Paper Title\* (use style: *paper title*)

\*Note: Sub-titles are not captured in Xplore and should not be used

line 1: 1st Given Name Surname   
line 2: *dept. name of organization   
(of Affiliation)*  
line 3: *name of organization   
(of Affiliation)*line 4: City, Country  
line 5: email address or ORCID

line 1: 4th Given Name Surname  
line 2: *dept. name of organization*  
*(of Affiliation)*  
line 3: *name of organization   
(of Affiliation)*line 4: City, Country  
line 5: email address or ORCIDline 1: 2nd Given Name Surname  
line 2: *dept. name of organization   
(of Affiliation)*  
line 3: *name of organization   
(of Affiliation)*line 4: City, Country  
line 5: email address or ORCID

line 1: 5th Given Name Surname  
line 2: *dept. name of organization   
(of Affiliation)*  
line 3: *name of organization   
(of Affiliation)*line 4: City, Country  
line 5: email address or ORCIDline 1: 3rd Given Name Surname  
line 2: *dept. name of organization   
(of Affiliation)*  
line 3: *name of organization   
(of Affiliation)*line 4: City, Country  
line 5: email address or ORCID

line 1: 6th Given Name Surname  
line 2: *dept. name of organization   
(of Affiliation)*  
line 3: *name of organization   
(of Affiliation)*line 4: City, Country  
line 5: email address or ORCID

***Abstract*—Monkeypox is a viral disease that affects both animals and humans.Monkeypox can have a substantial negative influence on human health, particularly in areas with a lack of healthcare services. The sickness can produce epidemics, and it might be difficult to stop the spread of the disease. For effective treatment and to stop the disease from spreading further, early identification and detection of monkeypox are essential. Therefore, the healthcare industry may benefit from the development of precise and effective methods for the detection of monkeypox, such as image classification.In this paper, we propose a novel approach for detecting Monkeypox using image classification. The proposed method utilizes a Transfer Learning Model and other machine learning models to classify images of patients with Monkeypox. The system employs a majority voting technique to improve the accuracy of the classification. The proposed system is evaluated using a dataset of images obtained from patients with Monkeypox, and the results show that the proposed approach achieves high accuracy in detecting Monkeypox. The proposed system has the potential to assist healthcare professionals in diagnosing and treating patients with Monkeypox, and it can contribute to the efforts of controlling the spread of the disease.**

***Keywords—Classification,Deep Learning,Transfer Learning, ensemble Learning,Monkeypox***

# I. INTRODUCTION

Monkeypox is a rare viral disease that is similar to human smallpox but less severe. It belongs to the Orthopoxvirus genus and family of Poxviridae. When epidemics hit monkeys maintained for study in 1958, the illness was first recognized. The Democratic Republic of the Congo (formerly Zaire) reported the first human case of monkeypox in 1970. Since then, occasional cases and outbreaks have been documented in various African nations, the United States, the United Kingdom, and Singapore.

Human monkeypox symptoms resemble smallpox symptoms but are less severe. Fever, headache, muscle aches, backache, swollen lymph nodes, chills, and weariness are the first symptoms of the illness. After that, a rash appears, frequently first on the face before moving to other regions of the body. The rash evolves and passes through various stages before developing a scab and eventually falling off. The disease typically lasts 2-4 weeks, and the majority of patients recover completely. However, the illness can occasionally be deadly or seriously debilitating, especially in those with compromised immune systems.For those with low immune systems or those who have not received the smallpox vaccine, monkeypox can be a deadly illness. Monkeypox does not now pose a significant hazard to public health on a par with COVID-19.In the future, it's feasible for a virus like the monkeypox or another infectious agent to start a pandemic like COVID-19. Changes in human behavior, climatic and environmental changes, as well as a rise in international travel and commerce, are just a few of the numerous elements that might lead to the genesis and spread of a new illness.

Viruses may also change and adapt over time, which might increase their virulence or ability to spread. This is why it's crucial to keep an eye on new infectious illnesses, investigate them, and create plans to stop and stop their spread.

AI classification of the monkeypox illness is crucial for a number of reasons. AI can assist in the early identification and categorization of monkeypox cases, which will speed up and increase the precision of diagnosis and treatment. This may be particularly crucial in areas with poor healthcare access or limited resources.

For a variety of reasons, classifying monkeypox using image classification AI can be crucial. Skin lesions and fever are symptoms of the viral illness known as monkeypox, which can be challenging to differentiate from illnesses including chickenpox, smallpox, and measles. Based on clinical and epidemiological information, such as the appearance and location of skin lesions, image classification AI can assist healthcare workers in effectively diagnosing and classifying instances of monkeypox.

To categorize photos of monkeypox skin lesions, we used three machine learning algorithms and transfer learning. A pre-trained neural network is utilized as the foundation for a new neural network that is trained on a particular task in the transfer learning approach. For our model, we started with the Xception pre-trained neural network.

Our research's primary contributions are:

1) Using machine learning and transfer learning techniques to accurately classify monkeypox skin lesions from photos.

2) Analyzing the performance of three machine learning techniques on the monkeypox dataset: support vector machines (SVMs), k-nearest neighbors (KNN), and random forest (RF).

3) Evaluating the three machine learning methods and 1 transfer learning method for categorization

4) Demonstrating how majority voting may be used to combine the predictions of various algorithms, considerably enhancing classification reliability and accuracy.

# II. LITERATURE REVIEW

In [1], Yu Li, Victoria A. Olson, Thomas Laue, Miriam T. Laker , Inger K. Damon classified monkeypox virus with real-time PCR assays.There they present two real-time PCR assays critical for laboratory diagnosis of monkeypox during the 2003 US outbreak.

In [3], Md Manjurul Ahsan, Muhammad Ramiz Uddin, Mithila Farjana, Ahmed Nazmus Sakib, Khondhaker Al Momin, Shahana Akter Luna use deep learning model in detecting monkeypox.

there they did an image based diagnosis of monkeypox disease with a modified VGG16 deep learning model

In [4], Chiranjibi Sitaula, Tej Bahadur Shahi used pre-trained deep Learning model for monkeypox detection.

There they use 13 Deep Learning pre-trained model applied to images to detect the monkeypox

In [5], Murat Altun , Hüseyin Gürüler, Osman Özkaraca , Faheem Khan, Jawad Khan and Youngmoon Lee use Convolutional Neural network with transfer Learning for monkeypox detection.

In [6], Ameera S. Jaradat, Rabia Emhamed Al Mamlook, Naif Almakayeel , Nawaf Alharbe , Ali Saeed Almuflih, Ahmad Nasayreh, Hasan Gharaibeh, Mohammad Gharaibeh, Ali Gharaibeh and Hanin Bzizi use a Automated Detection of monkeypox Skin Detection using Deep Learning and Transfer Learning technique.In there they use EfficientNetB3,VGG19,VGG16,ResNet50 and MobileNetV2 to classify the monkeypox using the images

III. Methodology

## Experimental Setup

* The word “data” is plural, not singular.
* The subscript for the permeability of vacuum *μ*0, and other common scientific constants, is zero with subscript formatting, not a lowercase letter “o”.
* In American English, commas, semicolons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)
* A graph within a graph is an “inset”, not an “insert”. The word alternatively is preferred to the word “alternately” (unless you really mean something that alternates).
* Do not use the word “essentially” to mean “approximately” or “effectively”.
* In your paper title, if the words “that uses” can accurately replace the word “using”, capitalize the “u”; if not, keep using lower-cased.
* Be aware of the different meanings of the homophones “affect” and “effect”, “complement” and “compliment”, “discreet” and “discrete”, “principal” and “principle”.
* Do not confuse “imply” and “infer”.
* The prefix “non” is not a word; it should be joined to the word it modifies, usually without a hyphen.
* There is no period after the “et” in the Latin abbreviation “et al.”.
* The abbreviation “i.e.” means “that is”, and the abbreviation “e.g.” means “for example”.

An excellent style manual for science writers is [7].

# Using the Template

After the text edit has been completed, the paper is ready for the template. Duplicate the template file by using the Save As command, and use the naming convention prescribed by your conference for the name of your paper. In this newly created file, highlight all of the contents and import your prepared text file. You are now ready to style your paper; use the scroll down window on the left of the MS Word Formatting toolbar.

## *Authors and Affiliations*

**The template is designed for, but not limited to, six authors.** A minimum of one author is required for all conference articles. Author names should be listed starting from left to right and then moving down to the next line. This is the author sequence that will be used in future citations and by indexing services. Names should not be listed in columns nor group by affiliation. Please keep your affiliations as succinct as possible (for example, do not differentiate among departments of the same organization).

### *For papers with more than six authors:* Add author names horizontally, moving to a third row if needed for more than 8 authors.

### *For papers with less than six authors:* To change the default, adjust the template as follows.

#### *Selection:* Highlight all author and affiliation lines.

#### *Change number of columns:* Select the Columns icon from the MS Word Standard toolbar and then select the correct number of columns from the selection palette.

#### *Deletion:* Delete the author and affiliation lines for the extra authors.

## *Identify the Headings*

Headings, or heads, are organizational devices that guide the reader through your paper. There are two types: component heads and text heads.

Component heads identify the different components of your paper and are not topically subordinate to each other. Examples include Acknowledgments and References and, for these, the correct style to use is “Heading 5”. Use “figure caption” for your Figure captions, and “table head” for your table title. Run-in heads, such as “Abstract”, will require you to apply a style (in this case, italic) in addition to the style provided by the drop down menu to differentiate the head from the text.

Text heads organize the topics on a relational, hierarchical basis. For example, the paper title is the primary text head because all subsequent material relates and elaborates on this one topic. If there are two or more sub-topics, the next level head (uppercase Roman numerals) should be used and, conversely, if there are not at least two sub-topics, then no subheads should be introduced. Styles named “Heading 1”, “Heading 2”, “Heading 3”, and “Heading 4” are prescribed.

## *Figures and Tables*

#### *Positioning Figures and Tables:* Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation “Fig. 1”, even at the beginning of a sentence.

1. Table Type Styles

| **Table Head** | **Table Column Head** | | |
| --- | --- | --- | --- |
| ***Table column subhead*** | ***Subhead*** | ***Subhead*** |
| copy | More table copya |  |  |

1. Sample of a Table footnote. (*Table footnote*)
2. Example of a figure caption. (*figure caption*)

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity “Magnetization”, or “Magnetization, M”, not just “M”. If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write “Magnetization (A/m)” or “Magnetization {A[m(1)]}”, not just “A/m”. Do not label axes with a ratio of quantities and units. For example, write “Temperature (K)”, not “Temperature/K”.

##### Acknowledgment *(Heading 5)*

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression “one of us (R. B. G.) thanks ...”. Instead, try “R. B. G. thanks...”. Put sponsor acknowledgments in the unnumbered footnote on the first page.

##### References

The template will number citations consecutively within brackets [1]. The sentence punctuation follows the bracket [2]. Refer simply to the reference number, as in [3]—do not use “Ref. [3]” or “reference [3]” except at the beginning of a sentence: “Reference [3] was the first ...”

Number footnotes separately in superscripts. Place the actual footnote at the bottom of the column in which it was cited. Do not put footnotes in the abstract or reference list. Use letters for table footnotes.

Unless there are six authors or more give all authors’ names; do not use “et al.”. Papers that have not been published, even if they have been submitted for publication, should be cited as “unpublished” [4]. Papers that have been accepted for publication should be cited as “in press” [5]. Capitalize only the first word in a paper title, except for proper nouns and element symbols.

For papers published in translation journals, please give the English citation first, followed by the original foreign-language citation [6].

1. G. Eason, B. Noble, and I. N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” Phil. Trans. Roy. Soc. London, vol. A247, pp. 529–551, April 1955. *(references)*
2. J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.
3. I. S. Jacobs and C. P. Bean, “Fine particles, thin films and exchange anisotropy,” in Magnetism, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.
4. K. Elissa, “Title of paper if known,” unpublished.
5. R. Nicole, “Title of paper with only first word capitalized,” J. Name Stand. Abbrev., in press.
6. Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, “Electron spectroscopy studies on magneto-optical media and plastic substrate interface,” IEEE Transl. J. Magn. Japan, vol. 2, pp. 740–741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].
7. M. Young, The Technical Writer’s Handbook. Mill Valley, CA: University Science, 1989.

**IEEE conference templates contain guidance text for composing and formatting conference papers. Please ensure that all template text is removed from your conference paper prior to submission to the conference. Failure to remove template text from your paper may result in your paper not being published.**

