Improved detection of acute intracranial hemorrhage: A deep learning approach on a non-contrast Head CTs.

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Disclosures

- Rashmi S. Thakkar – None
- Ross W. Filice – None
- Joseph H. Yacoub - None

Background

- Timely and precise identification of acute intracranial hemorrhages (ICH) is imperative for prompt medical interventions, mitigating neurological damage and enhancing overall patient outcomes.
- This study aims to assess efficacy of commercial deep learning algorithm to retrospectively detect missed acute ICHs on a non-contrast CT head.

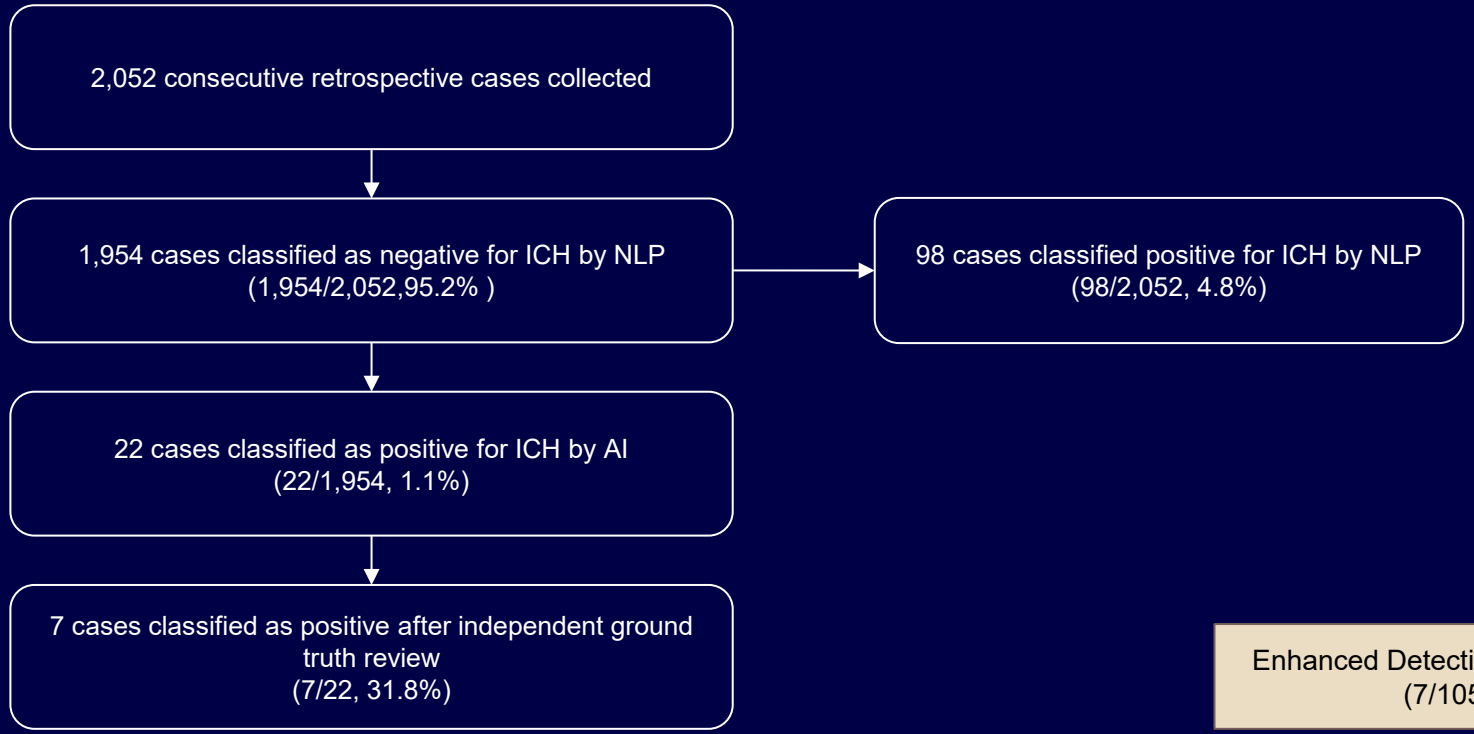
Method

- Data – March 27, 2023 – April 10, 2023 (consecutive 2-week period)
- Natural language processing (NLP) algorithm was employed to classify radiological reports as negative and positive for ICH
- Commercial deep learning AI algorithm was applied to imaging data to identify instances of missed acute ICH (negative by NLP, positive by AI)
- Ground truth was assumed for concordant cases.
- Discordant cases underwent review by a neuroradiologist to establish ground truth.

Results

- Total of 2,052 retrospective cases collected.
- Prevalence of acute ICH was 5.1% (105/2052) – based on positive reports.
- AI algorithm flagged – 22 cases as suspected missed acute ICH
- 31.8% (7/22) cases – true positive ICH resulting in 6.6% (7/105) enhanced detection rate.
- 11 false positive cases flagged by algorithm

Enhanced Detection Rate

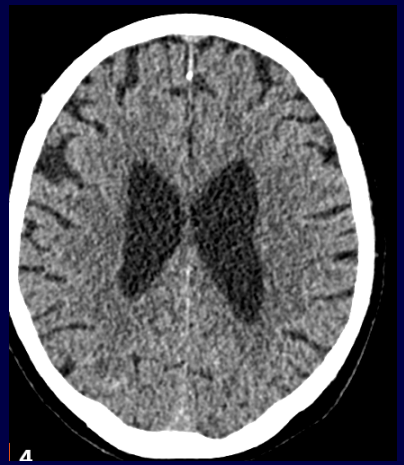


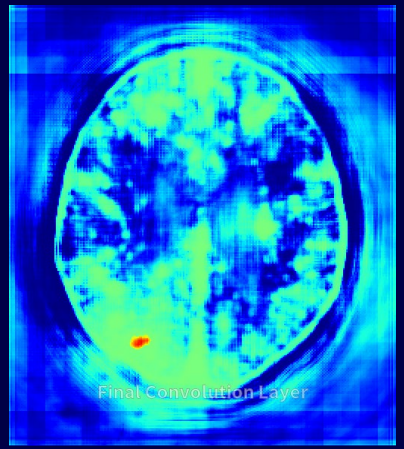
Enhanced Detection Rate 6.6%
(7/105)

AI & Radiologist Performance

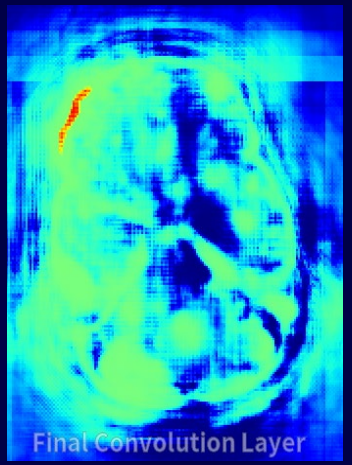
	Radiologist	AI Algorithm
Sensitivity	93.75%	95.54%
Specificity	99.85%	99.43%

Cases of Missed ICH



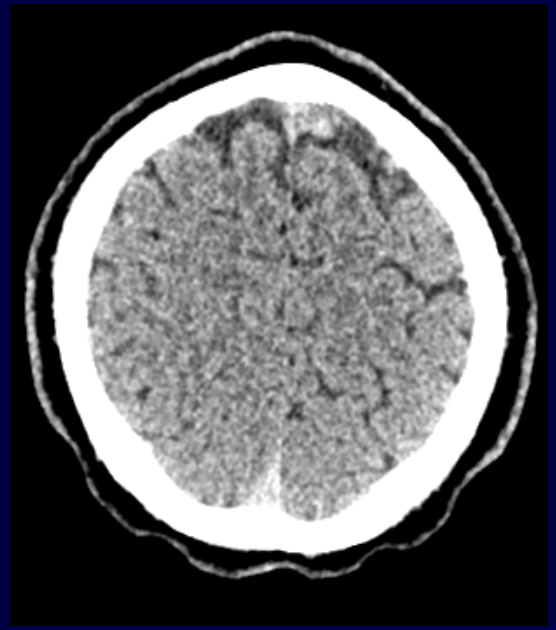


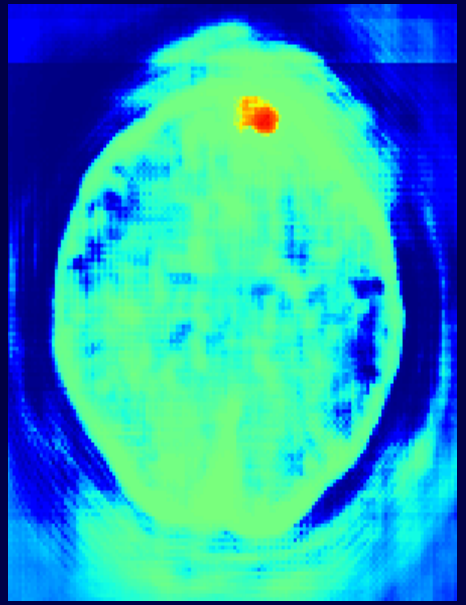
Right parietal lobe acute subarachnoid hemorrhage



Right convexity acute subdural hemorrhage

False positive – related to cortical vein hyperdensity





Conclusion

- This study underscores the potential of deep learning systems as quality improvement tools to help identify missed acute ICH, showcasing the promise of advancement in medical imaging technologies.
- A commercially available AI algorithm for acute ICH may be beneficial in detecting additional hemorrhages in 3.4 out of every 1000 patients who undergo non-contrast CT head.