

SnakeChat: a conversational-AI based app for snake classification

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Abstract: This is the Supplementary Material for the main paper. On this document, I have organized more samples of conversations with SnakeChat. It can be useful to better understand the synergy between SnakeFace and openAI APIs I have explored on the main paper. It can also be useful to better understand limitations and strengths of the system. I have occasionally done comparisons with other options, such as BARD as general language model and MobileNet as general computer vision model. I am going to present two configurations for discussion purposes: a simple configuration and modifications from this simple configuration.

Keywords: biology; bioinformatics; conversational artificial intelligence; Snakes; openAI; chatGPT; chatbots.

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1. Preliminaries

I am going to discuss two configurations. The first configuration is the latest one (section 2), and the second configuration was the first one (section 4). On a possible deploy on production mode, those options may be available on a *Setting Page*, where each user can see what works best for them.

I do not see this app as a real-world usage: a mistake can cost a lot. Some snakes are dangerous, and misclassifications happen. I believe the best application of the system is for educational, learning, experiences. For those scenarios, the misclassifications will have no real consequences. Snakes should always be handled with extreme care.

There are texts in Portuguese because this is the aimed language. Also, the descriptions are in Portuguese due to the same reason: I want to make sure it works accordingly on the aimed language. chatGPT was mainly trained in English (about 90% of the dataset).

2. Configuration 2: with latest TM models

2.1 Configuration of SnakeChat

1. *gpt-4-vision-preview* for describing the image (just when not provided by the user);
2. *gpt-4-1106-preview* for guessing the snake and guessing which model from SnakeFace to call;
3. *gpt-4-vision-preview* for final guess;

On this configuration, I have used the most powerful configuration, and more expensive model, all the way, which will

also drive which model to call.

There are apparent differences on the behaviors when compared to using the chatGPT API, which does not necessarily means superiority of one configuration over another:

- *gpt-4-1106-preview* explains more on the final answer, which can be useful the extra information;
- *gpt-4-1106-preview* tends to call just one function, which can be interesting sometimes, but when the call is wrong, this is the only information it has. When more than one model is called, it may create extra results on tough cases to classify;
- *gpt-4-1106-preview* tends to be more careful on the final reply, raising flags such as warnings about the cares one should have when handling snakes. The response tend to be more "conservative", raising important reminders when dealing with snakes;

As I see it, the user may need to try different configurations and see what works best for them.

The model was validated, therefore, I am going to use images that are online. This means that there are chances that the image is already on the training dataset. I have tried to avoid this whenever possible. When that happens, the prediction will be almost 100%, which does not mean that all 100% predictions are already on the training datasets. The reason for choosing this is that those images are already online, and we have selected public domain images or CC BY, as so we can replicate them herein without concerns on copyright. All the images were selected from INaturalist.



Figure 1. *Apostolepis assimilis* (image #1). Source: INaturalist. License: protected by copyright.

2.2 *Apostolepis Assimilis*

SnakeChat: Vamos ver o que conseguimos fazer!

SnakeChat: Descrição da imagem: É uma serpente vermelha, com a cabeça preta e branca. Está na mão de uma pessoa, parece pequena e inofensiva. [human generated description]

SnakeChat: Uma sugestão textual. serpente vermelha com cabeça preta e branca. Vamos agora usar a imagem para tentar identificar.

SnakeChat: Probabilidade de 66% de ser uma *Oxyrhopus rhombifer* usando SnakeFace, um sistema de identificação por imagens. [the prediction was wrong by SnakeFace, the second option was correct]

SnakeChat: Em conclusão: Based on the description provided, the snake might be an *Oxyrhopus rhombifer*, which has a 65.84% probability according to the model. This snake is known as the false coral due to its resemblance to the venomous coral snakes, but it itself is not venomous. As always, it's best to consult an expert for a definitive identification. Please remember that interacting with wild snakes should be done with caution and respect for the animal.

I have done a test on INaturalist Computer Vision, and they got it right. Keep in mind that this image was taken from INaturalist, there is no way to know they did not have this image on their training dataset, which would make the model get it right.

I did not consider this is a wrong model calling. Even the specialized model on false coral snake got this one wrong. Maybe, this is because of the hand. This snake is generally easy to classify. BARD also got it wrong, classified as *Erythrolamprus aesculapii*. In fact, when we check the confusion matrix for this model (SM attached to the main paper), these two species were not confused. It is possible we need more data, with more different backgrounds (e.g., human hands).

MobileNet (both v1 and v2), our general purpose model, saw a ringneck snake. This is a very different snake, even in coloration.

What about if we ask GPT 4 Vision model to try to guess the snake, that may support on the prediction.

SnakeChat: Vamos ver o que conseguimos fazer!

SnakeChat: Descrição da imagem: The snake in the image appears to be a Red-bellied Black Snake (*Pseudechis porphyriacus*), which is identifiable by its distinctive coloration, with a glossy black back and a red or pink belly. However, without a clearer view or additional information about its geographical location, it's difficult to make a definitive identification. It's also important to note that there are some non-venomous snakes that mimic the appearance of venomous ones, so care should always be taken when encountering snakes in the wild. Please note that my assessment is based solely on the visible characteristics in the image, and exact identification can be challenging without in-person examination by an expert.

SnakeChat: Uma sugestão textual. *Pseudechis porphyriacus*. Vamos agora usar a imagem para tentar identificar.

SnakeChat: Probabilidade de 94% de ser uma *Apostolepis assimilis* usando SnakeFace, um sistema de identificação por imagens.

SnakeChat: Em conclusão: Based on the provided description and the predictive model's guess, there seems to be a mismatch in the identification of the snake. The model suggests it is an *Apostolepis assimilis* with a high degree of confidence, but according to your description, the snake in the photo resembles a Red-bellied Black Snake (*Pseudechis porphyriacus*), which is characterized by its glossy black upper parts and contrasting red or pink belly. It's important to note that identifying snakes based solely on descriptions can be challenging, and the model might not be accurate if it isn't trained with sufficiently diverse data, including variations within the species. If you are in doubt and need accurate identification for safety reasons or scientific interest, it would be best to consult with a herpetologist or a local wildlife expert.

The guess was very wrong from GPT 4 Vision, the snake guessed *Pseudechis porphyriacus* is very different. Nonetheless, now, it called the right model, and got the right prediction. This is the issue of asking their API to make the guess: it generally gets it wrong, and interfere on the final response. The model gets confused when preparing the final response.

Now let's instead ask just for an image description, no snake prediction from the openAI API.

SnakeChat: Vamos ver o que conseguimos fazer!

SnakeChat: Descrição da imagen: The snake in the image is predominantly reddish-brown, appearing quite uniform in color throughout the length of its body. Its head has distinctive coloration with a black cap, and there seems to be a white or light-colored ring at the neck, just below the head, which provides a stark contrast against the black and the reddish-brown of the body. The belly of the snake is not visible in the image, so I cannot provide a description for that part. The tail seems to continue with the same reddish-brown hue as the rest of the body, without any visible distinct patterns or markings. The colors and pattern give the snake a simple yet striking appearance.

SnakeChat: Uma sugestão textual. cobra-vermelha. Vamos agora usar a imagem para tentar identificar.

SnakeChat: Probabilidade de 94% de ser uma Apostolepis assimilis usando SnakeFace, um sistema de identificação por imagens.

SnakeChat: Em conclusão: Based on the description you've provided, the snake in the photo is likely to be *Apostolepis assimilis*, commonly known as the red-bellied snake or the red cobra. It is important to note that common names can sometimes vary and may not accurately represent the species' official name. Since this model estimation is based solely on the description and not an actual photo, the identification might not be precise, and it's always recommended to consult with a herpetologist or use a reliable field guide or app for accurate identification. Please exercise caution around snakes, as some species can be venomous and dangerous to humans.

It got it right!

On the next case, let me tell the model a right guess. On this scenario, I have a strong feeling this is a false coral snake.

SnakeChat: Vamos ver o que conseguimos fazer!

SnakeChat: Descrição da imagen: Parece-me ser uma coral falsa

SnakeChat: Uma sugestão textual. Coral falsa. Vamos agora usar a imagem para tentar identificar.

SnakeChat: Probabilidade de 94% de ser uma Apostolepis assimilis usando SnakeFace, um sistema de identificação por imagens.

SnakeChat: Em conclusão: Based on the description you provided, it seems the snake in the photo is likely an *Apostolepis assimilis*, which is also known as a false coral snake, with a high probability of 94.24%. This species is known for having coloration and patterns similar to those of the venomous coral snakes, which they mimic as a form of protective mimicry to deter predators. It's important to handle such identifications with caution and consult a local expert if you need to interact with or handle the snake.

Got it right!

The function calling model is the model that decides which model to use. Let see what *gpt-3.5-turbo-1106* can do.

SnakeChat: Vamos ver o que conseguimos fazer!

SnakeChat: Descrição da imagen: É uma cobra toda vermelha, mas com a cabeça preta, e branco em volta da cabeça. Está nas mãos de uma pessoa, por isso, é uma serpente pequena, e não perigosa [human-generated description].

SnakeChat: Uma sugestão textual. Coral. Vamos agora usar a imagem para tentar identificar.

SnakeChat: Probabilidade de 84% de ser uma *Oxyrhopus rhombifer* usando SnakeFace, um sistema de identificação por imagens.

SnakeChat: Em conclusão: Based on the description provided, the snake in the photo is likely an *Oxyrhopus rhombifer*, also known as the False Coral Snake, with an approximate probability of 83.86%. This species is characterized by its vibrant red color with a black head and a white ring around the head. It appears small in size and is being held by a person, suggesting it is not a dangerous species.

It actually called the model totally right: the model for false coral snake. But, the model did not predict well from this image.

2.3 Bothrops alternatus

The next case is interesting, it is hard to see, but the TM model saw it with almost 100% of probability. It is important to keep in mind that this "probability" is not a statistical probability in the *strict sense*. It is a degree of certainty of the model on the given image. This means that getting one image wrong with high probability does not mean it will get all the species/genus wrong as well. It is number that should be read on the context of the input image. There is no statistical sampling and analysis when using these term, it is just a number for us herein.

If we try with a description generated from openAPI API:

SnakeChat: Vamos ver o que conseguimos fazer!



Figure 2. *Bothrops alternatus*. Source: INaturalist. Copyright protected by the user.

SnakeChat: Descrição da imagen: I'm sorry, but there is no visible snake in the image you provided. The picture shows an outdoor scene with grass, plants, and a few flowers. The environment could be a good habitat for snakes, but there are no snakes discernible in this photo. If you have another image or if the snake is hidden and you would like me to attempt to point it out, please let me know additional details or provide another picture.

SnakeChat: SnakeChat: I understand that you don't see the snake in the photo. Without a visual confirmation of the snake and its distinctive features such as color and pattern, it is not possible to identify the species accurately. If you are certain there is a snake hidden within the scene and can provide further details such as colors and patterns that you might have observed, I can try to assist with a possible identification using the appropriate model. Otherwise, if you have another photo where the snake is clearly visible, please provide that for accurate identification..

They cannot see the snake, as I was unable at the first minute looking at the image. It is on the grass.

By using a human description.

SnakeChat: Vamos ver o que conseguimos fazer!

SnakeChat: Descrição da imagen: Parece uma cobra grande, perigosa, que dá bote. Ela possui cores escuras, preto e cinza, formando padrões que repetem.

SnakeChat: Uma sugestão textual. serpente de padr ildeoes escuros preto e cinza. Vamos agora usar a imagem para tentar identificar.

SnakeChat: Probabilidade de 68% de ser uma *B. neuwiedi* usando SnakeFace, um sistema de identificação por imagens.

SnakeChat: Em conclusão: O modelo identificou a cobra na foto como *B. neuwiedi*, conhecida

mais comumente como jararaca, com uma probabilidade de cerca de 68%. As jararacas são conhecidas por suas cores e padrões escuros que podem incluir preto e cinza, o que coincide com a descrição dada. É importante notar, no entanto, que identificar cobras apenas pela descrição de cor e padrão pode ser difícil e impreciso sem referências visuais mais detalhadas.

Better than before. It used the general model. The choice was not totally wrong, but not the best model. Still, better than nothing!

If we give a better guess, it will actually use the right model.

SnakeChat: Vamos ver o que conseguimos fazer!

SnakeChat: Descrição da imagen: Parece me uma jararaca

SnakeChat: Uma sugestão textual. jararaca. Vamos agora usar a imagem para tentar identificar.

SnakeChat: Probabilidade de 98% de ser uma *Bothrops neuwiedi* usando SnakeFace, um sistema de identificação por imagens.

SnakeChat: Em conclusão: Based on the description provided, the snake in the photo is likely a *Bothrops neuwiedi*, commonly known as the jararaca-pintada or Neuwied's lancehead, with a high confidence probability of approximately 97.6%.

It used the *Bothrops* model. The correct answer is *Bothrops alternatus*, but those snakes are very similar. BARD gave as prediction *Erythrolamprus aesculapii*, totally different snakes.

I have done a placebo experiment (Fig. 3): I have taken the same image and created a new one focused on the grass, no snake. The model "got confused": it gave probabilities to all of them. Remember: those models see what they were trained to see, with their best. MobileNet saw even rabbits on the full image, or a crocodile. The image with the snake gave a better result than the placebo. I am considering in the future to train the models with a *placebo* class: a class with just backgrounds. This could increase the chances of seeing the snake. This is a fool-proof system, avoiding bizarre predictions. After doing simulations, this makes the system more "conservative", it may refuse to make any prediction on a image like the one I have presented.

Without too much work, it is possible to do something interesting. It is possible to use a general-purpose model to detect the snake, or lack of it, in the image. This could be used to avoid senseless predictions, e.g., where there is no snake.

We are going to use MobileNet, the same model I have used as feature model for transfer learning, done as default on TM. See their official documentation for more information. I am using both MobileNet V1 and V2: it seems that V1 is better at our image, it at least sees a snake. V2 does not see



Figure 3. Placebo image, no snake

anything, but it is much better on other images. I have done several tests.

Here it goes the result.

SnakeChat: Vamos ver o que conseguimos fazer!

SnakeChat: Descrição da imagen: A cobra é cinza e preta, parece uma cobra grande. Padrões se repetem em manchas pretas com contorno mais claro, quase branco. Parece que perigosa

SnakeChat: Uma sugestão textual. cascavel. Vamos agora usar a imagem para tentar identificar.

SnakeChat: Probabilidade de 68% de ser uma Bothrops neuwiedi usando SnakeFace, um sistema de identificação por imagens.

SnakeChat: Em conclusão: Based on the given description and the refined prediction from our specialized model, the snake in the photo is likely Bothrops neuwiedi, commonly known as a type of lancehead. This species is a part of the Bothrops genus, which is known for its venomous pit vipers found throughout Central and South America. The description of the snake being gray and black with repeating black patches bordered by a lighter, almost white color suggests that it matches the typical appearance of Bothrops neuwiedi.

Which is not totally correct, the misclassification our model did is a common misclassification. The workflow is correct: it called the general purpose model. It could have called the Bothrops model, but as we have seen, that would not have solved anything. See that for this case, I have provided both a human-image description and the probabilities from both MobileNet V1 and V2. I have also tested with just MobileNet, and it also works. This could be an option for the openAI API description, which is paid. For a possible deploy, costs should be considered. MobileNet is free for usage, no charge at all.

2.4 Micrurus carvalhoi

On our next case, I am going to use the following configuration:



Figure 4. *Micrurus carvalhoi*. Source: INaturalist. License: CC BY-NC 4.0 DEED

1. MobileNet V1 and V2 for detecting objects on the image;
2. *gpt-4-vision-preview* for describing the image (just when not provided by user);
3. *gpt-4-1106-preview* for guessing the snake and guessing which model from SnakeFace to call;
4. *gpt-4-vision-preview* for final guess;

Our testing image is below (Fig. 4).

Final result:

SnakeChat: Vamos ver o que conseguimos fazer!

SnakeChat: objetos que detectamos na imagens:

- stinkhorn, carrion fungus - probability 21.83%
- military uniform - probability 6.4323581755161285%
- honeycomb - probability 5.139583721756935%
- ruddy turnstone, *Arenaria interpres* - probability 21.811361610889435%
- **king snake, kingsnake** - probability 13.10141533613205% [this is MobileNet V2]
- stinkhorn, carrion fungus - probability 10.326718538999557%

SnakeChat: Descrição da imagen: The snake in the image has a distinctive color pattern with bands of black, red, and white. The black bands are thick and prominent, bordering sections of bright red and white. These colors are arranged in a repeating tri-color pattern along the length of its body. The head of the snake appears black with adjacent red and white coloration although the details are not fully visible. The snake's tail follows the same banding pattern as the rest of its body, and its belly is not visible as it is obscured by the leaf litter on the ground. The vibrant colors and banded pattern are quite conspicuous against the natural forest floor.

SnakeChat: Uma sugestão textual. king snake, kingsnake. Vamos agora usar a imagem para tentar identificar.

SnakeChat: Probabilidade de 60% de ser uma *Micrurus frontalis* usando SnakeFace, um sistema de identificação por imagens.

SnakeChat: Em conclusão: Based on the description and the refinement through our models, the snake seen in the photo appears to be *Micrurus frontalis*, also known as the Southern Coral Snake, with a probability of 60.10%.

king snake is similar to the coral snakes, it is a false coral snake. Our model at least were able to fix the wrong prediction from MobileNet.

The prediction was wrong, but close. Those snakes are hard to classify. You can check the respective confusion matrix. It called the model for false vs. true coral snake, which is not good for separating the true coral snakes amongst themselves. If we input the same image on the true coral snake model, it will give 100% for the correct prediction (i.e., *Micrurus carvalhoi*). Therefore, the model called was not totally wrong, but not the best. Still, a much better prediction than the initial one from MobileNet.

It would be nice to compared with INaturalist, but this image was selected from INaturalist. Therefore, chances are this image is already on their training dataset. Anyway, they could not make a prediction. In their suggestion (10-top suggestion), none of the snakes were the correct one.

2.5 *Bothrops neuwiedi*

On our next case, I am going to use the following configuration:

1. MobileNet V1 and V2 for detecting objects on the image;
2. A human-generated description;
3. *gpt-4-1106-preview* for guessing the snake and guessing which model from SnakeFace to call;
4. *gpt-4-vision-preview* for final guess;

After entering on our system.

SnakeChat: Vamos ver o que conseguimos fazer!

SnakeChat: objetos que detectamos na imagens:

- badger - probability 23.14417213201523% -
 - armadillo - probability 16.17738902568817% -
 - skunk, polecat, wood pussy - probability 9.66% -
 - wood rabbit, cottontail, cottontail rabbit - probability 75.0554084777832% -
 - armadillo - probability 3.268721327185631% -
 - hare - probability 1.927720196545124% [no snake seen by MobileNet]



Figure 5. *Bothrops neuwiedi*. Source: INaturalist. License: CC BY 4.0 DEED

SnakeChat: Descrição da imagen: É uma cobra grande, está enrolada, parece perigosa. Possui uma coloração cinza e preta. As manchas são pretas, com bordas mais claras. Parece em posição de defesa, para dá um bote.

SnakeChat: SnakeChat: Based on the description provided, the snake has a gray and black coloration with black spots and lighter borders. Given this information and the fact that it appears to be in a defensive stance, it suggests that the snake could potentially be from the *Bothrops* genus, which is known for such behavior and color patterns. In Brazilian Portuguese, snakes from the *Bothrops* genus are well-known and include species such as "jararaca," "urutu," and "jararacuçu." The general purpose computer vision model predictions listed various mammals like the badger, armadillo, skunk, rabbit, and hare, which indicates that it recognized an animal but failed to correctly identify it as a snake. Since we are looking for a Brazilian snake that matches the description given, we should use the specialized *Bothrops* model to refine the prediction. We will ignore the general purpose model's guess as it is not relevant to the snake species. Let's proceed with using the *Bothrops* model to identify the snake species from the description..

SnakeChat: Uma sugestão textual. urutu. Vamos agora usar a imagem para tentar identificar.

SnakeChat: Probabilidade de 99% de ser uma *Bothrops neuwiedi* usando SnakeFace, um sistema de identificação por imagens.

SnakeChat: Em conclusão: Based on the description provided and using the specialized *Bothrops* model, the snake in the photo is likely to be a *Bothrops neuwiedi* (also known as "jararaca-pintada" or "urutu"), with a high probability of

99.16%. *Bothrops neuwiedi* are known for their distinctive gray and black coloration with black spots, which matches the description you provided.

Correct! Even gave a nice lesson on Brazilian snakes!

See that both MobileNet models failed to see any snake. Since I have also provided a human description, the model used this description to make a prediction.

I have done the same identification, but using *gpt-3.5-turbo-1106* for picking the model. The result was a wrong prediction. It called just one model, a model for true coral snake.

SnakeChat: Vamos ver o que conseguimos fazer!

SnakeChat: objetos que detectamos na imagem:

- badger - probability 23.14417213201523%
- armadillo - probability 16.17738902568817%
- skunk, polecat, wood pussy - probability 9.669951349496841%
- wood rabbit, cottontail, cottontail rabbit - probability 75.0554084777832%
- armadillo - probability 3.268721327185631%
- hare - probability 1.927720196545124%

SnakeChat: Descrição da imagem: É uma cobra grande, está enrolada, parece perigosa. Possui uma coloração cinza e preta. As manchas são pretas, com bordas mais claras. Parece em posição de defesa, para dá um bote.

SnakeChat: Uma sugestão textual. alamo correeiro. Vamos agora usar a imagem para tentar identificar.

SnakeChat: Probabilidade de 97% de ser uma *Micrurus fro...* usando SnakeFace, um sistema de identificação por imagens.

SnakeChat: Em conclusão: Based on the description of the snake as being large, coiled, appearing dangerous with gray and black coloring and black spots with lighter borders, and in a defensive position, it corresponds to the "*Micrurus frontalis*" species, also known as "coral verdadeira" in Portuguese. Our refined model indicates there is a high probability (97.47%) that the snake in the image is indeed a *Micrurus frontalis*.

I have tried a second time, and this behavior is something to worry about: the model seems to explain what is wrong. On the second attempt, it called the general model, which is not the best, but better, which made the wrong prediction.

On the second attempt, just the conclusion.

Based on the description provided and the refinement from our specialized model, the snake in the photo appears to be a *Micrurus frontalis*, also known as the frontal coral snake or São Paulo coral snake, with a high probability of 76.48%.



Figure 6. *Erythrolamprus aesculapii*. Source: INaturalist. License: CC BY-NC 4.0 DEED

This snake species is **characterized by a grey and black coloration with distinct black patterns edged with lighter borders** [this is a well-known trait from the *Bothrops*]. Please note that coral snakes can be highly venomous, so if this is a real-world situation, it is important to maintain a safe distance and avoid any interaction with the snake.

Micrurus frontalis are snakes that do not strike. What is curious: I have entered the same conclusion on Bing, which has chatGPT under the hood. It confirmed the conclusion, using sites as citation. I have also asked BARD to assess the correctness of the paragraph, and it confirmed it is correct. I have confronted BARD, it asked me for apologies and fixed the misinformation. In fact, when chatGPT gained momentum, a joke that was around on social was about a person confronting chatGPT on a math problem, which chatGPT was correct. After confrontation, chatGPT actually agreed with the person, that mentioned his wife as a source. It seems the same behavior: a wrong function calling triggered a wrong prediction, which triggered a wrong argumentation as conclusion. This is a real risk with those models, also present on Bing. Another behavior that was reported was chatGPT explaining how a slug makes metamorphosis: it actually gave details and explanations on how that happens; which makes no sense. It is not possible to replicate those behaviors, but it can happen such a senseless conclusion. Even though those behaviors were reported at the beginning of the hype around chatGPT, it seems it is still present as we can see from this case.

2.6 *Erythrolamprus aesculapii*

Our next snake is *Erythrolamprus aesculapii*. It is a false coral snake (Fig. 6).

The result of the conversation is as following.

SnakeChat: Vamos ver o que conseguimos fazer!

SnakeChat: objetos que detectamos na imagens: - red-breasted merganser, *Mergus serrator* - probability 15.827979147434235% - sandbar, sand bar - probability 11.23899221420288% - black swan, *Cygnus atratus* - probability 6.82341456413269% - red-breasted merganser, *Mergus serrator* - probability 33.022481203079224% - paddle, boat paddle - probability 6.536214053630829% - water snake - probability 6.415729969739914%

SnakeChat: Descrição da imagen: É uma cobra vermelha, preta e branca. O vermelho se destaca, as cores estão em bandas. Parece uma cobra coral.

SnakeChat: Uma sugestão textual. cobra coral. Vamos agora usar a imagem para tentar identificar.

SnakeChat: Probabilidade de 100% de ser uma *Erythrolamprus aesculapii* usando SnakeFace, um sistema de identificação por imagens.

SnakeChat: Em conclusão: Based on the description provided, the snake in the photo appears to be an *Erythrolamprus aesculapii*, commonly known as the False Coral Snake, with a very high probability of 99.92%. This species closely resembles the true coral snake in its red, black, and white banding but is part of a different genus found in Brazil.

MobileNet detected water snake, which is totally different from the snake on the image. The function calling called the right model, not necessary the best model. It called the model for true coral vs. false coral snakes. It gave the probability of almost 100%. This is a very good result, all the way.

INaturalist could not see a snake, saw on their 10-top guesses several bird-like animal such as Common Gallinule. See that INaturalist Vision has the goal to support user to make a first guess, which is refined by their human-community, whereas our model is for a precise prediction. Therefore, even though I am constantly comparing, this is just for discussion purpose. Those two algorithms have different goals.

3. Lower section of the Result Table for configuration 1

This configuration was the first version of the chatbot, it is a simple configuration using the models from [1]. It can be seen as a simple configuration, minimal configuration. The previous configuration are enhancements of the chatbots, they were added to handle possible mistakes this version was doing. The user may need to test different configurations, different combination for their needs. The under the hood algorithms from openAI are the same, thus, the emergent behaviours is the same. These simulations can be useful to learn more about what to expect from our chatbot.

3.1 Configuration of SnakeChat

1. *gpt-4-vision-preview* for describing the image;
2. *gpt-4-1106-preview* for guessing the snake and guessing which model from SnakeFace to call;
3. *gpt-4-vision-preview* for final guess;

On this configuration, we use the most powerful, and more expensive model, all the way, which will also drive which model to call.

The conversation as it goes, we just extracted the essentials.

3.2 *Oxyrhopus rhombifer*

SnakeChat: Vamos ver o que conseguimos fazer!

SnakeChat: Descrição da imagen: The snake in the image has a striking pattern composed of three main colors: black, red, and white. The colors form a distinctive and repeating pattern across the snake's body. The black color forms bands that wrap around the snake's body and appear to be more prominent or thicker than the other colors, creating a strong visual contrast. Within these black bands, there are patches of red, which are separated and framed by lines of white, resembling a chain-like pattern. The alternating red and white segments are enclosed within the black bands, which gives the snake a segmented appearance. This type of coloration can serve as effective camouflage or as a warning to potential predators.

SnakeChat: Uma sugestão textual. cobra coral. Vamos agora usar a imagem para tentar identificar.

SnakeChat: Uma sugestão textual. cobra coral. Vamos agora usar a imagem para tentar identificar.

SnakeChat: Uma sugestão textual. cobra coral. Vamos agora usar a imagem para tentar identificar.

SnakeChat: Probabilidade de 69% de ser uma *Oxyrhopus rh...* usando SnakeFace, um sistema de identificação por imagens.

SnakeChat: Probabilidade de 58% de ser uma *Micrurus corallinus* usando SnakeFace, um sistema de identificação por imagens.

SnakeChat: Probabilidade de 82% de ser uma *Oxyrhopus rhombifer* usando SnakeFace, um sistema de identificação por imagens.

SnakeChat: Em conclusão: The snake in the photo appears to be a cobra coral snake, also known as a *Micrurus corallinus*. Its striking black, red, and white coloration is a characteristic feature of this species.

4. Second section of the Result Table

4.1 Configuration of SnakeChat

1. *gpt-4-vision-preview* for describing the image;
2. *gpt-4-1106-preview* for guessing the snake and guessing which model from SnakeFace to call;
3. *gpt-3.5-turbo-1106* for final guess;

On this configuration, we leave the most powerful, and more expensive model, for guessing the snake, which will also drive which model to call. It can make the difference.

The conversation as it goes, we just extracted the essentials.

4.2 *Bothrops Jararaca*

The snake in this image has a patterned body mainly consisting of brown, tan, and darker brown hues. The coloration gives a good camouflage against the natural background. The darker brown markings appear in irregular patches and bands along the body, interspersed with lighter tan regions, which might be scales. The snake's overall appearance is that of a typical pattern you might see in various non-venomous and venomous snake species. The pattern provides effective camouflage in the natural environment with a mix of branches and foliage where it's resting.

Guess: caninana

Called just one model, correct: *Bothrops jararaca* (97%)

Final (correct): The snake in the photo appears to be a *Bothrops jararaca*, a venomous pit viper species found in South America.

Obs. we did a previous simulation, it also guessed wrong, calling all the models as a result of the wrong guessing, but the final result was correct. The final model was able to handle the conflicting information.

4.3 *Erythrolamprus aesculapii*

The snake in the image has a striking pattern comprised of black, red, and white bands. These bands encircle the snake's body and are arranged in a repeating sequence. The black bands are prominent and seem to be the thickest, providing a strong visual contrast with the other colors. The red bands are thinner and vibrant, closely followed by thin white bands that separate each black and red section. The pattern is consistent throughout the visible part of the snake's body, giving it a distinctive and recognizable appearance, which is commonly associated with some species of coral snakes.

cobra coral. [wrong guess that drove the wrong model picking]

Micrurus corallinus (63%). [it called just one model since it thought it was a coral snake].

Final: The snake in the photo appears to be a *Micrurus corallinus*, also known as the Coral Snake. [wrong guessing]

Obs. At the moment, none of the models from SnakeFace can get this snake right, even though it is possible, as we did on our paper on SnakeFace. As we retrain the models, we cannot make sure we keep what we did right. Training neural models is a win-lose game we need to balance. *Erythrolamprus aesculapii* is the champion on fooling our models, mimicking a true coral snake [1]

4.4 *Oxyrhopus rhombifer*

The snake in the image has a coloration that is primarily composed of black, red, and white. The colors are arranged in a distinct pattern where the black appears as the base color with bands of red and white accentuating the scales. The bands of red and white are not continuous but are segmented and surrounded by the black, creating a chain-like pattern along the length of the snake's body. The red bands are particularly bold and noticeable, each bordered by thin lines of white, which makes the pattern quite striking and vivid against the black background of the snake's skin. The snake's head is visible with similar coloration continuing onto it. The serpent is coiled on a textured surface, which looks somewhat faded or discolored with speckles of various tones.

Coral Snake [wrong guessing]

SnakeChat: Probabilidade de 82% de ser uma *Oxyrhopus rhombifer* usando SnakeFace, um sistema de identificação por imagens.

SnakeChat: Probabilidade de 69% de ser uma *Oxyrhopus rh...* usando SnakeFace, um sistema de identificação por imagens.

Final: Based on the description, the snake in the photo appears to be a cobra coral snake or a false coral snake. The colors and pattern described match those of the *Oxyrhopus rhombifer* species.

Obs. see that it was able to override its initial wrong guess after the results from SnakeFace.

References

- 1 PIRES, J. G.; BRAGA, L. H. D. Snakeface: a transfer learning based app for snake classification. *Revista Brasileira de Computação Aplicada*, v. 15, n. 3, p. 80–95, nov. 2023. Disponível em: <https://seer.upf.br/index.php/rbca/article/view/15028>.