



ASSET 2026 Pharmacy Workshop Series

Understanding AI: Foundations in Pharmacy

*People. Knowledge. Better
healthcare.*

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Learning objectives

By the end of this session, you should feel comfortable enough to:

- 1 Explain what AI means in a pharmacy context.
- 2 Tell the difference between AI, machine learning, deep learning, NLP, computer vision and generative AI.
- 3 Describe, in simple terms, how a machine-learning model learns from examples.
- 4 Recognize the kinds of data used in pharmaceutical AI.
- 5 Spot where AI can support work across the pharmaceutical lifecycle.
- 6 Discuss benefits, limitations and responsible use — without treating AI as magic.

A question to begin with...

Can a computer help discover a new drug?

Can AI detect adverse drug reactions?

Can AI identify a defective tablet?

Can ChatGPT give reliable drug information?

Will AI replace pharmacists?

What do you think?

Why are we talking about AI in pharmacy?

Healthcare and pharmaceutical research generate huge amounts of data.

Drug development is lengthy, expensive and full of decisions about what to test next.

Patients are increasingly described by complex clinical, genomic and real-world data.

Manufacturing produces continuous process and quality data.

AI can help us find patterns, prioritize work and handle information at a scale humans cannot manage alone.

*AI is a tool.
Its value depends on the
data, the question and
the people using it.*

So, what is Artificial Intelligence?

A useful classroom definition

Artificial intelligence is the broad field of creating computer systems that can perform tasks such as recognising patterns, understanding language, making predictions or generating new content.

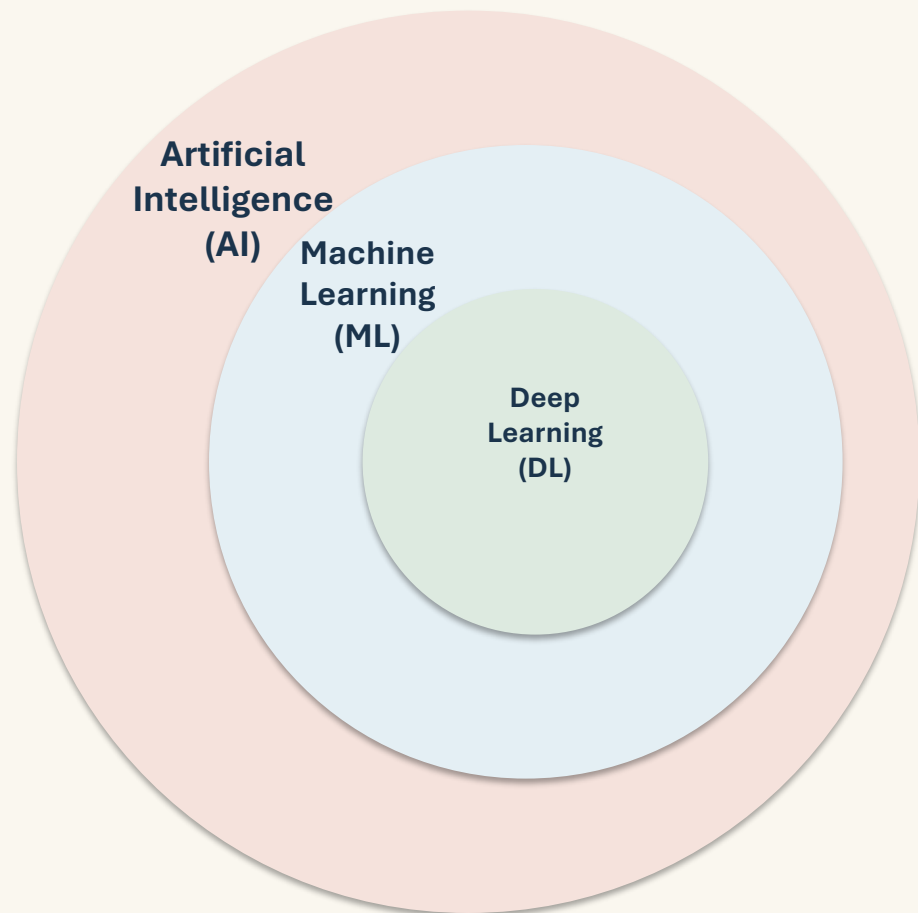
*In simple words:
AI helps computers learn,
reason or solve problems.*

AI is not one program.

AI does not automatically mean a robot.

Not every piece of software is AI.

AI, Machine Learning and Deep Learning



AI

The big umbrella: systems designed to perform intelligent tasks.

Machine learning

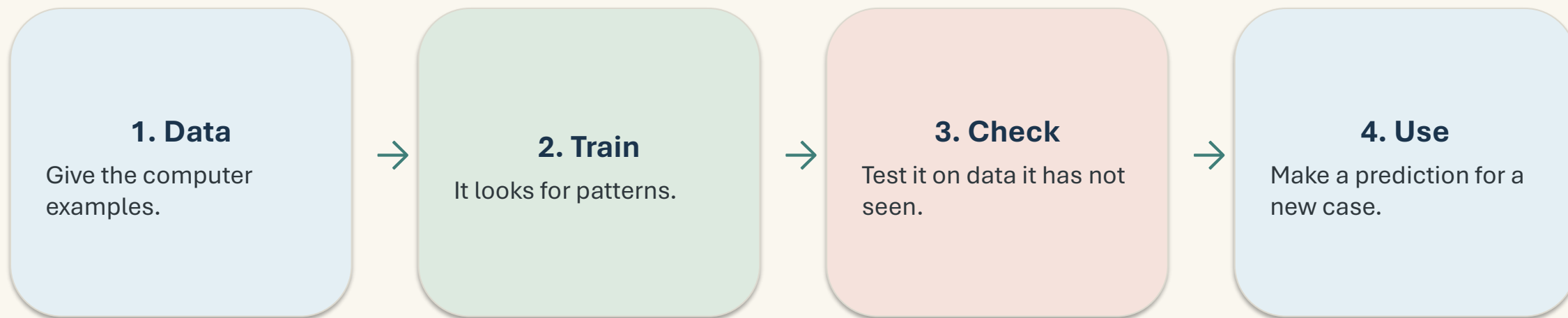
A way for computers to learn patterns from data rather than being given every rule.

Deep learning

A type of machine learning that uses multi-layer neural networks for complex patterns.

All deep learning is ML — but not all ML is deep learning.

How does Machine Learning learn?



It is not magic — it is learning from examples.

A simple example: predicting toxicity

What we already know

Compound A → Toxic

Compound B → Non-toxic

Compound C → Toxic

Compound D → Non-toxic

...plus molecular
properties

The model learns

It looks for relationships
between molecular
information and the known
toxicity outcomes.

A new compound

The trained model
receives a new
compound and
estimates its toxicity
risk.

Prediction: Non-toxic
Probability: 0.82

Prediction ≠ proof

The AI tools you will keep meeting

Machine Learning

Learns patterns from data.

Deep Learning

Uses neural networks for complex data.

NLP

Works with language and text.

Computer Vision

Works with images and video.

Generative AI

Creates new content.

Different pharmacy problems call for different tools.

Natural Language Processing (NLP)

Where the text comes from

Clinical notes
ADR reports
Prescriptions
Research papers
Patient questions

NLP

What NLP can help with

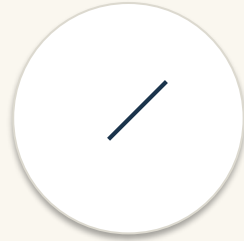
- Extract key information
- Identify drugs and adverse events
- Organise or classify reports
- Search and summarise literature
- Power chatbots and search tools

Example: "The patient developed severe nausea after starting Drug X." → Drug X | Adverse event: nausea

Computer Vision



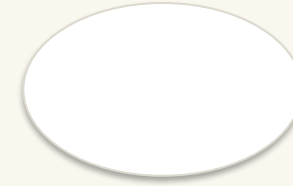
Normal



Cracked



Discoloured



Wrong shape

Checks images or video for visual patterns.

Useful for tablet/capsule inspection, packaging checks, microscopy and medical imaging.

Can flag unusual items automatically — but quality teams still define acceptance criteria and review exceptions.

Generative AI

What it can generate

Text
Images
Ideas
Code
Summaries
Candidate molecular
representations in
research

How a pharmacist might use it

Explain a concept
Draft educational material
Summarise a paper
Brainstorm research
questions
Rephrase technical
information

What to remember

A confident answer can
still be wrong.

References may be
inaccurate.

Clinical or scientific claims
must be checked.

*Helpful assistant — not an unquestionable
authority.*

What kind of data does pharmaceutical AI use?

Chemical

Molecular structures,
properties, descriptors

Biological

Genes, proteins,
pathways, bioactivity

Clinical

Patient records,
lab results, outcomes

Text

Literature,
clinical notes, ADRs

Images

Medical images,
product images

Manufacturing

Process parameters,
quality measurements

Good data matters more than people think

*Good data
→ better predictions*

*Poor or biased data
→ misleading results*

Accurate enough for the task

Representative of the population or problem

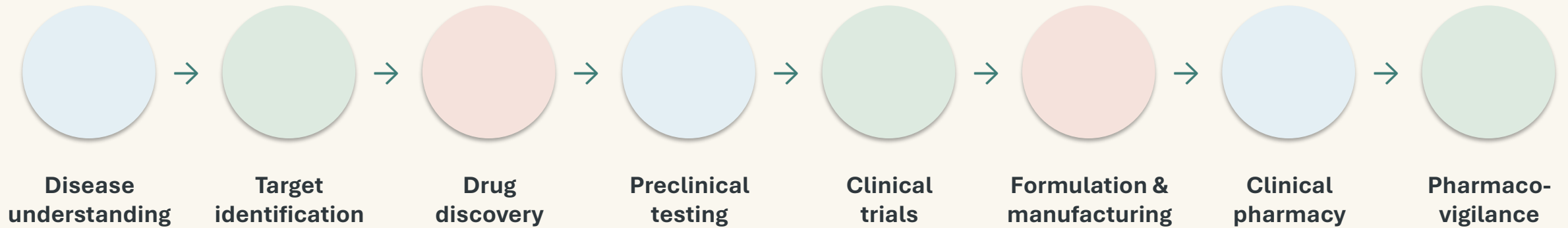
Large enough to learn useful patterns

Collected and labelled consistently

Handled ethically and securely

Garbage in, garbage out.

AI across the pharmaceutical lifecycle



AI can support every stage — from molecules to patients.

A few examples across the lifecycle

Drug discovery → Virtual screening, property prediction, lead prioritisation

Preclinical → Predicting efficacy or toxicity

Clinical trials → Patient selection, data analysis, trial design

Manufacturing → Process monitoring, defect detection

Clinical pharmacy → Prescription screening, decision support

Pharmacovigilance → Processing ADR reports and supporting signal detection

AI vs traditional software

Traditional / rule-based

Humans define the rules.

Example:

IF storage temperature > specified limit → send an alert.

Useful when rules are clear and fixed.

AI / machine learning

The model learns patterns from examples.

Example:

Use several process variables and historical batches to estimate the risk of batch failure.

Useful when relationships are complex.

What AI cannot do — at least not reliably

Guarantee that a prediction is correct.

Make poor-quality data trustworthy.

Prove that a statistical association causes a biological effect.

Replace appropriate laboratory, preclinical or clinical validation.

Guarantee that generated references or explanations are accurate.

Take responsibility for high-stakes clinical decisions.

AI supports pharmacists — it does not replace judgement.

Responsible use: questions we should always ask

Bias & representation

Is the data fair?

Privacy & security

Is patient information protected?

Transparency

Can we explain what the system is doing?

Validation

Has it been tested for this use?

Human oversight

Who is responsible for the final decision?

Responsible AI is part of good pharmacy practice.

Where might you actually meet AI as a pharmacist?

- ✓ AI-assisted prescription or medication review
- ✓ Drug–drug interaction and medication-safety tools
- ✓ Automated processing of adverse-event reports
- ✓ Formulation or process optimization in industry
- ✓ Visual inspection in pharmaceutical manufacturing
- ✓ Literature searching, summarization and evidence synthesis
- ✓ Patient education and communication tools
- ✓ Research workflows involving molecular or clinical data

You may already be using AI without calling it AI.

Class activity

- 1 Predict toxicity of 20,000 molecules.
- 2 Identify cracked tablets on a production line.
- 3 Analyse 100,000 ADR reports.
- 4 Predict treatment response in cancer patients.
- 5 Summarise a newly published research paper.

*For each scenario,
think about:*

- Which AI approach?
- What data?
- What could go wrong?

Looking ahead...

*“AI will not replace pharmacists.
But pharmacists who understand AI will be
better prepared to use it, question it and
guide its use.”*

Next class

AI in Drug Discovery and
Development

- Target identification
- Virtual screening
- QSAR
- Molecular docking
- ADMET prediction
- Generative molecular design

*The goal is not to become a computer
scientist — it is to become an AI-literate
pharmacist.*

Key takeaways

- 1 AI is the broad field; ML, deep learning, NLP, computer vision and generative AI are related tools and approaches.
- 2 AI learns or works from data, so the quality of the data matters enormously.
- 3 Different pharmacy problems require different AI methods.
- 4 AI can support work across the pharmaceutical lifecycle.
- 5 AI has limitations: outputs must be checked, interpreted and validated responsibly.

Same goal. New tools. Better-informed practice.