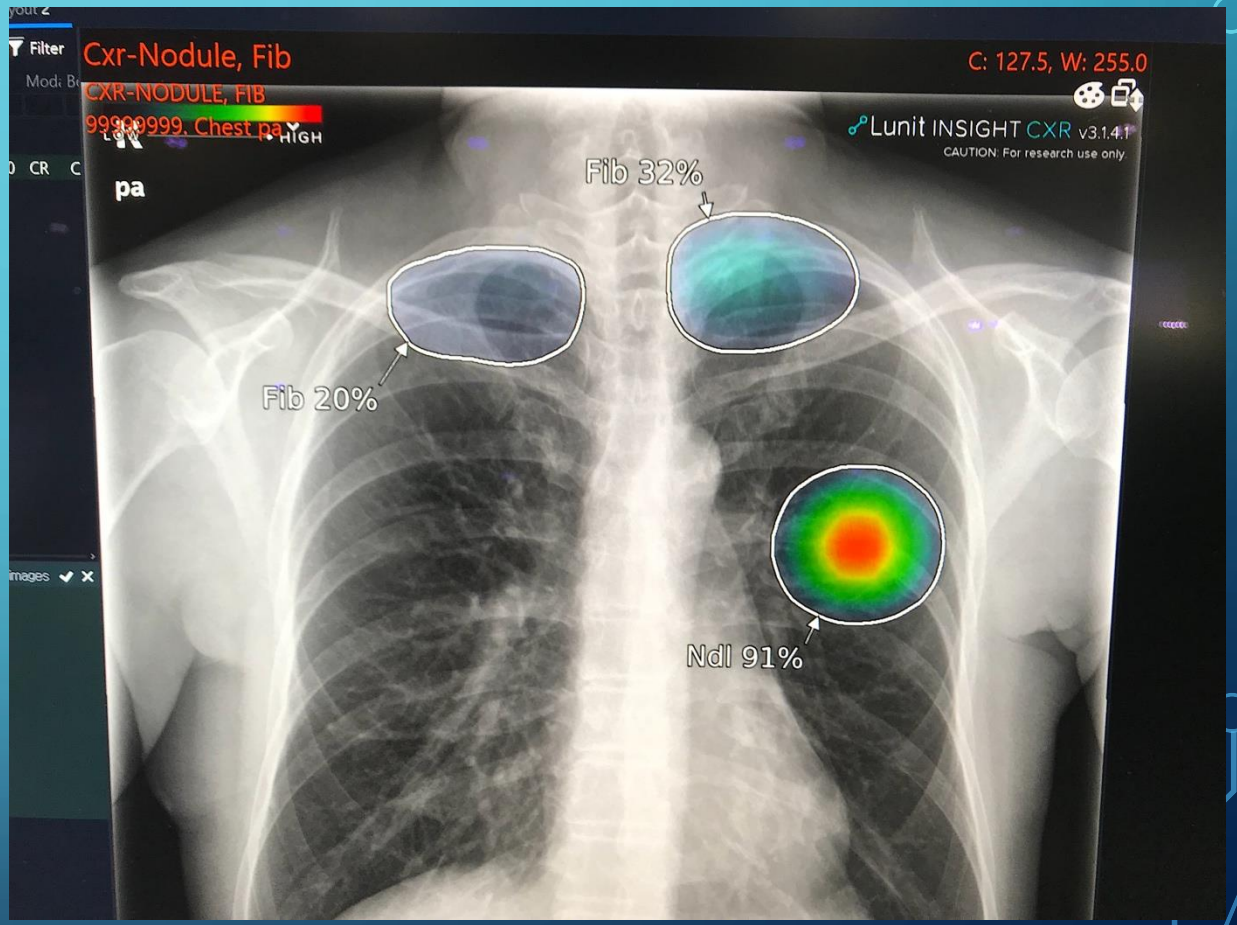
C21 ARTIFICIAL INTELLIGENCE IN RADIOLOGIC TECHNOLOGY AND ITS FUTURE

OBJECTIVES

- Define artificial intelligence and its role in radiologic technology
- Describe the development of AI in medical imaging
- Illustrate how AI improves diagnostic accuracy and workflow efficiency
- Explain the role of AI in early disease detection
- Identify ethical, privacy and professional challenges associated with AI use

INTRODUCTION

- Artificial intelligence (AI) has rapidly expanded in healthcare, particularly in radiology, due to the digital nature of imaging data.
- Radiology departments face increasing imaging volumes and demand for rapid, accurate interpretation.
- AI systems assist healthcare professionals by analyzing images, detecting abnormalities, and improving workflow processes (Strubchevska et al., 2024).



- https://radiologybusiness.com/topics/artificial-intelligence/photo-gallery-examples-fda-cleared-ai-radiology

THESIS STATEMENT

- Artificial intelligence is transforming image analysis in radiologic technology by enhancing diagnostic accuracy, improving workflow efficiency, and assisting with early disease detection, while also introducing new challenges related to ethics, data privacy, and professional roles.

DEVELOPMENT OF AI IN RADIOLOGY

- Early AI systems in radiology included computer-aided detection (CAD) tools developed in the 1990s and early 2000s.
- These systems relied on rule-based algorithms and had limited diagnostic accuracy.
- Modern AI uses machine learning and deep learning, particularly convolutional neural networks, which learn patterns directly from large imaging datasets (Ahmad, 2021).

- https://techvify.com/artificial-intelligence-vs-machine-learning-vs-deep-learning

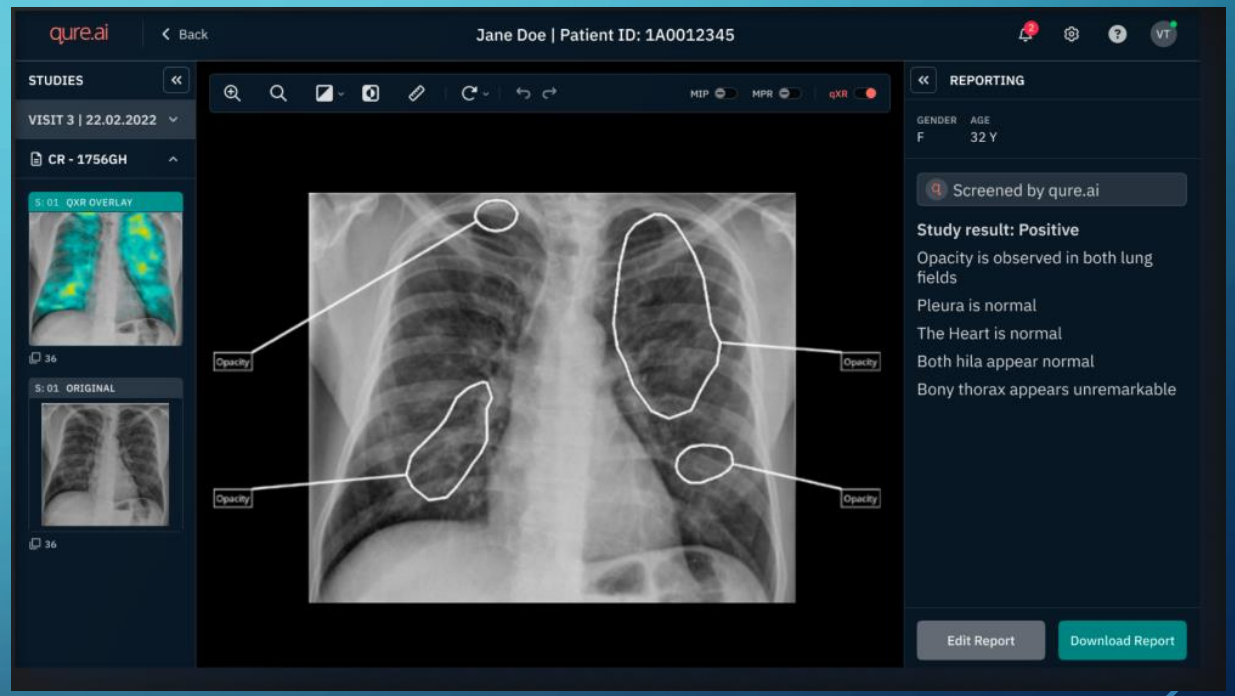
WHERE AI IS USED TODAY

- AI is currently used in multiple imaging modalities, including CT, MRI, mammography, and digital radiography.
- Commercial AI products assist with lung cancer detection, stroke assessment, fracture detection, and image quality evaluation.
- AI tools are integrated into PACS systems and imaging consoles to support clinical workflows (Antonissen et al., 2025).

- https://rayscape.ai/customer-story?id=ZNnaXxAAACkArreu

BENEFITS OF AI IN IMAGE ANALYSIS – DIAGNOSTIC ACCURACY

- AI improves diagnostic accuracy by detecting subtle abnormalities that may be missed by human readers.
- Studies show AI systems perform comparably to radiologists in specific tasks such as breast cancer detection and lung nodule identification.
- AI also reduces inter-reader variability and improves consistency in image interpretation (Pesapane et al., 2018).



- https://hubpublishing.co.uk/ai-software-helps-speed-up-x-ray-reporting/

BENEFITS OF AI IN IMAGE ANALYSIS – WORKFLOW EFFICIENCY

- AI automates repetitive tasks such as lesion measurement, image quality assessment, and structured report generation.
- Triage algorithms prioritize urgent cases such as intracranial hemorrhage, improving turnaround times and patient outcomes.
- These tools help radiology departments manage increasing imaging volumes efficiently (Glielmo et al., 2024).

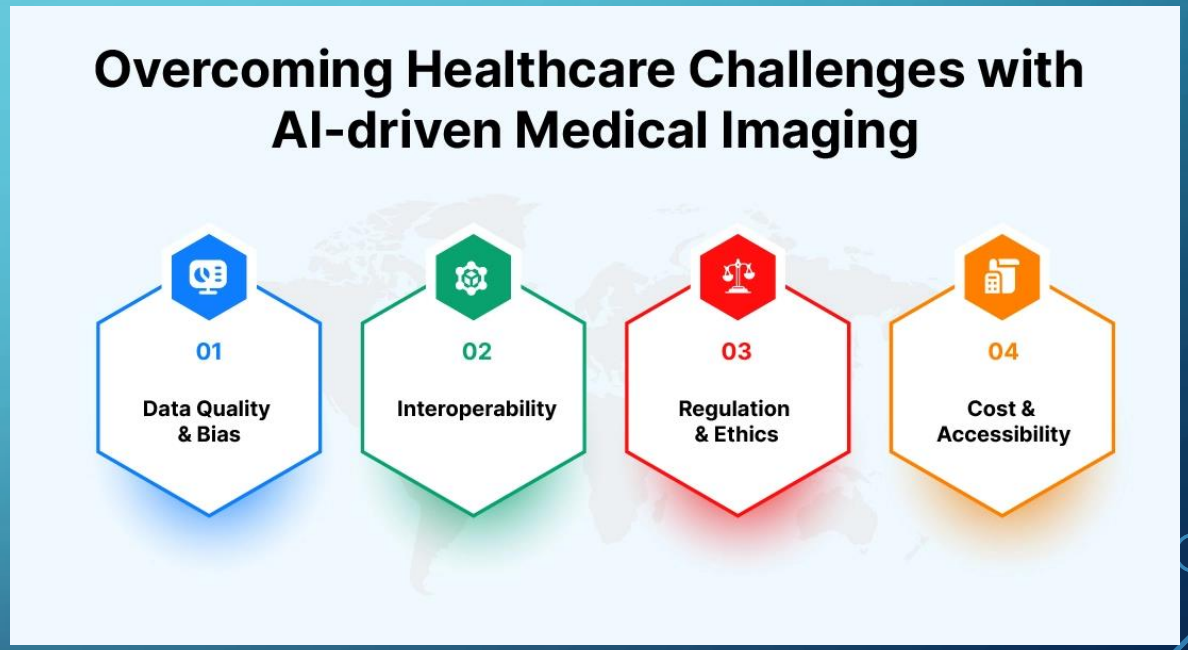
- https://www.bacancytechnology.com/blog/ai-in-radiology

BENEFITS OF AI IN IMAGE ANALYSIS – EARLY DISEASE DETECTION

- AI enhances early disease detection by identifying subtle imaging features associated with early pathology.
- Examples include early lung cancer on CT, microcalcifications in mammography, and early ischemic stroke on MRI.
- Early detection improves prognosis and reduces healthcare costs through timely intervention (Ahmad, 2021).

CHALLENGES – ALGORITHMIC BIAS AND RELIABILITY

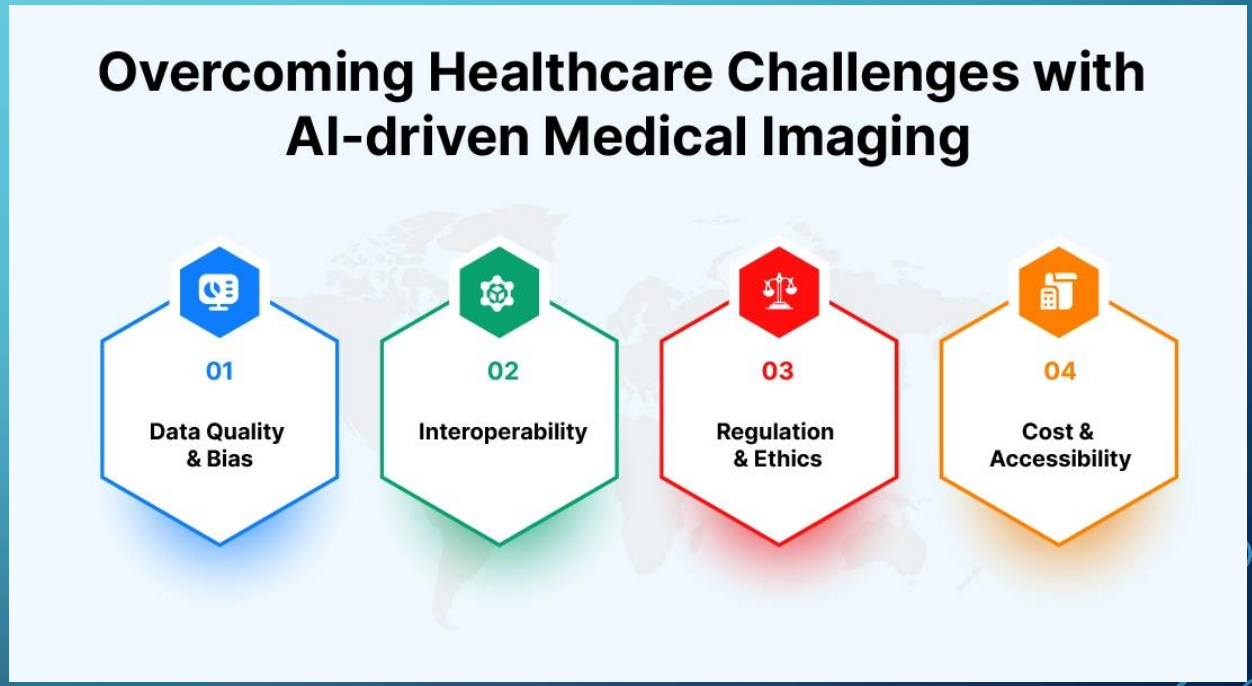
- AI systems learn from training datasets, and limited or unrepresentative data can lead to biased performance across populations.
- Algorithmic bias may contribute to health disparities if certain demographic groups are underrepresented.
- Ensuring diverse datasets is essential for safe AI deployment (Antonissen et al., 2025).



- https://www.bacancytechnology.com/blog/ai-in-medical-imaging

CHALLENGES – OVER-RELIANCE AND TRANSPARENCY ISSUES

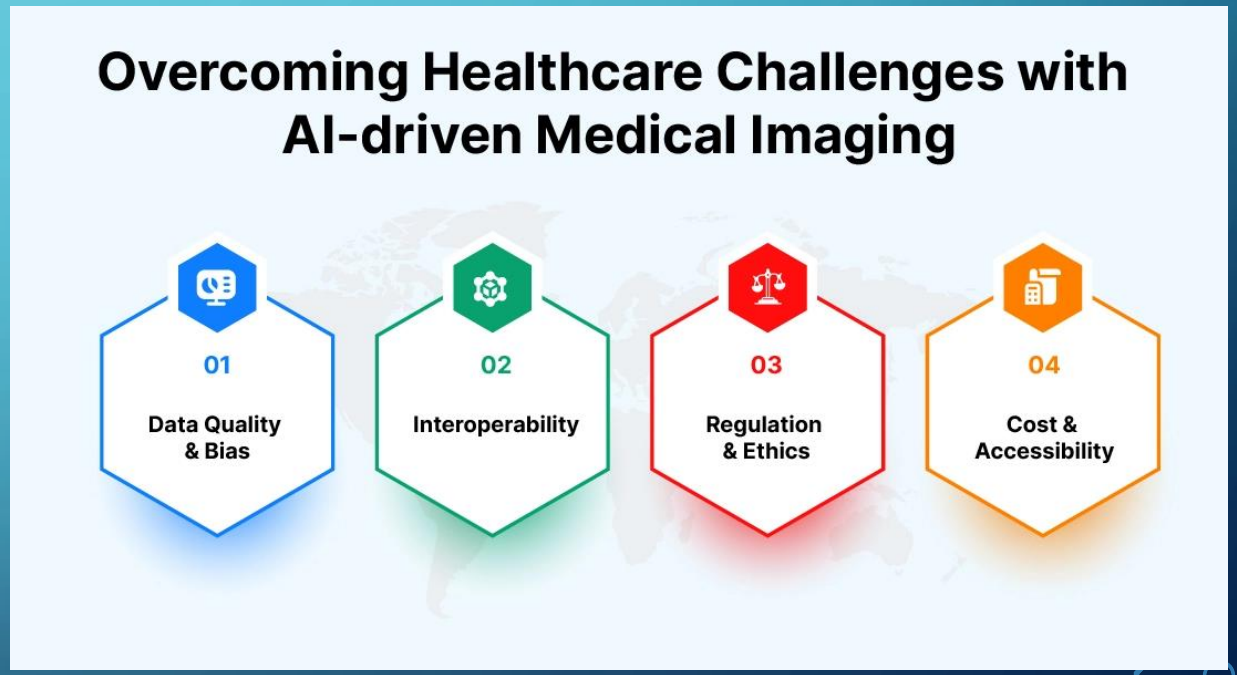
- Over-reliance on AI may reduce human vigilance in image interpretation.
- Many AI systems function as “black boxes,” meaning their decision-making processes are not easily understood.
- Human oversight remains essential to ensure patient safety and diagnostic accuracy (Pesapane et al., 2018).



- https://www.bacancytechnology.com/blog/ai-in-medical-imaging

CHALLENGES – DATA PRIVACY AND CYBERSECURITY

- AI development requires large volumes of patient imaging data, raising concerns about privacy and security.
- Imaging data must comply with HIPAA regulations, and cloud-based AI platforms increase cybersecurity risks.
- Strong data governance and security protocols are required (ASRT, 2024).



- https://www.bacancytechnology.com/blog/ai-in-medical-imaging

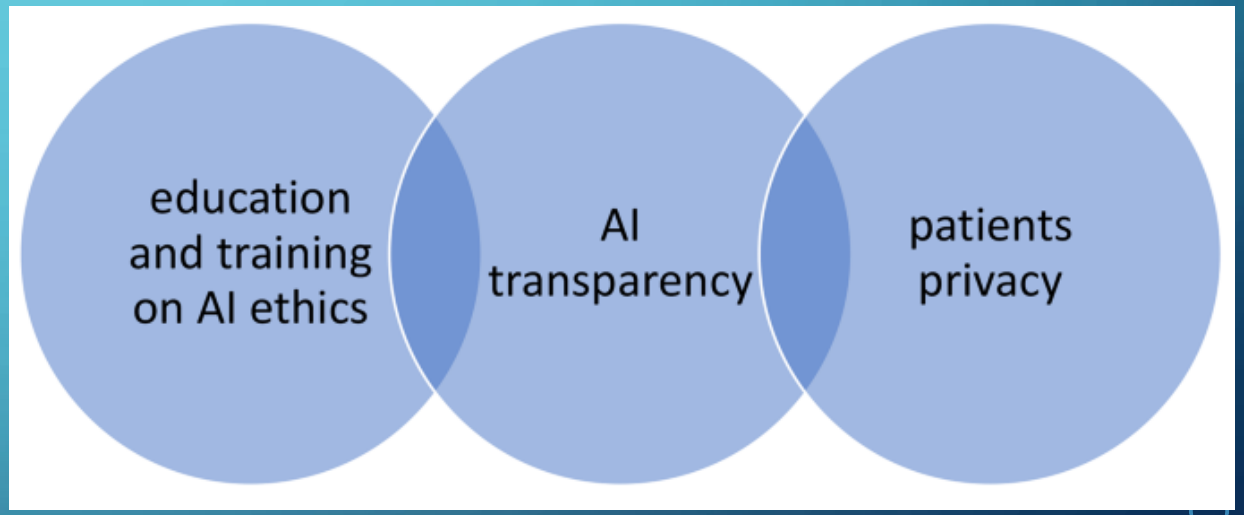
IMPACT ON RADIOLOGIC TECHNOLOGISTS

- AI is not expected to replace radiologic technologists.
- Technologists remain essential for patient positioning, safety monitoring, and equipment operation.
- AI may expand technologists' roles in technology oversight, quality assurance, and data management (ASRT, 2024).

- https://radiologybusiness.com/topics/artificial-intelligence/hello-ai-goodbye-radiology-we-know-it

EDUCATION AND TRAINING REQUIREMENTS

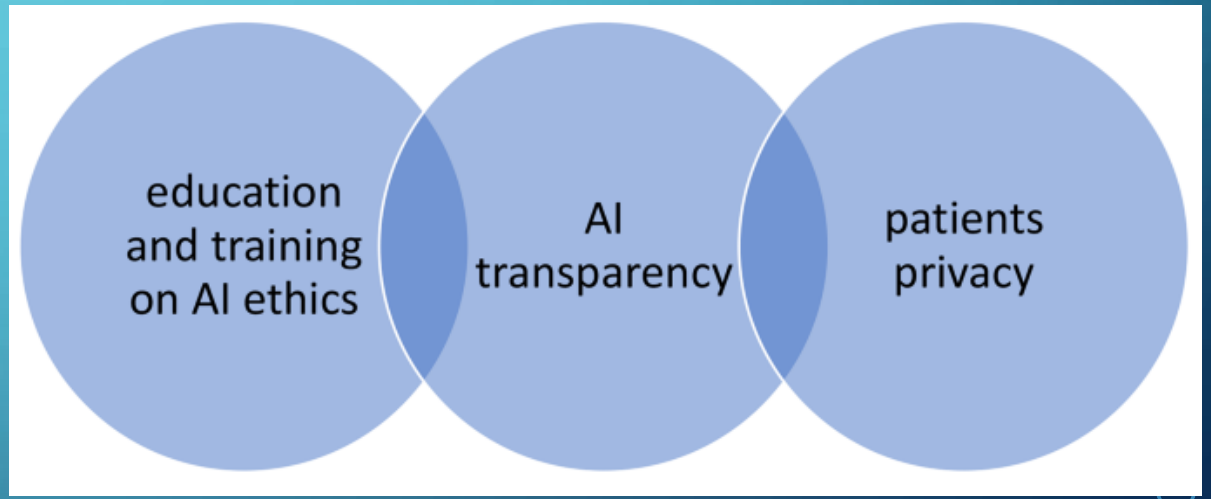
- As AI becomes integrated into imaging systems, technologists must receive training in AI concepts, system operation, and troubleshooting.
- Surveys suggest AI education should be incorporated into radiology curricula for students and professionals (Li et al., 2025).



- https://link.springer.com/article/10.1186/s12910-024-01052-w

ETHICAL RESPONSIBILITY

- Ethical concerns include transparency, accountability for AI-assisted decisions, and maintaining patient trust.
- Humans must remain final decision-makers to ensure ethical clinical practice.
- Responsible AI implementation requires collaboration among technologists, radiologists, and policymakers (Glielmo et al., 2024).



- https://link.springer.com/article/10.1186/s12910-024-01052-w

THE FUTURE OF AI IN RADIOLOGIC TECHNOLOGY

- AI is expected to continue advancing and integrating into clinical workflows.
- Hybrid human–AI models will likely become standard practice.
- AI may improve access to imaging in underserved areas and reshape professional roles in radiology (Strubchevska et al., 2024).

- https://hellofuture.orange.com/en/ai-in-medicine-uses-and-consequences-on-radiology-work/

CONCLUSION

- Artificial intelligence is transforming radiologic technology by improving diagnostic accuracy, workflow efficiency, and early disease detection.
- While AI offers significant benefits for patient care, challenges related to bias, data privacy, and professional responsibility must be addressed.
- Radiologic technologists play a critical role in ensuring AI is used safely, ethically, and effectively.

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