STUDY NOTES · BASIC CONCEPT

What Are AI Foundation Models, and How Can Sovereign AI Strengthen India’s Technological Independence?

Science & Technology

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1. Understanding the News

The reported launch of EKA-1, Dhīr 2B and Dhīr 5B under India's indigenous AI development efforts highlights a growing policy priority: developing artificial intelligence capabilities that reflect India's languages, needs and strategic interests.

The article describes EKA-1 as a model with 26.3 billion parameters and support for 22 Indian languages, while the Dhīr models are described as lightweight systems designed to operate on devices without continuous internet connectivity. It also identifies AIKosh as the platform through which the models are available.

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These product-specific details are claims reported in the supplied article. The broader concepts below explain the technology and its significance for India.

2. What Is Artificial Intelligence?

Artificial intelligence (AI) refers to computer systems designed to perform tasks that typically require human cognitive abilities, such as understanding language, recognising patterns, generating content and solving problems.

Major categories include:

- **Machine learning:** Systems learn patterns from data rather than relying exclusively on explicitly programmed rules.
- **Deep learning:** A branch of machine learning that uses multilayered neural networks.
- **Generative AI:** AI that generates content such as text, images, audio, video or code.
- **Large language models (LLMs):** Models trained to process and generate human language.
- **Multimodal AI:** Models that work with multiple kinds of input or output, such as text, images and audio.

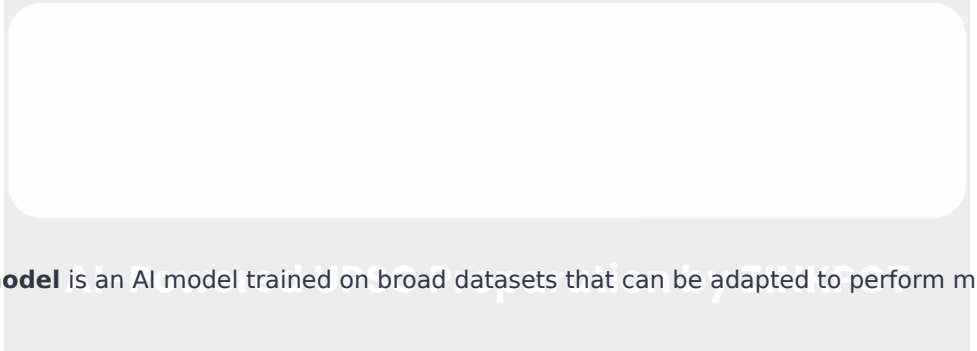
Foundation models form an important part of modern generative AI, although not every AI system is a foundation model.

3. What Is an AI Foundation Model?

Medium

Large Language Models - AI Solutions

Deep Dive into Modern Natural Language Processing | Towards AI



A **foundation model** is an AI model trained on broad datasets that can be adapted to perform many different tasks.

Instead of building a completely separate model for every application, developers can adapt a foundation model for activities such as translation, summarisation, question answering, coding and document analysis.

How does it work?

1. Training data

Text, code, images or other relevant datasets

2. Model training

Neural networks learn patterns and relationships

3. Adaptation and evaluation

Fine-tuning, instruction training and safety testing

4. Applications

Chatbots, translation, coding, public services and specialised tools

Foundation models are not automatically accurate or reliable. Their outputs depend on the training process, the quality of the data, model design and the context in which they are used.

4. What Are Parameters in an AI Model?

Parameters are numerical values learned during model training. They help determine how a neural network processes information and produces outputs.

For example, the article describes EKA-1 as having 26.3 billion parameters. The Dhīr 2B and Dhīr 5B names indicate model sizes of approximately 2 billion and 5 billion parameters, respectively, as suggested by their naming.

Feature	EKA-1	Dhīr 2B	Dhīr 5B
Reported model size	26.3 billion parameters	Approximately 2 billion	Approximately 5 billion
General consideration	Larger models may offer greater capacity but can require more computing resources	Smaller models may be easier to deploy locally	May offer a different balance of capability and resource needs
Potential relevance	Language-intensive and specialised applications	Resource-constrained deployment	On-device or other efficient deployment, depending on hardware and optimisation

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The table distinguishes details reported in the article from general technical implications. Actual performance, language coverage, speed and hardware requirements require independent evaluation.

Important UPSC point: More parameters do not automatically mean better performance. Data quality, architecture, training methods, benchmarks and optimisation also influence results.

5. What Is Sovereign AI?

Sovereign AI refers broadly to a country's capacity to develop, control or govern AI capabilities in accordance with its national priorities, laws and strategic interests.

It can include domestic expertise, computing infrastructure, data governance, model development, deployment capabilities and regulatory institutions.

Sovereign AI does not necessarily mean that every component must be manufactured domestically. It is more accurately understood as reducing critical dependencies and increasing the ability to make independent decisions

about AI.

Why is it important for India?

Strategic autonomy: Domestic capabilities may reduce dependence on a small number of foreign AI providers.

Indian-language inclusion: Models adapted to Indian languages can help address the digital divide and improve access to services.

Economic development: AI can support productivity, research, entrepreneurship and new employment opportunities, while also disrupting some existing occupations.

Data governance: Sensitive information can be processed under appropriate domestic legal and institutional safeguards.

National security: Carefully designed systems may support cybersecurity, logistics, research and other authorised strategic applications.

6. What Is On-Device AI?

The Android Revolution: How Gemini AI Transformed Mobile Development Overnight | Medium

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On-device AI runs some or all of its computation directly on a device, such as a smartphone, laptop or specialised computer, rather than relying entirely on a remote cloud server.

This is often associated with **edge computing**, in which data is processed near the point where it is generated.

On-device AI versus cloud AI

Feature	On-device AI	Cloud-based AI
Processing	Primarily on the local device	Remote servers or data centres
Internet requirement	Some functions may work offline	Usually requires network access
Latency	Can be low because remote communication may not be needed	Depends partly on network and server conditions

Feature	On-device AI	Cloud-based AI
Privacy	Can keep certain data on the device	May involve transmitting data to external infrastructure
Computing capacity	Constrained by device hardware and battery	Can use substantial server-side resources
Updates and maintenance	May require device-specific updates	Centralised updates may be easier

Neither approach is universally superior. Hybrid systems can perform sensitive or routine tasks locally while using cloud resources for more demanding computation.

Privacy qualification: On-device processing can reduce data transmission, but it does not guarantee privacy. Applications still need secure storage, access controls, safe software and appropriate data-handling practices.

7. What Is AIKosh?

AIKosh is associated with India's IndiaAI initiative and serves as a resource platform for datasets and AI-related assets. Such platforms can help researchers, developers and institutions discover resources needed to develop, test and deploy AI systems.

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Access to datasets and models can support innovation by reducing barriers for researchers and smaller organisations.

However, the availability of a model on a platform does not automatically mean that it is open source, free for every commercial use or free of licensing restrictions. Users must check the applicable licence, documentation, usage conditions and data protections.

8. IndiaAI Mission: Policy Significance

India's IndiaAI Mission is a national initiative intended to strengthen the country's AI ecosystem through infrastructure, innovation, skills and responsible development.

Its broad areas of relevance include:

- **Computing infrastructure:** Improving access to computing resources needed for model development.
- **Innovation support:** Encouraging domestic AI startups, researchers and developers.
- **Datasets and platforms:** Facilitating access to useful data resources and development tools.
- **Skills development:** Building AI expertise across research, industry and education.
- **Application development:** Encouraging AI solutions for public services and economic sectors.

- **Responsible AI:** Addressing reliability, privacy, fairness, transparency and security.

Indigenous foundation models can contribute to these goals, but they are only one component of a wider ecosystem.

9. Applications of Indigenous Foundation Models

IPPB App Guide: Rural Banking and Aadhaar Services 2026

Banking and financial services

Language-based customer support, document processing and assistance with routine financial queries. Sensitive financial decisions require strong safeguards and human oversight where appropriate.

Best CSC Center Hinjewadi Pune | Shripada Enterprises

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Governance

Multilingual access to public information, assistance with forms and document summarisation, subject to accuracy, accessibility and data-protection requirements.

Now everyone wants to be a software developer, as interest in coding rockets - TechRepublic

Software development

Code generation, debugging assistance, documentation and software testing support.

ASTM F3502-21: The New Respiratory Standard | AirPop

Research and education

Study assistance, translation, literature exploration and data analysis, with verification of generated outputs.

Defence and government applications require particularly careful evaluation. Local deployment may help with connectivity and data-control requirements, but secure deployment also depends on hardware, software integrity, access controls, testing and operational procedures.

10. Major Challenges Facing India's AI Ecosystem

Computing infrastructure: Training advanced models can require expensive processors, data centres, electricity and cooling.

Data quality and representation: Models need reliable, diverse and legally usable datasets. Under-representation of Indian languages and dialects can reduce performance for some users.

Accuracy and hallucinations: Generative AI can produce plausible but false information, making independent verification essential.

Bias and fairness: Training data can reproduce social inequalities or produce uneven performance across communities and languages.

Cybersecurity: Models and their surrounding applications may be vulnerable to data leakage, malicious inputs and other attacks.

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Hardware dependence: Domestic model development may still rely on imported chips, specialised equipment or foreign cloud services.

Accountability: Clear rules are needed to determine responsibility when AI systems cause harm or make consequential errors.

Energy and environmental costs: Large-scale model training and inference consume electricity and may require substantial cooling resources.

11. Way Forward

India should combine indigenous model development with investment in computing infrastructure, high-quality multilingual datasets and research talent. Independent benchmarking should evaluate accuracy, safety, language performance, energy use and deployment costs.

Public agencies should adopt privacy-by-design, cybersecurity testing and clear accountability mechanisms. Sensitive applications should have appropriate human oversight, while procurement decisions should consider reliability and total lifecycle costs rather than parameter counts alone.

Partnerships among universities, startups, public institutions and industry can expand access to AI resources and encourage innovation. Open research and interoperable tools can also strengthen the ecosystem, subject to legitimate security, privacy and licensing constraints.

12. Conclusion

Indigenous foundation models such as those described in the news represent an important development in India's pursuit of technological capability. Their significance lies not simply in model size or domestic branding, but in their ability to deliver reliable, secure and accessible services suited to India's needs.

For India, sovereign AI should mean technological capability combined with inclusion, accountability, resilience and responsible governance.

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