Unit 6 Formative Activity: Deep Learning Application and Societal Impact

Application Overview: AI-Based Medical Imaging Diagnostics

Deep learning has revolutionised medical diagnostics, particularly through convolutional neural networks (CNNs) used in medical imaging. These models can analyse X-rays, CT scans, and MRIs to detect diseases such as pneumonia, brain tumours, and breast cancer with a level of accuracy comparable to or exceeding human radiologists.

How It Works

The deep learning model, typically a CNN, is trained on thousands of annotated medical images. Through backpropagation, the network learns features such as shapes, textures, and anomalies that are correlated with specific medical conditions. Once trained, the model can process new images and predict the likelihood of various diagnoses, highlighting areas of concern for clinicians.

Socio-Technical and Ethical Implications

Positive Impacts:

- Improves diagnostic accuracy and speed, especially in areas with a shortage of medical professionals.
- Reduces the workload on healthcare workers, allowing them to focus on critical decision-making and patient care.
- Enables early disease detection, improving treatment outcomes.

Ethical and Privacy Concerns:

- Risk of bias: If training data lacks diversity, predictions may be less accurate for underrepresented groups.
- Accountability: Determining liability in cases of misdiagnosis remains unclear.
- Data privacy: Training requires large amounts of sensitive medical data, raising concerns around data protection and consent.
- Transparency: Many deep learning models operate as "black boxes," making it difficult to interpret how decisions are made.

To address these challenges, medical AI systems must be developed with transparent methodologies, diverse datasets, and strict data governance policies. Clinicians should use these tools as decision-support systems rather than replacements for professional judgement.

References

References

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