

# Artifact Analyzer

By FLL Team 10462 – Galactic Pastry Delivery Service

## Summary –

Documenting dig sites can be tedious. Artifact Analyzer can help! Enter data and photos in real time at the dig site. Add more later when you are back in the lab or office. Then let AI assist in finding common connections between layers, other digs, and even other sites. The more site data that can be connected, the more connections between people, places, and time can be discovered! Connecting the dots between the known can lead to new sites, new artifacts and still more connections to the past. With Artifact Analyzer, the past becomes clearer so much faster!

This document uses [sample data](#) generated from three investigation sites to demonstrate how AI agents can be used to make connections between data sets. Investigation sites include Cahokia Mounds in Illinois, Mitchell Archaeological site in South Dakota, and On a Slant Village in North Dakota.

An early version of Artifact Analyzer can be found here: <https://artifact-analyzer.vercel.app/>.

As of 4 February, functionality is limited to Site setup and test functions. A full, working version is described below. The [AI output](#) at the end was generated using Chat GPT.

## Sample Dig Site –



Layers of our favorite pastries with LEGO artifacts. These were used in presentations and at snack time.

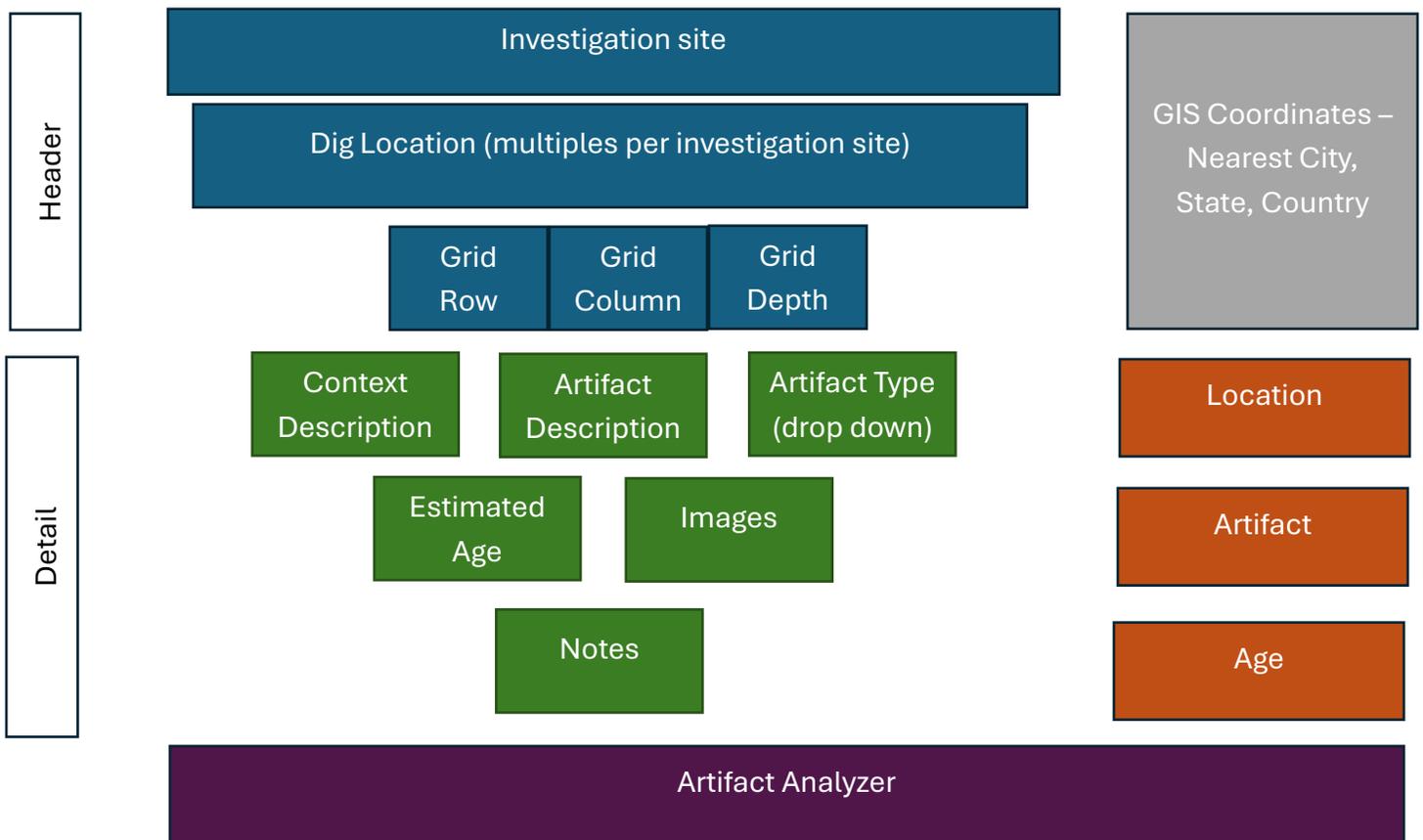
## Version 3 details

### Features as “Buttons” on a screen

**Create a Dig button** – Opens a new form to input dig data.

**Review / Edit a Dig button** – Opens an existing drop down for editing data from a previously recorded dig. Query fields should be able to help users find the dig they want to view or edit. (Searchable by Country, State, City, artifact Type, estimated age) Anyone can look at any dig, but only creators can edit their own dig. Someone who wants to edit a dig, would need permission from the dig creator. They’d get an email to do so if a user attempts to edit one that’s not theirs.

### Data layout –



### Key

	This is data is entered to create an Investigation Site.
	Data generated based on GPS of device location. (Can be added / overwritten after save.)
	This data is entered the first time a record or image is taken. For subsequent images, all fields (all colors) default to the last value of the previous record. Only a record index identifier is unique.
	AI Agents that will scour the Artifact Analyzer data on individual levels and compare data and make connections to other locations, artifacts, or ages across the whole database.
	A final Master Agent reviews the other agent output and identifies any cross-site comparisons, builds migration models or trade networks, and generates explainable, reasoned paths and suggests further research.

## Information fields

### When you create an Investigation Site

<b>Data Name</b>	<b>Example</b> (notes)
<b>Investigation Site</b>	<b>Mitchell River Site</b> (user entered)
<b>Dig Location</b>	<b>Plot 101</b> (user entered)
<b>Grid Row</b>	<b>5</b> (user entered)
<b>Grid Column</b>	<b>5</b> (user entered. Note – by convention during detail entry, columns will be expressed as sequential letters beginning with “A”.)
<b>Grid Depth</b>	<b>NA</b> (No pre-configuration required. Expressed in feet of depth, entered incrementally.)
<b>GIS Coordinates</b>	<b>43.4716, 98.034</b> (learned from laptop or phone)
<b>Location</b>	<b>3200 Indian Village Rd, Mitchell, SD 57301</b> (defaulted from laptop or phone)

### Fields at Detail Creation...

<b>Data Name</b>	<b>Example</b> (notes)
<b>Context Description</b>	<b>Dried mud with small stones</b> (text – 64 characters)
<b>Artifact Type</b>	<b>Stone Tool</b> (Selected from drop down)
<b>Artifact Description</b>	<b>Arrowhead, rounded head with notches at base.</b> (text – 128 characters)
<b>Estimated Age</b>	<b>1100 CE</b> (text, to be expressed in years as BCE or CE.)
<b>Images</b>	<b>6_revealed arrowhead</b> (36-character name entry is optional, or use system generated name of photograph from attached Bluetooth device. Photo gets the Header and Detail information as metadata, including time-stamp.)
<b>Notes</b>	<b>Rounded ends indicate Mandan culture.</b> (text, maximum allowed size within reason.)

### Sample Artifact Type for dropdown

<b>Artifact Types</b>	<b>Examples</b>
<b>Stone</b>	Hammerstone, knives, drills, stones
<b>Pottery</b>	Shards, vessels
<b>Bone</b>	Awls, needles, flakers, gaming pieces
<b>Shell</b>	Beads, tools, scrapers, scoops
<b>Metal</b>	Tools, knives, buttons
<b>Animal remains</b>	Bison, deer, fish, butchering / burnt bones
<b>Botanical remains</b>	Seed, charcoal samples, nutshells
<b>Fiber</b>	Basketry, wove mats, footwear, cordage
<b>Features</b>	Hearths, middens, storage pits, postholes
<b>Architectural</b>	Slab foundations, daub, wood fragments
<b>Trade goods - out of place</b>	Shells, minerals, metal plate, flint
<b>Post-contact</b>	Glass beads, musket balls, buttons, buckles
<b>Cultural</b>	Whole objects, identified or not

## Future feature ideas to add

- 1)** A dig owner can create a team where team members can edit each other's dig information.
- 2)** Allow attachments in the same way photos are attached so things like scanned notebook pages can be added using a phone or page scanning App.
- 3)** Consider Artifact Types sub-category as an optional field? It is important to make it selectable to assist AI review.
- 4)** Consider adding reports to display summary data for each site.
- 5)** Ensure all photos are available by investigation and dig site.

## How it works

1. Create an Investigation Site using the App on a mobile phone or laptop by entering:

<b>Investigation Site</b>
<b>Dig Location</b>
<b>Grid Row</b>
<b>Grid Column</b>
<b>Grid Depth</b>
<b>GIS Coordinates</b>
<b>Location</b>

2. Connect hardware you are planning to use. For example - A laptop to be used in the field that is connected to a hotspot connected to the App. Connect a camera to the laptop via Bluetooth.
3. Take an initial picture of the Dig location. Enter information. You haven't started digging yet, so the grid details aren't needed. Unless you are lucky, there are no artifacts either.

<b>Context Description</b>
<b>Artifact Type</b>
<b>Artifact Description</b>
<b>Estimated Age</b>
<b>Images</b>
<b>Notes</b>

<b>Grid Row</b>
<b>Grid Column</b>
<b>Grid Depth</b>

4. Set up the Grid System to be used and take another photo.

<b>Context Description</b>
<b>Artifact Type</b>
<b>Artifact Description</b>
<b>Estimated Age</b>
<b>Images</b>
<b>Notes</b>

<b>Grid Row</b>
<b>Grid Column</b>
<b>Grid Depth</b>

5. Dig in and find something interesting! Take photos, repeat entry - updating artifact and grid details as appropriate.

<b>Context Description</b>
<b>Artifact Type</b>
<b>Artifact Description</b>
<b>Estimated Age</b>
<b>Images</b>
<b>Notes</b>

<b>Grid Row</b>
<b>Grid Column</b>
<b>Grid Depth</b>

6. Data is recorded to the cloud provided there is internet access, otherwise it is saved and synced for later uploads.
7. Digging can be paused as needed and resumed by opening the App and selecting the right Investigation site. A Map button will make the selection of sites easier as well as highlight where other dig sites are.
8. To analyze data, open the App. AI Agents are available to analyze data by selecting individual records, whole Dig sites, A grouping of Dig sites, a whole Investigation Site, or a grouping of Investigation sites. Agents are available to analyze Location, Artifact, Age of the artifacts found, and a full, findings comparison by a Master Agent that will use the output of the other agents to look for connections between the dig sites analyzed. Any output of any of the agents is stored by date and by username and indexed to the specific source data referenced. Subsequent AI Agent runs can include or exclude these findings based on user selection.

In order to get the best and more accurate information, it is suggested to start small in the analysis – start with the individual agents across the dig sites of interest, then analyze using the Master Agent for those findings. Following up on any relevant content, then expand to the whole investigation site. Then, search for any key terms or cultural references in other sites nearby and begin your search for connections. Subsequent Master Agents will attempt to find connections with site findings.

9. Output is available in several forms and generally starts with pins representing a dig site on a map. The map displays a selected state (or country...) with Investigation Site pins. Clicking on the pin will reveal a table of dig sites at that Investigation Site. Clicking a dig site pin will show two photos – the first photo of the clear, non-excavated site, and the photo of the deepest portion of the dig site. A short, AI generated summary of the dig site will be listed along with artifact count and date range of items found. A printout is available by dig site, showing all records of the database. Any AI generated content is available by dig site index reference. Clicking a “Show connections” button will display a map with pins denoting AI forecasted connections in red and confirmed connections in green. An archaeologist will have the chance to approve the connection from the generated listing during the Master AI review process.

# Test Data set (Generated from real data found online and by MS Co-pilot)



artifact\_dataset.csv

## Location Agent (AI analysis by Location)

### What the investigation and dig sites tell us about archaeology in these areas

You're looking at three major sites, each with equal representation in the dataset:

- **Cahokia (East St. Louis, IL)** – Mississippian heartland
- **Mitchell (39DV2, SD)** – Plains village tradition
- **Mandan Villages (Mandan, ND)** – Upper Missouri Plains, late prehistoric to early contact

Despite being geographically distinct, all three sites show:

- Dense cultural deposits (pits, hearths, architectural features)
- Evidence of **sedentary or semi-sedentary communities**
- Repeated use of the same spaces over time (multiple contexts per site)

### What's striking:

This is not “light-touch” archaeology (e.g., hunting camps or transient stops). All three locations reflect **long-term occupation with planned space use**—storage pits, hearths, architectural remains, and refuse zones appear consistently.

### Regional takeaway:

These areas were not marginal or peripheral landscapes. They were **population centers or hubs**, deeply integrated into subsistence, ritual, and trade systems appropriate to their ecological zones (riverine floodplains and plains-adjacent river systems).

## Artifact Agent (AI analysis by Artifact)

### What is common—and what is conspicuously absent

#### Commonalities across sites

Across all locations, you see a recurring toolkit:

- **Subsistence-related artifacts**
  - Animal remains
  - Bone tools (awl, fishhook)
  - Botanical remains

- **Domestic and architectural evidence**
  - Pottery
  - Structural/architectural materials
  - Features (hearths, storage pits)
- **Symbolic or cultural items**
  - Shell ornaments
  - Engraved or worked decorative pieces
- **Trade and interaction**
  - Out-of-place trade goods
  - Exotic materials (shell far from source areas)

This combination strongly suggests **self-sufficient communities** with:

- Food production and processing
- Craft specialization (bone, shell, pottery)
- Participation in regional or interregional exchange networks

#### **What's missing (and what that tells us)**

Notably absent or rare:

- Weapons of war in quantity
- Large-scale metal toolkits (pre-contact contexts)
- Clear elite-only assemblages (no strong wealth stratification visible)

#### **Interpretation:**

These are not primarily military, elite, or short-lived extraction sites. Instead, they represent **everyday lived landscapes**—places where people cooked, worked, traded, ritualized, and raised families.

## Age Agent (AI analysis by Age)

### Chronological patterns and overlap

The dataset breaks cleanly into three overlapping time ranges:

- **1000–1200 CE** (Cahokia)
- **1000–1150 CE** (Mitchell)
- **1450–1750 CE** (Mandan Villages)

### Key observations

- Cahokia and Mitchell overlap heavily in time
- Mandan villages extend later, into the early contact period
- Artifact categories remain remarkably consistent despite the time shift

### What this suggests about the people

- There is **cultural continuity in lifeways**, even as societies change
- Core practices—food storage, craft production, settlement planning—persist
- Later Mandan material shows adaptation rather than rupture (post-contact items appear, but alongside traditional materials)

### Big-picture takeaway:

These societies were **resilient and adaptive**, not fragile. Even with major shifts (climate, trade networks, eventual European contact), the fundamental structure of daily life remains recognizable.

## Combined AI Agents

Taken together, the data points to a shared pattern:

**River-oriented, sedentary communities engaged in agriculture, craft production, and long-distance exchange, with strong cultural continuity across centuries.**

### Key conclusions

1. These sites functioned as **regional nodes**, not isolated villages
2. Trade networks (especially shell and exotic goods) were **stable and persistent**
3. Social organization emphasized **household and community continuity**, not elite dominance
4. Cultural practices outlasted political or environmental changes

This is especially compelling given the geographic spread: different environments, similar solutions.

## What other sites should be included—and why

To deepen and test these conclusions, I'd recommend adding:

### 1. Smaller satellite or hinterland sites

- Farmsteads or seasonal camps near Cahokia or Mandan villages
- Purpose: understand economic dependency and rural–urban interaction

### 2. Earlier Woodland-period sites

- To trace the *emergence* of these patterns
- Purpose: determine which behaviors are inherited vs. innovative

### 3. Trade-source locations

- Shell source areas (Gulf Coast, Atlantic)
- Lithic quarry sites
- Purpose: clarify directionality and intensity of trade networks

### 4. Contact-period transition sites

- Especially sites with mixed indigenous and European material culture
- Purpose: examine cultural resilience and selective adoption

## Final thoughts

These datasets tell a story of people who built systems that worked, refined them over centuries, and adapted when they had to.

The analyzed dataset captures **continental-scale Indigenous economy** that worked astonishingly well for centuries.