Reach out to the EpochDev team! 🙋🏽‍♂️ ♀

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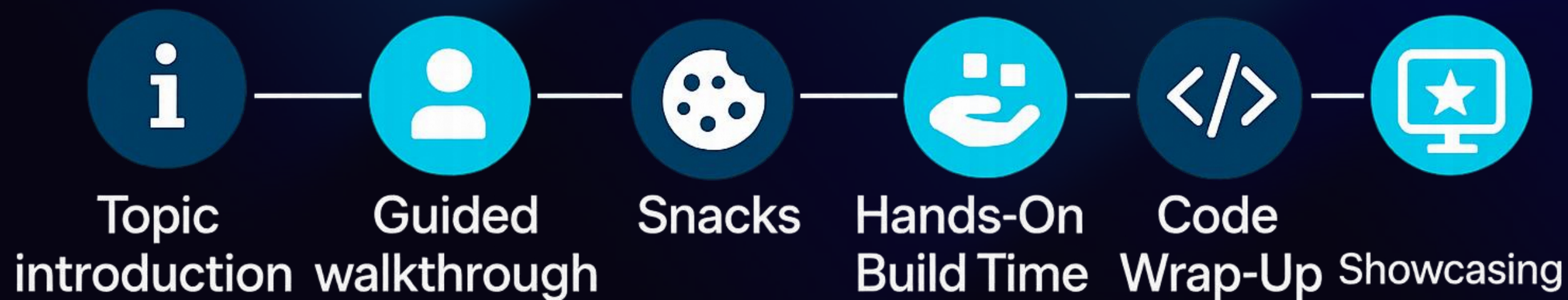

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What is EpochDev?

Space to grow by:

- Practicing
- Creating
- Showcasing
- Learning!

Community:

- Express your ideas
- Join us in competitions
- Develop with us

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Agenda

Topic introduction — Guided walkthrough — Snacks — Hands-On Build Time — Code Wrap-Up — Showcasing

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Computer Vision 101

Can a Computer Read Your handwritten numbers?

Concepts you'll familiarise with:

- Computer vision

- Neural Networks

- Handwritten digits (MNIST)

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What is Computer Vision?

Computer vision teaches machines to "see" and interpret images, transforming raw pixels into meaningful information.

- Examples:

- Face unlock on smartphones

- Self-driving cars reading road signs

- Applications scanning handwritten notes

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How do machines interpret Images?

- Computers only understand NUMBERS!!!!

- Then the question is ... How can we represent an image in numbers?
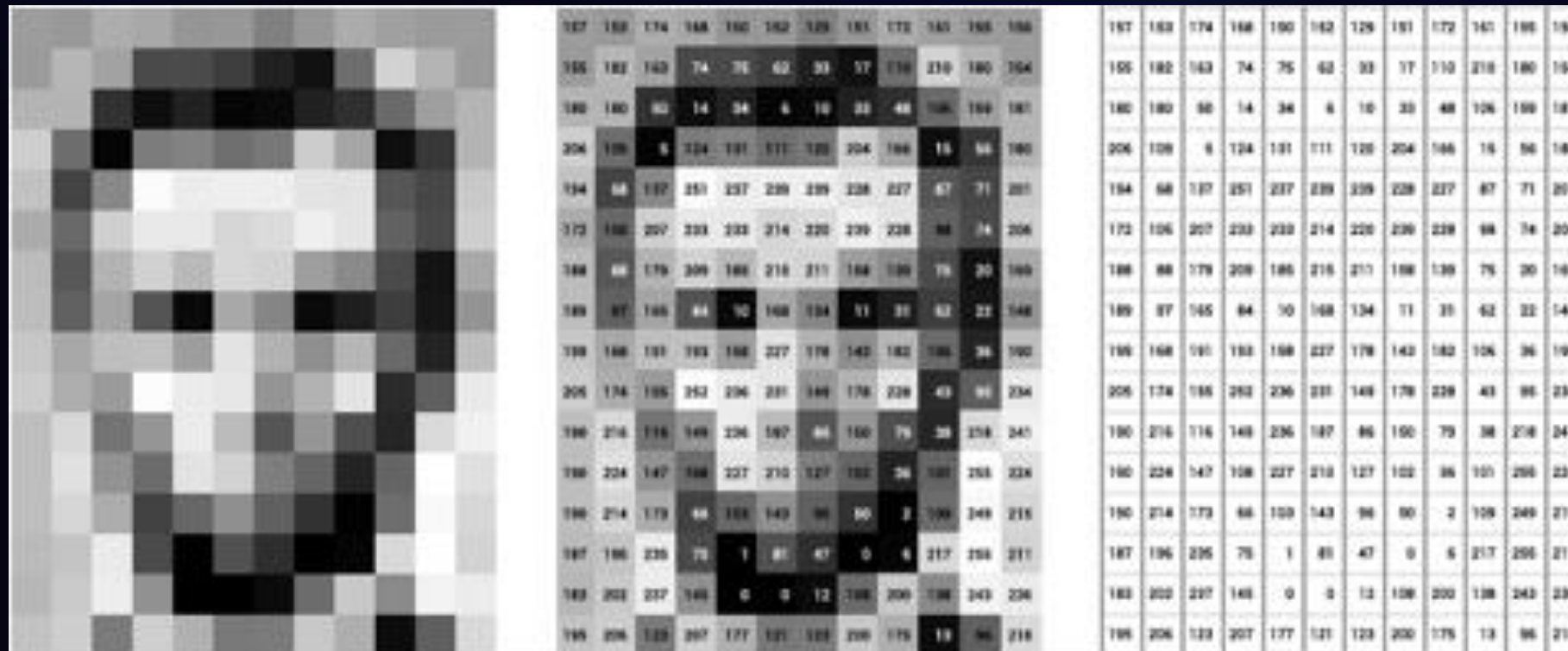
What Are Neural Networks?

Brain Made of Math

Simplified computational models inspired by the human brain's structure.

Learns from Examples

Adjusts its internal connections by processing large datasets, much like a child learning to identify objects.

Finds Patterns Automatically

Identifies complex relationships in data without explicit programming for each rule.

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How Do Neural Networks Work in Vision?

1

Pixels → Patterns

Images are broken down into numerical pixel values, which the network analyses for basic shapes like lines and curves.

2

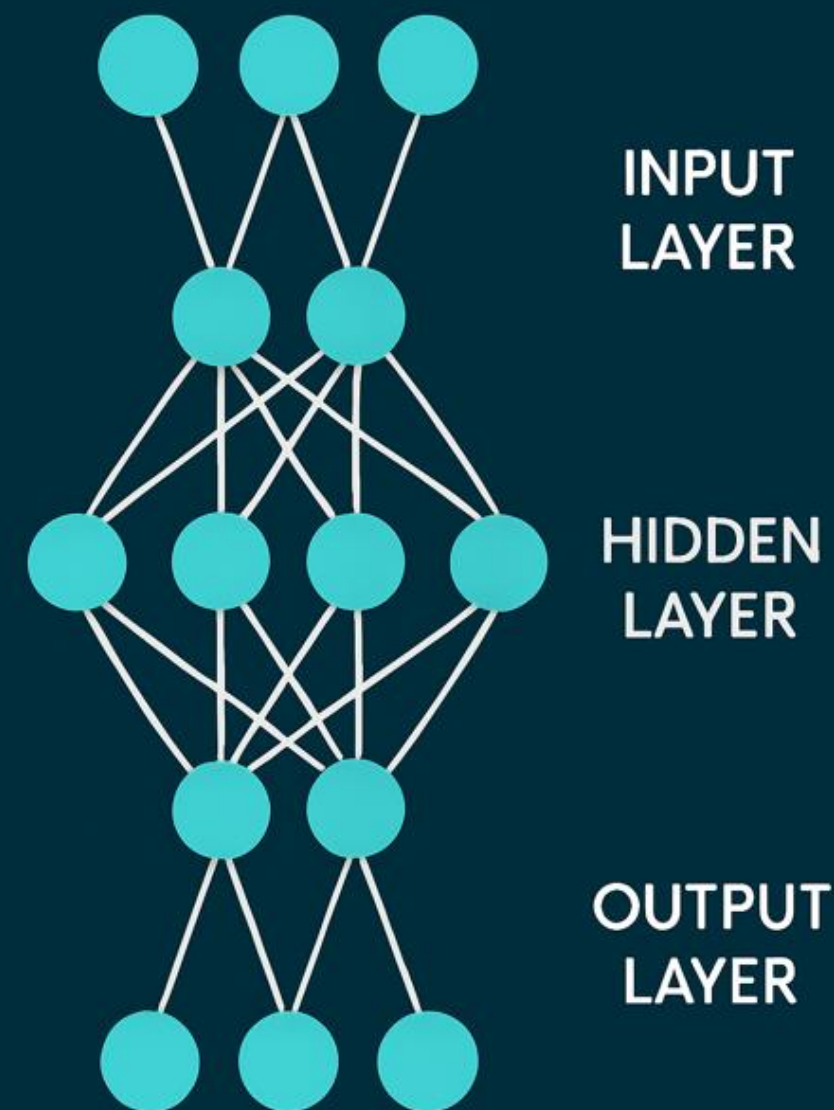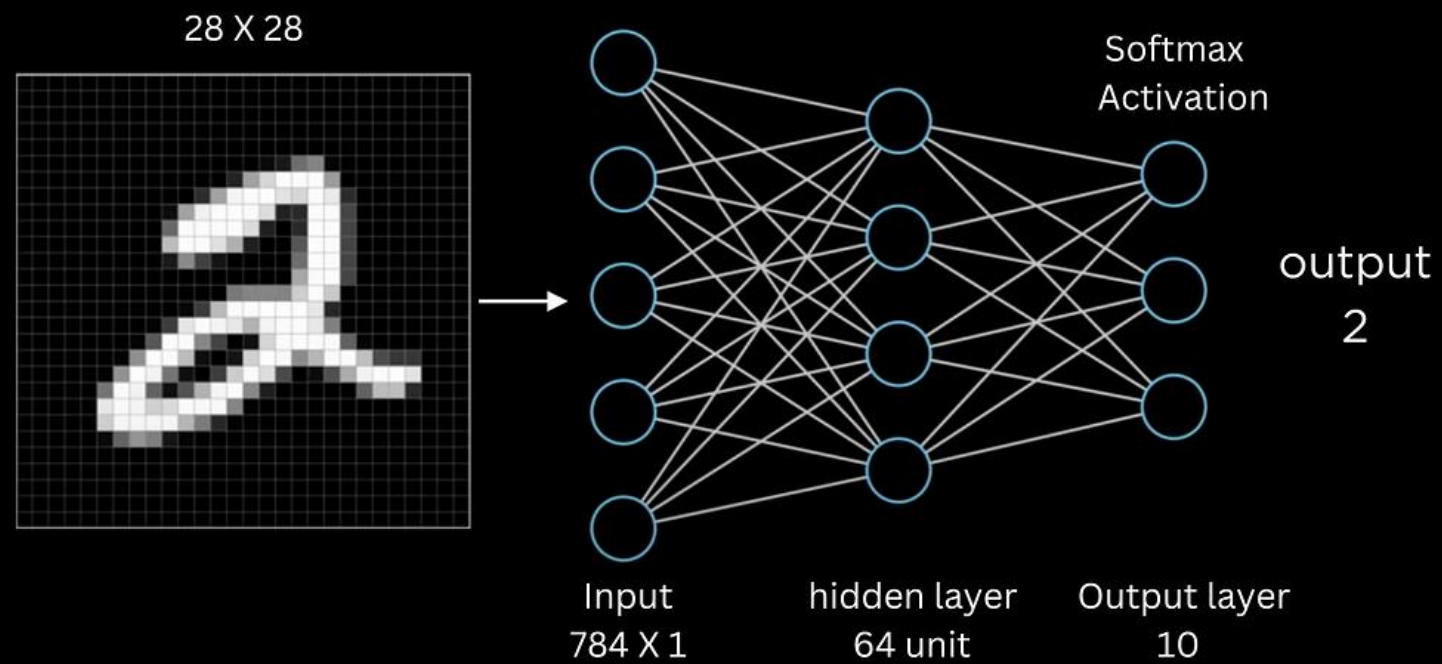### Learns Shapes Over Time

Through repeated exposure to images, the network refines its ability to recognise more complex visual features.

3

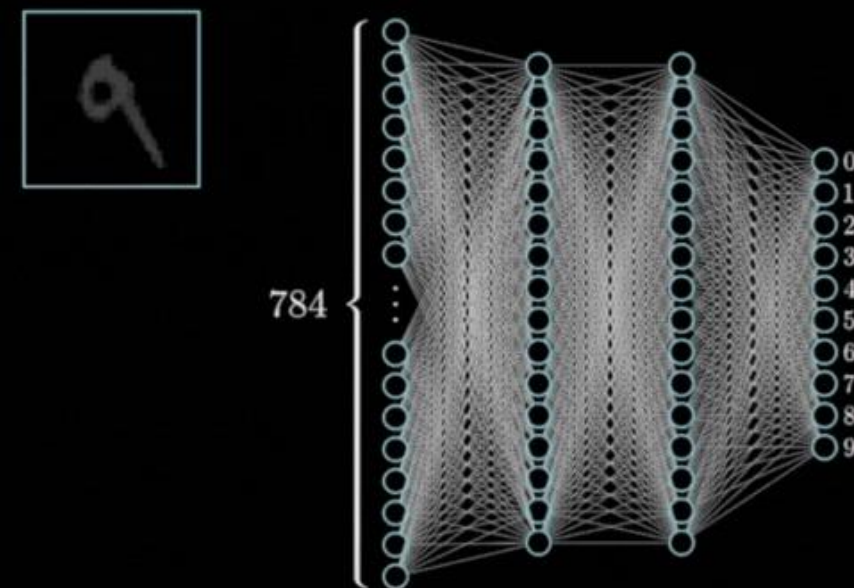### Predicts Digits

Based on learned patterns, it makes a probabilistic prediction, e.g., "This is likely a 2" with a certain confidence score.

INPUT
LAYER

HIDDEN
LAYER

OUTPUT
LAYER

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28 X 28

Softmax Activation

output 2

Input 784 X 1

hidden layer 64 unit

Output layer 10

Plain vanilla
(aka "multilayer perceptron")

784

0
1
2
3
4
5
6
7
8
9

Why is Reading Handwriting Hard?

- **Everyone writes differently:** Vast variations in style, size, and slant make generalisation difficult for machines.

- **Some digits look alike:** A sloppy '2' can resemble a '7'; '9' can look like '4', creating ambiguity.

- **No context:** Unlike words in a sentence, isolated digits lack linguistic context to aid interpretation.


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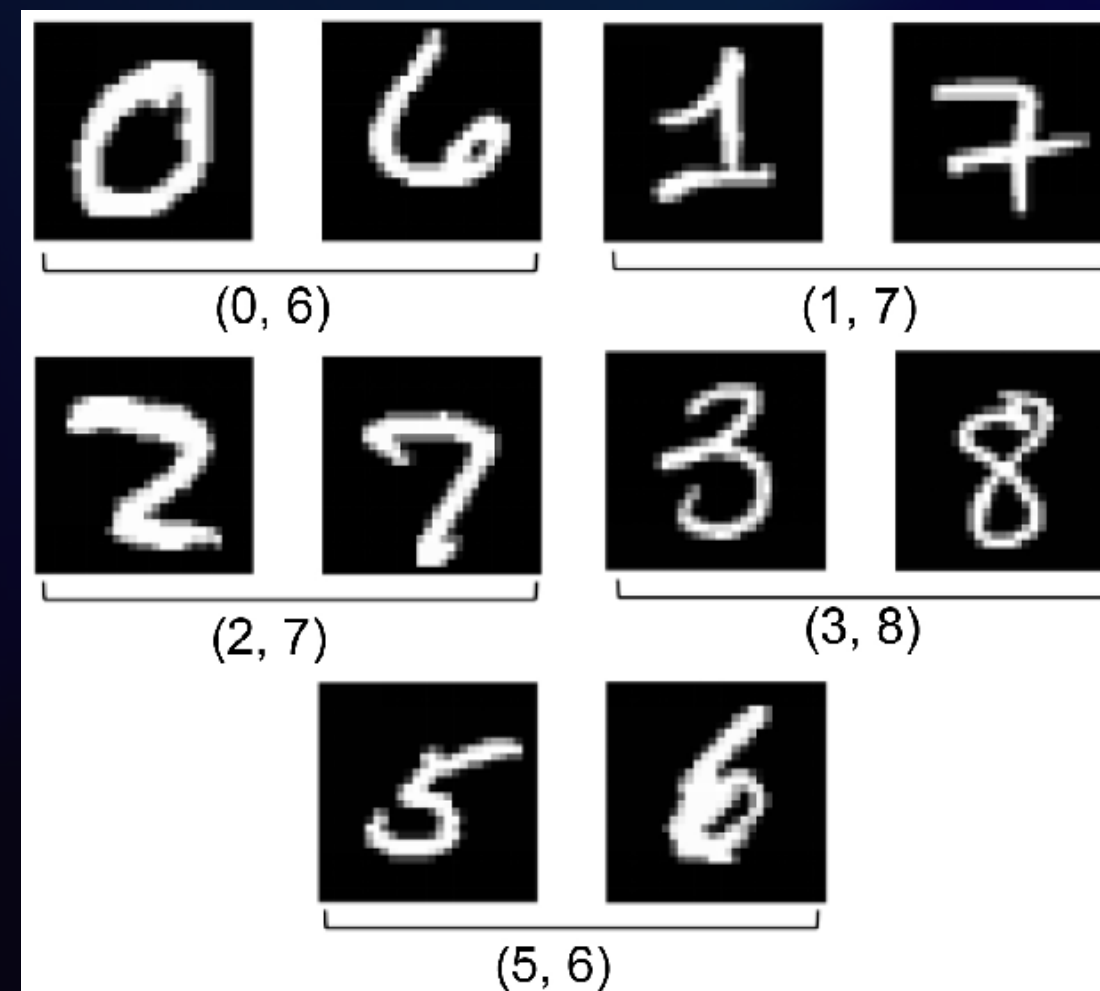
What is MNIST?

The **MNIST** (Modified National Institute of Standards and Technology) dataset is the "Hello World" of computer vision, a foundational resource for training and testing machine learning algorithms.

· **70,000 handwritten digit images:** A large collection for robust training.

· **Each labeled 0–9:** Every image has a correct numerical classification.

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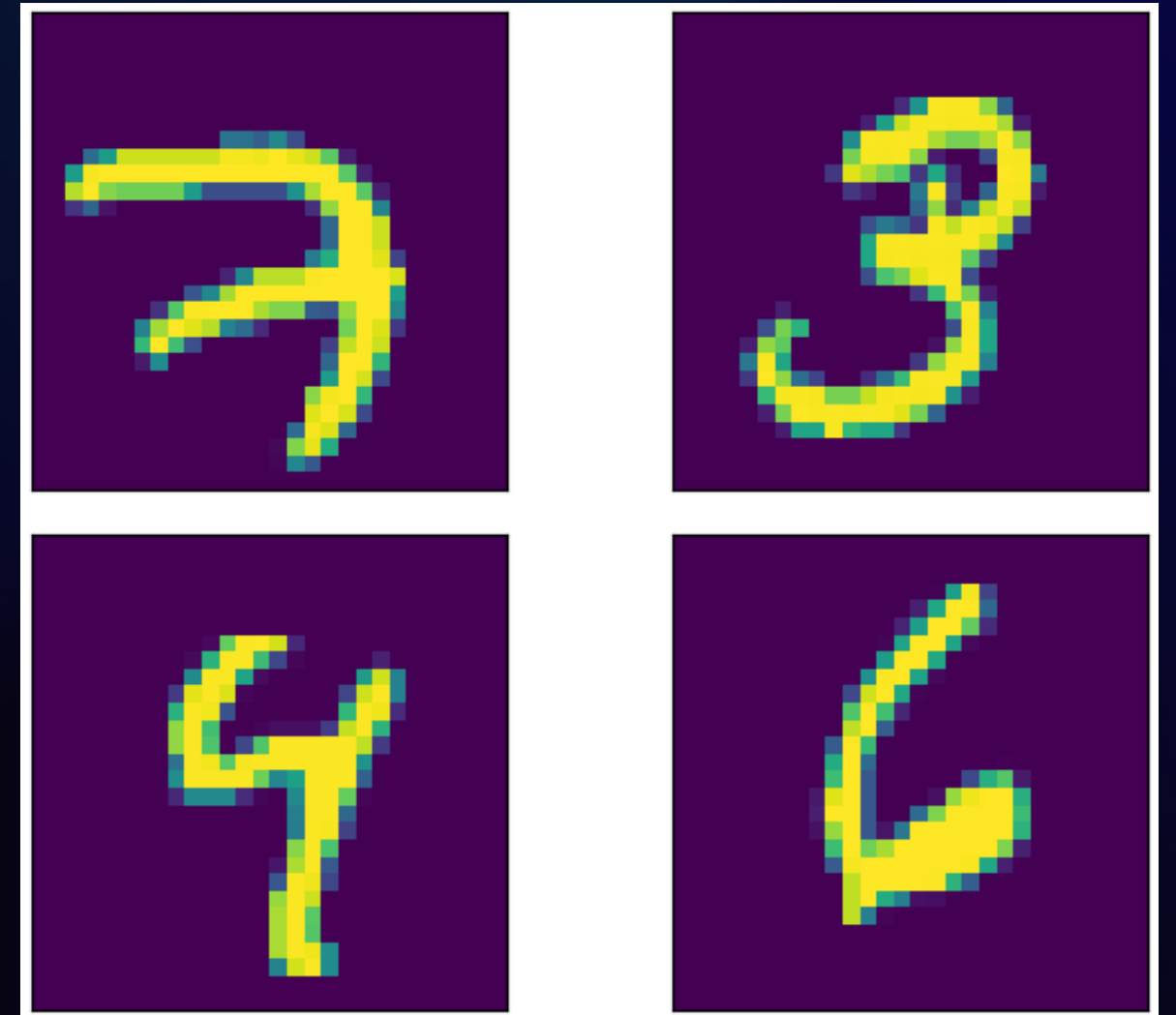
Why MNIST?

- Simple and well-understood dataset.

- Great for beginners to test image classification models.

- Small size = fast training.

- Benchmark for comparing models.

28

28

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How Does It Learn?

1

2

3
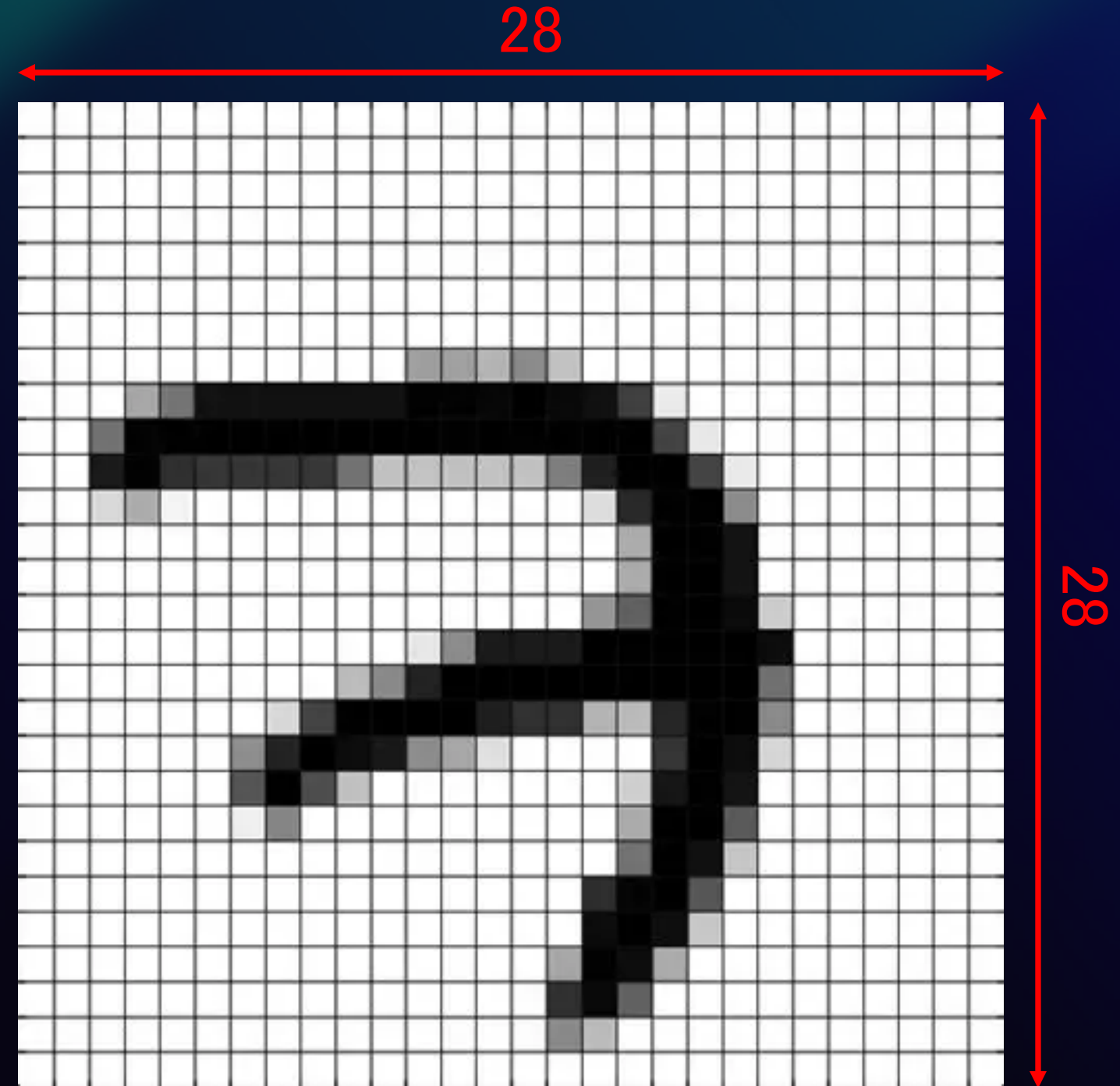
Training: Learns from Examples

The network processes thousands of digit images alongside their correct labels, adjusting its internal parameters.

Identifying Patterns

It identifies common features, like loops in an '8' or straight lines in a '1', distinguishing digits.

Predicting: Applies Patterns

When shown a new, unseen digit, it applies the learned patterns to make an accurate classification.

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Quick Recap – Key Takeaways

Machines can 'see' images

Computer vision empowers machines to interpret visual data.

Handwriting is tough (even for humans)

Variability makes digit recognition a complex challenge.

MNIST teaches pattern recognition

The dataset is ideal for training and testing digit classifiers.

You'll build your own handwritten classifier today!

Experience hands-on how neural networks learn to identify numbers.

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Questions & Answers

What surprised you most about how computers learn to see?

Are there any concepts you'd like to dive deeper into before we move into the hands-on part?

Code Walkthrough – What Are We Building?

Todays Project:

- Build a neural network to recognize handwritten digits

- Walk through each part step by step: from layers to evaluation

- Use the MNIST dataset for hands-on learning

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Walkthrough Plan

1. Import Libraries

2. Load and Preprocess Data

3. Build & Train the Model

4. Evaluate Model Performance

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Your Turn: Build a Digit Classifier

Load a Dataset

Prepare the handwritten digit images for processing.

Train a Simple Neural Network

Teach the network to recognise patterns in the digits.

Test on New Digits

Evaluate your model's accuracy with unseen data.

See Your Computer Guess!

Witness your machine learning model in action.

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Pizzaaaaa!

"Form your squad (max 3) & mingle like a pro!"

15:00

Developing time! 🛠️

1. Dataset selection

2. Model development

3. Github repo

4. Presentation preparation (3 mins)
   - Introduce the idea
   - What your model/app does
   - How it does it?
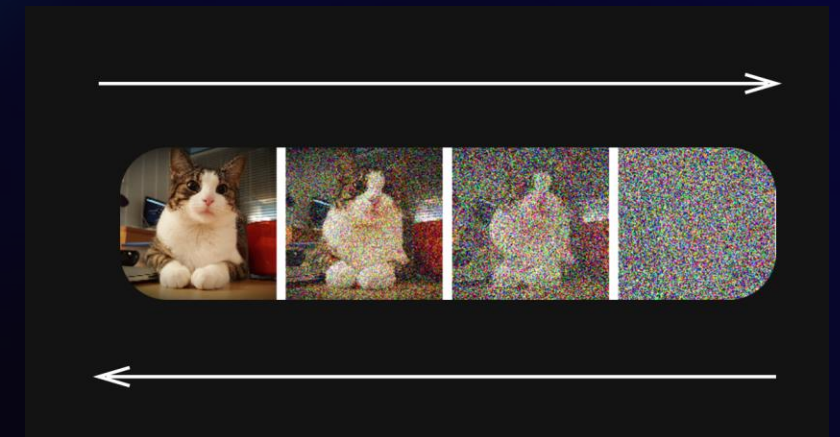   - Development decisions
   - Sell it!

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What's on the Next Workshop ?

Option 1: Language Models 101

Option 2: Diffusion Models – The AI That Paints from Noise

Option 3: The Eyes of AI – Exploring Object Detection

Before you go 🚶‍♂️ ♂️

1. Upload your code to GitHub

2. Share your LinkedIn profile to be mentioned in post

3. Give us feedback!

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Thank you

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