Video: Surgical Analysis

Frame-by-frame analysis of surgical videos for phase recognition, tool tracking, and complication prediction

Surgical Video Characteristics

Unique properties of video data

- High resolution (HD, 4K)
- Long duration (1-6 hours)
- Complex scene changes
- Various surgical tools

Video Processing Techniques

Spatiotemporal information extraction

- Frame sampling (FPS adjustment)
- 2D CNN + RNN/LSTM
- 3D CNN: spatiotemporal convolution
- Optical flow: motion analysis

Surgical Phase Recognition

Surgical workflow analysis

- Phase recognition (7-10 phases)
- Action segmentation
- Temporal CNN (TCN)
- Real-time feedback

Multimodal Integration

Video and other data sources

- Video + kinetic data
- Video + surgical records
- Video + patient information
- Time synchronization critical

Tool tracking and

Surgical skill

Complication risk

usage analysis

objective assessment

early detection