# Session 2: Image Classification — Instructor Guide

This guide supports instructors delivering the Newegg AI Workshop – Session 2 (Image Classification). It includes session flow, teaching tips, key concepts, and challenge solutions.

## Session Overview

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| Session Title | Session 2: Image Classification |
| Duration | 90 minutes |
| Objective | Students learn how AI can recognize and categorize images using neural networks. They will train a simple image classifier using the CIFAR‑10 dataset and understand how models learn visual patterns. |
| Materials | Jupyter Notebook (Session\_2\_Train\_Classifier\_Beginner\_Final.ipynb), Internet access, GPU-enabled environment (e.g., NiceGPU), PPT slides. |

## Teaching Flow

* 1. Introduction (10 min): Discuss what image classification means and show real-world examples like Google Photos or self-driving cars.
* 2. Demo (15 min): Display sample CIFAR‑10 images and explain how neural networks identify patterns.
* 3. Guided Practice (40 min): Students follow the notebook to build and train a simple CNN using PyTorch.
* 4. Challenge Activity (20 min): Students complete mini challenges (e.g., change epochs, adjust learning rate, test custom images).
* 5. Wrap-Up & Reflection (5 min): Discuss how image recognition is used in real-world AI applications and connect to the upcoming chatbot session.

## Key Concepts

• Image classification: identifying objects or scenes in images.

• Neural networks (CNNs): algorithms inspired by the human brain that process image data.

• Dataset preprocessing: normalization and batching of images for training.

• Training loop: how AI learns by minimizing loss through gradient descent.

• Evaluation metrics: accuracy and prediction visualization.

• Real-world use: AI in photo tagging, self-driving vehicles, and e-commerce product recognition.

## Instructor Notes

⚙️ Emphasize learning through visuals: Encourage students to interpret results visually (correct vs. incorrect predictions).

💡 Connect to daily life: Ask how classification is used in their phones (photo apps, animal recognition, etc.).

🧠 Simplify concepts: Use metaphors—convolutional layers are the 'eyes,' fully connected layers are the 'brain.'

🎯 Highlight experimentation: Let students test different hyperparameters to observe performance changes.

⚠️ Remind about GPU/CPU: If no GPU is available, training will be slower but still functional.

## Challenge Questions (Student Version)

1. 🧠 Try training the model for more epochs. Does accuracy improve?

2. 🎨 Modify the model by adding another convolutional layer or changing filter sizes.

3. ⚙️ Adjust the learning rate or batch size. How does this affect training?

4. 📸 Upload and test your own image. What does the AI predict?

5. 🚀 Bonus: Replace CIFAR‑10 with CIFAR‑100 and compare performance.

## Challenge Solutions (Instructor Reference)

1. 🧠 More epochs generally improve accuracy, but excessive training can cause overfitting.

2. 🎨 Adding layers increases model capacity but may slow training—students will observe higher accuracy but longer runtime.

3. ⚙️ Lower learning rate stabilizes training; higher rates may cause oscillation.

4. 📸 The model performs best on familiar CIFAR‑10 classes; custom images outside these may give unexpected results.

5. 🚀 CIFAR‑100 is harder; accuracy typically drops, showing how model complexity and dataset difficulty interact.