

WEBINARS & WORKSHOPS
INTRODUCTION TO COMPUTER VISION:
UNRAVELING THE WONDERS OF COMPUTER VISION

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ABSTRAK

The computer vision workshop is a crucial platform addressing the escalating demands of this rapidly evolving field within computer science. In today's era, visual data processing is integral across diverse sectors such as healthcare, security, and industry, making the workshop a guiding beacon for participants navigating the complex terrain of computer vision. Central to its agenda is the dissemination of practical insights into training data for object recognition, a cornerstone for unleashing the full potential of computer vision applications. Participants delve into fundamental concepts, encompassing nuances of deep learning alongside the intricacies of data training and object detection. Employing Google Colab and Python programming language, the workshop emphasizes practical application, equipping participants with cutting-edge tools. Expected outcomes encompass participants fostering a profound grasp of underlying principles, refining proficiency in data training for nuanced object detection, and bolstering confidence through hands-on exercises. Designed holistically, the workshop integrates elements such as deep learning, computer vision, interactive Q&A sessions, and practical exercises, ensuring participants acquire a robust skill set ready for real-world challenges in the dynamic realm of computer vision.

Keywords: *Computer Vision, Deep Learning, Data Training, Object Detection, Google Colab, Python Programming, Hands-on Experience, Interactive Sessions, Practical Applications, Real-World Challenges.*

INTRODUCTION

Computer vision is a rapidly advancing discipline within computer science that finds wide-ranging applications across various sectors, including industry, healthcare, and security (Marpaung et al., 2022). Its proficiency in comprehending and scrutinizing images and videos yields numerous advantages, such as streamlining intricate and repetitive tasks, amplifying efficiency and productivity, and fortifying security measures (Dompeipen et al., 2021).

The purpose of this workshop is to furnish participants with a hands-on introduction to the intricacies of computer vision, placing particular emphasis on the process of training data to recognize and detect objects.

Workshop Objectives:

1. Immerse participants in the fundamental concepts of computer vision.
2. Familiarize participants with the intricacies of training data and the detection of objects.
3. Demonstrate the practical utilization of Google Colab and the Python programming language for computer vision.
4. Provide participants with ample opportunities to apply and reinforce their newly acquired knowledge through practical exercises.

Anticipated Workshop Outcomes:

1. Participants will cultivate a comprehensive understanding of the underlying principles governing the functionality of computer vision.
2. Participants will develop proficiency in training data to effectively detect various objects.
3. Participants will gain confidence in utilizing Google Colab and the Python programming language for computer vision applications.

The Workshop Structure encompasses the following key components:

1. Deep Learning
2. Computer Vision
3. Question and Answer Session
4. Hands-on Workshop

Target Participants:

The workshop is tailored for students and professionals who harbor an interest in the realm of computer vision. No prior knowledge of computer vision is required for participation.

Pedagogical Approaches:

The workshop will employ a diverse range of instructional methods, including presentations to impart theoretical knowledge, live demonstrations to showcase practical applications, and interactive exercises to provide participants with hands-on experience.

Comprehensive Workshop Content:

1. In-depth exploration of the foundational concepts underpinning computer vision.
2. Step-by-step elucidation of the processes involved in training data and detecting objects.
3. Practical guidance on leveraging Google Colab and the Python programming language for computer vision applications.

METHODS

Webinars and Workshops involve several stages and preparations. The initial stage involves preparing simple basic material so that it is easily digested by participants from various backgrounds. The material discussed in this activity is about Deep Learning and Computer Vision. The webinar contains a basic introduction to Computer Vision and then continued with workshops or training related to the basic implementation of the use of tools based on the material, namely making Computer Vision models using the Convolutional Neural Network (CNN) algorithm and implementing Transfer Learning with Google Colab tools.



Image2. 1 Google Colab Logo
(<https://colab.research.google.com>)

In the workshop session, the dataset "Horse & Human" was used as an example in teaching. It can be seen in figure 2.2 that this dataset was obtained from one of the well-known websites as a dataset provider, namely "<https://www.kaggle.com>". This dataset contains a set of images of horses and humans designed to help workshop participants understand the concepts and applications of artificial neural networks in image recognition. Implementation using this dataset, workshop participants can learn how to train artificial neural network models to recognize and distinguish between horse and human images automatically.



Image 2. 2 Dataset Horse and Human Image

The material given in the webinar is about Deep Learning and Computer Vision, namely:
Deep Learning :

1. Definition of Deep learning
2. Definition of artificial intelligence
3. Four traits that Artificial Intelligence must have
 - Perceive & respond
 - Learn & adapt
 - Problem solving & decisions making
 - Communication
4. The difference between deep learning and artificial intelligence
5. Difference deep learning dan machine learning
6. Key concepts deep learning
 - Neural networks
 - Layer
 - Deep neural networks
 - Training
 - Hierarchical representation
 - Transfer learning
 - Activation function

- Optimization and regularization
- 7. Neural networks
 - Definition of Neural networks
 - Similarities between the human brain and neural networks
- 8. How deep learning works
 - Proses Training dan Learning
 - Automatic Representation of Features
- 9. Application of deep learning

Computer Vision :

1. Introduction to Computer Vision
2. Computer Vision Capabilities
3. Basic Concepts in Computer Vision
 - a. Image Processing
 - Filtering
 - Transformation
 - Restoration
 - b. Detection
 - Object Detection
 - Object Identification
 - c. Segmentation
 - Colour
 - Texture
 - Contour
 - d. Introduction of Patterns
 - e. Haman 3d
 - f. Object Tracking
 - g. Classification & Introduction
 - h. Video Processing
 - i. Augmented Reality
4. Computer Vision Applications
 - a. Health
 - b. Automotive
 - c. Retail and e-commerce
5. Self-Extraction and Matching
6. Challenges and Future Directions in Computer Vision
 - a. Accuracy and Performance
 - b. Interpretation of Context
 - c. Multi Model Capability

In the application of *Artificial Intelligence (AI)* technology in the *Computer Vision* subfield with *Python* programming, especially in *Image Recognition* for object detection (Bhatt et al., 2021). Participants were guided to design and implement several models, namely *Convolutional Neural Network (CNN) algorithm* and *Transfer Learning* using the 'Horse and Human' dataset. The main purpose of this stage is to make a description of the process in the practice of making *Computer Vision* projects so that in the future participants can easily train their skills in making other projects.

As for the technical discussion, the implementation of activities was carried out and agreed through licensing from the Informatics Engineering Study Program at the time of

implementation on Tuesday, January 30, 2024 at 13.00 - 17.30 WIB. This activity was carried out online through the Zoom Meeting Conference which was disseminated through the public.

After the activity took place, participants were asked to do a Google Form to find out the results of the participants' understanding in this activity. The questionnaire questions asked are as follows:

1. What is Deep Learning?
2. What does the term "neural network" mean in the context of deep learning?
3. What is Computer Vision?
4. What is "Feature Extraction" in Computer Vision?
5. What is "Image Filtering" in the context of Computer Vision?

Table 2. 1 Schedule of Webinars and Workshops

SELASA, 30 JANUARI 2024			
NO	WAKTU (WIB)	KEGIATAN	KETERANGAN
1	13.00 - 13.30	Persiapan	Panitia & Peserta
2	13.30 - 13.35	Pembukaan	Mc
3	13.35 - 13.40	Pembacaan Ayat Al-Quran	Panitia
4	13.40 - 14.25	Materi 1 (Deep Learning)	Pemateri 1 & Moderator
5	14.25 - 15.15	Materi 2 (Computer Vision)	Pemateri 2 & Moderator
6	15.15 - 15.30	Qna	Moderator
7	15.30 - 16.00	Ishoma	Panitia & Peserta
8	16.00 - 17.00	Workshop	Pemateri
9	17.00 - 17.15	Quiz	Operator
10	17.15 - 17.30	Dokumentasi & Penutup	Mc

RESULT AND DISCUSSION

The results of the webinar and workshop on the introduction of computer vision were :

1. **Understanding of Basic Concepts**
 Webinar and workshop participants can gain a better understanding of the basic concepts of Computer Vision, including image processing, feature extraction, and pattern recognition.
2. **Practical Skills**
 Participants can develop practical skills in applying Computer Vision techniques through case studies or practical projects described during the event.
3. **Practical Experience Through Case Studies**

Workshops include case studies or concrete projects to give participants hands-on experience in solving problems using Computer Vision algorithms and techniques.

4. Introduction to Tools and Frameworks

Participants are introduced to popular tools and frameworks used in Computer Vision development, enabling them to more effectively involve themselves in future projects. Examples of tools used during the workshop are Github and Google Collaboration.

5. Networking and Collaboration

Webinars and workshops often provide opportunities for participants to connect with fellow professionals or other attendees, enabling the exchange of ideas and future collaboration.

6. Understanding of Industry Applications

Attendees can gain insight into how Computer Vision is applied in various industries, such as automotive, healthcare, or security.

7. Up-to-Date Information

If the webinar covers the latest developments in the field of Computer Vision, participants can gain insight into the latest trends and technologies.

8. Additional Resources

Participants are provided with additional resources, such as literature references, datasets, or online tutorials to help them continue learning after the event ends.

9. Result workshop introduction to computer vision

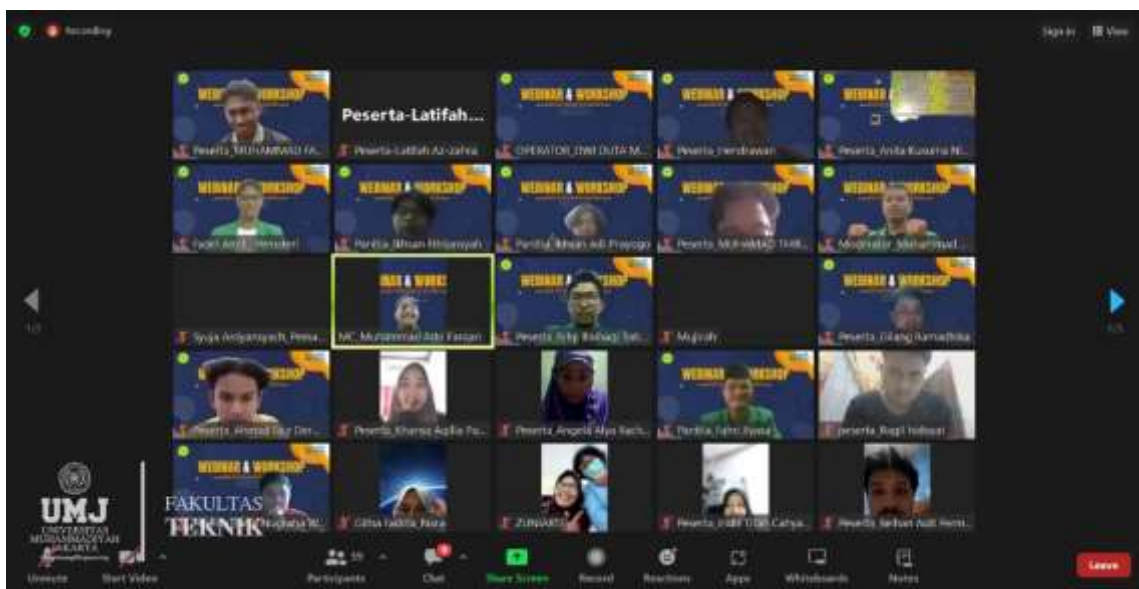


Image 3. 1 Documentation of Webinar and Workshop



```

import numpy as np
from google.colab import files
from tensorflow.keras.utils import load_img, img_to_array

uploaded = files.upload()

for fn in uploaded.keys():

    path = '/content/' + fn
    img = load_img(path, target_size=(100, 100))
    x = img_to_array(img)
    x /= 255
    x = np.expand_dims(x, axis=0)

    images = np.vstack([x])
    classes = model.predict(images, batch_size=10)
    print(classes[0])

    if classes[0]>0.5:
        print(fn + " is a human")
    else:
        print(fn + " is a horse")
    
```

Image 3.2 Code used for the workshop

The Discussion webinar and workshop introduction to computer vision were :

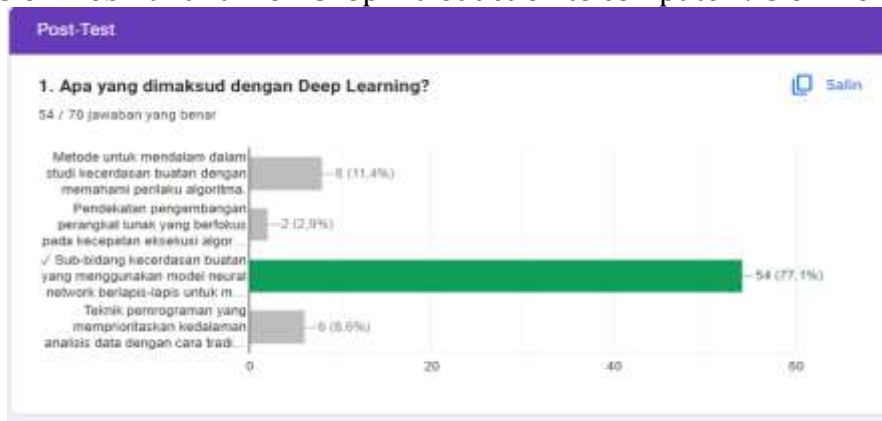


Image 3.3 Response to question 1

1. Participants provide feedback on whether the material presented increases understanding of what is meant by Deep Learning? The result obtained from this question was **77.1%** by answering the sub-field of artificial intelligence which uses a multi-layered neural network model to understand and process data.

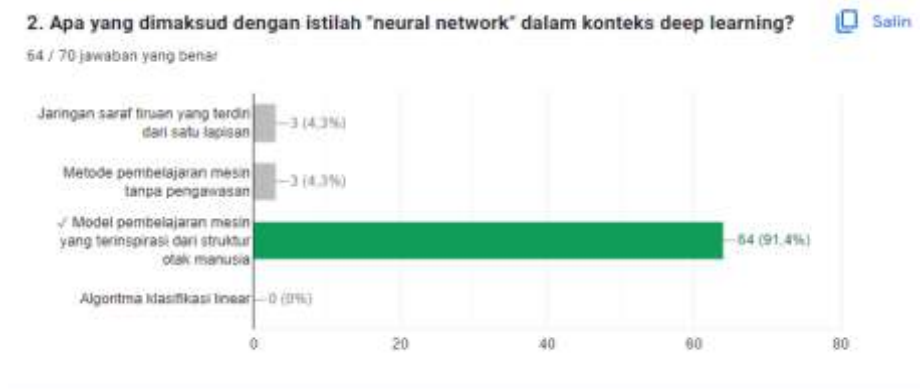


Image 3.4 Response to question 2

- Participants provide feedback on whether the material presented increases understanding of what is meant by Deep Learning? The result obtained from this question was **91.4%** by answering a machine learning model inspired by the structure of the human brain.

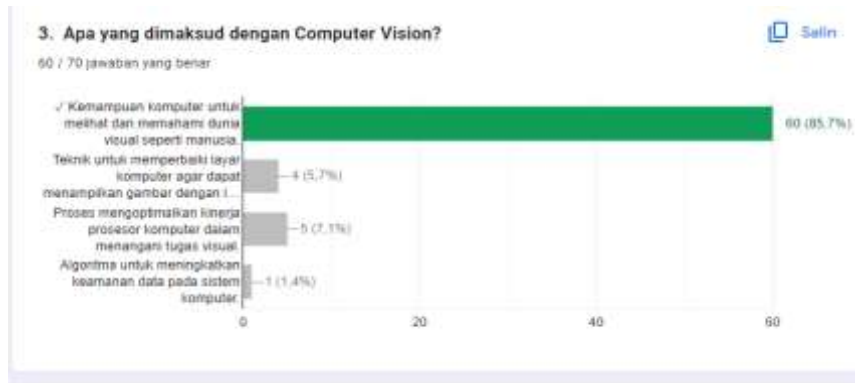


Image 3.5 Response to question 3

- Participants provide feedback on whether the material presented increases understanding of what is meant by Deep Learning? The result obtained from this question was **85.7%** by answering the ability of computers to see and understand the visual world like humans.

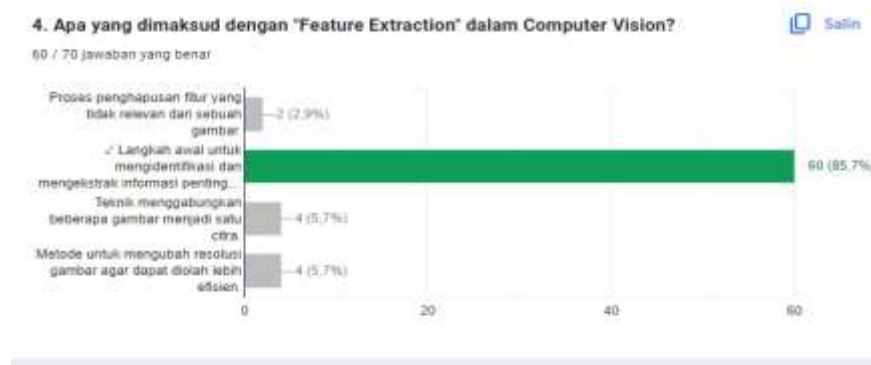


Image 3.6 Response to question 4

- Participants gave responses on whether the material presented increased their understanding of What is Deep Learning? The result of the question was **85,7%** by answering. The first step is to identify and extract important information from an image.

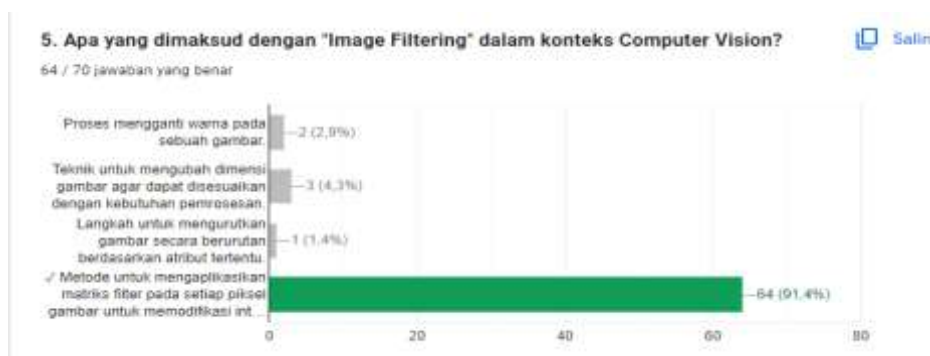


Image 3.7 Response to question 5

5. Participants gave responses on whether the material presented increased their understanding of what is Deep Learning? The result of the question was **91.4%** by answering The method of applying a filter matrix to each pixel of an image to modify the color intensity or emphasize certain features.

CONCLUSION

From the results of the general webinar and workshop activities, it can be concluded that:

1. The participants of the webinar and workshop successfully gained a profound understanding of the role of Deep Learning and Computer Vision in the context of modern technology. The presented material covered the fundamental concepts of Deep Learning, Computer Vision algorithms, and their practical applications, providing a strong foundation for the participants.
2. The webinar session guided participants through the stages of implementing Deep Learning in Computer Vision with relevant case studies. The material was not only conceptual but also provided practical insights into how this technology can be applied in object recognition, pattern detection, and image processing.
3. Participants not only gained conceptual knowledge but were also engaged in practical activities. The workshop sessions focused on designing and implementing source code using the Python programming language to support Computer Vision applications. The use of platforms like Google Colab aided participants in applying this practical knowledge to real solutions in various fields.
4. The survey results indicate success in delivering the material, with the majority of participants being able to understand and absorb the information effectively. The efficiency of material delivery by the speaker received positive feedback, demonstrating participant satisfaction with the discussions on Deep Learning and Computer Vision.
5. With the knowledge gained from this webinar and workshop, participants are expected to feel motivated to continue self-directed learning in the field of Deep Learning and Computer Vision. This is anticipated to support the development of technology and innovative applications in various aspects of daily life.

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