Artificial Intelligence Prioritization Tool for Intracranial Hemorrhage on CT for Urgent Cases

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Problem

- Intracranial hemorrhage can be a critical condition and prompt detection and reporting of this finding on emergency head CT scans can be important for patient management.
- Thus, it is useful to prioritize potentially life threatening cases and expedite patient care.

Goal

The goal of this report is to highlight the functionality and preliminary experience using convolution neural network software from Aidoc (Tel Aviv, Israel) for detecting and triaging cases with possible intracranial hemorrhage on CT scans performed through at the University of Chicago.

Innovation

- Deep learning software analyses the images for possible acute intracranial hemorrhage immediately after the patients are scanned
- Abnormalities are flagged on the PACS worklist to alert the radiologist (Figure 1).
- Key images showing the abnormalities are listed on the workstation for rapid survey by the radiologist (Figure 2).
- The purpose of the software is to reduce report turnaround time and increase the radiologist's confidence.

Figure 1
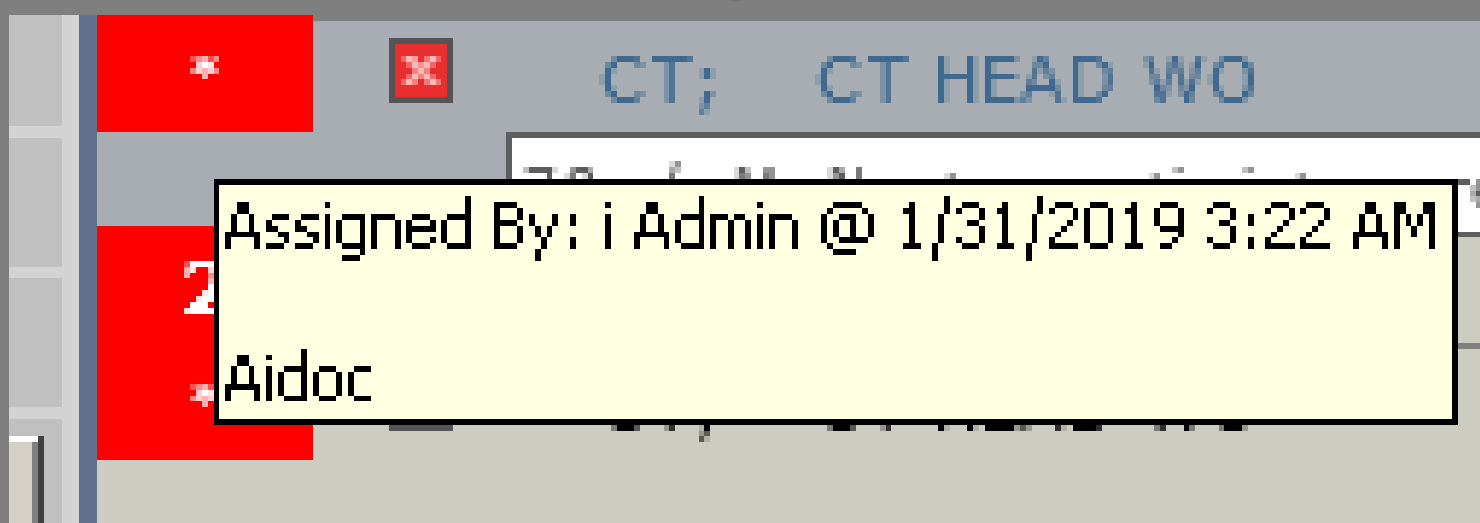
A case flagged on the PACS worklist.

Figure 2
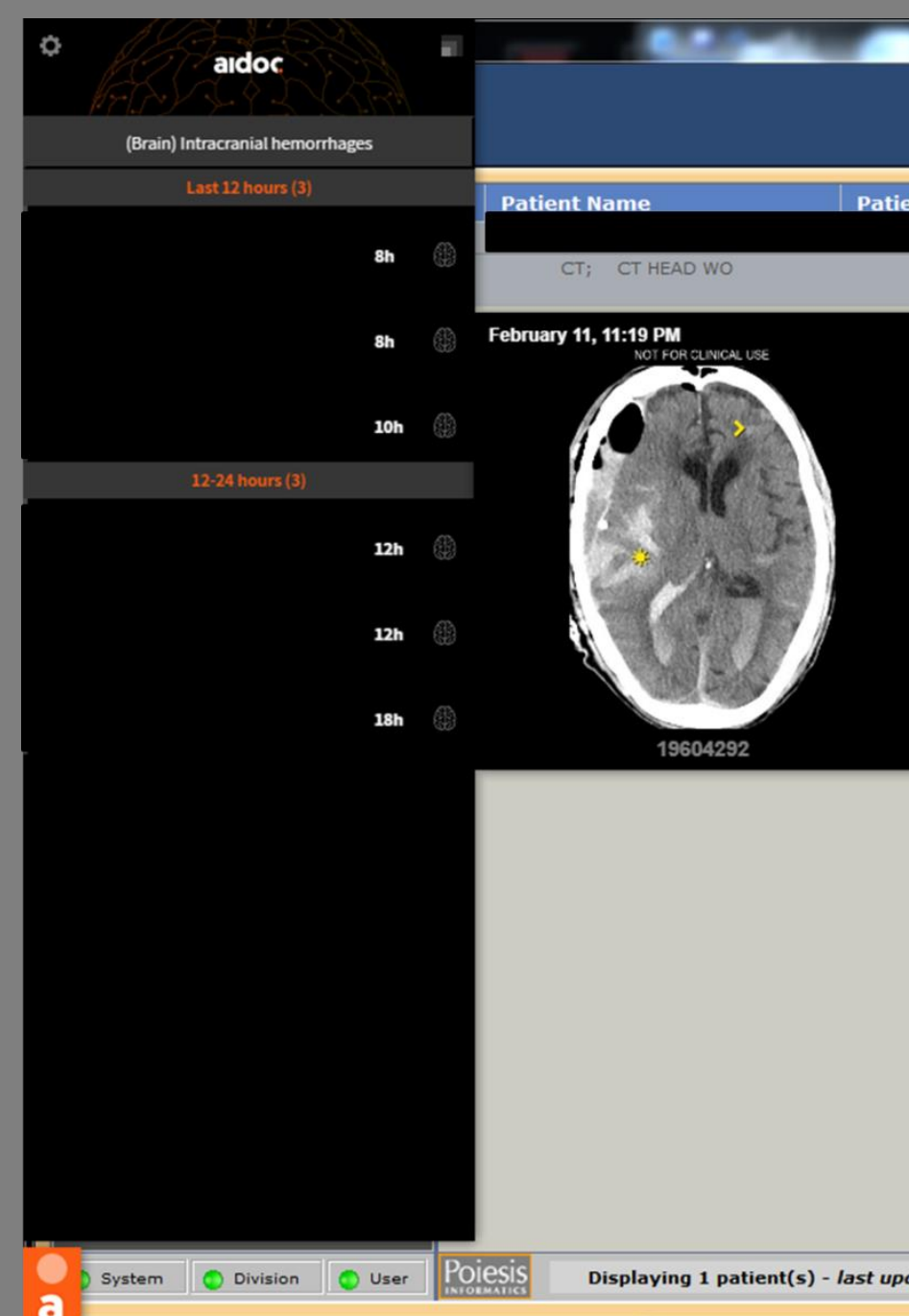
AIdoc tool bar opened on the radiology workstation, which lists flagged cases that can be rapidly surveyed via key images.

Figure 3

True positive case showing hemorrhage.

Figure 4

False positive case showing a tumor.

Results to Date

During the two months of enrollment in this study, a total of 373 urgent CT exams were flagged by the network for possible intracranial hemorrhage out of 2,026 scans analyzed (18.4%) with the following results:

- Among the flagged cases, the network correctly identified hemorrhage in 274 (73.5%) cases, while 5 (1.3%) flagged cases were considered indeterminate for hemorrhage, and 94 (25.2%) were negative for hemorrhage.
- Among all cases flagged by the software, 229 (62.5%) were follow-up cases, while 144 (37.5%) were initial scans and 75 (20.1%) were trauma/emergency department cases, 290 (77.7%) were inpatient cases, and 8 (2.1%) were outpatient cases. Inpatient cases accounted for 219 (95.6%) of the follow up cases.
- Among the 144 cases that were determined to be true positives or indeterminate for hemorrhage, 66 (44.4%) were newly flagged cases, of which 39 (58.2%) were performed in trauma/emergency department cases.

Next Steps

- Continue monitoring accuracy of the software for intracranial hemorrhage detection on CT.
- Determine the impact on turn around time for reporting intracranial hemorrhage on emergency CT scans.
- Determine whether false positive and previously diagnosed cases flagged by the software delay the review of other urgent cases on the worklist.

Acknowledgements