

Using Deep Learning and Deepfake Techniques in Tourism (Interactive Statues Application)



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ABSTRACT

The preservation and promotion of ancient civilizations have always been of great importance in the field of cultural heritage. When searching in this field, the main problem is the difficulty of providing a tour guide for each visitor at a historical site who wants information about a specific statue. It is not feasible to have a personal tour guide for every individual, especially considering the cost implications. Therefore, is proposed to use deepfake technology to address this problem by creating fake videos of statues talking about themselves. This approach aims to provide an alternative and easy-to-access way for tourists to obtain information about specific statues without the need for a physical tour guide. The use of deepfake technology, which is typically associated with entertainment purposes, is repurposed to serve as a useful tool and virtual tour guide for visitors. The application aims to provide an interactive and immersive experience for tourists, researchers, and students interested in ancient Egyptian civilization.

INTRODUCTION

This research aims to address the challenges faced by tourists visiting ancient Egyptian sites, including limited tour guide numbers and high costs. With an increasing number of visitors to Egypt in 2022 reaching 12 million. To overcome these challenges, the proposal involves creating a user-friendly mobile application utilizing deep learning techniques. The application will provide comprehensive information about kings and queens, replacing manual guidance with an automated system.[1]

- The primary objective of this research is to develop an efficient tour-guide application for tourists and students and citizens.
- The application will utilize mobile camera technology to detect and recognize statues.
- Once a statue is recognized, the application will generate a faked video where the statue speaks about itself.
- Provide users with detailed information about its history and origins.
- The application aims to serve as a substitute for a physical tour guide, reducing the need for printed brochures and lowering guide costs for tourists.
- This project contributes to the promotion of tourism in Egypt and the expansion of knowledge about its ancient civilization.
- As the number of tourists continues to rise, the demand for such an application is expected to increase.

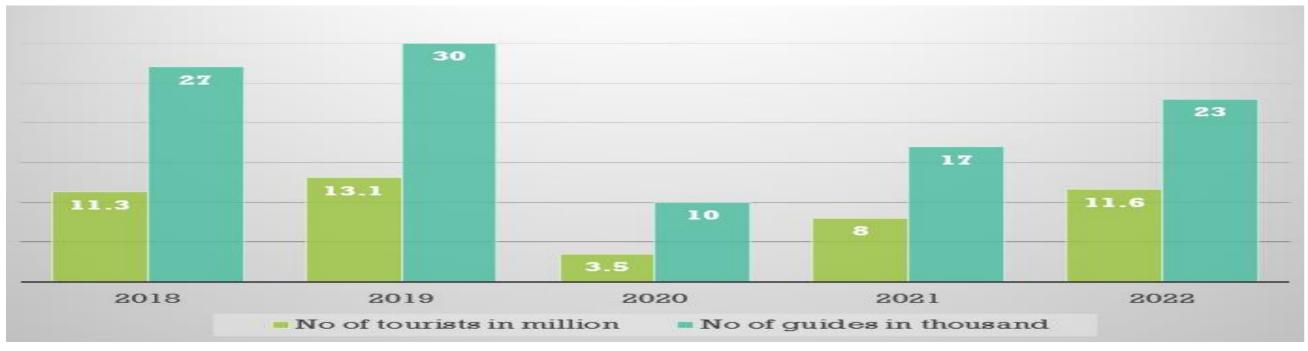


fig.1 Statistics between the number of tourists and tour guides in Egypt

METHODOLOGY

Our system architecture consists of multiple layers, each with its own distinct purpose and contribution to the overall functionality of the system.

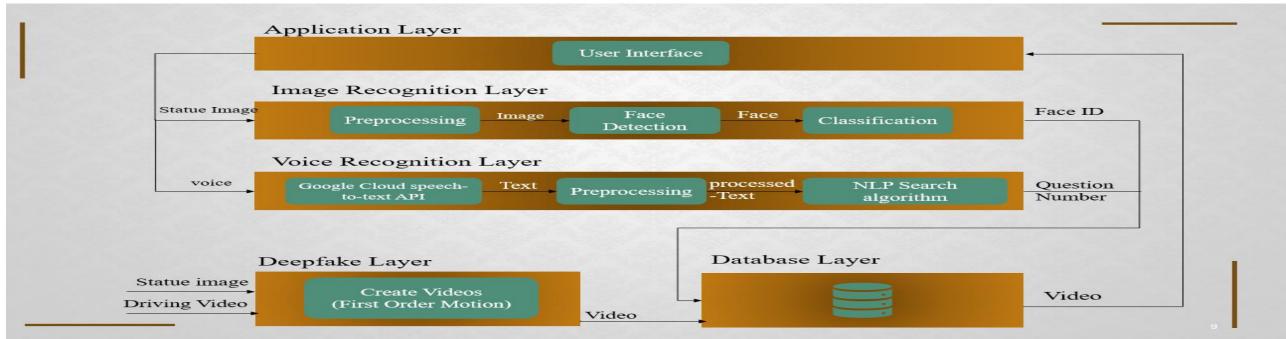


fig.2 System Architecture

• Image Recognition, Classification Layer

It utilizes advanced image recognition algorithms and deep learning techniques, such as convolutional neural networks (CNN). find that the best architectural model in terms of results, speed, and accuracy is VGG-19.[2] preprocessing techniques:

- 1) By resizing the images
- 2) By employing noise removal techniques
- 3) By employing augmentation techniques.

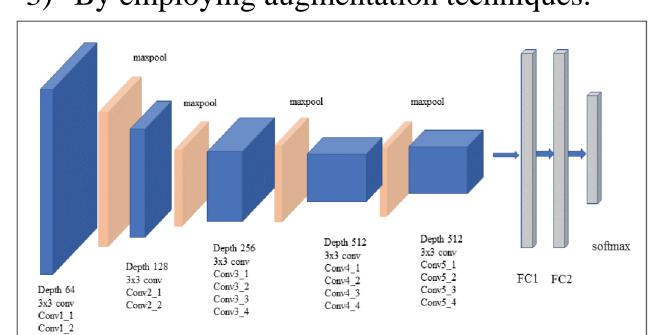


fig.3 VGG-19 Architecture

• Voice Recognition Layer

- 1) Take the question record then analyze it and extract the question number.
- 2) Use Google Cloud API.
- 3) Use the NLP technique. [4]

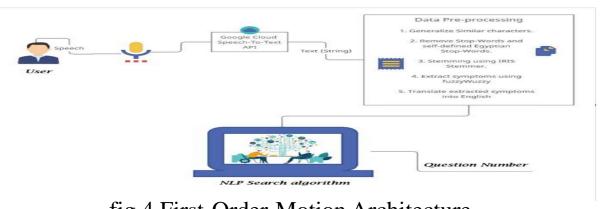


fig.4 First-Order-Motion Architecture

• Deepfake Model Layer

responsible for creating realistic and captivating videos. Use The first-order motion model. It consists of two main units.[3]

- The Motion Module
- Image Generation Module

Factors that influence the model Quality:

- 1) Video Processing
- 2) Image Processing

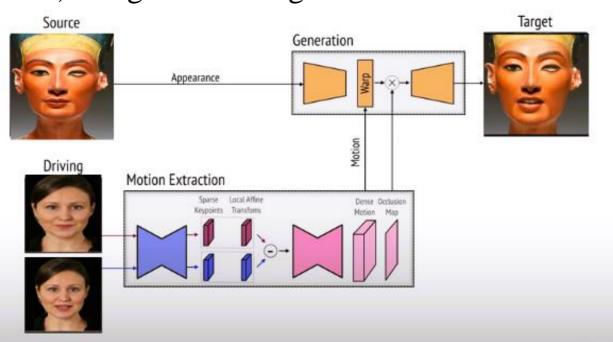


fig.4 First-Order-Motion Architecture

• Database Layer

acts as a central repository for storing and managing system data. It provides the infrastructure for administrators and database managers to control and manipulate system resources, the Firebase platform was used.

• Application Layer

serving as the user interface of the system, visually appealing, and feature-rich. It consists of two main Applications:

- 1) The Mobile Application
- 2) The Desktop Application

RESULTS

The implementation of the proposed methodology yielded promising outcomes, showcasing the effectiveness and potential of the developed mobile application in revolutionizing the tourist experience.

• Image Recognition and Classification

Showing the results of using various models in image recognition and classifying them.

Model	Augmentation	Accuracy	
SVM	No	41.64%	
SVM	Yes	59.09%	
LeNet-5	No	37%	
Custom CNN	No	52%	
Custom CNN	Yes	69.5%	
Alex Net	No	46%	
Alex Net	Yes	66%	
VGG-16	Yes	74%	
VGG-19	No	92.76%	
VGG-19	Yes	96.78%	

TABLE I TRIAL SUMMARY

Conclude that the VGG-19 architecture has achieved a remarkable accuracy rate of 97%.

• User-Friendly Mobile Interface

built using the Flutter framework, was different screen sizes and devices.

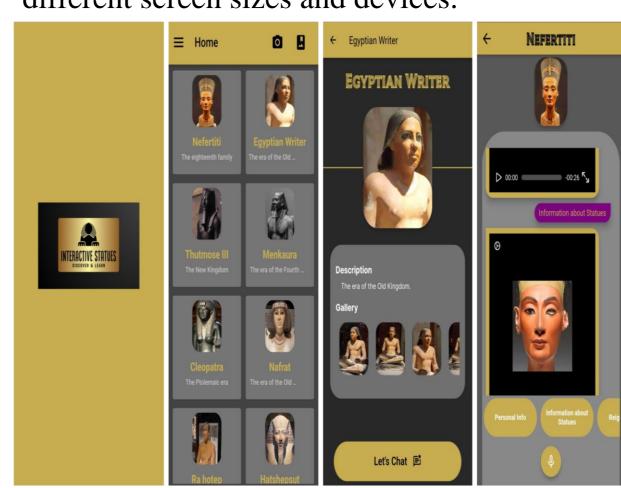


fig.6 Mobile App Screens

• Deepfake Video Generation

The Model can produce realistic and highquality results. Measuring the Quality of the model typically involves evaluating the quality of the generated videos and assessing how well they align with the desired outcomes.

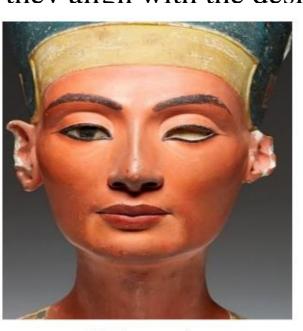


fig.5 Deepfake Video Generation

By achieving a remarkable 95% precision in generating videos, exhibiting a high degree of fidelity and reliability.

• Desktop application

providing administrators with designed with simplicity, ease of use, quick comprehensive control over the database. They loading times, and responsiveness across could easily create, edit, delete, and add videos of Talking Statues. develop using the Tkinter library.



fig.7 Desktop App Screens

• Datasets

using it to achieve various goals in various fields and applications.

The data set is mainly divided into two parts:

1) The Textual dataset: Contains all the information on statues of kings and Queens collected, verified, and reviewed from documented historical sources and references [5]

	personal Info	Statues and information about them	The full family / reign period	his works	The current location of the statue (statues)	Tomb or Statue Finder (Names / Dates)	Oddities and wonders happened to the s
	I am the son of King American I and Queen Naterities, and my wife is Nation the third, as was my sister too.	They found 10 statues of the and the statues were made of limestone. This group depicts me in my youth when I was sitting on the throne.	I was a king from the middle Eggstan state and I am the second king of the twelfth dynams, I raise Eggst for 45 years from 1971 to 1925 BC.	To ordinard mg father's expansionist policies of an offendive name in Nabia, by initiating two expeditions to this region, and adopted the official southern border of Eggst next the second waterfall, where a defensive perison was placed and a sixty plaque was excited on it. It also organized a campla- sisting plaque was excited on it. It also organized a campla- tion the cause of the intertminity of the cause of the intertmining.	The statue is now in the Eggstian Museum	My group of statues was discovered in 1994 inside a pit in the funerary temple of my pyramidal group in the Lisht area of Elegoum.	
	which means (transfiguration like Ra). They called me Selblem Eb, which means strong in heart, and Hoor Nelex, which means good Horus. My lather is King Khalu.		I was in the era of the Old Kingdom and my order was the fourth king of the Fourth Dynasty, and Inded for 24 years from 2555 to 2525-BC.	log modified of a which is that it is about to inform allowing group in Gize, which is characterized by the presence of the Valley Temple in which the most beautiful statuses of the ancient Egiptian civilization were found. The status of the Sphitzis attributed to me, as researches called if (Nur-Un-Harmann et al. 1997), and is a status of the sphitzis attributed to me, as researches called if (Nur-Un-Harmann et al. 1997), as presented in the sphitzis attributed to the sphitzis attributed to the sphitzis and the sphitzis attributed to the sphitzis attribu	The statue is now in the Egyptian Museum	The statue was found in the Valley Temple of the King by the escavations team of Harvard University and the Boston Museum under the leadership of archaeologist George Restner in 1910.	
	Lam King Senutret II, my original name is (Sen Osen) and my royal name is (Chaoka Ra), which means the pover of Rails coming. My lather is Senutret I, my mother is Nellet Hall the	Status of Sensore III, made of gray grante. Its height is \$2.0 m. The features of the statue follow the realistic school, and technically, the statue is reproached with an excessive elementary in the arms.	I was in the era of the Middle Kingdom and the 12th dynasty, and I was the 18th king of the family, And Inded for 38 years from 1878-1828 BC	They consider the the greatest of the 12th dynasty kings. I built the first water canal linking the Mediterranean and the Red Sea	The statue is now in the Egyptian Museum	The statue was discovered by the Egyptian German mission working in the Matariya archaeological area in 2005.	
"Sheikh Al Bala	Also known as the High Priest	The Status was found in the Kabar Mastaba in Saggara, north of the pyramid of Opose. The status in IC om high and has other status accompanied by his ville. The status was made of wood (apurpose) and the are.	Taved in the era or the Uld Kingdom, between the end of the Fourth Eggstan Dynasty and the beginning of the Fifth Eggstan Dynasty laves 246Ks is 2323 RC.	I was the governor of a province and then a click to the king in the arms and I was associated with some military campaigns in the south of the Lewant.	The statue is now in the Egyptian Museum	My statue was discovered by Auguste Mariette in the Saggara necropolis during excavation in 1900.	Verlind the eye in the statue intaid with rook crystal, showing the afive, and it is an application of the thought and belief that doning Egyptian thinking in nerms of immortality and rebirts.
	Jam Open Nirkelth, whose name means «The Bouddle) has Conner I am the wind of King Amenhouse The Health of Conner I am the wind of King Amenhouse The Health of Conner I am the wind of King Amenhouse I the Section Adhermant, and one of the most powerful Engineers (again.) Sheet was not selled the committee of the Conner I amenhouse Engineers (I health and health of the Managhaman to take over the kingdom. It had a high stratur during the house of the risk of the Conner I amenhouse I	a jeine of illmentore. One of the most vooderfulgineer of and tours the accidence as, it is the most famous disways of the queen, and one of the most famous pieces of strollyate ever. Made of obstreed femalitations and some opposition and op	the fourteenth century BC from 1370 to 1330 BC.	Queen histeretti shared her husband in the vocahig of the new god Alen, the power of the sun disk, and alse and the husband were the mediative showers the people and fine, and it is a some off but the histolescent be granted only when the royal copyle useful. During the vally pars of the husband of rule, faileretti changed Maleronies and basetti, which go also recent to because the beautiful has come."	There are two places, one currently in the Bellin Museum and the other in the Egyptian Museum	The German Egyptologist Ludwig Blookwald found the Famous status on Discender 6, 1921 in the workshop of Turtimosis the prolptor in Reharts.	
Khufu	Lenking that's and ne personal name is (Dhaun Khali) meaning (Dhaun protects me) and the Harian mane is thalight flowly (by steher, light Granders, and mp mother, Claver Hotsphares). My whese size (in its Merketz, Hariansen) and mp soot are Khali. Detail Hots Melley Harian the second My whole size (in its Merketz, Hariansen) and mp soot are Khali. Detail Hotsphares (in its Mariansen) Could Fay Min Hariansen) and the Could Fay Min Harian (Shalin, Shalin Sharian (Earl, Harian Baser), Melen Yager.	My status found in the temple of the good flower America in Algebra is made of keep, and its keepfel is about 7.5 cm.	the era of the modern state and is considered one of the most important documents for the		The statue is now in the Eggislan Moseum	A integral inertial found the statule in 1900 AD in Adgition, southern Egypt.	
	son, Prince Tuthmosis: My vives are Queen Nefertiti, who is the most famous. You and Ankhesen Amun, and	statues, each about 4-7 meters high, made of sandstone. These statues reflecting familiar appearance in an	I was a ruler of the 10th Dynasty and ruled Eggst for about 17 years from 1053 to 1036	I was the owner of the first religious revolution in history. As the first pairs of my site passed, I shared-power with my lates in the eaglet. Thefer, But I was determined to solviere a resident implementation of the solviere and the solviere	The status is now in the Egyptian Museum	Here Charder revealed a group of Catiss statues of King Albertane in the open-courge of the temple of Albertane in the open-courge of the temple of Albertane in The part about the eventual of 2.8 gapes column bases erected from of each of them is a large statue of ling Albertane, each about 4.7 meter byle, make of standards a. 8 colonial Mahertane.	•

2) The Image dataset

We faced Two problems:

- lack of quality images.
- lack of the number of images.

So, we decided to visit Egyptian museums and Collect statues' Images.



fig.9 Image dataset Sample

CONCLUSION

In conclusion, this research has resulted in the development of a groundbreaking mobile application that aims to revolutionize the tourist experience in Egypt and beyond. By leveraging deep learning, and Flutter Framework, We have created an interactive platform that provides easy access to information about ancient Egyptian kings and queens.

The application incorporates advanced deep learning models, including the VGG-19 convolutional neural network for image recognition and classification, as well as the first-order motion model for generating realistic talking statues. Through conversations with the virtual statues, users can gain extensive knowledge, ask questions, and receive video responses, allowing for a deeper understanding of the statues' historical significance.

The proposed methodology encompasses a user-friendly mobile application, a desktop application for administrators and database managers, a comprehensive dataset of historical information, and robust deep-learning models. Each component has been meticulously designed to ensure a seamless and efficient user experience. We are dedicated to pushing the boundaries of technology-enabled tourism and anticipate a future where the application continues to inspire and educate individuals worldwide.

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