# Oak D

## Unleash Your Creativity with Oak-D and TouchDesigner

*see bottom of the page for tutorials & setup.*

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*Check out the OAKExamples.toe file for the various possibilities with OakD, native in TD.*

# The Oak-D AI Powered Camera: A Game Changer in Computer Vision

Artificial Intelligence (AI) is revolutionizing various fields, and one area where it is making significant advancements is computer vision. In this article, we will delve into the world of the Oak-D AI powered camera. We will explore its features, applications, and advantages over other cameras in the market. Moreover, we will guide you through the process of setting up the necessary libraries and provide an overview of the depth AI examples.

# 1. Introduction

AI has become a game changer in various industries, and computer vision is one domain where its impact is transformative. The Oak-D AI powered camera is a remarkable innovation in the world of computer vision. Equipped with stereo and mono cameras, as well as an RGB camera, the Oak-D camera is capable of running various AI models. In this article, we will explore the capabilities of the Oak-D camera and guide you through the process of getting it up and running.

# 2. Overview of the Oak-D AI Powered Camera

The Oak-D camera, developed by Luxonis, is an AI powered camera that combines hardware and software to enable advanced computer vision applications. It consists of stereo and mono cameras on the sides, along with an RGB camera in the middle. This configuration allows the camera to capture depth and color information simultaneously. Additionally, the Oak-D camera can load and run various AI models, making it versatile and suitable for a wide range of applications.

# 3. Understanding Depth AI and its Applications

Depth AI is the Spatial AI platform that is embedded in the Oak-D camera. It is responsible for processing the captured data and running the AI models. The Oak-D camera supports numerous AI models that enable applications such as media pipe HAND tracking, YOLO object recognition, gaze estimation, segmentation, and text detection.

## 3.1 Media Pipe Hand Tracking

One of the key applications of the Oak-D camera is media pipe hand tracking. This AI model allows the camera to track and recognise hand movements in real time. It has extensive applications in fields such as robotics and engineering, and is gaining popularity in the art and tech communities.

## 3.2 YOLO Object Recognition Model

The Oak-D camera is also capable of running the YOLO (You Only Look Once) object recognition model. This model enables real-time object detection and recognition, providing accurate and fast results. It has applications in fields such as surveillance, autonomous vehicles, and augmented reality.

## 3.3 Gaze Estimation

Another powerful feature of the Oak-D camera is the ability to estimate gaze direction. This AI model can accurately determine where a person is looking, enabling applications such as eye tracking, Attention analysis, and user interaction in various domains.

## 3.4 Segmentation

The Oak-D camera can also perform image segmentation, which involves separating an image into different regions or objects. This enables precise object identification and tracking, with applications in areas such as medical imaging, scene understanding, and image editing.

## 3.5 Text Detection

Text detection is another AI model that the Oak-D camera can handle effectively. It can identify and extract text from images, enabling applications such as optical character recognition (OCR), document analysis, and text-to-speech conversion.

# 4. Comparing Oak-D with Other Cameras in the Market

When exploring AI powered cameras, it is essential to consider the available options. One popular camera in the market is the Azure Camera. However, the Oak-D camera offers several advantages over the Azure Camera.

## 4.1 Azure Camera

The Azure Camera is a well-known AI powered camera in the market. While it offers impressive features, it falls short in certain areas compared to the Oak-D camera. Firstly, the Oak-D camera is more affordable, making it an attractive option for various applications. Additionally, the Oak-D camera has the ability to load and run multiple AI models, providing greater flexibility compared to the limited options of the Azure Camera.

## 4.2 Pros and Cons of Oak-D

Pros:

- Affordability: The Oak-D camera offers a cost-effective solution for AI powered computer vision applications.

- Versatility: With the ability to load and run multiple AI models, the Oak-D camera caters to a wide range of applications.
- Depth Sensing: The stereo and mono cameras of the Oak-D camera enable accurate depth sensing in well-lit environments.

Cons:

- Limited Depth Sensing in Low-Light Environments: The depth sensing capabilities of the Oak-D camera are limited in poorly lit environments, unless the AI infrared (IR) illumination feature is used.
- Integration Challenges: While the Oak-D camera offers extensive capabilities, integrating it into existing systems might require technical expertise.

# 5. Setting Up the Necessary Libraries

Before diving into the world of the Oak-D camera, it is important to set up the necessary libraries and dependencies. This section will guide you through the process step by step.

## 5.1 Installing Python and Required Libraries

Python is the language used for this project and requires the latest version of Python 3 to be installed. The depth AI examples use the OpenCV library for computer vision tasks. To install OpenCV, simply run the command `python3 -m pip install opencv-python`.

## 5.2 Using PyCharm as the Integrated Development Environment

PyCharm is an integrated development environment that simplifies the process of writing and running Python code. It is recommended to use PyCharm for this project. Download and install PyCharm from the JetBrains Website.

## 5.3 Working with Virtual Environments

To ensure project isolation and avoid conflicts between different versions of libraries, it is best to work with virtual environments. PyCharm automatically creates a virtual environment for each project, allowing you to install project-specific libraries without affecting other projects. This practice ensures a smooth development experience.

# 6. Exploring the Depth AI Examples

The depth AI examples provided with the Oak-D camera are a great starting point for understanding its capabilities. This section will provide an overview of two examples: the Color Camera RGB Video and the Stereo Depth Video.

## 6.1 Understanding the Color Camera and RGB Video Example

The Color Camera and RGB Video example demonstrates how to capture RGB video using the Oak-D camera. It opens an OpenCV window showing the live video feed from the camera. This example allows users to gain Insight into the camera's color capabilities and serves as a baseline for further exploration.

## 6.2 Exploring the Stereo Depth Example

The Stereo Depth example showcases the Oak-D camera's depth sensing capabilities. It creates a 3D depth map by using the stereo and mono cameras. The example visualizes the depth map by rendering multiple views, providing a comprehensive understanding of the camera's depth Perception.

# 7. Conclusion

The Oak-D AI powered camera is a remarkable tool for computer vision applications. Its versatility, affordability, and support for various AI models make it a valuable asset in fields such as robotics, engineering, and art. By understanding the setup process and exploring the provided depth AI examples, you can unleash the full potential of this powerful camera and dive into the world of AI powered computer vision.

# Highlights

- The Oak-D AI powered camera combines hardware and software to enable advanced computer vision applications.
- Depth AI, the spatial AI platform embedded in the Oak-D camera, allows for the execution of various AI models.
- The Oak-D camera supports applications such as media pipe hand tracking, YOLO object recognition, gaze estimation, segmentation, and text detection.
- When compared to the Azure Camera, the Oak-D camera offers affordability, versatility, and the ability to load multiple AI models.
- Setting up the necessary libraries, using PyCharm as the IDE, and working with virtual environments are essential steps in utilizing the Oak-D camera.

- Exploring the provided depth AI examples, such as the Color Camera RGB Video and Stereo Depth Video, allows users to grasp the capabilities of the Oak-D camera.

# FAQ

Q: Can the Oak-D AI powered camera be integrated into existing systems easily?

A: While the Oak-D camera offers extensive capabilities, integrating it into existing systems might require technical expertise due to its advanced features and dependencies.

Q: How does the depth sensing of the Oak-D camera work in poorly lit environments?

A: The stereo and mono cameras of the Oak-D camera rely on well-lit environments for accurate depth sensing. However, the Oak-D Pro version, equipped with AI infrared (IR) illumination, can provide depth sensing in poorly lit environments.

Q: Are there alternative cameras to the Oak-D for AI powered computer vision applications?

A: Yes, the Azure Camera is a popular alternative. However, the Oak-D camera offers advantages such as affordability, versatility, and the ability to load multiple AI models.

Q: What software is required to run the Oak-D camera?

A: The Oak-D camera requires the installation of Python, OpenCV, and the depth AI library. The PyCharm IDE is recommended for managing the project and running the examples.

Alternatively use a tool like Touchdesigner. Explore the example-file : OAKExamples.toe

Another resource, found at a comparable university in Londen: Arts.Ac.Uk

Tutorials when taking the PyCHharm toute:

https://www.youtube.com/embed/bXQM9byBA6o

https://www.youtube.com/embed/OPPDKpB6gRo

https://www.youtube.com/embed/dQcXADLzDUY?t=0s

https://www.youtube.com/embed/LEQxybLmA2w

At HKU we have an OakD Lite in the Blackbox.  This works best in well lit envoirnments (no IR)

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