Adel Ozdem

adel.ozdem@laverne.edu

Department of Computer Science, University of La Verne

Comps

Prof. Juan Rodriguez

January 29, 2026

## 1. System Overview & Core Functions

The "Chagas AI" system is designed for the rapid identification of the *Triatoma dimidiata* (kissing bug) and the assessment of its potential infectious status using artificial intelligence. The primary goal is to provide an accessible tool for early detection efforts against Chagas disease.

**Core AI Functions:**

- **Focus & Isolation:** The AI is designed to perform background removal to focus strictly on the insect, regardless of whether the photo was taken in a laboratory or under natural field conditions with varying lighting and backgrounds.
- **Classification:** The model identifies the bug as **Infected**, **Uninfected**, or **Unknown** (if the image does not contain a bug or the quality is too poor for analysis).
- **Robustness:** By utilizing **Data Augmentation** and **GANs (Generative Adversarial Networks)**, the system overcomes the challenge of a small dataset by creating variations of the *Triatoma dimidiata* species to improve recognition accuracy across different environments.

## 2. System Interface Mockups

### *A. User Submission & Image Upload*

This interface emphasizes the ease of use for the end-user to provide data for analysis.

- **Function:** Users can upload a raw image for instant AI analysis.
- **Alternative:** Options to enter bug details manually or search the existing database.

***B. AI Analysis & Pre-processing Results***

This screen visualizes the "bridge between concept and implementation" by showing how the AI interprets the data.

- **Visual Focus:** The system displays the isolated insect image after background removal.
- **Metrics:** It provides a **Predicted Species**, **Predicted Impact** (Infected/Uninfected), and an **AI Confidence Score**(e.g., 65.63%).

***C. Geospatial Distribution (Map Explorer)***

A key structure for system engineering that emphasizes the core function of tracking disease vectors.

- **Function:** Visualizes the location of confirmed bugs using color-coded markers (Red for Infected, Green for Uninfected).

***D. Data Validation & Administration***

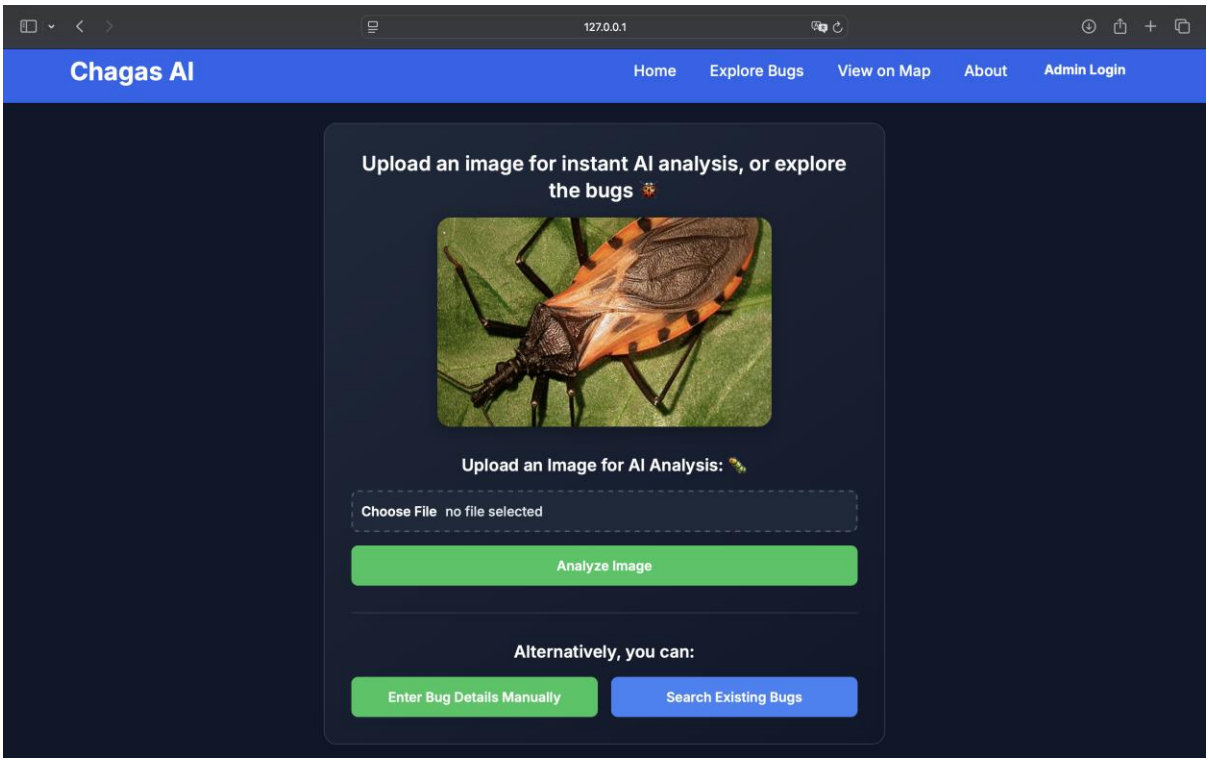
To ensure the system minimizes rework and maintains high-quality data.

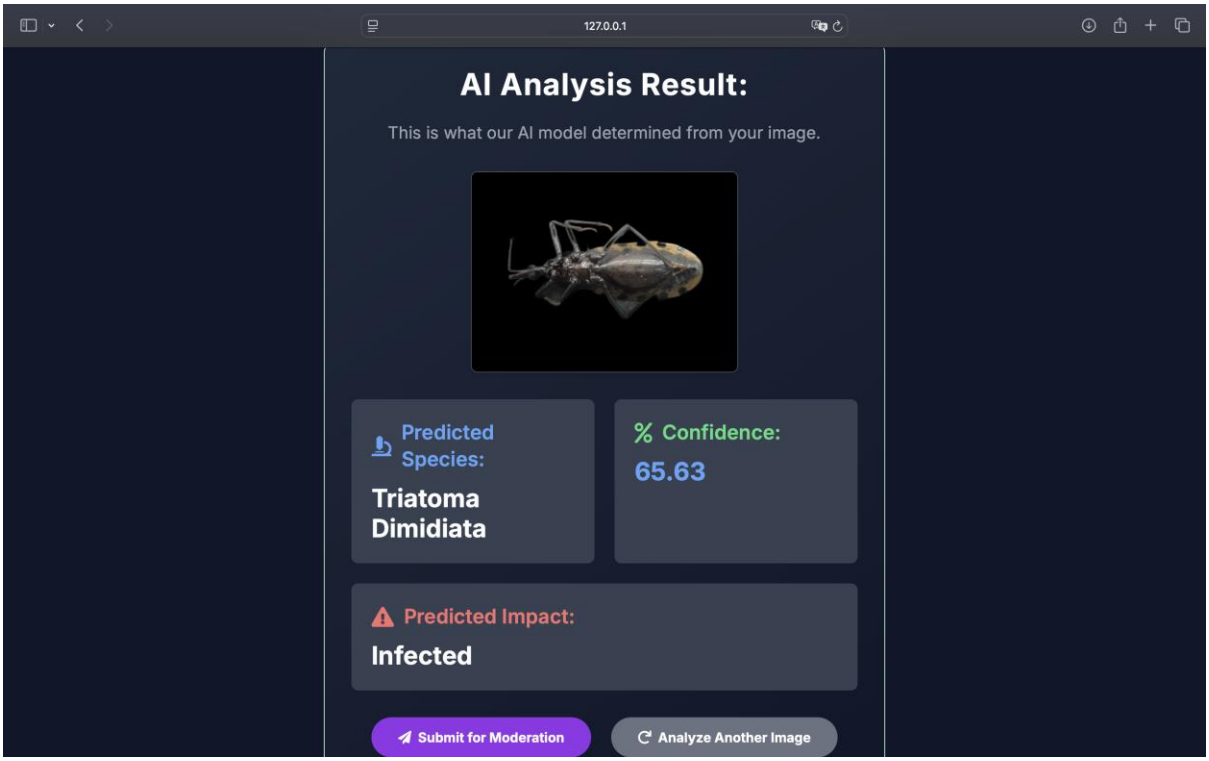
- **Function:** An admin interface to "Edit All Bug Submission Details," allowing for manual correction of AI predictions (e.g., Parasitology Status) and metadata (location, time, behavior).

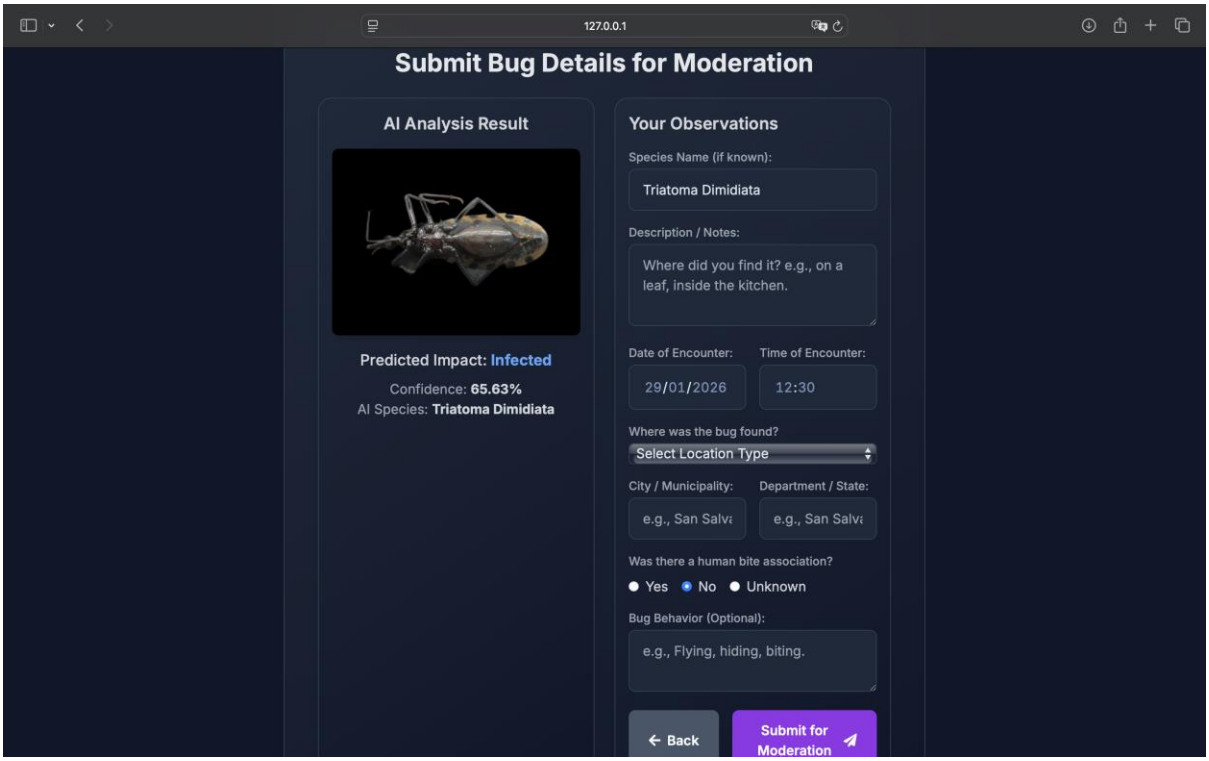
### 3. Technical Implementation Strategy

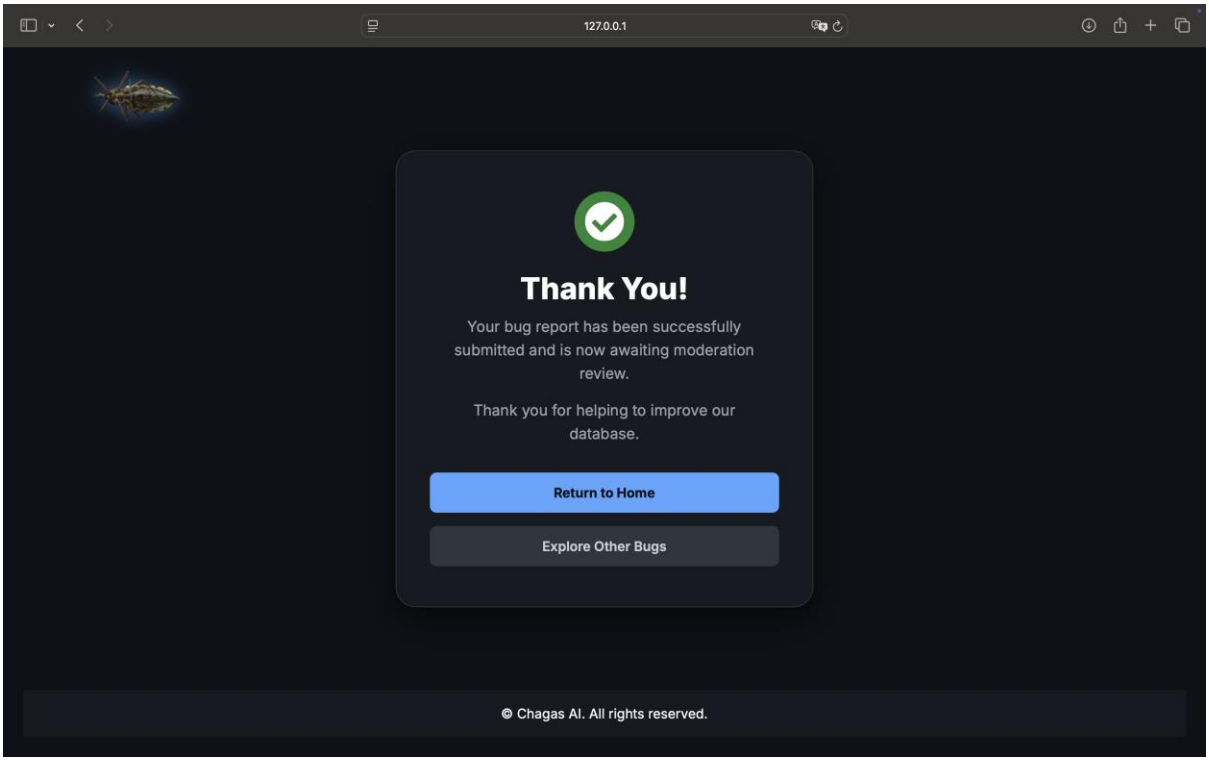
To achieve the design layout shown in these mockups, the system utilizes:

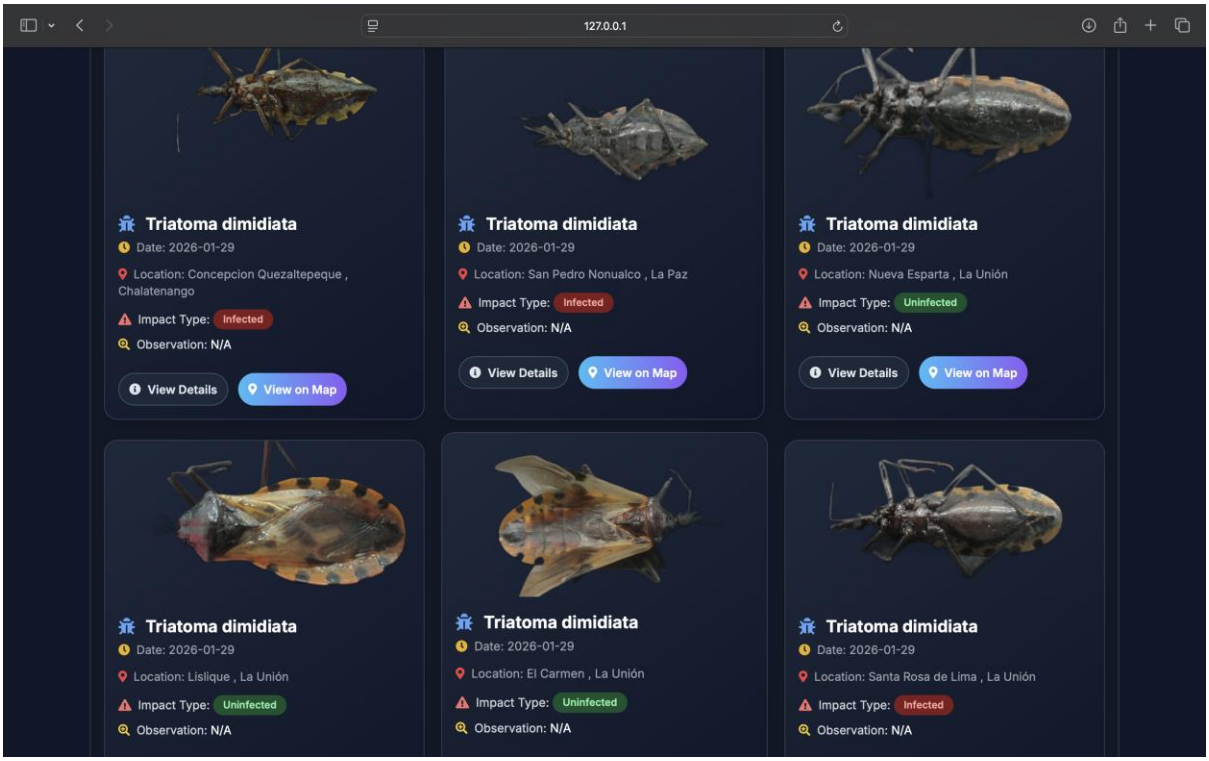
- **Object Detection:** Using **YOLO** to locate the bug and crop the image to remove environmental noise.
- **Out-of-Distribution (OOD) Detection:** If the confidence score falls below a specific threshold, the system triggers the **"Unknown"** classification to avoid false positives.

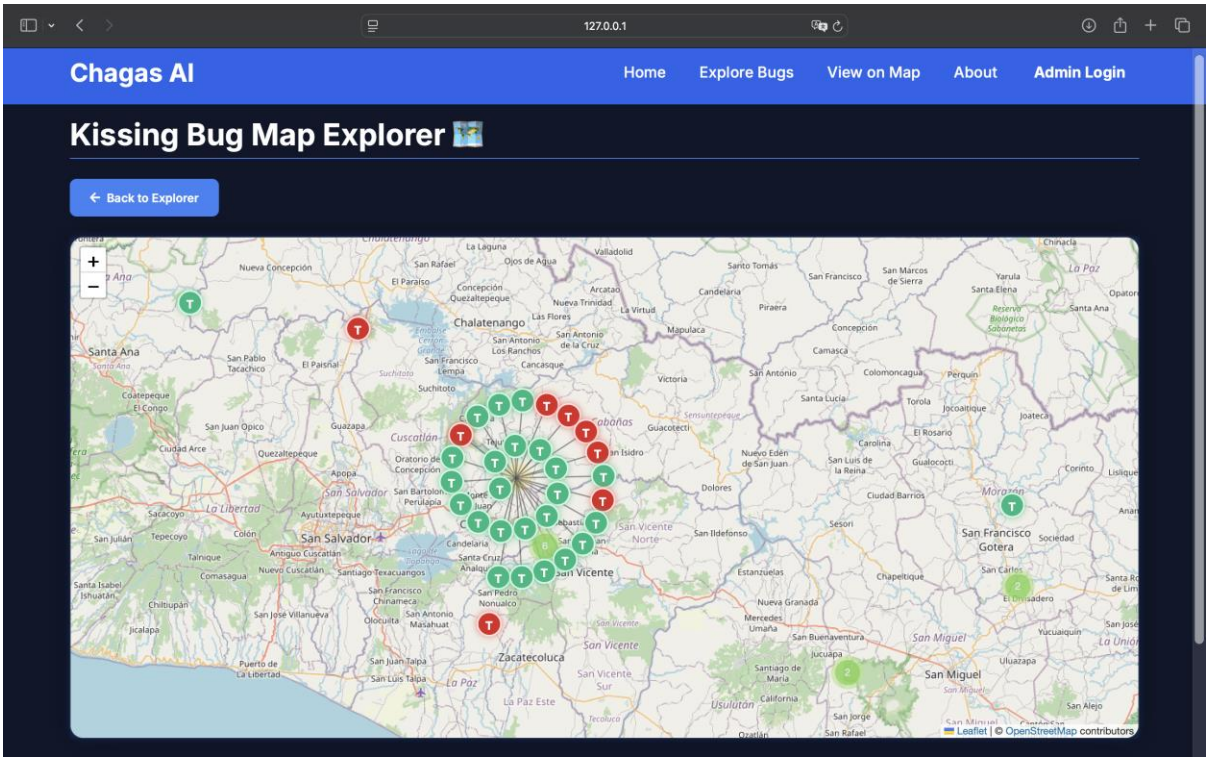


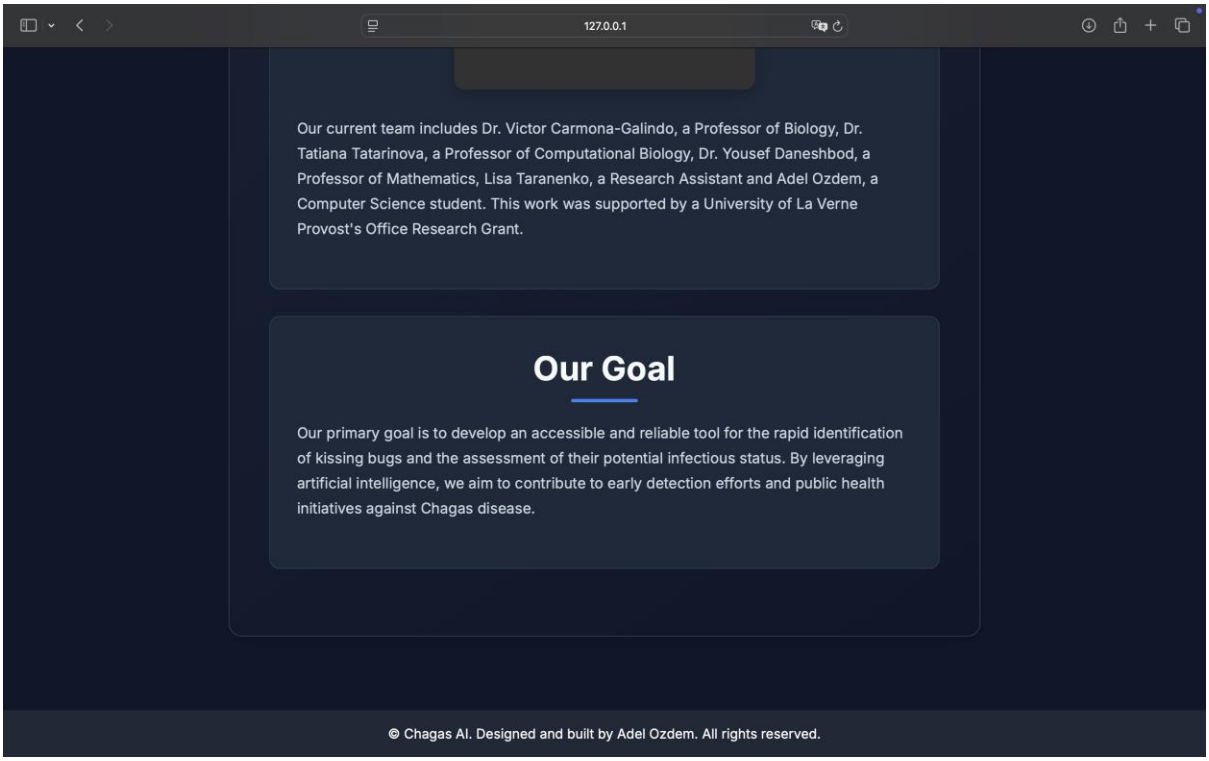

127.0.0.1
AI Analysis Result:
This is what our AI model determined from your image.
Predicted Species:
Triatoma Dimidiata
% Confidence:
65.63
Predicted Impact:
Infected
Submit for Moderation
Analyze Another Image

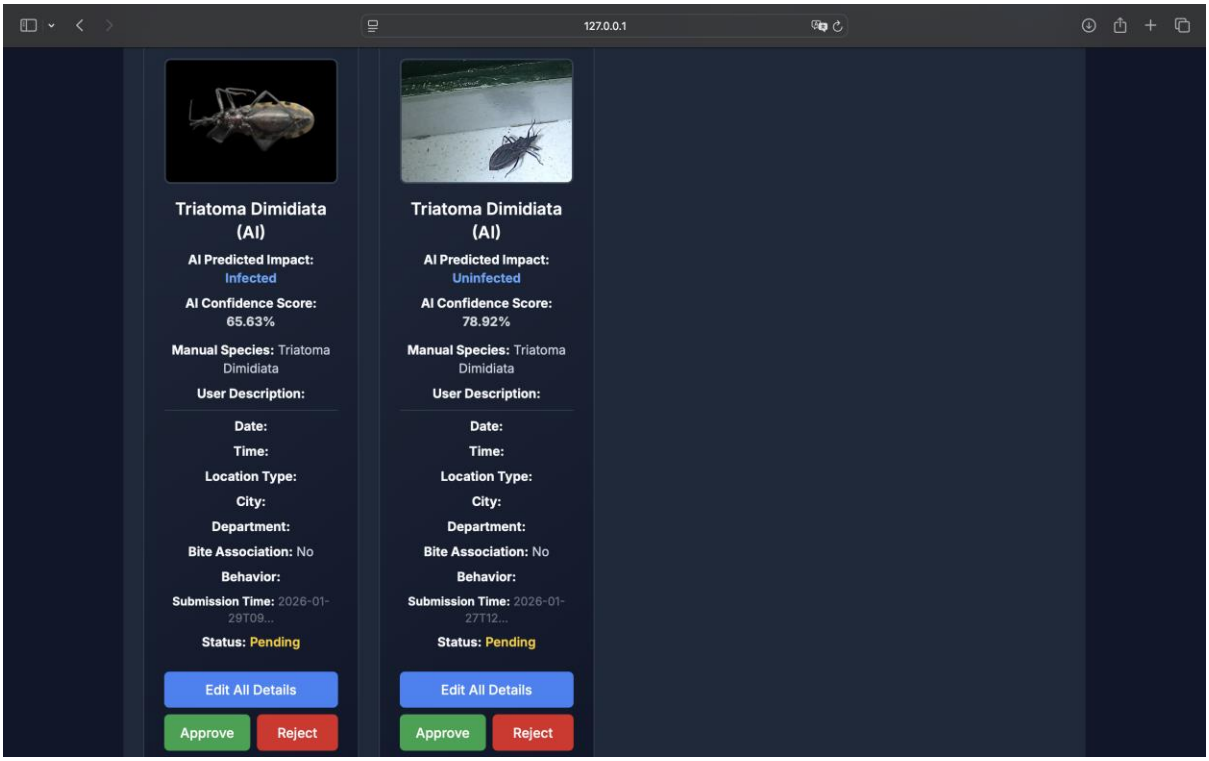

127.0.0.1
Submit Bug Details for Moderation
AI Analysis Result
Predicted Impact: Infected
Confidence: 65.63%
AI Species: Triatoma Dimidiata
Your Observations
Species Name (if known):
Triatoma Dimidiata
Description / Notes:
Where did you find it? e.g., on a leaf, inside the kitchen.
Date of Encounter:
29/01/2026
Time of Encounter:
12:30
Where was the bug found?
Select Location Type
City / Municipality:
e.g., San Salv
Department / State:
e.g., San Salv
Was there a human bite association?
Yes
No
Unknown
Bug Behavior (Optional):
e.g., Flying, hiding, biting.
← Back
Submit for Moderation

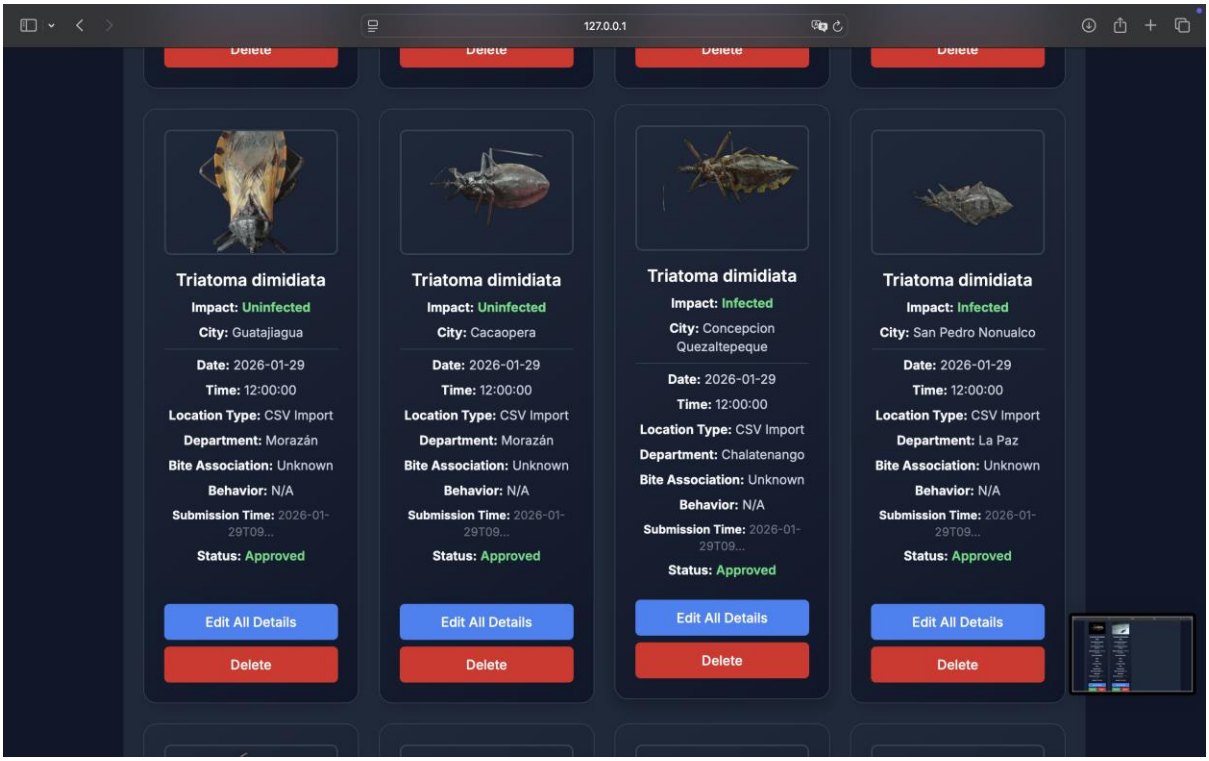

127.0.0.1
Thank You!
Your bug report has been successfully submitted and is now awaiting moderation review.
Thank you for helping to improve our database.
Return to Home
Explore Other Bugs
© Chagas AI. All rights reserved.

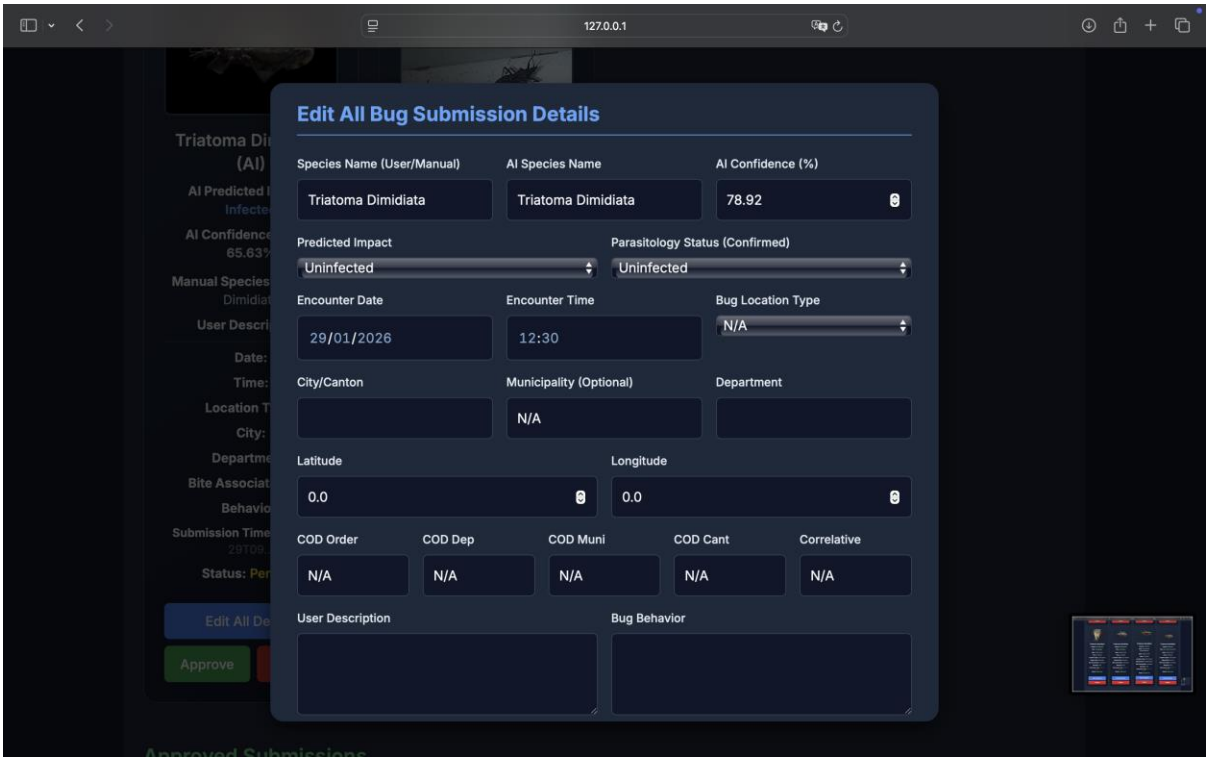

127.0.0.1
Triatoma dimidiata
Date: 2026-01-29
Location: Concepcion Quezaltepeque , Chalatenango
Impact Type: Infected
Observation: N/A
View Details
View on Map
Triatoma dimidiata
Date: 2026-01-29
Location: San Pedro Nonualco , La Paz
Impact Type: Infected
Observation: N/A
View Details
View on Map
Triatoma dimidiata
Date: 2026-01-29
Location: Nueva Esparta , La Unión
Impact Type: Uninfected
Observation: N/A
View Details
View on Map
Triatoma dimidiata
Date: 2026-01-29
Location: Lislique , La Unión
Impact Type: Uninfected
Observation: N/A
Triatoma dimidiata
Date: 2026-01-29
Location: El Carmen , La Unión
Impact Type: Uninfected
Observation: N/A
Triatoma dimidiata
Date: 2026-01-29
Location: Santa Rosa de Lima , La Unión
Impact Type: Infected
Observation: N/A

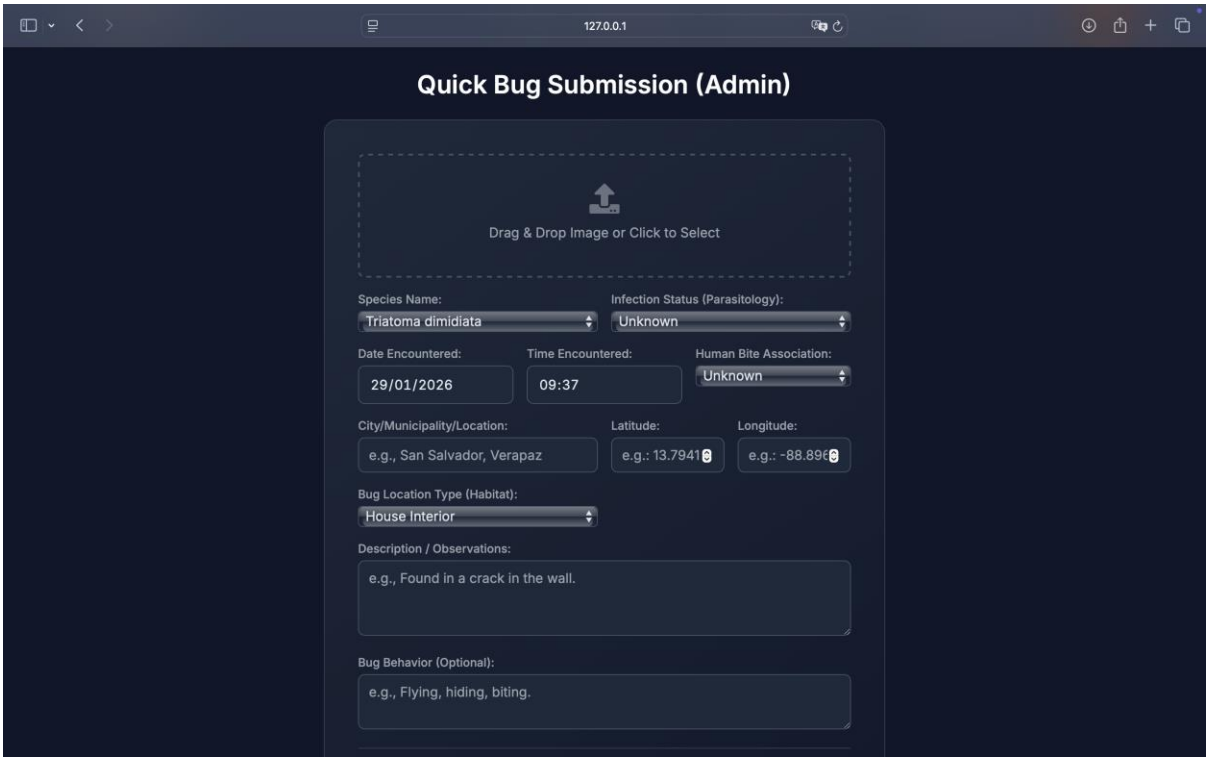

127.0.0.1
Chagas AI
Home
Explore Bugs
View on Map
About
Admin Login
Kissing Bug Map Explorer
Back to Explorer
Chalatenango
San Salvador
San Vicente
Zacatecoluca
San Miguel
Leaflet | © OpenStreetMap contributors

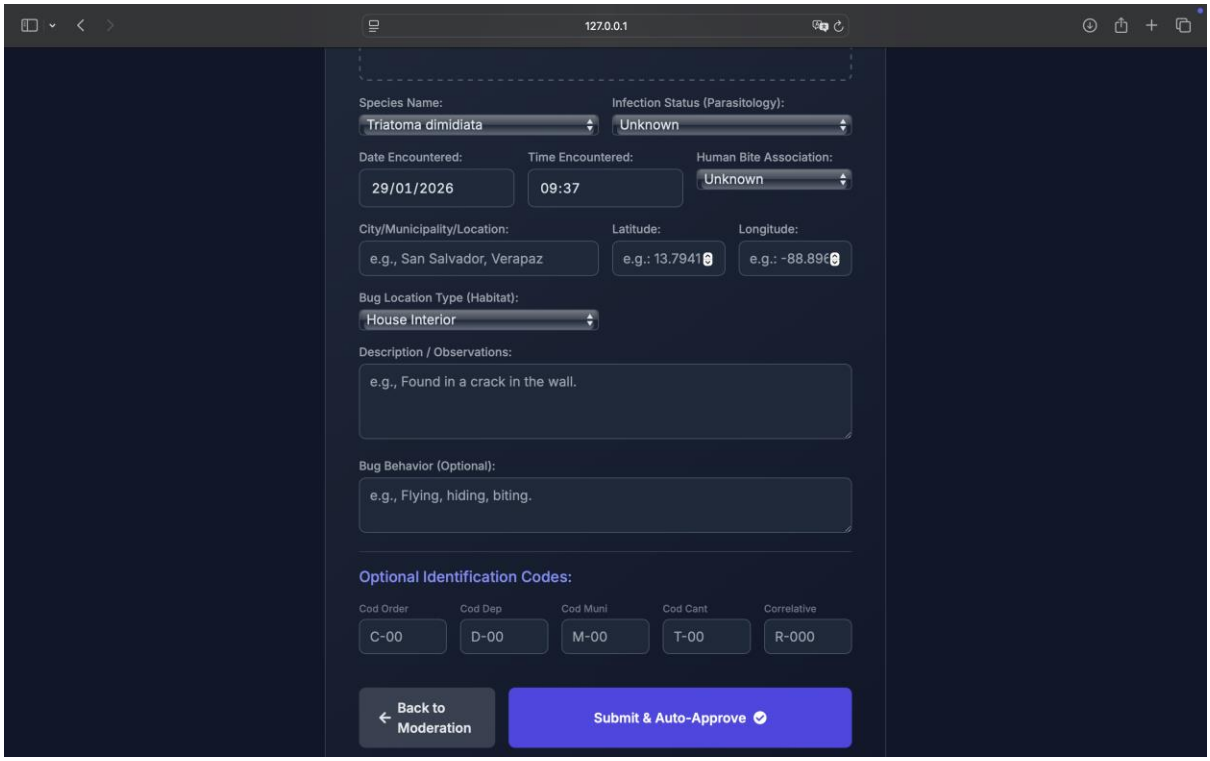

127.0.0.1
Our current team includes Dr. Victor Carmona-Galindo, a Professor of Biology, Dr. Tatiana Tatarinova, a Professor of Computational Biology, Dr. Yousef Daneshbod, a Professor of Mathematics, Lisa Taranenko, a Research Assistant and Adel Ozdem, a Computer Science student. This work was supported by a University of La Verne Provost's Office Research Grant.
Our Goal
Our primary goal is to develop an accessible and reliable tool for the rapid identification of kissing bugs and the assessment of their potential infectious status. By leveraging artificial intelligence, we aim to contribute to early detection efforts and public health initiatives against Chagas disease.
© Chagas AI. Designed and built by Adel Ozdem. All rights reserved.


127.0.0.1
Triatoma Dimidiata (AI)
AI Predicted Impact: Infected
AI Confidence Score: 65.63%
Manual Species: Triatoma Dimidiata
User Description:
Date:
Time:
Location Type:
City:
Department:
Bite Association: No
Behavior:
Submission Time: 2026-01-29T09...
Status: Pending
Edit All Details
Approve
Reject
Triatoma Dimidiata (AI)
AI Predicted Impact: Uninfected
AI Confidence Score: 78.92%
Manual Species: Triatoma Dimidiata
User Description:
Date:
Time:
Location Type:
City:
Department:
Bite Association: No
Behavior:
Submission Time: 2026-01-27T12...
Status: Pending
Edit All Details
Approve
Reject


127.0.0.1
Triatoma dimidiata
Impact: Uninfected
City: Guatajiagua
Date: 2026-01-29
Time: 12:00:00
Location Type: CSV Import
Department: Morazán
Bite Association: Unknown
Behavior: N/A
Submission Time: 2026-01-29T09...
Status: Approved
Edit All Details
Delete
Triatoma dimidiata
Impact: Uninfected
City: Cacaopera
Date: 2026-01-29
Time: 12:00:00
Location Type: CSV Import
Department: Morazán
Bite Association: Unknown
Behavior: N/A
Submission Time: 2026-01-29T09...
Status: Approved
Edit All Details
Delete
Triatoma dimidiata
Impact: Infected
City: Concepcion Quezaltepeque
Date: 2026-01-29
Time: 12:00:00
Location Type: CSV Import
Department: Chalatenango
Bite Association: Unknown
Behavior: N/A
Submission Time: 2026-01-29T09...
Status: Approved
Edit All Details
Delete
Triatoma dimidiata
Impact: Infected
City: San Pedro Nonualco
Date: 2026-01-29
Time: 12:00:00
Location Type: CSV Import
Department: La Paz
Bite Association: Unknown
Behavior: N/A
Submission Time: 2026-01-29T09...
Status: Approved
Edit All Details
Delete


127.0.0.1
Edit All Bug Submission Details
Species Name (User/Manual)
Triatoma Dimidiata
AI Species Name
Triatoma Dimidiata
AI Confidence (%)
78.92
Predicted Impact
Uninfected
Parasitology Status (Confirmed)
Uninfected
Encounter Date
29/01/2026
Encounter Time
12:30
Bug Location Type
N/A
City/Canton
Municipality (Optional)
N/A
Department
Latitude
0.0
Longitude
0.0
COD Order
N/A
COD Dep
N/A
COD Muni
N/A
COD Cant
N/A
Correlative
N/A
User Description
Bug Behavior
Approve


127.0.0.1
Quick Bug Submission (Admin)
Drag & Drop Image or Click to Select
Species Name:
Triatoma dimidiata
Infection Status (Parasitology):
Unknown
Date Encountered:
29/01/2026
Time Encountered:
09:37
Human Bite Association:
Unknown
City/Municipality/Location:
e.g., San Salvador, Verapaz
Latitude:
e.g.: 13.7941
Longitude:
e.g.: -88.89
Bug Location Type (Habitat):
House Interior
Description / Observations:
e.g., Found in a crack in the wall.
Bug Behavior (Optional):
e.g., Flying, hiding, biting.


127.0.0.1
Species Name:
Triatoma dimidiata
Infection Status (Parasitology):
Unknown
Date Encountered:
29/01/2026
Time Encountered:
09:37
Human Bite Association:
Unknown
City/Municipality/Location:
e.g., San Salvador, Verapaz
Latitude:
e.g.: 13.7941
Longitude:
e.g.: -88.89
Bug Location Type (Habitat):
House Interior
Description / Observations:
e.g., Found in a crack in the wall.
Bug Behavior (Optional):
e.g., Flying, hiding, biting.
Optional Identification Codes:
Cod Order
C-00
Cod Dep
D-00
Cod Muni
M-00
Cod Cant
T-00
Correlative
R-000
Back to Moderation
Submit & Auto-Approve