

Source: TG-Snake Topic Driver

Title: Att.3 - Presentation (TG-Snake)

Purpose: Discussion

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Faculty of Medicine,
University of Geneva

Abstract: This PPT summarizes the status of work within TG-Snake, for presentation and discussion during the meeting.

Topic Group: Snakes & snakebite

Progress update

Rafael Ruiz de Castañeda
Lukas Picek
Andrew Durso
Isabelle Bolon

Institute of Global Health,
Faculty of Medicine,
University of Geneva

E-Meeting: 19-21 May 2021



Snakebite envenoming (SBE): A silent global health crisis

- **5 million snake bites** globally every year
- **SBE kills 81,000 - 138,000** and disables over **400,000** people
- In **India**, SBE causes **5 deaths/hour**, affecting in **70%** of cases the main family breadwinner



Snakebite Envenoming

A strategy for prevention and control



Launched **23 May, Geneva**

Goal: Reduce deaths and disabilities by 50% before 2030



1,960 observations

CC

Western Diamondbac...
(*Crotalus atrox*)



1,707 observations

CC

Western Rattlesnake
(*Crotalus oreganus*)



1,205 observations

CC

Copperhead
(*Agkistrodon contortrix*)



1,174 observations

CC

Cottonmouth
(*Agkistrodon piscivorus*)



389 observations

CC

Timber Rattlesnake
(*Crotalus horridus*)



368 observations

CC

Mohave Rattlesnake
(*Crotalus scutulatus*)



309 observations

CC

Prairie Rattlesnake
(*Crotalus viridis*)



283 observations

CC

Red Diamond Rattlesn...
(*Crotalus ruber*)



279 observations

©

Texas Coralsnake
(*Micrurus tener*)



257 observations

CC

Sidewinder
(*Crotalus cerastes*)



227 observations

CC

Speckled Rattlesnake
(*Crotalus mitchellii*)



142 observations

CC

Terciopelo
(*Bothrops asper*)



116 observations

CC

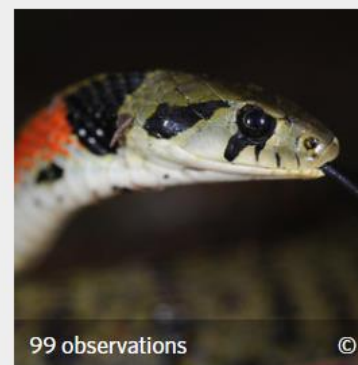
Eyelash Viper
(*Bothriechis schlegelii*)



111 observations

CC

Western Massasauga
(*Sistrurus tergeminus*)



99 observations

©

Tiger Keelback
(*Rhabdophis tigrinus*)



1,960 observations CC

1,707 observations CC

1,205 observations CC

1,174 observations CC

389 observations

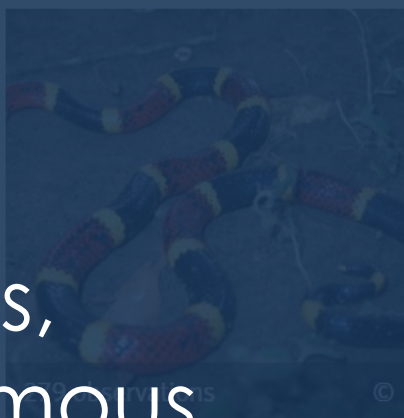
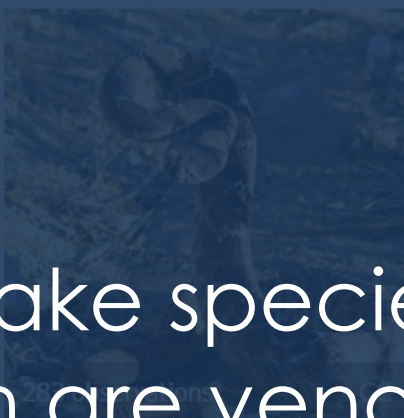
Western Diamondback...
(*Crotalus atrox*)

Western Rattlesnake
(*Crotalus oreganus*)

Copperhead
(*Agkistrodon contortrix*)

Cottonmouth
(*Agkistrodon piscivorus*)

Timber Rattlesnake
(*Crotalus h...*)



368 observations CC

287 observations

287 observations

287 observations

257 observations

Mohave Rattlesnake
(*Crotalus...*)

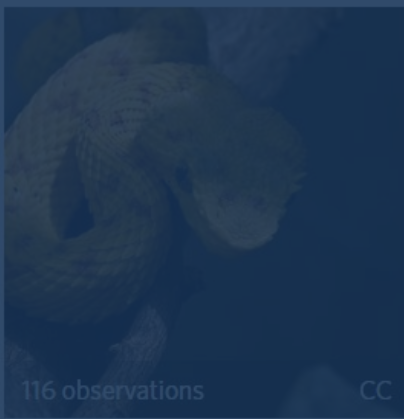
Prairie Rattlesnake
(*Crotalus...*)

Red Diamond Rattlesnake
(*Crotalus...*)

Texas Coralsnake
(*Micruroides...*)

Sidewinder
(*Crotalus cer...*)

3,700 snake species,
650 of which are venomous,
and of these 250 are medically important



227 observations CC

142 observations CC

116 observations CC

111 observations CC

99 observations

Speckled Rattlesnake
(*Crotalus mitchellii*)

Terciopelo
(*Bothrops asper*)

Eyelash Viper
(*Bothriechis schlegelii*)

Western Massasauga
(*Sistrurus tergeminus*)

Tiger Keelback
(*Rhabdophis...*)

Ecology

(e.g. snake geographic distribution)

Epidemiology

(e.g. antivenom distribution)



Snake ID

Clinical Research

(e.g. antivenom clinical trials)

Healthcare

(e.g. antivenom choice)

 OPEN ACCESS  PEER-REVIEWED

RESEARCH ARTICLE

Identifying the snake: First scoping review on practices of communities and healthcare providers confronted with snakebite across the world

Isabelle Bolon , Andrew M. Durso, Sara Botero Mesa, Nicolas Ray, Gabriel Alcoba, François Chappuis, Rafael Ruiz de Castañeda

Published: March 5, 2020 • <https://doi.org/10.1371/journal.pone.0229989>



Biting snake spotted

Average: **70%** of victims

Range: 52% – 92%

India: 77%

Source: Prabhmeet, Russel's viper, Kerala, Wikimedia commons

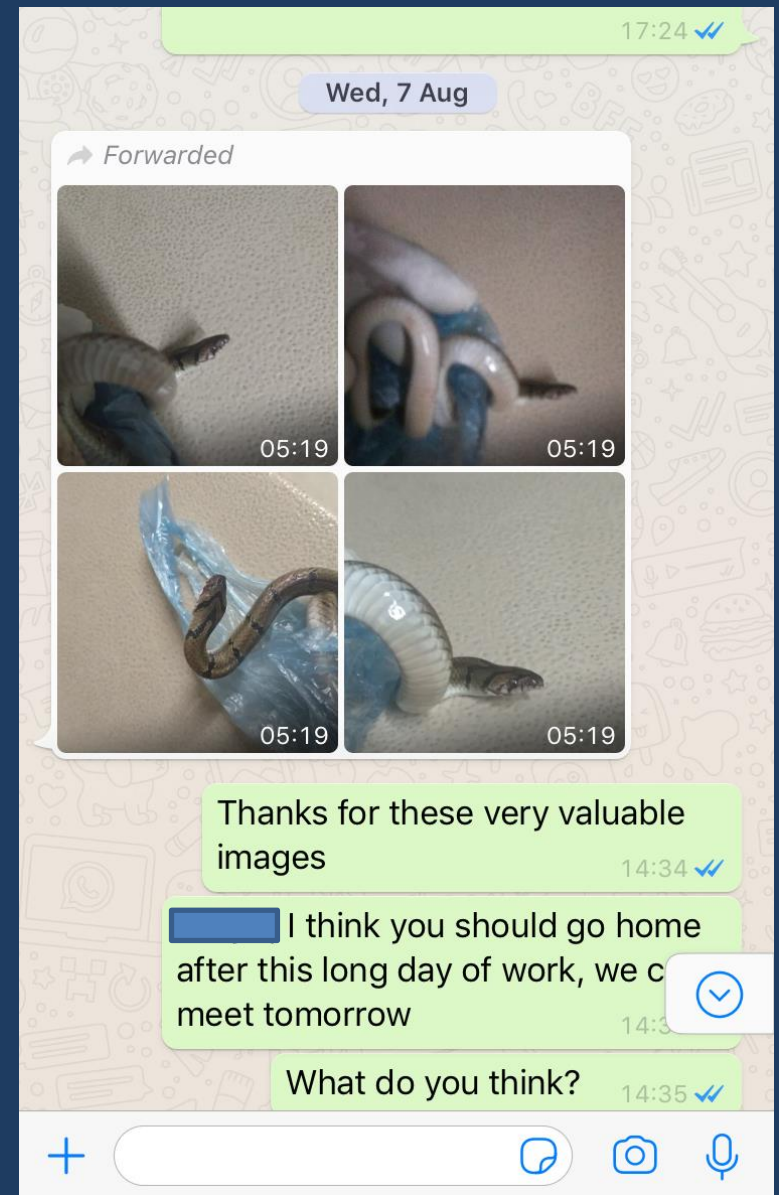
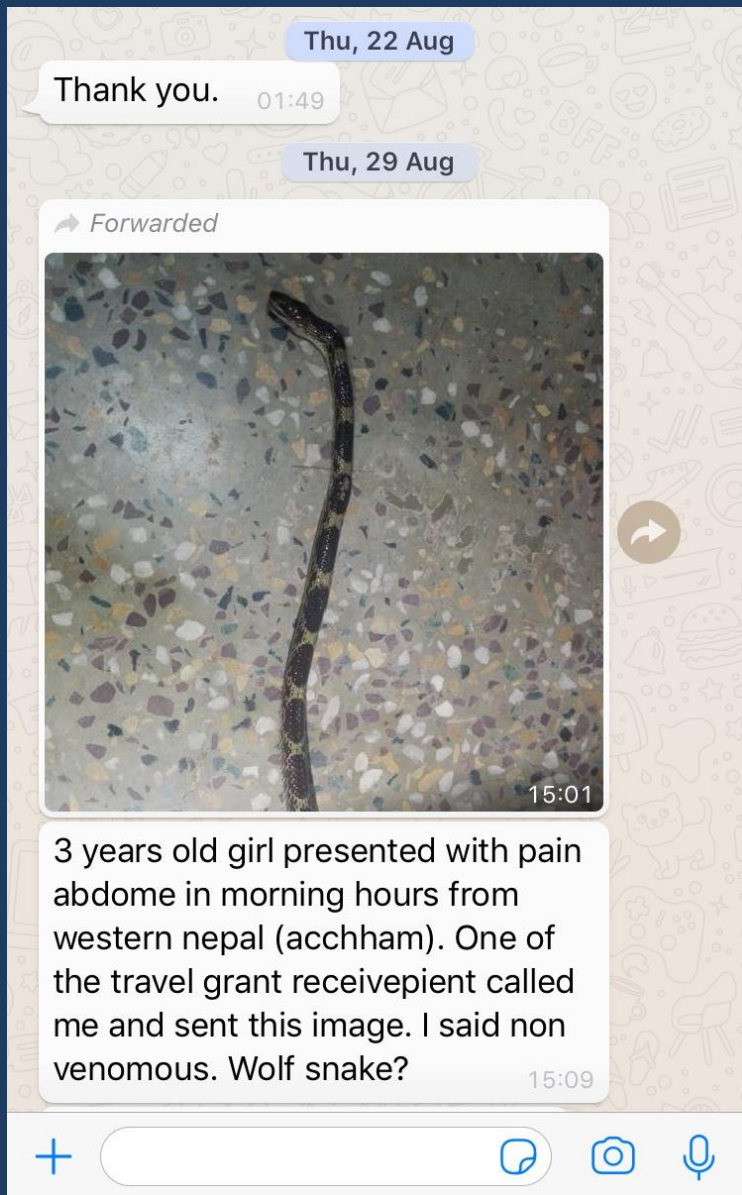


Biting snake captured/killed

In 114/150 (76%) articles
In 30/35 countries

% snakes captured/killed
e.g. in Asia

- Myanmar: 35%
- Thailand: 27%
- **India: 24%**
- Laos: 21%
- Sri Lanka: 20%

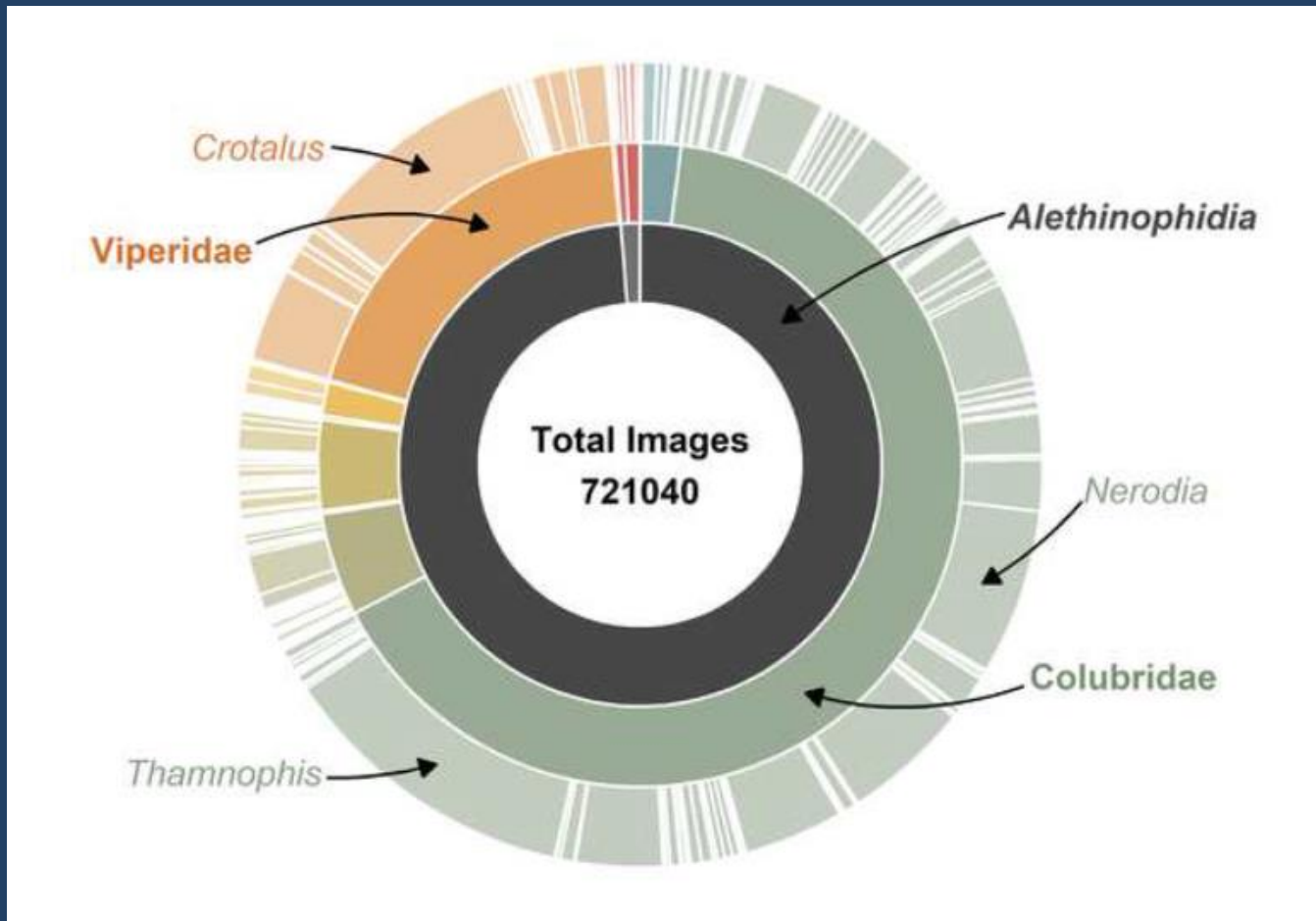




Empowering neglected communities with AI:





- **First app** applying CV to snake identification & snakebite management
- **WHO** recommends **photographing the biting snake**
- **Easy to access/use** by victims/healthcare providers at low-cost
- **Key players & end users**, onboard
- **Human** in the loop

> 700,000 photos of 3,098 of the world's 3,879 snake species (79.9%)



Citizen Science and Online Data: Opportunities and Challenges for Snake Ecology and Action against Snakebite. *Toxicon:X*, under review

Observations

 Serpents  Emplacement   Filtres

 Serpents
Sous-ordre Serpentes 

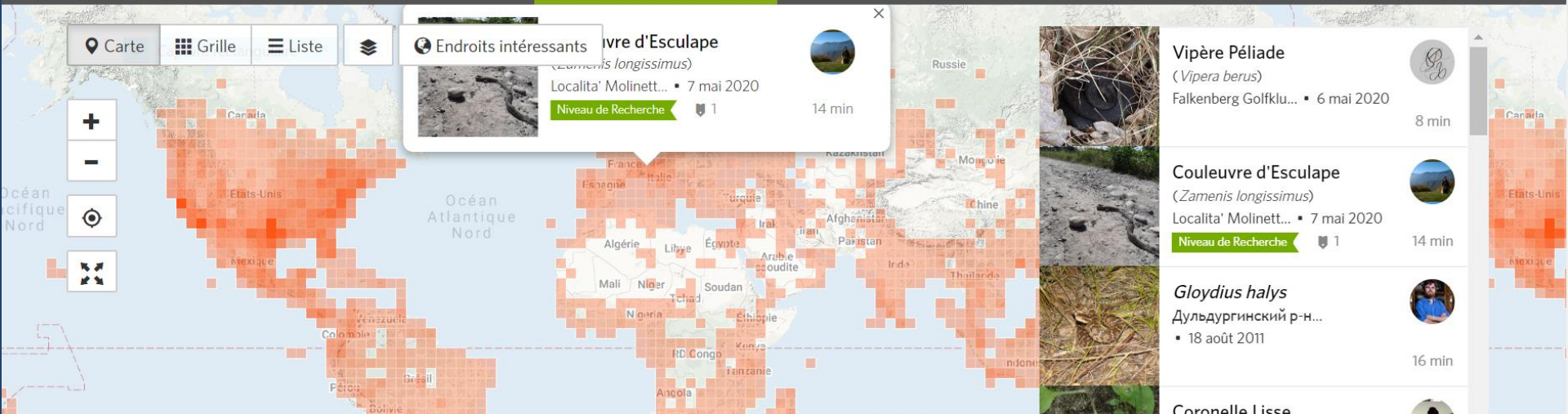
Le monde


328.424
OBSERVATIONS


2.206
ESPÈCES

16.047
IDENTIFICATEURS


77.841
OBSERVATEURS



Carte Grille Liste  Endroits intéressants

Couleuvre d'Esculape
(*Zamenis longissimus*)
Localita' Molinett... • 7 mai 2020
Niveau de Recherche  1 14 min

Vipère Péliade
(*Vipera berus*)
Falkenberg Golfklu... • 6 mai 2020
8 min

Couleuvre d'Esculape
(*Zamenis longissimus*)
Localita' Molinett... • 7 mai 2020
Niveau de Recherche  1 14 min

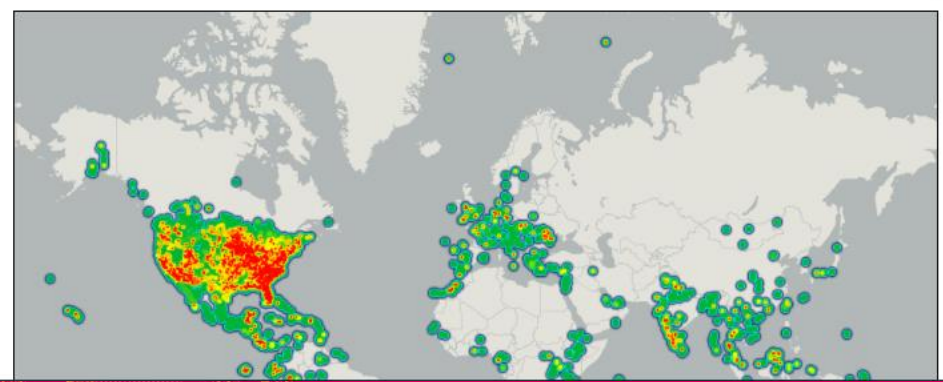
Gloydus halys
Дульдургинский р-н...
• 18 août 2011
16 min

Coronelle Lisse

Cottonmouth (*Agkistrodon piscivorus*)



Records Today: 8 Last 7 Days: 778 Last 30 Days: 4,613 Total Records: 190,898



Source: [HerpMapper](https://herpmapper.org)

Snake Identification

Public Group

Discussion

Members

Events

Videos

Photos

Files

Search this group

Shortcuts

FoodHack Geneva 201...

* Be respectful * No shaming * No negative emoticons * No guessing * Dead snakes allowed * Limit discussion that isn't ID related

CLICK HERE TO READ THE *FULL* RULES
COMMENTS THAT DON'T FOLLOW THE RULES MAY BE DELETED

We have a great group with a friendly, *professional* atmosphere; it's up to *YOU* to keep it that way!

Join Group

Join this group to post and comment.

+ Join Group

MEMBERS

52,611 Members



DESCRIPTION

Wondering what kind of snake you have found? This group is to be... [See More](#)

TAGS

Reptiles · Snakes

CREATE NEW GROUPS

Groups make it easier than ever to share with friends, family and teammates.

Create Group

PINNED POST



Christopher E. Smith shared a link.

April 8, 2015

RULES (Updated: 3 July 2017)

TinyURL: <https://tinyurl.com/Snakelidentification>

Read these rules in full. Any violation of these rules will result in the deletion of your post and possibly your permanent removal from this group. There are plenty of experts here to help identify snakes, we will not miss a few. ...
[Continue Reading](#)



Submit Observation



Indiansnakes.org

For snakes & snake people



Enter your keyword

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- Blogs
- Commandments
- Fang Facts
- Find a Snake Rescuer
- India Snake Bite Initiative
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Over 45,000 people die in Rural India from snake bites every year



Updates From the Field



India's largest digital snake database



Round 1: Completed Round 2: Completed Round 3: Completed Round 4: Completed

Snake Species Identification Challenge

1 Travel Grants
1 Authorship/Co-Authorship

Classify images of snake species from around the world

By  Institute of Global Health &  LifeCLEF  27.4k  752  46  885  22 Follow

Overview Leaderboard Discussion Insights Resources Submissions

Participate

- Task
- Datasets
- Prizes
- Timeline
- Contact Us

Starter Kit : <https://github.com/Alcrowd/snake-species-identification-challenge-starter-kit>

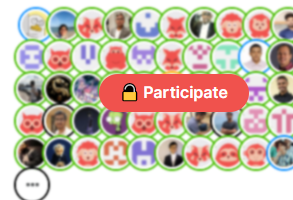
Snakebite is the most deadly neglected tropical disease (NTD), being responsible for [a dramatic humanitarian crisis in global health](#)

Snakebite causes over 100,000 human deaths and 400,000 victims of disability and disfigurement globally every year. It affects poor and rural communities in developing countries, which host the highest venomous snake diversity and the highest burden of snakebite [due to limited medical expertise and access to antivenoms](#)

Antivenoms can be life-saving when correctly administered but this often [depends on the correct taxonomic identification](#) (i.e. family, genus, species) of the biting snake. Snake identification is also important for improving our understanding of snake diversity and distribution in a given area (i.e. snake ecology) as well as the impact of different snakes on human populations (e.g. snakebite epidemiology). But [snake identification is challenging](#) due to:






- their high diversity
- the incomplete or misleading information provided by snakebite victims

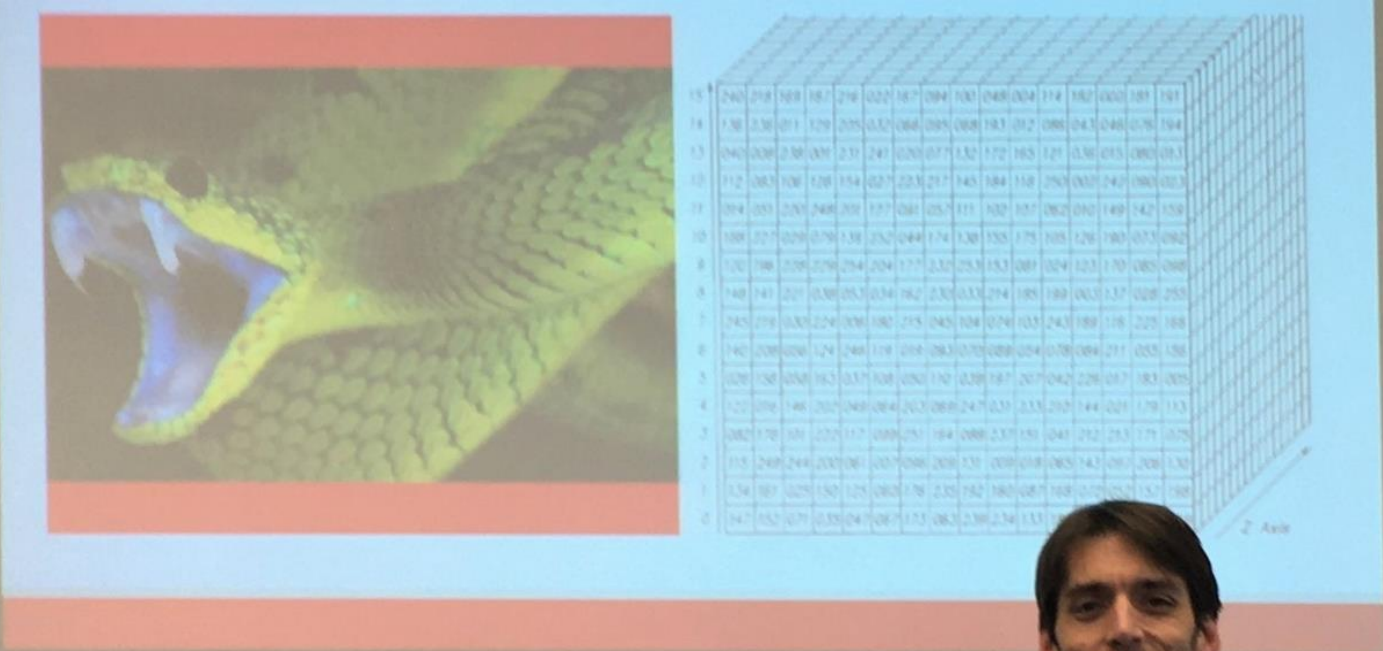
PARTICIPANTS



LEADERBOARD

See all

01	 picekl	0.794
02	 gokuleloop	0.76
03	 FHDO_BCSG	0.594
04	 andrijdavid	0.497
05	 ai4good	0.225



Source: I. Bolon



Supervised Learning Computer Vision Benchmark for Snake Species Identification From Photographs: Implications for Herpetology and Global Health

 Andrew M. Durso^{1,2*},  Gokula Krishnan Moorthy^{3*},  Sharada P. Mohanty⁴,  Isabelle Bolon²,  Marcel Salathé^{4,5} and  Rafael Ruiz de Castañeda²

¹Department of Biological Sciences, Florida Gulf Coast University, Ft. Myers, FL, United States

²Institute of Global Health, Faculty of Medicine, University of Geneva, Geneva, Switzerland

³Eloop Mobility Solutions, Chennai, India

⁴AlCrowd, Lausanne, Switzerland

⁵Digital Epidemiology Laboratory, École Polytechnique Fédérale de Lausanne, Geneva, Switzerland

We trained a computer vision algorithm to identify 45 species of snakes from photos

AIcrowd Challenge:

- Round 4 completed
- 245,185 images, split into 783 species, includes geographic location (continent, country)
- Top F1 score: 0.794
- Lukas Picek wins co-authorship + travel grant



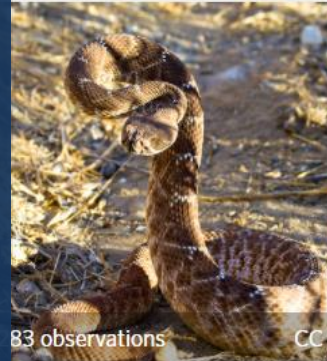
205 observations CC
Copperhead
Agkistrodon contortrix



1,174 observations CC
Cottonmouth
(Agkistrodon piscivorus)



389 observations CC
Timber Rattlesnake
(Crotalus horridus)



83 observations CC
Brown Diamond Rattlesnake
Crotalus ruber



279 observations ©
Texas Coralsnake
(Micrurus tener)



257 observations CC
Sidewinder
(Crotalus cerastes)



6 observations CC
Eyelash Viper
Bothriechis schlegelii



111 observations CC
Western Massasauga
(Sistrurus tergeminus)



99 observations ©
Tiger Keelback
(Rhabdophis tigrinus)



IMAGE
CLEF



ImageCLEF / LifeCLEF - Multimedia Retrieval in CLEF

Home > LifeCLEF 2020

Navigation

- ▶ [ImageCLEF 2020](#)
- ▼ [LifeCLEF 2020](#)
 - [BirdCLEF 2020](#)
 - [GeoLifeCLEF 2020](#)
 - [PlantCLEF 2020](#)
 - [SnakeCLEF 2020](#)
- ▶ [ImageCLEF 2019](#)
- ▶ [LifeCLEF 2019](#)
- ▶ [ImageCLEF 2018](#)
- ▶ [LifeCLEF 2018](#)

SnakeCLEF 2020



CLEF 2020 Conference and Labs of the Evaluation Forum

Information Access Evaluation meets Multilinguality, Multimodality, and Visualization

22-25 September 2020

Baringo County, Kenya




Source: Via A. Durso



Snake ID details



 Country: Kenya

 Created: 10/11/2020, 8:04 AM

AI



- 1 - *Dendroaspis polylepis*: 99.30%
- 2 - *Dispholidus typus*: 0.46%
- 3 - *Crotaphopeltis hotamboeia*: 0.09%
- 4 - *Python sebae*: 0.06%
- 5 - *Philothamnus semivariegatus*: 0.03%

Kakuma Refugee Camp, Kenya





Snake ID details



📍 Country: Kenya

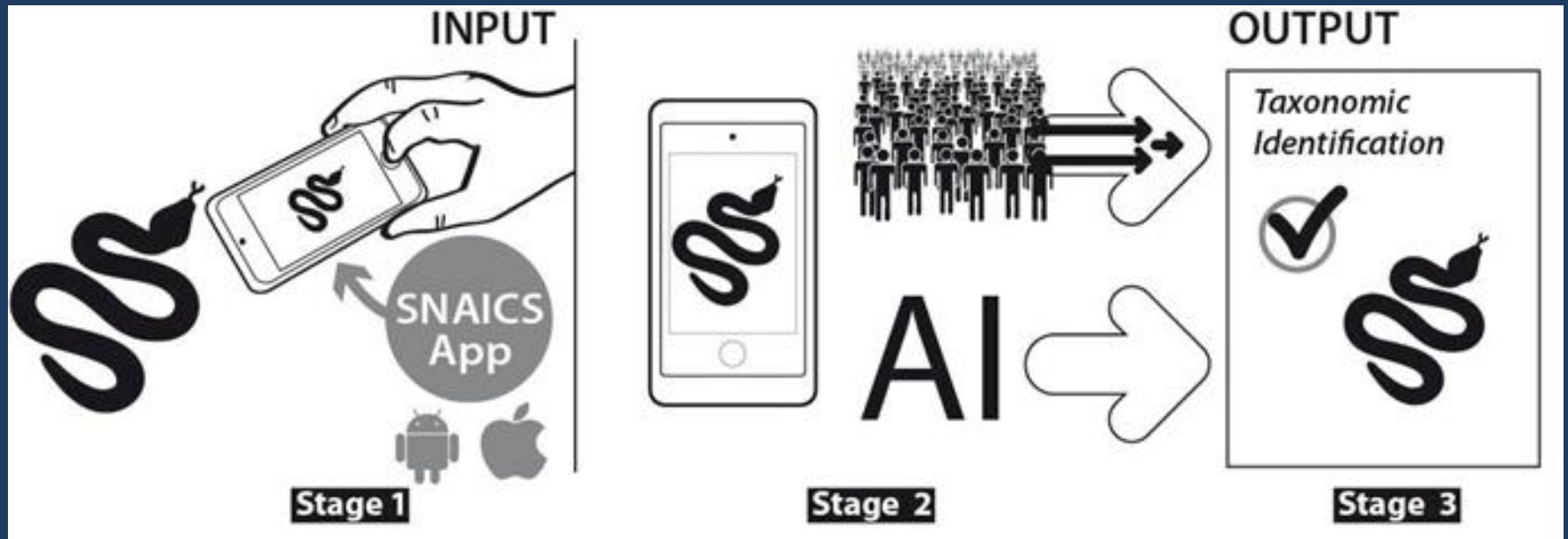
📅 Created: 12/11/2020, 7:31 PM

AI



- 1 - *Echis pyramidum*: 97.24%
- 2 - *Dasypeltis scabra*: 2.47%
- 3 - *Telescopus semiannulatus*: 0.28%
- 4 - *Bitis arietans*: 0.00%

AI + Communities of herpetologists



1,960 observations CC

Western Diamondbac...
(*Crotalus atrox*)

1,707 observations CC

Western Rattlesnake
(*Crotalus oreganus*)

1,205 observations CC

Copperhead
(*Agkistrodon contortrix*)

1,174 observations CC

Cottonmouth
(*Agkistrodon piscivorus*)

389 observations CC

Timber Rattlesnake
(*Crotalus horridus*)

SNAKE ID CHALLENGE



[CHALLENGE](#) [WINNERS](#) [FORUM](#) [ABOUT](#) [EN](#) ▾

[LOGIN](#)

DO YOU KNOW THESE SNAKES?

THE SNAKE IDENTIFICATION CHALLENGE

[SEE THE CHALLENGE](#)

[LEARN MORE](#)

Challenge ended. Thank you for your contributions! The next Challenge is coming soon.

A joint initiative by



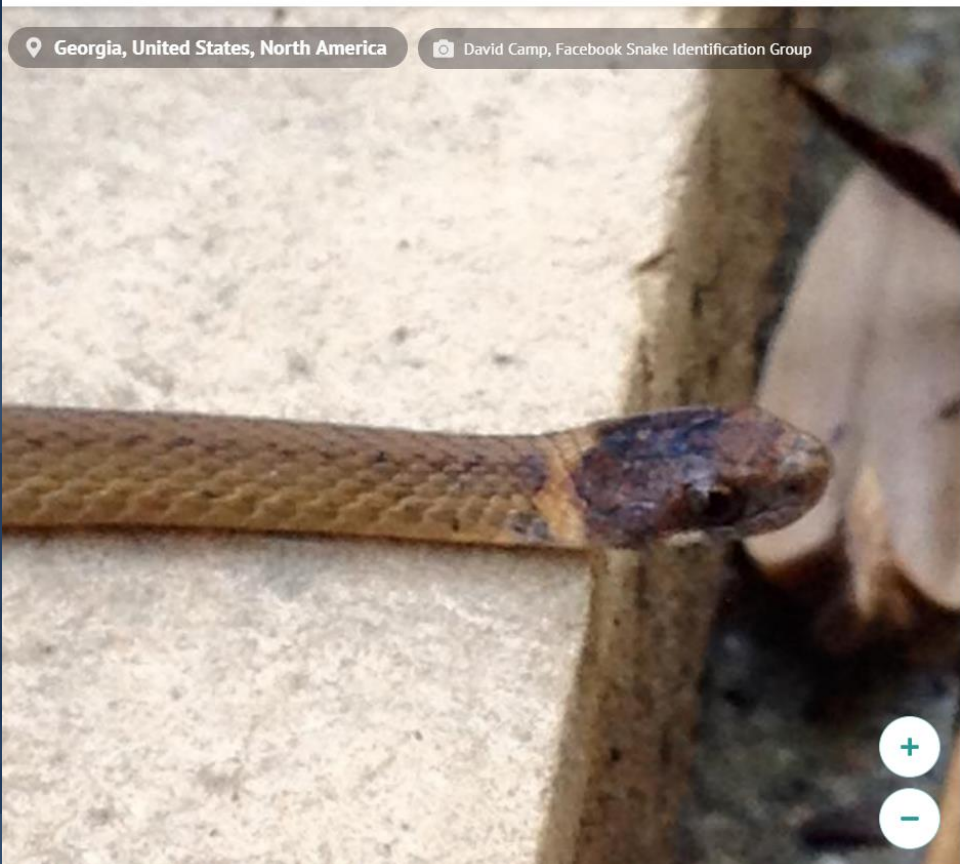
Speckled Rattlesnake
(*Crotalus mitchellii*)

Terciopelo
(*Bothrops asper*)

Eyesh Viper
(*Bothriechis schlegelii*)

Western Massasauga
(*Sistrurus tergeminus*)

Tiger Keelback
(*Rhabdophis tigrinus*)



Difficulty Easy ▾

What Snake is This?


Family, Genus, Binomial or Common Name ▾

i Already over.

- Earn 12 points for the correct binomial.
- Earn 9 points for the correct genus.
- Earn 6 points for the correct family.

[SEND FEEDBACK ON THIS IMAGE](#)

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 Open Access

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 Tools  Share

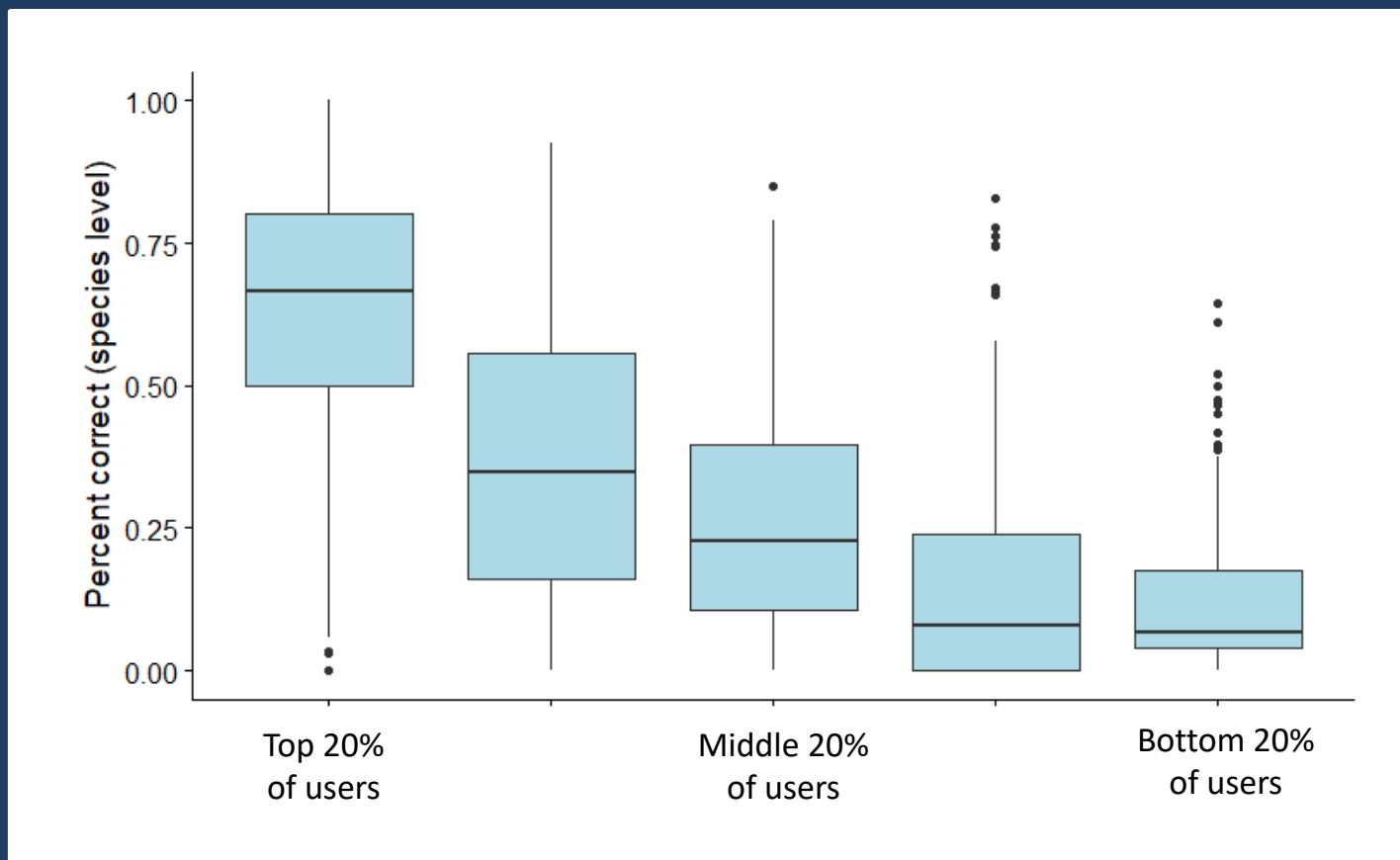
Cite this article ▾

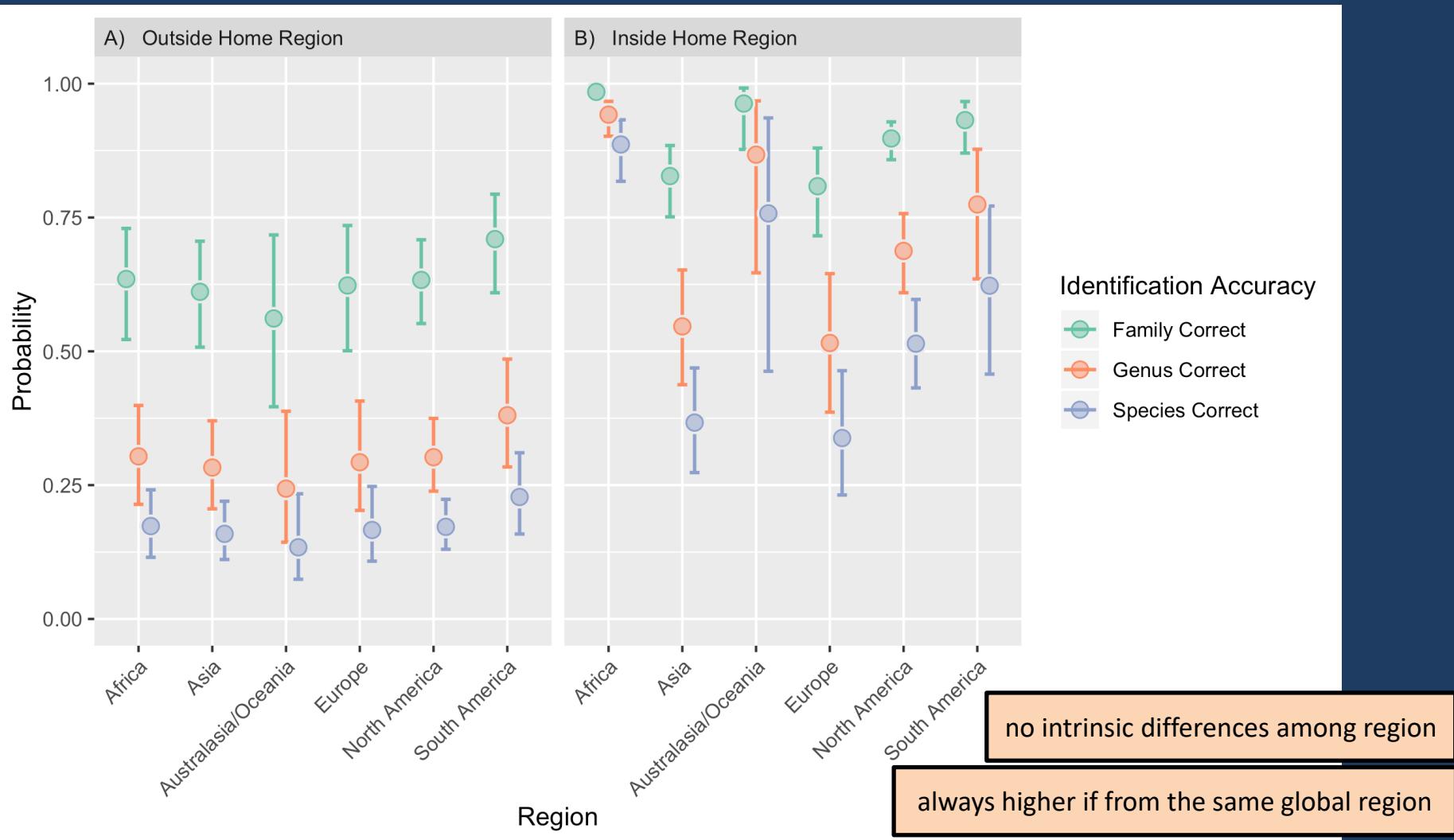
Research articles

Crowdsourcing snake identification with online communities of professional herpetologists and avocational snake enthusiasts

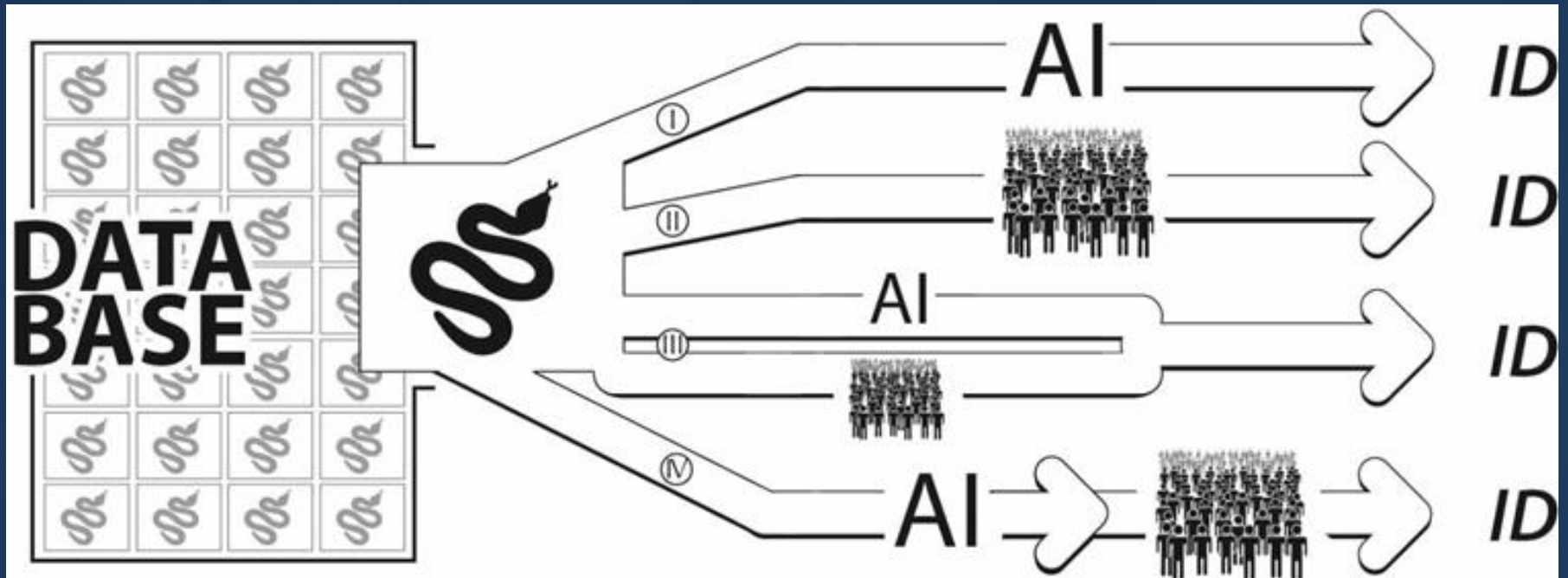
A. M. Durso , I. Bolon, A. R. Kleinhesselink, M. R. Mondardini, J. L. Fernandez-Marquez, F. Gutsche-Jones, C. Gwilliams, M. Tanner, C. E. Smith, W. Wüster, F. Grey and R. Ruiz de Castañeda

50% of participants provide an ID within 17 seconds, 95% within 2 minutes but accuracy varies widely from person to person

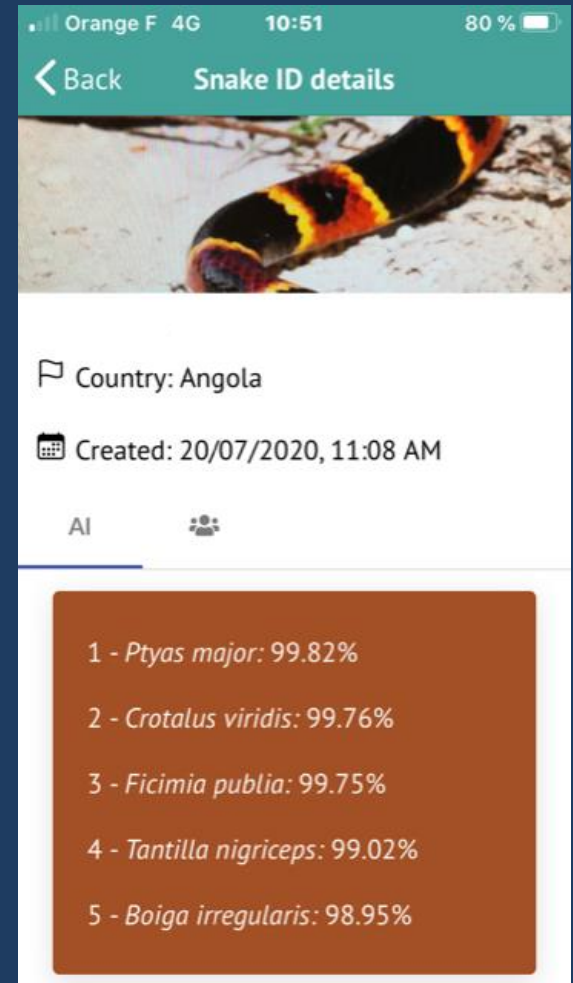
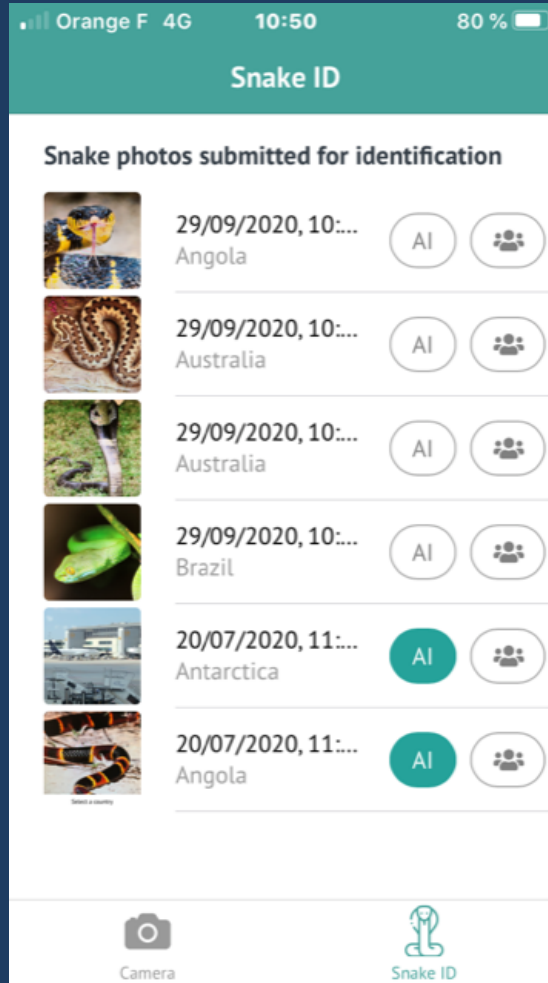
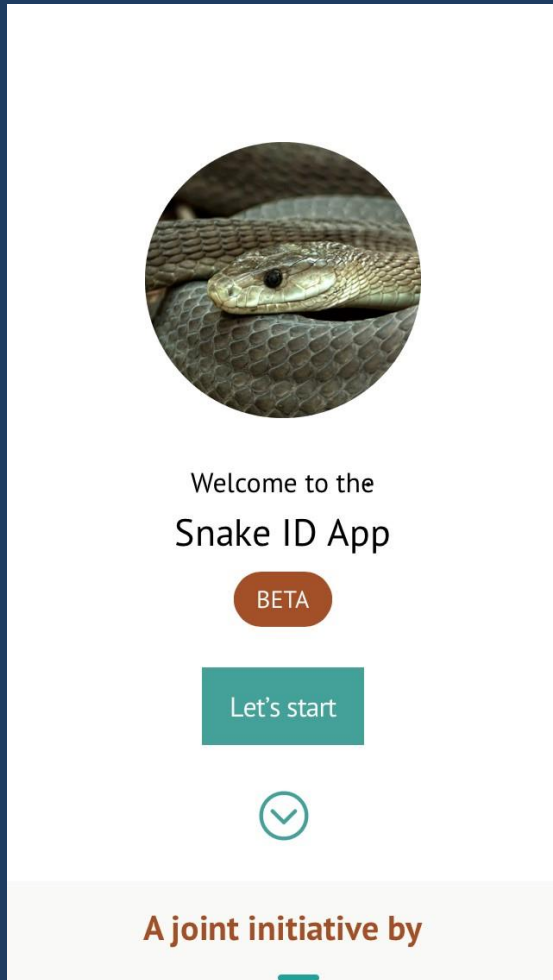




Next steps 2020: Reasoner development + testing



Snake ID App Beta



Further functionalities: Connect snake ID results with snake databases



In collaboration with Dr. Gloria Macia, data scientist at F. Hoffmann-La Roche AG



I know the animal group → select guide!
Cnidarians (Jellyfish, Corals and Anemones)

I know the the name of the culprit → enter into search field!

Picture guide to possible culprits

Key to animal groups

I don't know the animal group → select guide!

VAPAGuide – Venomous And Poisonous Animals Guide

A free-access expert system on the biology and clinical management

Field testing: herpetologists, snake catchers, health professionals



Call «Data & Health»

From the world's largest snake photo dataset to the first human-machine intelligence system to diagnose snakebite: Supporting healthcare providers and snakebite victims in low resource settings

Fondation
privée des

HUG

Publications from our group:

- **Nature Correspondence** - Citizen science could map snakebite risk
- **Lancet Digital Health** - Snakebite and the challenge of snake identification: Empowering neglected communities and healthcare providers with artificial intelligence
- **PLoS ONE** - Identifying the snake: First scoping review on practices of communities and healthcare providers confronted with snakebite across the world
- Joly, Alexis, et al. "Overview of LifeCLEF 2020: A System-Oriented Evaluation of Automated Species Identification and Species Distribution Prediction." International Conference of the Cross-Language Evaluation Forum for European Languages. Springer, Cham, 2020.
- **Royal Society Open Science** - Crowdsourcing snake identification with online communities of professionals and avocational enthusiasts
- **Frontiers in AI** - Supervised Learning Computer Vision Benchmark for Snake Species Identification From Photographs: Implications for Herpetology and Global Health
- **Toxicon X (in revision)** - Citizen Science and Online Data: Opportunities and Challenges for Snake Ecology and Action against Snakebite
- **The Lancet Digital Health (in prep)**: Identifying snakes of the world with artificial intelligence: A novel tool for ecology, epidemiology and medicine



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**citizen
cyberlab**



**CITIZEN
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HerpMapper



iNaturalist



**FACULTY OF APPLIED SCIENCES
UNIVERSITY
OF WEST BOHEMIA**



PiVa AI



Lifele



**GLOBAL
SNAKEBITE
INITIATIVE**



CiRES



**UNIVERSIDAD DE
COSTA RICA**

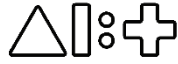


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AI for Health
An ITU Focus Group
In collaboration with WHO

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