

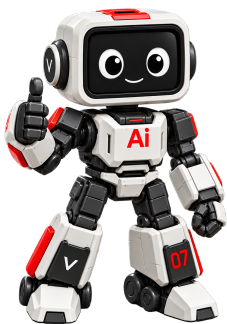


AI IN 7 DAYS

DAY 5 HANDBOOK - SELF-STUDY GUIDE

Deep Learning, Foundation Models and Generative AI

6 VIDEOS	60 MINUTES	3 PRACTICAL OUTPUTS	1 GENAI WORKFLOW
-------------	---------------	------------------------	---------------------



© 2026 AI PANTHIYA

අද ඔබ ඉගෙනගන්නේ

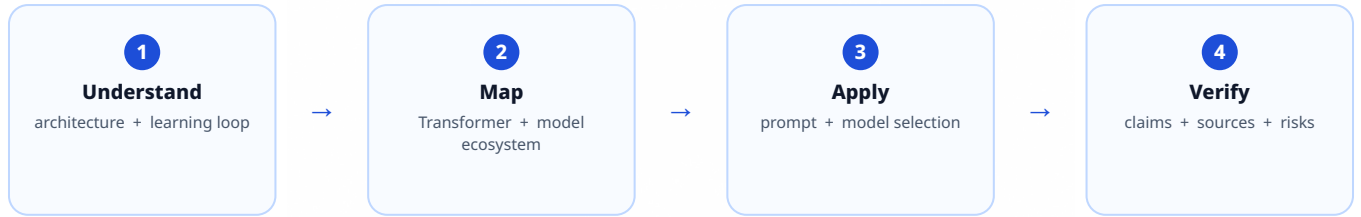
- Deep Learning සහ Generative AI අතර සම්බන්ධතාව
- Neural Network එකක් ඇතුළේ වැඩ කරන මූලික කොටස්
- Forward Pass, Loss, Backpropagation සහ Optimizer
- Tokens, Embeddings, Attention සහ Transformers
- Foundation Models, Hugging Face සහ model adaptation routes
- Professional Prompting, failure modes සහ verification



Day 5 Main Task: ඔබේ study, work හෝ business task එකකට **Professional Prompt Package + Model Selection Card + Five-Step Verification Checklist** එකක් සකස් කිරීම.

HOW TO USE THIS HANDBOOK

Day 5 එකේ goal එක model names කටහඩම් කරන එක නෙවෙයි. Neural Network එකක් කොහොමද prediction කරනේ, කොහොමද learn කරනේ, Transformer එක text process කරනේ, Foundation Model එකක් select/adapt කරනේ, සහ Generative AI output එක responsibly verify කරනේ කියන complete map එක තේරුම්ගැනීමයි.



Day 5 Learning Outcomes

- Feedforward, CNN, RNN/LSTM, Transformer සහ Autoencoder basic differences
- Input, Weight, Bias, Activation, Layer, Output, Parameter සහ Tensor තේරුම්ගැනීම
- Forward Pass, Loss, Backpropagation, Optimizer, Learning Rate, Batch, Epoch සහ Regularization map කිරීම
- Token, Embedding, Positional Information, Self-Attention, Encoder/Decoder සහ Context Window තේරුම්ගැනීම
- Proprietary, Open-weight, Hosted, Local deployment options compare කිරීම
- Prompting, RAG, Fine-tuning, LoRA, Distillation සහ Quantisation අතර decision map එක දැනගැනීම
- Hallucination, omission, fabricated citation, privacy සහ prompt injection risks හඳුනාගැනීම

Today's 6 Video Map

1. The Deep Learning and Generative AI Landscape
2. What Is a Neural Network?
3. How Neural Networks Learn
4. Transformers, Language Models and Decoding
5. Foundation Models, Generative Families and Hugging Face
6. Prompt Engineering, Failure Modes and Verification

Core rule: Better model ≠ bigger model. Better prompt ≠ guaranteed truth. Useful AI = right task fit + right model + right instructions + verification + responsible use.

The Deep Learning and Generative AI Landscape

Deep Learning, Foundation Models සහ Generative AI එකම map එකක තේරුම්ගන්න.

Big Picture

Artificial Intelligence - smart tasks solve කරන broad field එක

Machine Learning - data වලින් patterns learn කරන AI approach එක

Deep Learning - multi-layer Neural Networks භාවිත කරන ML family එක

Foundation Models - large, broadly pretrained models; many tasks සඳහා adapt කළ හැක

Generative AI - learned patterns මත new text, image, audio, code හෝ video generate කරන systems

Feedforward

Input → Hidden Layers → Output. Structured/tabular tasks සඳහා basic architecture.

CNN

Images වල spatial patterns හඳුනාගැනීමට useful. Classification, Detection, Segmentation.

RNN / LSTM

Sequence data සඳහා. LSTM longer-term information retain කරන්න design කරලා තියෙන RNN variant එකක්.

Transformer

Attention භාවිත කර sequence elements අතර relationships process කරන architecture.

Autoencoder

Encode → Latent Representation → Decode/Reconstruct. Compression, representation learning, anomaly detection.

Generative Families

Autoregressive, Diffusion, GAN සහ VAE - different generation mechanisms.

Important: හැම Deep Learning system එකක්ම Generative AI නෙවෙයි. Cat/Dog classifier එක Deep Learning විය හැක, නමුත් new image එකක් generate නොකරන නිසා Generative AI නෙවේ.

What Is a Neural Network?

Artificial Neuron එක biological neuron එකක digital copy එකක් නෙවේ. එක mathematical calculation unit එකක්.

One Neuron - Simple Flow

Inputs
 x_1, x_2, x_3



Weights
 w_1, w_2, w_3



Weighted Sum + Bias
 $z = \sum xw + b$



Activation



Output

Key Terms

- **Input:** model එකට දෙන features
- **Weight:** input influence control කරන learned value
- **Bias:** calculation adjust කරන learned value
- **Activation:** raw score transform කර nonlinear patterns learn කරන්න උදව් කරන function
- **Hidden Layer:** intermediate representations ඉගෙනගන්න layer
- **Output Layer:** final task result

Parameters vs Hyperparameters

Parameters - training එකෙන් model එක learn කරන values: weights, biases.

Hyperparameters - training කලින් developer/researcher set කරන settings: learning rate, batch size, number of layers, dropout rate.

Tensor - one or more dimensions තියෙන numerical structure. Neural networks data සහ calculations tensors ලෙස process කරනවා.

Tiny Example: $x_1=2, x_2=3, w_1=0.5, w_2=1.0, b=-1 \rightarrow z=(2 \times 0.5) + (3 \times 1) - 1 = 3 \rightarrow \text{ReLU}(3)=3$.

Two common mistakes: Weight එක ලොකුයි කියලා ඒ feature එක automatically “most important” නෙවෙයි. Layers වැඩි කළා කියලා model එක automatically better වෙන්නෙත් නැහැ.

How Neural Networks Learn

Neural Network learning loop එක: Forward Pass → Loss → Backpropagation → Optimizer Update.

1. Forward Pass

Input layers හරහා ගොස් prediction එක හදනවා.



2. Loss

Prediction සහ target compare කර error measure කරනවා.



3. Backpropagation

Loss එකට parameters කොට්ටර බලපානවද කියන gradients ගණනය කරනවා.



4. Optimizer

Gradients භාවිත කර weights සහ biases update කරනවා.

Learning Rate, Batch, Iteration, Epoch

- **Learning Rate:** parameter update step size
- **Mini-Batch:** එකවර process කරන training examples group එක
- **Iteration:** one batch process + one update step
- **Epoch:** full training dataset එක එක වතාවක් process කිරීම

Overfitting & Regularization

Training Loss ↓ නමුත් Validation Loss ↑ නම් overfitting වෙන්න පුළුවන්.

Dropout: training අතර random neurons temporarily deactivate කිරීම.

Early Stopping: validation performance improve නොවන විට training stop කිරීම.

Transfer Learning

Pretrained model එකේ learned knowledge ඇලුත් task එකකට reuse කිරීම.

Fine-Tuning

Pretrained model parameters කොටසක් හෝ සියල්ල task-specific data මත තවත් update කිරීම.

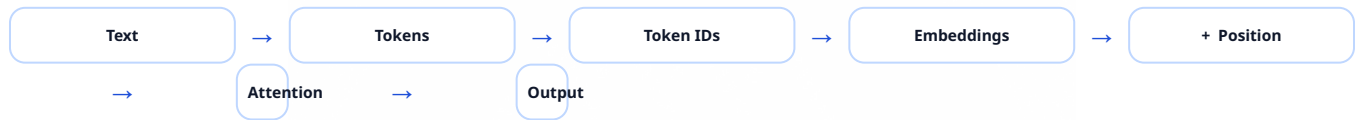
Self-Supervised Pretraining

Human labels වෙනුවට data එකෙන්ම learning signal හදාගෙන general patterns learn කිරීම.

Scientific distinction: Backpropagation gradients calculate කරනවා. Optimizer ඒ gradients භාවිත කර parameters update කරනවා.

Transformers, Language Models and Decoding

Text එක model එකට යන්නේ Text → Tokens → Token IDs → Embeddings → Transformer → Output ලෙස.



Transformer Concepts

- **Token:** text process කරන small unit
- **Token ID:** vocabulary එකේ numeric identifier
- **Embedding:** learned numerical vector representation
- **Positional Information:** sequence order information
- **Self-Attention:** current token එකට වෙනත් tokens කෙවිවර relevant ද කියලා calculate කරන mechanism
- **Context Window:** model එක එකවර consider කරන්න පුළුවන් token capacity - permanent memory නෙවෙයි

Encoder, Decoder & Model Types

Encoder: input එක contextual representation එකකට හරවනවා.

Decoder: context භාවිත කර output sequence generate කරනවා.

Encoder-Decoder: translation වගේ input → output sequence tasks.

Decoder-Only: previous tokens බලලා next tokens generate කරන autoregressive LLMs.

SLM vs LLM: smaller/faster/cost-efficient vs larger/broader capability. Biggest model always best නෙවෙයි.

Temperature

Lower = more predictable. Higher = more varied. **Accuracy guarantee නෙවේ.**

Top-k

Highest-probability candidates k ගණනක් පමණක් consider කරනවා.

Top-p

Cumulative probability threshold එක cover කරන top token set එක select කරනවා.

Foundation Models, Generative Families and Hugging Face

Model එකක් zero සිට train කරන්නම ඕන නැහැ. Existing model එක select, access, adapt සහ deploy කරන්න පුළුවන්.

Proprietary Model Service

Providerගේ servers වල model run වෙනවා; app/API හරහා access කරනවා. Setup easy, but cost, privacy, data handling සහ provider dependency බලන්න.

Hosted Open-Weight

Weights available, නමුත් cloud/server එකක run වෙනවා. Licence terms check කරන්න.

Local Deployment

PC/private server එකේ model run කරනවා. Privacy/control වැඩි, නමුත් RAM/GPU/storage/setup/maintenance manage කරන්න ඕන.

Hugging Face Ecosystem

Model Hub
pretrained models

Dataset Hub
training/evaluation data

Spaces
interactive demos

Transformers
Transformer model library

Diffusers
diffusion models

Pipelines
easy task interface

Model Card: purpose, intended use, evaluation, limitations, licence, risks. **Dataset Card:** source, collection, labels, languages, limitations, privacy/bias, licence.

Need better instructions?
Prompting / Few-shot



Need external or updated knowledge?
RAG



Need behaviour adaptation?
Fine-Tuning / LoRA

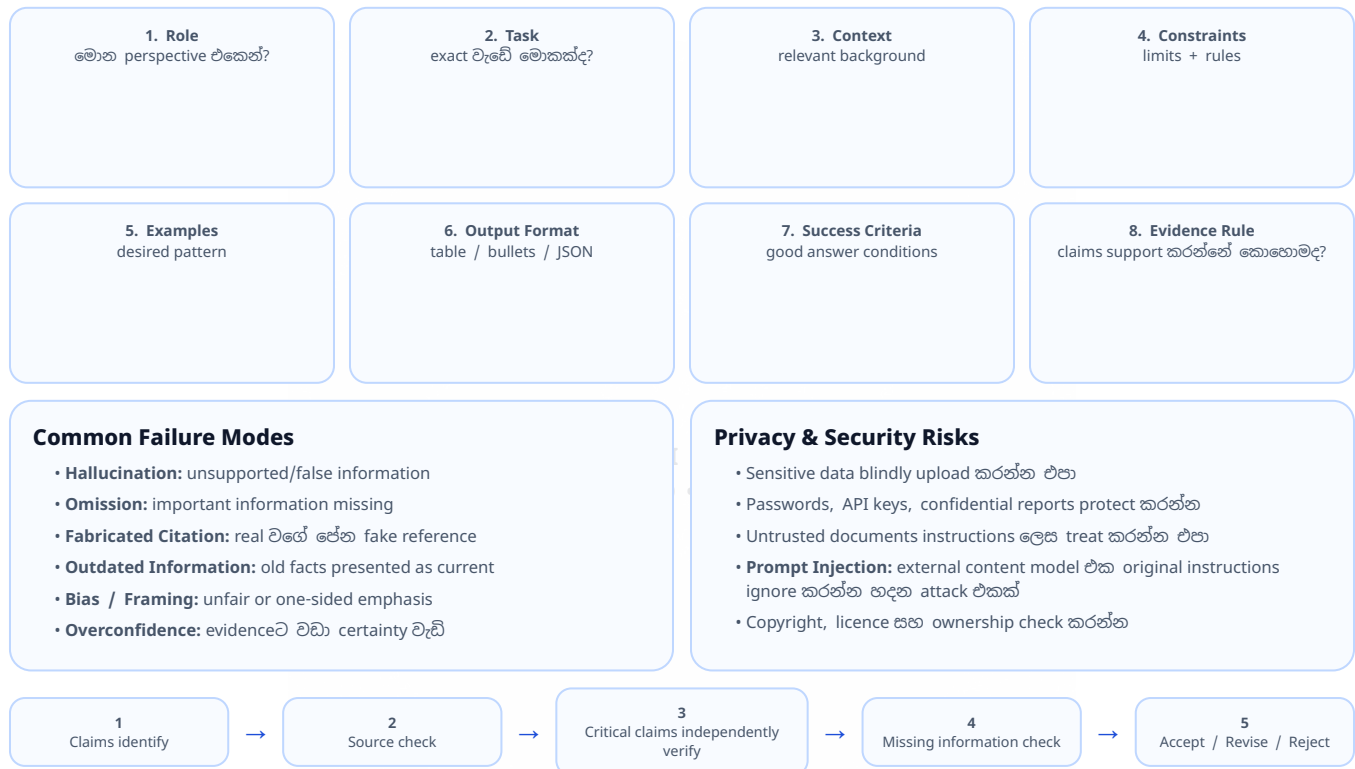


Need smaller/lighter deployment?
Distillation / Quantisation

RAG vs Fine-Tuning: RAG = model එකට current/relevant information ලබාදෙනවා. Fine-Tuning = model එක answer කරන behaviour/style/task pattern adapt කරනවා. Frequently changing facts “store” කරන්න Fine-Tuning alone හොඳම choice නෙවෙයි.

Prompt Engineering, Failure Modes and Verification

Good Prompt ≠ Guaranteed Truth. Prompt design සහ verification දෙකම අවශ්‍යයි.



High-impact use: medical, legal, financial, employment හෝ safety-critical decisions වල AI output alone final decision ලෙස භාවිත නොකරන්න. Risk වැඩි නම් verification සහ qualified human oversight වැඩි කරන්න.

DAY 5 PRACTICAL WORKSHEET

Source script එකේ practical package එකේ ප්‍රධාන outputs තුන මේ page එකෙන් complete කරන්න.

A. Model Selection Card

Task / Modality:
Model Family:
Access Route - API / Hosted Open-Weight /
Local:
Adaptation Route - Prompt / RAG / Fine-Tuning /
LoRA:
Quality / Latency / Context / Language
Needs:
Cost / Privacy / Deployment
Needs:
Licence / Model Card
Check:
Evaluation Plan:
Main Limitation / Risk:
Final Choice + Reason:

B. Professional Prompt Package

Real Task:
Intended User:
Role:
Task:
Context / Source:
Constraints:
Examples (if useful):
Output Format:
Success Criteria:
Evidence Rule:
Final Structured Prompt:

C. Five-Step Verification Checklist

1. Claim Check

Output එකේ check කළ හැකි
factual claims මොනවාද?

2. Source Check

Important claims supplied
source එකෙන් support
වෙනවාද?

3. Independent Check

Critical claim වෙතත්
trustworthy source, calculation,
code test හෝ expert review
එකකින් verify කළ යුතුද?

4. Completeness Check

Limitation, uncertainty,
exception, opposing evidence
හෝ missing information
ඕනෑමවාද?

5. Decision

Intended use සඳහා output
Accept / Revise / Reject?

Final flow: Task → Select Model → Prompt → Generate → Verify → Accept / Revise / Reject → Improve.

DAY 5 QUICK SELF-CHECK

Quiz Questions

1. Deep Learning සහ Generative AI අතර relationship එක?
2. CNN, RNN/LSTM, Transformer සහ Autoencoder basic use cases?
3. Weight, Bias සහ Activation roles?
4. Forward Pass, Loss, Backpropagation සහ Optimizer අතර flow එක?
5. Batch, Iteration සහ Epoch difference?
6. Transfer Learning vs Fine-Tuning?
7. Token, Token ID, Embedding සහ Position කියන්නේ මොනවාද?
8. Self-Attention කරන්නේ මොකක්ද?
9. Context Window permanent memory එකක්ද?
10. Temperature, Top-k සහ Top-p මොනවා control කරනවාද?
11. RAG vs Fine-Tuning?
12. Open-weight vs Open-source?
13. Hallucination සහ Omission difference?
14. Prompt Injection කියන්නේ මොකක්ද?
15. Five-Step Verification flow එක?

Answer Hints

- DL = neural-network family; GenAI = new content generate කරන category.
- Vision / sequences / attention / encode-reconstruct.
- Learned influence / shift / nonlinearity.
- Predict → error → gradients → update.
- Subset / one update / full pass.
- Reuse pretrained knowledge / update model for task.
- Text unit / ID / learned vector / order signal.
- Tokens අතර relevance calculate කරන mathematical mechanism.
- නැහැ.
- Randomness and candidate filtering.
- External knowledge vs behaviour adaptation.
- Weights availability ≠ fully open licence.
- Unsupported information vs missing important information.
- Untrusted content instructions override කරන්න උත්සාහ කිරීම.
- Claims → Source → Independent Check → Completeness → Decision.



Sampath Bandaranayake
Instructor - AI Panthiya

Need guided learning?

Online Zoom Classes - Contact Us on WhatsApp

WhatsApp: +81 70 2313 1981

MSc - AI and Digital Innovation (Final Year) - Tokyo International University, Japan

MBA - Cardiff Metropolitan University, UK

BSc - Applied Sciences, Sri Lanka

LinkedIn: <https://www.linkedin.com/in/sampathbandara/>

Website: <https://aipanthiya.com/>

Next step: **Day 6 - APIs, Embeddings, Vector Databases, RAG, Tools, Function Calling and AI Agents**