Sistema experto con reconocimiento facial implementado en servicios de conversación hombre-máquina para la automatización de procesos remotos multiplataforma en la identificación de personas reportadas como desaparecidas

Departamento de Ciencias de la Computación

Carrera de Ingeniería en Software

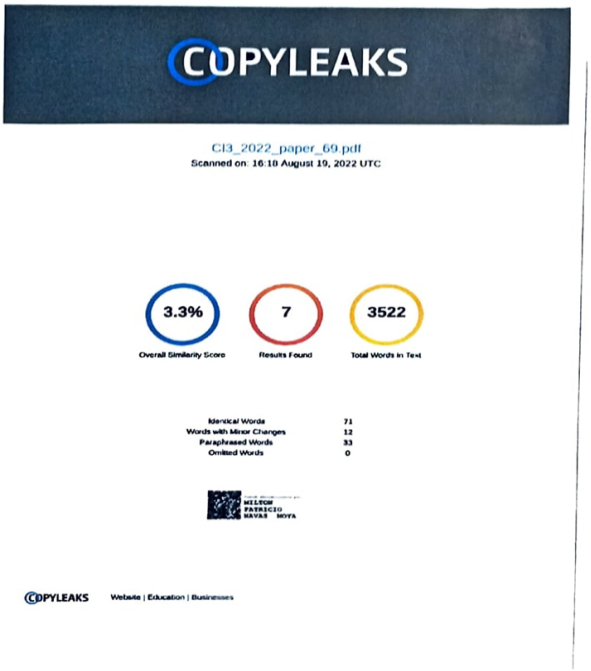
Artículo académico, previo a la obtención del Título de: Ingeniero en Software

Ortiz Araujo, Cindy Pamela y Panchi Chacón, Jefferson Fabián

Ing. Navas Moya, Milton Patricio

19 de agosto del 2022

Latacunga, Ecuador



COPYLEAKS

CI3_2022_paper_69.pdf
Scanned on: 16:10 August 19, 2022 UTC

3.3% Overall Similarity Score

7 Results Found

3522 Total Words in Text

Identical Words	71
Words with Minor Changes	12
Paraphrased Words	33
Omitted Words	0

MILTON PATRICIO NAVAS MOYA

COPYLEAKS Website | Education | Businesses

Nota: Colocar únicamente la página que indica el porcentaje de similitud de la herramienta contratada por la Universidad.

Firma:

.....

Navas Moya, Milton Patricio

C.C: 0502029275

Director

Departamento de Ciencias de la Computación

Carrera de Ingeniería en Software

Certificación

Certifico que el artículo académico: "**Expert system with facial recognition implemented in human-machine conversation services for the automation of multi-platform remote processes in the identification of people reported missing**" fue realizado por los señores **Ortiz Araujo, Cindy Pamela y Panchi Chacón, Jefferson Fabián,** el mismo que cumple con los requisitos legales, teóricos, científicos, técnicos y metodológicos establecidos por la Universidad de las Fuerzas Armadas ESPE, además fue revisado y analizado en su totalidad por la herramienta de prevención y/o verificación de similitud de contenidos; razón por la cual me permito acreditar y autorizar para que se lo sustente públicamente.

Latacunga, 19 de agosto de 2022

Firma:

.....

Navas Moya, Milton Patricio

Director

C. C. 0502029275

Departamento de Ciencias de la Computación

Carrera de Ingeniería en Software

Responsabilidad de Autoría

Nosotros, **Ortiz Araujo, Cindy Pamela y Panchi Chacón, Jefferson Fabián**, con cédulas de ciudadanía n° 0105845895 y n° 0503984056, declaro que el contenido, ideas y criterios del artículo académico: **Expert system with facial recognition implemented in human-machine conversation services for the automation of multi-platform remote processes in the identification of people reported missing** es de nuestra autoría y responsabilidad, cumpliendo con los requisitos legales, teóricos, científicos, técnicos, y metodológicos establecidos por la Universidad de las Fuerzas Armadas ESPE, respetando los derechos intelectuales de terceros y referenciando las citas bibliográficas.

Latacunga, 19 de agosto de 2022

Firma

Ortiz Araujo, Cindy Pamela

C.C.: 0105845895

Firma

Panchi Chacón, Jefferson Fabián

C.C.: 0503984056

ESPE
UNIVERSIDAD DE LAS FUERZAS ARMADAS
INNOVACIÓN PARA LA EXCELENCIA

Departamento de Ciencias de la Computación

Carrera de Ingeniería en Software

Autorización de Publicación

Nosotros, **Ortiz Araujo, Cindy Pamela y Panchi Chacón, Jefferson Fabián** con cédulas de ciudadanía n° 0105845895 y n° 0503984056, autores del artículo académico: **"Expert system with facial recognition implemented in human-machine conversation services for the automation of multi-platform remote processes in the identification of people reported missing"** autorizamos a la Universidad de las Fuerzas Armadas ESPE publicar en el Repositorio Institucional: el registro bibliográfico, el resumen y la dirección web indexada en la revista.

Latacunga, 19 de agosto de 2022

Firma

Ortiz Araujo, Cindy Pamela
C.C.: 0105845895

Firma

Panchi Chacón, Jefferson Fabián
C.C.: 0503984056

Departamento de Ciencias de la Computación

Carrera de Ingeniería en Software

Carta de Compromiso

Yo **Navas Moya, Milton Patricio**, con cédula de ciudadanía N° 0502029275 en mi calidad de Director del artículo académico: **Expert system with facial recognition implemented in human-machine conversation services for the automation of multi-platform remote processes in the identification of people reported missing**, de los autores: **Ortiz Araujo, Cindy Pamela y Panchi Chacón**, me comprometo a entregar a la Dirección de Carrera, la dirección web indexada en la revista del artículo en mención, una vez que el mismo sea publicado, con la finalidad de que finalmente sea incluido dentro de los metadatos del Repositorio Institucional.

Firma

.....

Navas Moya, Milton Patricio

C.C: 0502029275

ORTIZ ARAUJO, CINDY PAMELA <cportiz3@espe.edu.ec>

CI3 2022 notification for paper 69

2 mensajes

CI3 2022 <ci32022@easychair.org> 8 de agosto de 2022, 21:30
Para: Cindy Ortiz-Araujo <cportiz3@espe.edu.ec>

Dear Cindy Ortiz-Araujo:

We are pleased to notify you that your paper "Expert system with facial recognition implemented in human-machine conversation services for the automation of multi-platform remote processes in the identification of persons reported missing" has been accepted for oral presentation at CI3 2022, to be held form August 31 to September 2 of this year. The Conference Proceedings will be published in a Book Series of the SPRINGER Publishing House and indexed in the SCOPUS Citation Database.
To prepare the final version of your paper (version to be published), carefully read and follow the instructions cited below:
1. Papers must be prepared according to the Springer template (MS-WORD or LaTex format) without page numbers, written in English and with an extension of ** 12-15 pages, including figures and references **.
The template can be downloaded at https://www.springer.com/us/authors-editors/conference-proceedings/conference-proceedings-guidelines.
We recommend that you consider all the suggestions made by the reviewers and have a native speaker review the English of the paper.
2. * The final version * of your work must be submitted until *** August 21, 2022 ***, with the following attached documents:
• Paper in MS-WORD or Latex format (1 file).
• Paper in PDF forms (1 file).
• Document (Word or pdf) with the paper title; Easychair paper ID (number); name and mini biography (5 lines) of the speaker (1 file).
The documents must include names of the authors, affiliations and must be sent to the email ci3@ister.edu.ec.
3. Submitted documents will undergo a similarity check using Turnitin software. The maximum percentage of similarities accepted for publication is 15%.
4. For your paper to be published, it is ** mandatory ** that at least one of the authors (speaker) register at CI3 2022. The registration must be done by paying the corresponding fee and sending the payment receipt scanned (together with your full name, affiliation, and paper ID) to the email ci3@ister.edu.ec.
Finally, we ask that you consider CI3 2019 and CI3 2020 papers for citation in your accepted publication. The CI3 2019 and CI3 2020 published papers can be consulted at the following link: https://ister.edu.ec/congreso/technical-papers/.
Feel free to contact us (ci3@ister.edu.ec) if you need more information.
We look forward to hearing your presentation at the conference !!!

Regards,

CI3 2022
General Chair

CI3 2022 <ci32022@easychair.org> 8 de agosto de 2022, 21:34
Para: Cindy Ortiz-Araujo <cportiz3@espe.edu.ec>

[El texto citado está oculto]
SUBMISSION: 69
TITLE: Expert system with facial recognition implemented in human-machine conversation services for the automation of multi-platform remote processes in the identification of persons reported missing

PANCHI CHACON, JEFFERSON FABIAN <jfpanchi2@espe.edu.ec>

CI3 2022 notification for paper 69

CI3 2022 <ci32022@easychair.org> 8 de agosto de 2022, 21:30
Para: Jefferson Panchi-Chacón <jfpanchi2@espe.edu.ec>

Dear Jefferson Panchi-Chacón:

We are pleased to notify you that your paper "Expert system with facial recognition implemented in human-machine conversation services for the automation of multi-platform remote processes in the identification of persons reported missing" has been accepted for oral presentation at CI3 2022, to be held form August 31 to September 2 of this year. The Conference Proceedings will be published in a Book Series of the SPRINGER Publishing House and indexed in the SCOPUS Citation Database.
To prepare the final version of your paper (version to be published), carefully read and follow the instructions cited below:
1. Papers must be prepared according to the Springer template (MS-WORD or LaTex format) without page numbers, written in English and with an extension of ** 12-15 pages, including figures and references **.
The template can be downloaded at https://www.springer.com/us/authors-editors/conference-proceedings/conference-proceedings-guidelines.
We recommend that you consider all the suggestions made by the reviewers and have a native speaker review the English of the paper.
2. * The final version * of your work must be submitted until *** August 21, 2022 ***, with the following attached documents:
• Paper in MS-WORD or Latex format (1 file).
• Paper in PDF forms (1 file).
• Document (Word or pdf) with the paper title; Easychair paper ID (number); name and mini biography (5 lines) of the speaker (1 file).
The documents must include names of the authors, affiliations and must be sent to the email ci3@ister.edu.ec.
3. Submitted documents will undergo a similarity check using Turnitin software. The maximum percentage of similarities accepted for publication is 15%.
4. For your paper to be published, it is ** mandatory ** that at least one of the authors (speaker) register at CI3 2022. The registration must be done by paying the corresponding fee and sending the payment receipt scanned (together with your full name, affiliation, and paper ID) to the email ci3@ister.edu.ec.
Finally, we ask that you consider CI3 2019 and CI3 2020 papers for citation in your accepted publication. The CI3 2019 and CI3 2020 published papers can be consulted at the following link: https://ister.edu.ec/congreso/technical-papers/.
Feel free to contact us (ci3@ister.edu.ec) if you need more information.
We look forward to hearing your presentation at the conference !!!

Regards,

CI3 2022
General Chair

Expert system with facial recognition implemented in human-machine conversation services for the automation of multi-platform remote processes in the identification of people reported missing

Jefferson Panchi-Chacón[1[0000-0005-0398-4056]], Cindy Ortiz-Araujo[1[0000-0001-0584-5895]] and Milton Navas-Moya[1 [0000-0005-0202-9275]]

[1]Universidad de las Fuerzas Armadas ESPE, Latacunga, Ecuador
jfpanchi2@espe.edu.ec

Abstract. In Ecuador, the disappearance of people is a problem experienced by thousands of families. However, the advancement of technologies promotes the progress of public and private organizations working in this type of case. Therefore, the need for technological tools to identify missing people was analyzed by developing a software system with facial recognition in the chatbot; these services improve the identification of people reported as missing. Also, it was proposed to examine and retrieve information about missing people from official sources to capture, filter, organize and select data, which highlight the face in an image format that can be compared by facial recognition with pictures of suspicious people that are sent to the chat, to generate reports of missing individuals who are identified subsequently. The results obtained by evaluating the system while using the metrics of accessibility, efficiency and speed helped to validate the design; and, at the same time, the facial recognition module allowed the testing of three models: Single Shot Multibox Detector (SSD model), Tiny Face Detector (TFD model), and Multi-Task Cascade Convolutional Neural Networks (MTCNN model). This, so that it was evidenced that MissingApp optimizes the time for the identification of people reported as missing.

Keywords: missing, multi-platform, facial recognition, detection, chatbot.

1 Introduction

The chronology of the problem of people identified as missing around the world is immense. It is a perceptible frequent occurrence in society; disappearance is not linked to time or location, nor does it happen only in times of war [1]. In Ecuador, the disappearance of people affects indigenous families, Afro-Ecuadorians, and the mestizo society. This is reflected in the difficulty to access justice and the total effectiveness of the pronouncements of the competent authorities [2].

The Ministry of Government and the Attorney General's Office of Ecuador, on their websites, state that there were 57397 reports of disappearances from 1947 to 2019. Among these disappearances, 1392 are still under investigation [3]. These data raise

doubts about the reliability of these figures. Therefore, to improve the process of identifying people reported missing, it is necessary for this social phenomenon to affect the whole country [4]. In January of 2021, National Direction of Crimes against Life, Violent Deaths, Disappearances, Extortion and Kidnappings (DINASED) counted 256 cases of missing people in Ecuador; of these, more than 200 have been found. This is a trend that has been maintained since 2018; ever since, 15 522 people have disappeared in Ecuador, however, 95 % of them were found.

Figure 1 indicates the registered cases of people reported missing during 2022, showing a total of 3124, where 2743 have been found and 282 are still missing. In addition, it can be seen that the number of reports increases each month. According to DINASED, one of the reasons that help to locate missing people is that most of them disappear voluntarily [5].

Table 1. Missing people statistics for the year 2022

Month/state	Missing	Found	Dead	Total
January	32	591	16	639
February	46	557	27	630
March	58	596	19	673
April	67	537	20	624
May	79	462	17	558
Total	282	2743	99	3124

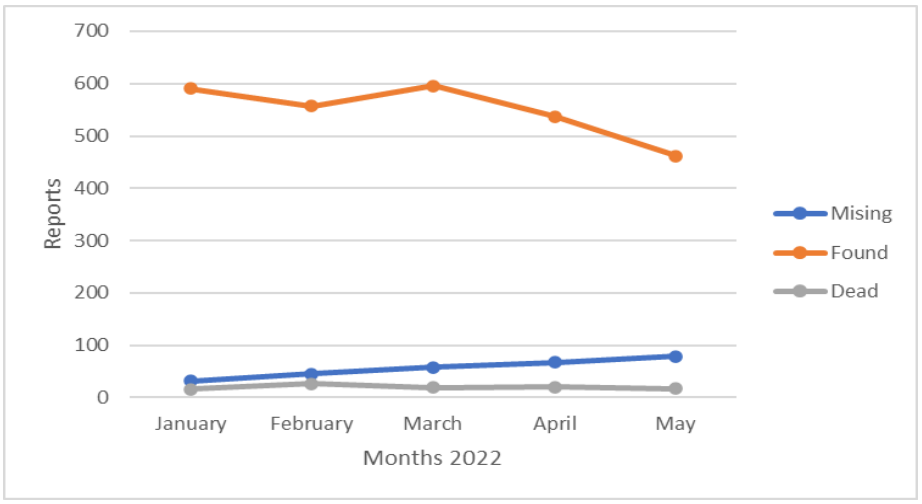


Fig. 1. Missing people statistics for year 2022

The advancement of technologies promotes the progress of organizations in all aspects. This progress has been related to the use of today's most valuable asset, also referred to

as "the oil of the 21st century", which is data. Personal data is within the category of information that is generated, processed and stored in entities, and there are also references to a sensitive nature caused by missing people investigations [6].

According to Wolfe [7], the disappearance of people is a social category problem that should be a priority for the State, which was used to focus only on cases of people who had visibly disappeared from official view. In addition, the use of technology has boosted the development of projects such as [8] and [9], that implement technological solutions for the tracking and identification of people reported as missing, making improvements to the current system to search for missing people in India and to develop an experimental design that combines facial recognition with deep learning through a convolutional neural network, respectively.

In 2020, DINASED created the "Alerta Desaparecidos" (Missing People Alert) application to collaborate in the search process by providing a rapid response when a case is reported. This application is managed by the National Police; therefore, there is a continuous interaction between police officers, community, complainants, and public and private institutions: hospitals, shelters, foster homes, private clinics, medical centers, nursing homes, morgues, and cemeteries. It is easy to use and it is free, which allows citizens to have an efficient interaction that facilitates the search. Thanks to technological advances, it is possible to use them in favor of this social problem, and there is still much to be done, taking into account that it is a problem that affects not only one person, but their entire family and close acquaintances or friends [10].

Disappearance affects countless Ecuadorians, regardless of their characteristics; under this background appears the Association of Relatives and Friends of Disappeared People in Ecuador (ASFADEC), an organization that promotes the dissemination and awareness of the problem, and struggles to locate the missing in order not to be seen only as one more statistic in an archive, working on actions of memory, truth, and justice [11].

This problem is the ideal context to develop a tool to improve the identification process of people reported missing. The information on missing people handled by the association corresponds to personal data made through its website and social networks, which limit the knowledge and recognition process. This project focuses on developing a computer system that improves this procedure; thus, reducing the complication of using figures and speeding up the deployment of reports on identified missing people. In addition, it makes it easier for those responsible to present relevant results before reporting to State entities.

2 Methods

Several aspects were considered to develop and implement the expert system with facial recognition in human-machine conversation services for the automation of multi-platform remote processes when identifying people reported missing, such as data collection and management, and the visualization of the results obtained [12].

The Missing system was developed based on a structure divided into three modules: MissingApp, MissingBot, and MissingApi. The following figure explains the basic general process of the operation of the expert system where the reporter sends through

the social networks Messenger and Telegram the picture of the person suspected of disappearance, which is obtained through the MissingBot module. Once the picture is received, it is evaluated by the MissingApi facial recognition module. The results are displayed on the MissingApp web page, which the volunteer and the system administrator manage.

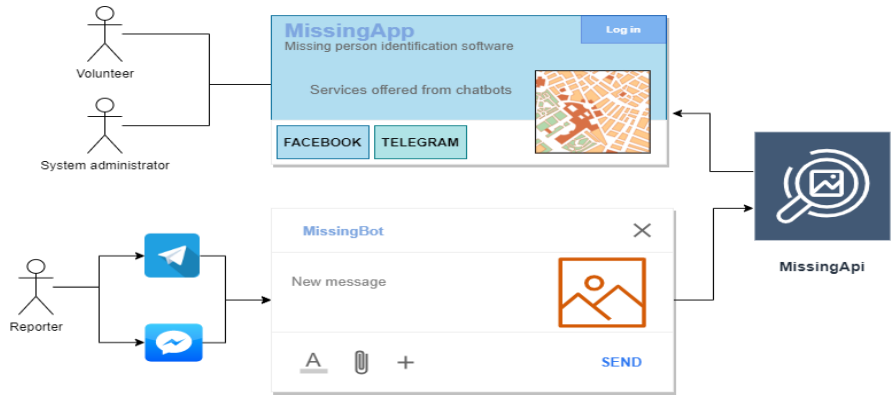


Fig. 2. General scheme of the system

Once the general operation has been explained, the system architecture is detailed using the C4 model, where the context levels and system containers are described for a better understanding [13]. Fig. 3 shows the interaction of people with the Missing system and the Desaparecidos Ecuador external system, where official information on people reported missing is obtained.

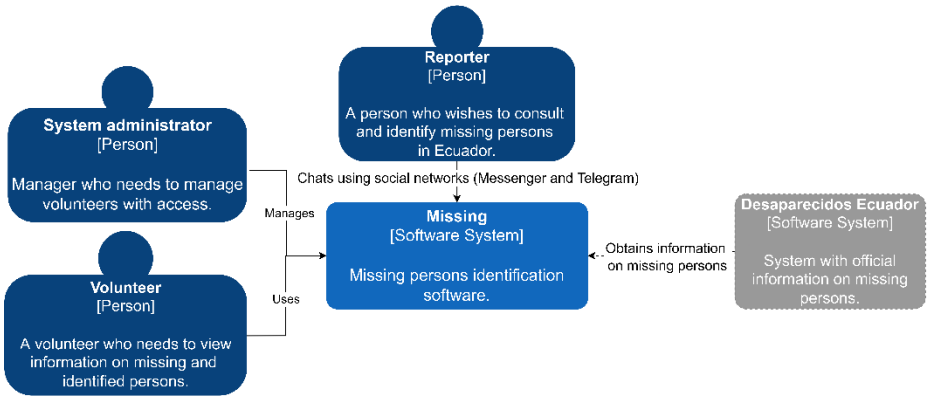


Fig. 3. System context diagram for Missing system

Also, the following figure shows the system container diagram corresponding to level 2 of the C4 model, which expands the Missing system and offers all the containers involved in the development and the technologies used.

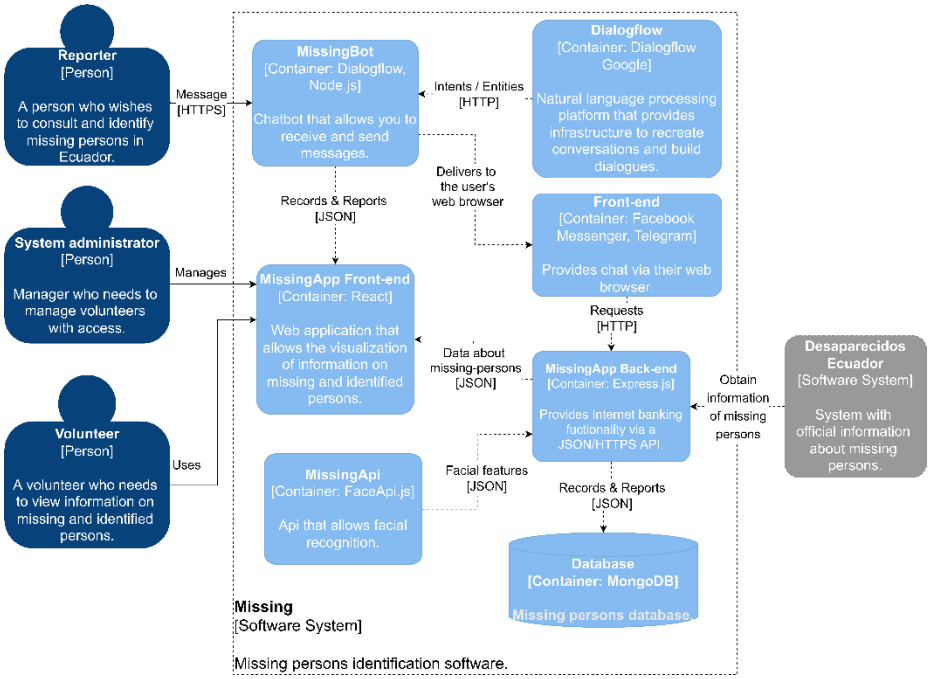


Fig. 4. Container diagram for Missing system

In addition, it can be seen that the Missing system consists of seven containers. The first one is MissingBot, on the server-side, which obtains the intentions and entities for the second container, DialogFlow, responsible for providing information to the first component and, in turn, it directs the user to the corresponding chat to the third container. This chat will send the requests to Missing Back-end, the fourth component located on the server-side. MissingBot will send records and reports to the fifth component, MissingApp Front-end, a client-side web application where MissingApp Back-end sends data about people reported missing. MissingApp Back-end sends records and reports to the sixth component, the database, but, in order to do this, it intervenes the seventh component, MissingApi, which allows the facial recognition and sends facial features to MissingApp Back-end.

Missing consists of a web application, a chatbot, and facial recognition. The web application was divided into front-end and back-end, developed with react and express.js, respectively; and all data is stored using the MongoDB database, complementing the stack of technologies known as MERN (MongoDb, Express.js, React, Node.js).

For the development of the chatbot, DialogFlow was used to facilitate the processing of natural language and to integrate it into the Telegram and Facebook Messenger social networks, taking advantage of the same database and server from the web application [14]. Finally, for the identification of people reported missing, there is a face recognition process from artificial intelligence, where the use of the SSD model, which increases the speed of inference processing by eliminating the need for the Region Proposal Network (RPN), is compared [15] to the TFD model, a real-time face detector

and consumes fewer resources than the SSD face detector [16]. The aforementioned, in addition to performing experimentation with the MTCNN model, being a three-stage cascaded CNN, which simultaneously returns five face landmarks along with the bounding boxes and scores for each face [17] to determine the performance of each of the models.

The dataset with which we worked was obtained by scraping from the official sources Desaparecidos Ecuador and ASFADEC, where the pictures obtained from the people reported as missing with their respective personal data will be collected. Also, for the deployment, the entire infrastructure was distributed on the Microsoft Azure cloud computing platform to lift all services with high-speed adaptability in a production environment [18]. ASFADEC members will supervise this.

On the other hand, the implementation of the system was organized within the cloud infrastructure by using Azure, where several services were scheduled, starting with an application function Missing-fun-scraping of the TimeTrigger type that was developed in Javascript language, which runs every 24 hours to retrieve information of missing people using a trigger that activates the function. The App Services service was raised to deploy two web application modules: Missing-app-web, and Missing-bot-chatbot, which were also developed in Javascript language launched on a Node.js server each.

In addition, an internal virtual machine resource was created to generate the FaceApi.js library to run Tensorflow and perform the facial recognition and identification process. In addition, the incorporation of Mongo Atlas facilitated the communication of the data with the cloud storage, allowing its connection with all the resources to update the information (see Fig. 5).

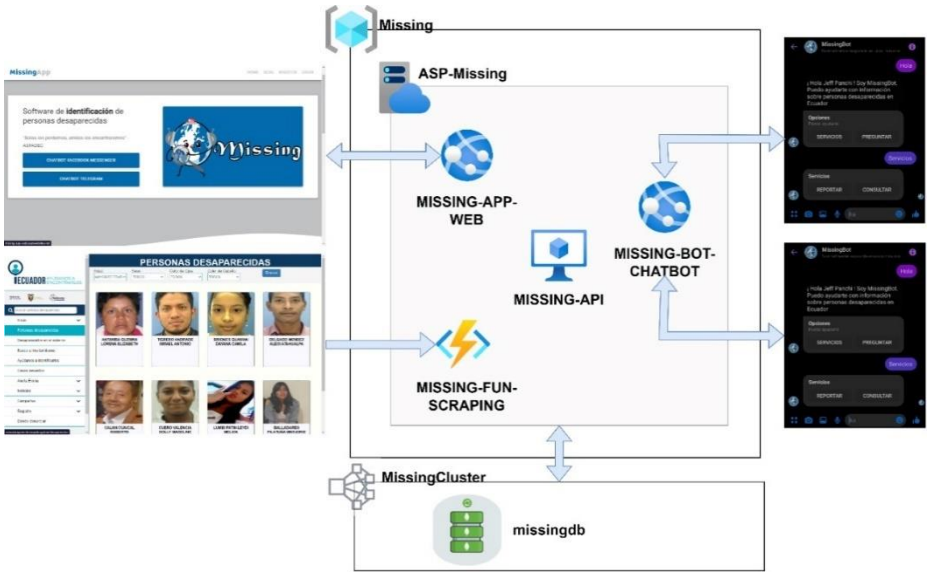


Fig. 5. Deployment diagram

3 Results

This section presents the results obtained by evaluating the system using three parameters: accessibility, efficiency and speed, to guarantee the quality of the product avoiding a deficient level of usability [19].

3.1 Accessibility

This parameter has two aspects: the access time to search and download posters of people reported as missing, and the access time to search and download information about people identified as missing, where the MissingApp system was compared with the currently used by ASFADEC, Desaparecidos Ecuador.

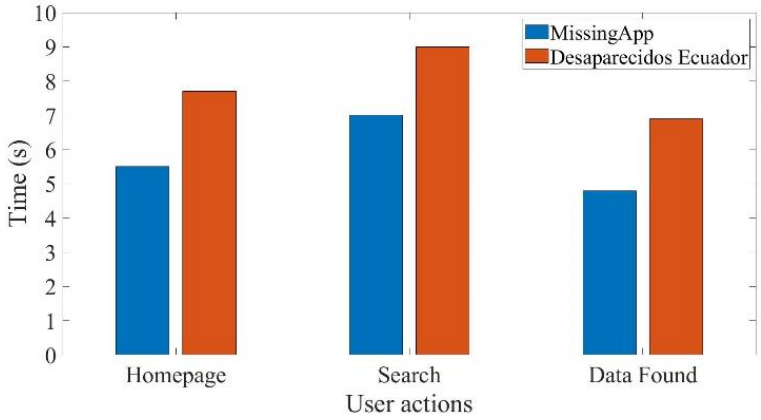


Fig. 6. Access time to search and download posters of people reported missing by evaluating the MissingApp page with Desaparecidos Ecuador from a cellphone detailing the actions it performs with the time it takes to complete them

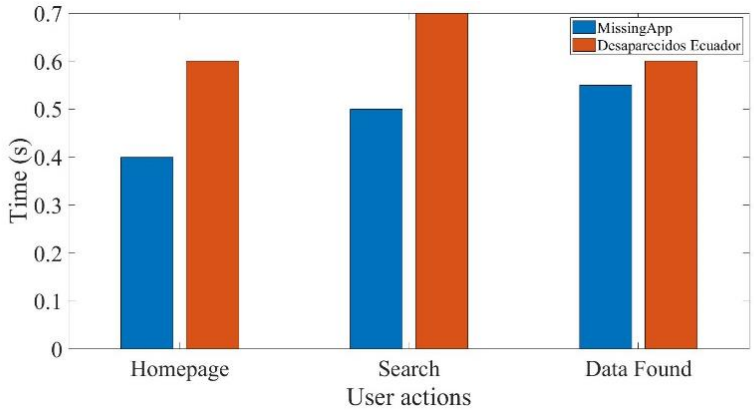


Fig. 7. Access time to search and download posters of people reported missing by evaluating the MissingApp page with Desaparecidos Ecuador from a computer detailing the actions it performs with the time it takes to complete them

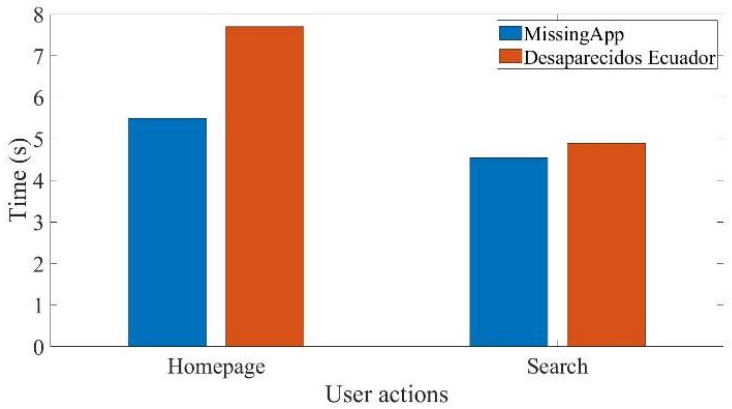


Fig. 8. Access time to search and download information of identified missing people by evaluating the MissingApp page with Desaparecidos Ecuador from a cellphone detailing the actions it performs with the time it takes to complete them

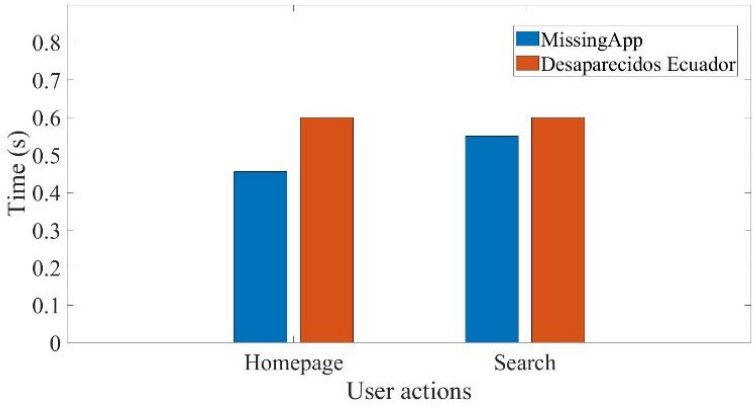


Fig. 9. Access time to search and download information about identified missing people by evaluating the MissingApp page with Desaparecidos Ecuador from a computer detailing the actions it performs with the time it takes to complete them

3.2 Efficiency

This parameter has two aspects: the average time to identify missing people and the average time to send and receive messages from the chatbot. For the first aspect, the three identification models (SSD model, TFD model, and MTCNN model) were compared; for the second, the chatbots in two social networks (Facebook Messenger and Telegram) were used.

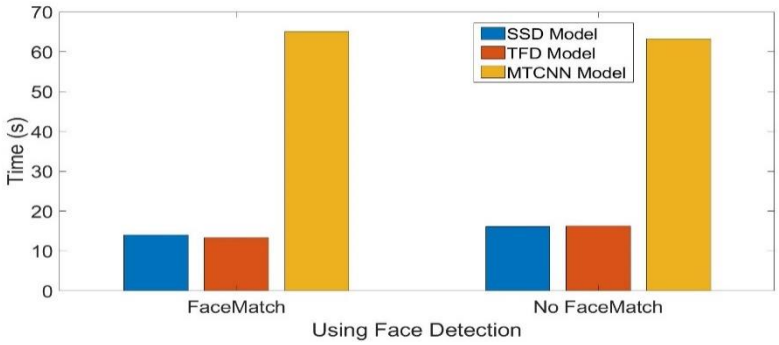


Fig. 10. Average time to identify people reported missing using the SSD, TFD, and MTCNN models after obtaining the necessary data through the chatbot

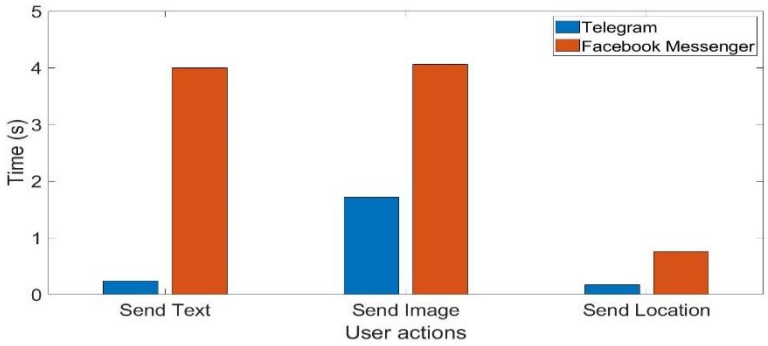


Fig. 11. When interacting with the user, the average time to send and receive messages from the chatbot by using the social networks Telegram and Facebook Messenger

3.3 Speed

This parameter has two aspects that were taken into account: the identification time for facial recognition by face, and the alert notification time for the identified person, where the three identification models (SSD model, TFD model, and MTCNN model) were compared for both aspects.

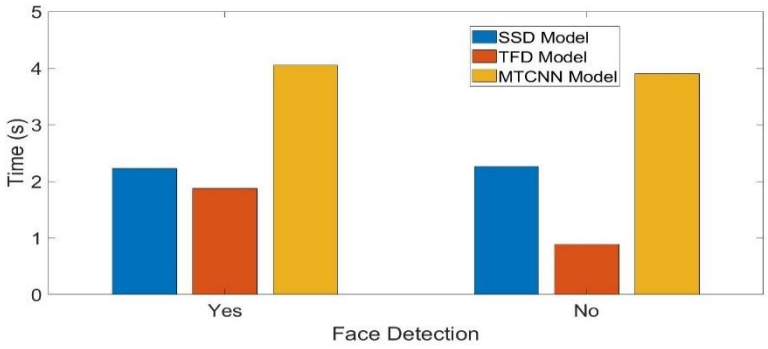


Fig. 12. Identification time for face recognition using the SSD, TFD, and MTCNN models

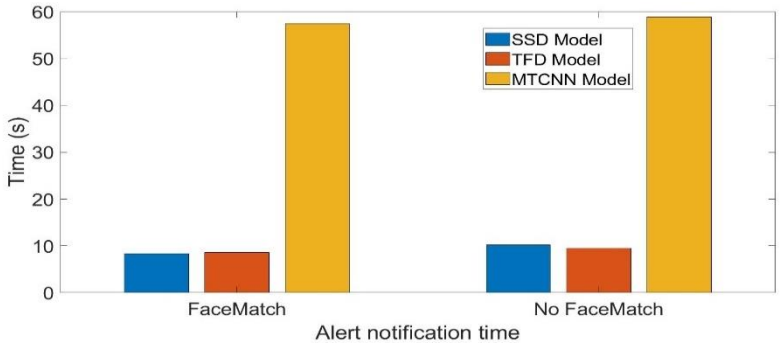


Fig. 63. The SSD, TFD and MTCNN models' identified person alert notification time

4 Discussion

In the analysis of accessibility, it is observed that the MissingApp application has a lower access time to search and download posters of people reported as missing, compared to the Desaparecidos Ecuador application. Also, even though Desaparecidos Ecuador does not have a registration option, log-in, or HTTPS protocol, the time in the search and data found is superior to the MissingApp's. About the devices, it is observed that access to the web application from a computer is faster than the access on a mobile device; thus, demonstrating that the application developed in this work offers a good accessibility to the user (see Fig. 6).

Moreover, as part of the accessibility, the access time to search and download information about identified missing people was evaluated, showing that MissingApp is much faster than Desaparecidos Ecuador in all the aspects mentioned, and access from a computer is much quicker than that from a mobile device (see Fig. 7).

In terms of efficiency, the three models (SSD, TFD and MTCNN) were evaluated to see how the facial recognition module interacts with the application. MissingApp uses the TFD model when assessing the time it takes to identify people reported missing, and it is much faster than the other models (see Fig. 8).

Another critical point was to analyze the average time to send and receive messages from the chatbot where the social networks Telegram and Facebook Messenger were contrasted. The aspects considered were: sending text, sending the picture of the person reported missing, and sending the location, where the Telegram application stood out, showing that it is much faster in all aspects (see Fig. 9).

Finally, when analyzing speed, the three models (SSD, TFD and MTCNN) were used again, focusing on two aspects: the face recognition identification time and the alert notification time for the identified person. For the first aspect, it can be seen that for both successful and unsuccessful face detections, the TFD model is much faster (see Fig. 12). However, the difference between the SSD and TFD models is minimal. To sum up, the TFD model is much faster (see Fig. 13).

5 Conclusions

This paper presents the development and validation of an expert system with facial recognition implemented in human-machine conversation services to automate multi-platform remote processes when identifying people reported missing.

The system's efficiency allows ASFADEC volunteers to handle data better and enable users to report more quickly and dynamically through chatbots. Also, the quality parameters to be analyzed showed that MissingApp performs well when searching and retrieving information from the chatbot or database. In addition, the TFD model used for the facial recognition module within the system is faster when identifying an image-making MissingApp, a high-performance system.

Moreover, the use of architecture for the modeling of the system helped with the vision of the product for its implementation, and to start with the MERN technology for the development of the web application. For this reason, it is essential to have a good architecture when raising the results of a system and the approach to the objectives.

With the analysis of this article, it can be seen that the use of artificial intelligence can automate processes such as the recognition of a person identified as missing within the ASFADEC database, a task that was performed manually and was prone to errors. For this reason, it is recommended to deepen the topic of facial recognition and, in a later work, improve the algorithm to speed up the process. Also, as a future work, it could support the application and its expansion by making it a multiplatform and converting the structure of the chatbot module in one of the microservices to ensure the availability of the server.

References

1. Robledo, C., Querales, M.: Desaparición de personas en el mundo globalizado: desafíos desde América Latina [Disappearance of people in the globalized world: challenges from Latin America]. Íconos (67), 7-15 (2020). https://revistas.flacsoandes.edu.ec/iconos/issue/view/185
2. Cepeda Alvear, H.: Factores que incidieron en la desaparición involuntaria de personas en la provincia de Manabí periodo 2020 – 2021 [Factors that influenced the involuntary disappearance of people in the province of Manabí period 2020 – 2021]. Polo del Conocimiento 7(1), 919-933 (2022). https://dialnet.unirioja.es/servlet/articulo?codigo=8331464
3. INREDH – Derechos humanos: la segunda caravana por las personas desaparecidas denuncia inconsistencias en las estadísticas del Estado [The second caravan for disappeared persons denounces inconsistencies in State statistics], https://inredh.org/la-segunda-caravana-por-las-personas-desaparecidas-denuncia-inconsistencias-en-las-estadisticas-del-estado/, last accessed 2022/05/23
4. El Comercio: La pandemia no frena a los familiares que reclaman a sus desaparecidos en Ecuador: “No nos van a callar, hasta nuestra vida por encontrarlos” [The pandemic does not stop the relatives who claim their disappeared in Ecuador: “They will not silence us, until our lives to find them”, https://www.elcomercio.com/actualidad/seguridad/familiares-busqueda-desaparecidos-denuncia-ecuador.html, last accessed 2022/06/16

5. Primicias: Ecuador: problemas familiares son la causa del 43 % de desapariciones [Ecuador: family problems are the cause of 43 % of disappearances], https://www.primicias.ec/noticias/sociedad/ecuador-personas-desaparecidas-dinased-problemas-sociales/, last accessed 2022/06/16
6. Fernández Lasquetty, J.: Hacia un modelo para la economía de los datos [Towards a model for the data economy], https://telos.fundaciontelefonica.com/telos-113-regulacion-hacia-un-modelo-para-la-economia-de-los-datos/, last accessed 2022/07/07
7. Wolfe, M.: Policing the lost: the emergence of missing persons and the classification of deviant absence. Theory and Society 51(6), 511–541 (2022). https://doi.org/10.1007/s11186-021-09466-w
8. Besra, A., Ahmed, A.J., Priyadarshini, S.: Missing Person Tracking System. In: Nath, V., Mandal, J.K. (eds) Proceeding of Fifth International Conference on Microelectronics, Computing and Communication Systems. Lecture Notes in Electrical Engineering, vol. 748, pp. 783–790. Springer, Singapore (2021). https://doi.org/10.1007/978-981-16-0275-7_65
9. Imoh, N., Vajjhala, N.R., Rakshit, S. Experimental face recognition using applied deep learning approaches to find missing persons. In: Basu, S., Kole, D.K., Maji, A.K., Plewczynski, D., Bhattacharjee, D. (eds) Proceedings of International Conference on Frontiers in Computing and Systems. Lecture Notes in Networks and Systems, vol. 404, pp. 3-11. Springer, Singapore (2022). https://doi.org/10.1007/978-981-19-0105-8_1
10. Ministerio de Gobierno: La Policía Nacional presenta aplicación para personas desaparecidas [The National Police presents application for missing persons], https://www.ministeriodegobierno.gob.ec/policia-aplicacion-desaparecidos-ecuador/, last accessed 2022/08/03
11. Asfadec – Desaparecidos en Ecuador: Desapariciones en Ecuador: una herida abierta [Disappearances in Ecuador: an open wound], https://asfadec.org/memoria-colectiva-desapariciones-una-herida-abierta-en-ecuador/ last accessed 2022/08/03
12. Mohammadi, H., Ghardallou, W., Mili, A.: Assume, capture, verify, establish: ingredients for scalable software analysis. In: 2021 IEEE 21st International Conference on Software Quality, Reliability and Security Companion (QRS-C), pp. 415-424. IEEE, Hainan (2021). https://doi.org/10.1109/QRS-C55045.2021.00068
13. Vázquez, A., García, A., García, F.: C4 model in a software engineering subject to ease the comprehension of UML and the software. In: 2020 IEEE Global Engineering Education Conference (EDUCON), pp. 919-924. IEEE, Porto (2020). https://doi.org/10.1109/EDUCON45650.2020.9125335
14. Maldonado, J., Cuadra, J.: Natural language interface to database using the DialogFlow voice recognition and text conversion API. In: 2019 8th International Conference on Software Process Improvement (CIMPS), pp. 1-10. IEEE, Leon (2019). https://doi.org/10.1109/CIMPS49236.2019.9082438
15. Tsunakawa, H., Kameya, Y., Lee, H., Shinya, Y., Mitsumoto, N.: Contrastive relevance propagation for interpreting predictions by a single-shot object detector. In: 2019 International Joint Conference on Neural Networks (IJCNN), 2019, pp. 1-9. IEEE, Budapest (2019). https://doi.org/10.1109/IJCNN.2019.8851770
16. Ye, F., Ding, M., Gong, E., Zhao, X., Hang, L.: Tiny Face Detection Based on deep learning. In: 14th IEEE Conference on Industrial Electronics and Applications (ICIEA), pp. 407-412. IEEE, Xi'an. https://doi.org/10.1109/ICIEA.2019.8834282
17. Zhang, L., Wang, H., Chen, Z. A multi-task cascaded algorithm with optimized convolution neural network for face detection. In: Asia-Pacific Conference on Communications Technology and Computer Science (ACCTCS), pp. 242-245. IEEE, Shenyang (2021).
18. Verma, A., Malla, D., Choudhary, A., Arora, V.: A detailed study of Azure platform & its cognitive services. In: International Conference on Machine Learning, Big Data, Cloud and

Parallel Computing (COMITCon), pp. 129-134. IEEE, Faridabad (2019). https://doi.org/10.1109/COMITCon.2019.8862178
19. García, F. J., García, A., Vázquez, A.: Modelo C4. Zenodo, https://doi.org/10.5281/zenodo.6509695, last accessed 2022/08/07