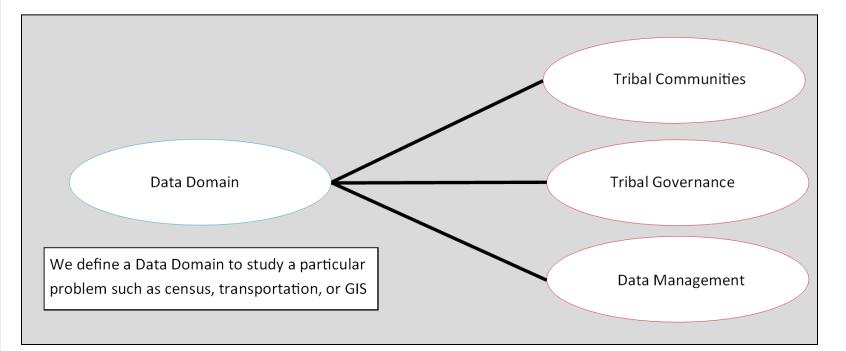
## Research Objectives: Expected Benefit

The benefit to tribes in capitalizing on a framework that has been designed from the bottom up with a Native-centric view of policy, experience, and data analysis is to create real and measurable solutions.

At the heart of this analysis are tribes' ability to assert self-determination and sovereignty in a way that has not been tested: data driven policy initiatives challenge the anecdotal nature of what has historically never been a zero-sum game for tribes relative to federal, state, and local authority challenges to that sovereignty.

# So How Do We Create a SMART Solution?

# First, we build a Data Domain around our Key Indicators:



# The Focus of a Native-centric Governance Framework

First, administrative dimensionality provides depth to ongoing discussions with tribes in strategic planning.

Doran (1981) has developed a SMART acronym in administrative planning that stresses the importance of achieving objectives.

While there is no way to provide simple solutions for every challenge in Indian Country; nonetheless in developing SMART solutions for tribal communities, the data sovereignty framework incorporates this philosophy.

# The Focus of a Native-centric Governance Framework

Doran (1981) has developed a SMART acronym in administrative planning that stresses the importance of achieving objectives.

Ideally speaking, these objectives should be used to administratively drive discussions in regard to practicality:

**S**pecific Target a specific area for improvement.

Measurable Quantify or at least suggest an indicator of progress.

Achievable State what results can realistically be achieved, given available resources.

**R**esponsible Specify who will do it.

Time-related Specify when the result(s) can be achieved.

# Data Sovereignty Key Indicators

The key indicators represent two distinct groups of cultural and data driven metrics In order of importance:

- I. Tribal Communities and Culture
- 2. Tribal Governance
- 3. Data Management
- 4. Data Domain(s)

#### Key Concepts Regarding the Descriptors

The design templates developed for the diagnostic tools in the next section rely on the key descriptors to remain fixed with the exception of data domain; which can be regarded as the indicator that can encompass any task a tribe needs to analyze. This maintains the integrity of the framework design.

In addition, it is important to prioritize the cultural design metrics first. Allowing tribal citizens to contribute in an overall governance strategy is an important aspect in indigenous nation building:

To be stable and effective in self-governing, governmental systems have to fit with the way a particular culture answers questions of who, what, where, and how. Key Indicator Definitions: The Higher Education Component

Key indicators are aligned to adhere to the research objectives and provide theoretical background information that is the basis of the diagnostic tool constructs for analysis.

These definitions are a set of guidelines establishing past or current work in each respective field, whether it is Federal Indian Law, governance strategies, or understanding research design principles. Key Indicator Definitions: The Higher Education Component The four definitions are:

Tribal Communities - Culture Matters

Tribal Governance - Sovereignty Matters

Data Management - Unifying Data in Indian

Country is Paramount

Data Domains - An Open Way to Examine Data-driven Decision-Making

#### Step 1: Inductive Reasoning in Assigning Key Indicator Priorities

The framework is intended to inductively generalize a rank or order of key indicators simply as a starting point in the analysis to answer:

- Why is it important?
- What are the current conditions?
- What the implications / possible actions?
- Form a question cloud specific to each indicator

#### Step 2: Diagnostic Evaluation of Key Descriptors

Once a rank of key indicators has been established, an examination of the key descriptors can begin. It was established previously, every key indicator's descriptors remain constant to provide a way to uniformly assess the interaction of governance, community and data practices. The next step is to evaluate the level of fulfillment each descriptor plays in contributing to the selected data domain.

For instance, if the tribal government has an existing agreement with a stakeholder in analyzing traffic data, then not only is nation to nation communique fulfilled, but data ownership, security and privacy may also have been established as well. Thus, examining other key descriptors such as to conducting further data analysis would be of higher priority in goal setting.

#### Step 3: Exploratory Analysis of the Targeted Data Domain

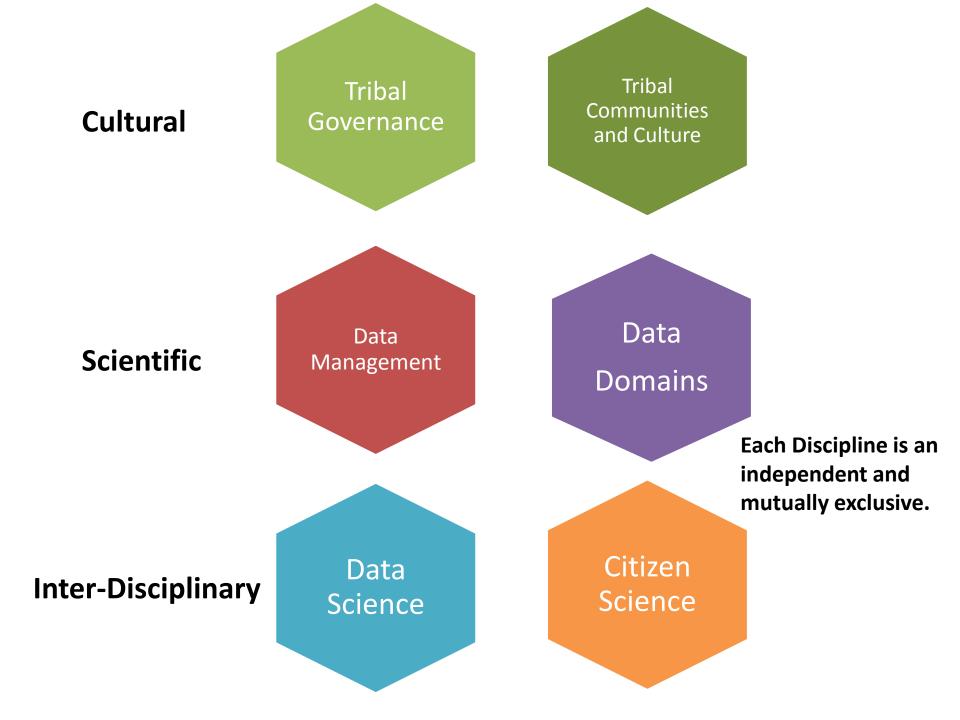
Once the key descriptors have been examined, then a formal exploratory analysis can begin. In design theory, an exploratory analysis will provide an assessment of information already collected or need to be collected, design options, looking at operational capacity, or how to unify existing structures with the purpose of creating a unified set of practices to produce more measurable outcomes.

After examining the specific metrics of interest, a comprehensive plan can be produced to begin creating infrastructure for more advanced techniques. Some analyses may simply remain on the exploratory level because tribes are only interested in reporting descriptive measures; however the exploratory process also provides flexibility to undertake any number of more advanced techniques to advance a data domain beyond this level of evaluation.

#### Step 4: Development of Tiered Set of Advanced Analyses

The final step in this process is once an exploratory analysis has identified areas of interest that tribes choose to explore beyond the scope of descriptive measures; a statistical design framework can be established to advance techniques of higher order such as regression, geospatial, or logistic modeling, machine learning, point process, pattern recognition or predictive analytics.

The body of techniques to advance data beyond just qualitative are well established and these techniques are extremely powerful in helping tribes in asserting sovereignty as a matter of selfdetermination in any number of policy outcomes that will benefit tribes in any data domain of their choosing.

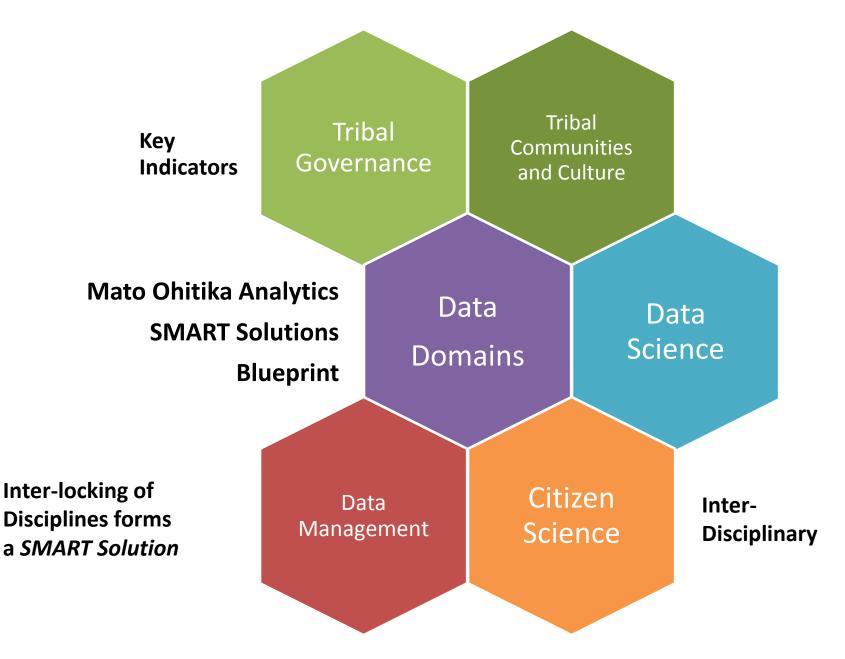


#### **SMART Solution Key Indicator Blueprint Key Indicators** Tribal Data Communities Management and Culture History Data Collection Practices Data Analysis Culture Data Ownership **Cultural Values** Security and Privacy Citizenry **Key Descriptors Key Descriptors** Tribal Data Domains Governance Federal Indian Law & The Indicator and 4 Policy Custom Designed Nation to Nation Descriptors Drive the Communique Inter- disciplinary Analysis **Tribal Sovereignty** and Strategic Assessment Self-Determination

Key Descriptors

**Key Descriptors** 

#### The Data Sovereignty Initiative



Examples and Possible Uses of this Proof of Concept

- Tourism Analysis
- Census 2020
- Tribal Traffic Safety
- Historic Preservation
- Transportation
- Higher Education
- Health Care

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#### Machine Learning and AI

#### So What is Machine Learning?

Machine learning evolved out of the subfield of computer science known as artificial intelligence (AI). Whereas the focus of AI is to make machines intelligent, able to think rationally like humans and solve problems, machine learning is concerned with creating computer systems and algorithms so that machines can "learn" from previous experience. Because intelligence cannot be attained without the ability to learn, machine learning now plays a dominant role in Al.

## Machine Learning and Al So What is Machine Learning?

The machine-learning community divides learning problems into various categories: the two most relevant to statistics are

- Supervised learning
- Unsupervised learning

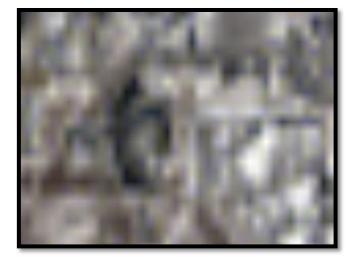
# Case Study 2: Machine Learning and So What is Machine Learning?

One such machine learning technique is called a *Support Vector Machine* (SVM). It is a supervised learning technique in which a set of training data is used to 'train' the algorithm to identify objects in a geospatial raster image for image classification.

# Case Study 2: Machine Learning and So What is Machine Learning?

One such machine learning technique is called a *Support Vector Machine* (SVM). It is a supervised learning technique in which a set of training data is used to 'train' the algorithm to identify objects in a geospatial raster image for image classification.

### Machine Learning Example: Which Image is Better, and Why?





Landsat7 30 meter

Rapid Eye 5 meter

#### Satellite Imagery at a Glance



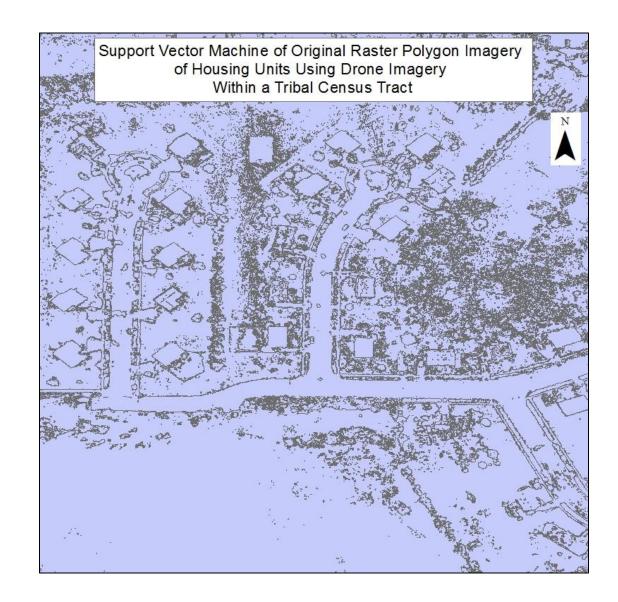


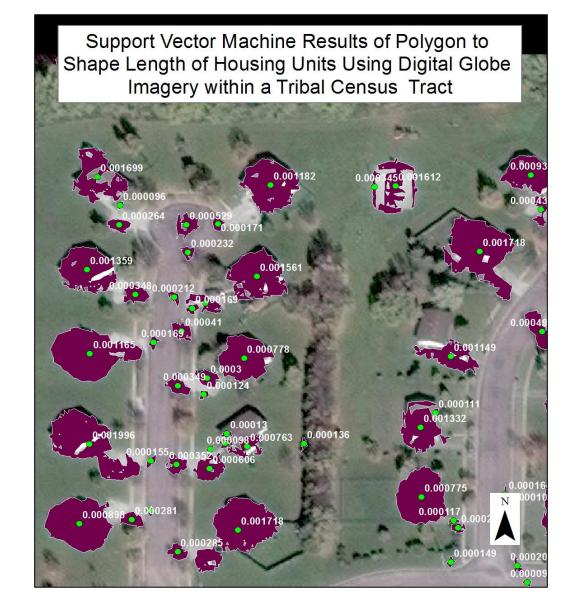
#### So What a SVM Actually Do?



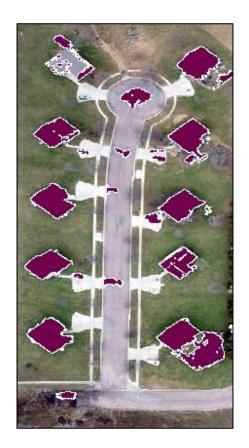


















#### The Results and Thoughts



This point pattern is now a *Master Address File* and has the power to attach any number of covariates that can model any topic that is of interest to a tribal government. Tribes will undoubtedly have the associated postal addresses associated with any tribal housing under their respective tribal housing authority, so having the geospatial point pattern can create an innumerable number of geospatial outcomes to the tribes benefit.

#### Part 2: AIANTA & Data Analytics: Bridging Data Science and Tourism

## **Topics of Interest Today**

- Define tourism asset
- Survey sampling
- NATIVE Act
- Developing a database for tourism assets
- Strategic assessment of current operational capacity

#### So What is a Tourism Asset?

#### How can we define a tourism asset?

## Let's look at the current map of AIANTA members.

### What is the NATIVE Act?

Public Law 114–221

114th Congress

An Act,

To enhance and integrate Native American tourism, empower Native American communities, increase coordination and collaboration between Federal tourism assets, and expand heritage and cultural tourism opportunities in the United States.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION I. SHORT TITLE.

This Act may be cited as the "Native American Tourism and Improving Visitor Experience Act" or the "NATIVE Act".

## What is the NATIVE Act?

SEC. 2. PURPOSES.

The purposes of this Act are—

(1) to enhance and integrate Native American tourism—

(A) to empower Native American communities; and

(B) to advance the National Travel and Tourism

Strategy;

(2) to increase coordination and collaboration between Federal tourism assets to support Native American tourism and bolster recreational travel and tourism;

(3) to expand heritage and cultural tourism opportunities in the United States to spur economic development, create jobs, and increase tourism revenues;

(4) to enhance and improve self-determination and selfgovernance capabilities in the Native American community and to promote greater self-sufficiency;

### What is the NATIVE Act?

#### (Continued)

(5) to encourage Indian tribes, tribal organizations, and Native Hawaiian organizations to engage more fully in Native American tourism activities to increase visitation to rural and remote areas in the United States that are too difficult to access or are unknown to domestic travelers and international tourists;

(6) to provide grants, loans, and technical assistance to Indian tribes, tribal organizations, and Native Hawaiian organizations that will—

(A) spur important infrastructure development;

(B) increase tourism capacity; and

(C) elevate living standards in Native American communities; and

(7) to support the development of technologically innovative projects that will incorporate recreational travel and tourism information and data from Federal assets to improve the visitor experience.

## What is the NATIVE Act? Current goals under Section 4

SEC. 4. INTEGRATING FEDERAL TOURISM ASSETS TO STRENGTHEN NATIVE TOURISM OPPORTUNITIES.

(a) SECRETARY OF COMMERCE AND SECRETARY OF THE INTERIOR .---

The Secretary of Commerce and the Secretary of the Interior shall update the respective management plans and tourism initiatives of the Department of Commerce and the Department of the Interior to include Indian tribes, tribal organizations, and Native Hawaiian organizations.

(b) OTHER AGENCIES .—The head of each agency that has recreational travel or tourism functions or complementary programs shall update the respective management plans and tourism strategies of the agency to include Indian tribes, tribal organizations,

and Native Hawaiian organizations.

(c) NATIVE AMERICAN TOURISM PLANS .---

## What is the NATIVE Act? Current goals under Section 4

(c) NATIVE AMERICAN TOURISM PLANS .---

(I) IN GENERAL .—The plans shall outline policy proposals—

(A) to improve travel and tourism data collection and analysis;

(B) to increase the integration, alignment, and utility of public records, publications, and Web sites maintained by Federal agencies;

(C) to create a better user experience for domestic travelers and international visitors;

(D) to align Federal agency Web sites and publications;

(E) to support national tourism goals;

(F) to identify agency programs that could be used to support tourism capacity building and help sustain tourism infrastructure in Native American communities;

## What is the NATIVE Act? Current goals under Section 4

(Section 4 Continued)

(G) to develop innovative visitor portals for parks, landmarks, heritage and cultural sites, and assets that showcase and respect the diversity of the indigenous peoples of the United States;

(H) to share local Native American heritage through the development of bilingual interpretive and directional signage that could include or incorporate English and the local Native American language or languages; and
(I) to improve access to transportation programs related to Native American community capacity building Plans.

for tourism and trade, including transportation planning for programs related to visitor enhancement and safety.



#### **Outcome Topics**

- Primers for stimulating economies
- How to measure the economic impact of tourism in Indian Country
- Job creation
- Creating means to utilize tools to create economic outcomes through tourism

#### Part 3: A Data Science Proof of Concept in Real Time

#### Part 3:

#### A Data Science Proof of Concept in Real Time

This demonstration will show the power of data science and how the Data Sovereignty Initiative informs decision making on many levels. The data collected by willing participants in this presentation will drive discussion, possible decision making possibilities,.

The breakout session link:

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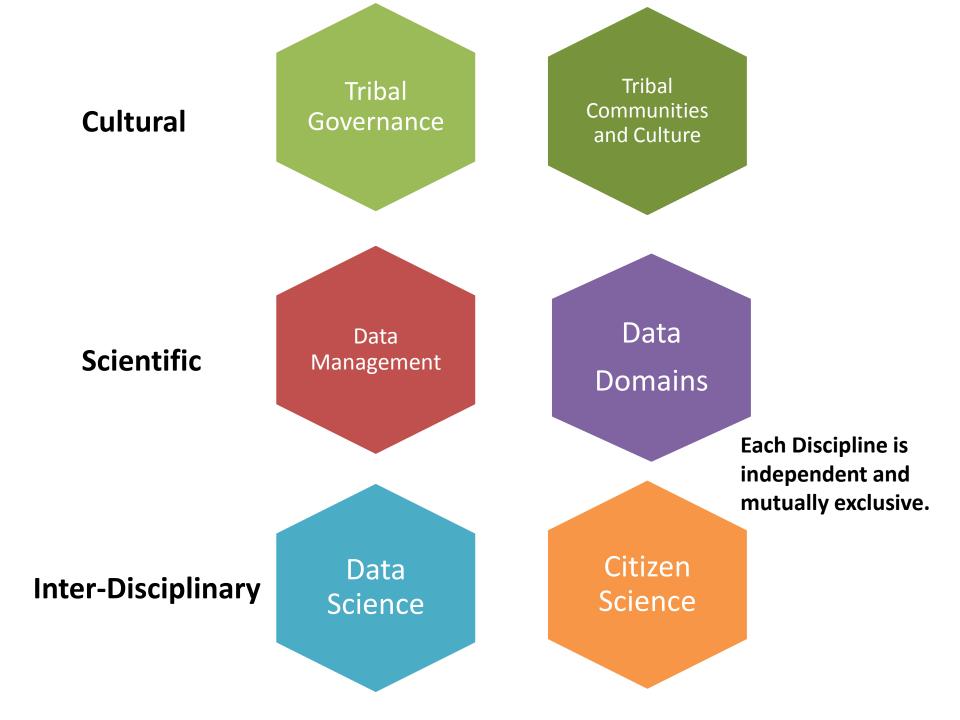
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Thank you for your participation!



Let's Talk About Some Implications in Data Collection & Analysis.

First, let's look at the Data Sovereignty Initiative Metrics one more time

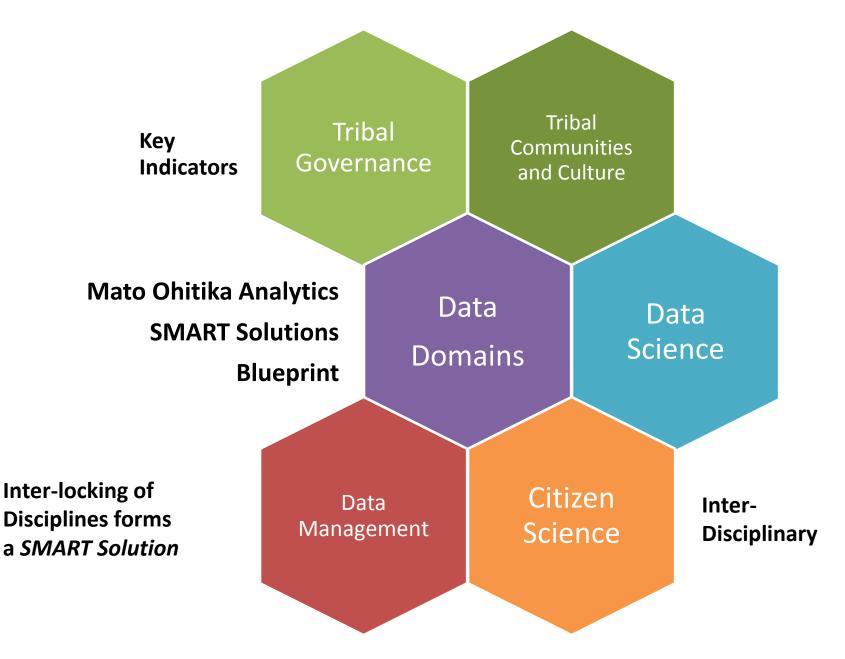


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Key Descriptors

**Key Descriptors** 

#### The Data Sovereignty Initiative



### Part 3: A Data Science Proof of Concept in Real Time Let's look at the Results in Real Time

## Part 3: A Data Science Proof of Concept in Real Time

Let's talk about the results of this exercise.

# **Final Thoughts**

- The SMART solutions design is a disruptive way to begin using data science for our benefit
- Data analytics can and should be used ethically to inform decisions
- Digital infrastructure built will be open source to share with communities
- Machine Learning will pave the way to creating unique outcomes for our communities

## Roadmap Working with AIANTA and the NATIVE Act

- The exploratory analysis that has been ongoing has been creating many topics of discussion
- A strategic assessment of AIANTA's operational capacity is currently underway using statistical design theory
- A strategic plan is underway to comply with the provisions of the NATIVE act
- Incorporating these solutions with a web design company, Real Time Solutions

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This concludes the Talk I will take questions at this time.

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