Science & Technology · GS - III

Examine the role of specialised AI processors, advanced memory technologies and confidential computing in strengthening the artificial intelligence infrastructure. What opportunities and challenges do these developments present for India's digital ecosystem?

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MARKS	WORD LIMIT
10	~150 words

Answer Hint

AI accelerators, Tensor Processing Units, parallel computing, HBM and SRAM, memory bottleneck, confidential computing, data privacy, hardware security, indigenous semiconductor development, digital sovereignty, research and innovation.

Model Answer

Introduction

The expansion of artificial intelligence requires high-performance computing infrastructure capable of processing enormous datasets securely and efficiently. Specialised processors and advanced memory technologies are increasingly central to this infrastructure.

Technological Significance

- **AI accelerators:** TPUs and GPUs perform specialised computations, improving the efficiency of AI training and inference.
- **Advanced memory:** HBM provides high bandwidth, while SRAM enables rapid access to frequently used data, reducing computational bottlenecks.

- **Confidential computing:** Hardware-based security protects sensitive information during processing, strengthening privacy and trust in cloud-based AI services.

Opportunities and Challenges for India

These technologies can support India's AI ecosystem, digital public infrastructure, healthcare research and strategic applications. However, dependence on imported advanced chips, high infrastructure costs, energy consumption and shortages of specialised talent remain major constraints. Data security and concentration of computing resources also require attention.

Way Forward

India should promote semiconductor research, domestic chip design, advanced packaging, secure cloud infrastructure and industry-academia partnerships. Public investment and international technological cooperation can accelerate indigenous capabilities.

Conclusion

Secure and efficient AI infrastructure is essential for digital sovereignty. India must combine technological innovation with affordability, security and responsible deployment.

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