MACHINE LEARNING AND VISUAL RECOGNITION: A PROOF-OF-CONCEPT INTRACRANIAL HEMORRHAGE SCREENING AND CLASSIFICATION MODEL

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Pediatric Trauma Society
San Diego, CA - 11/14/2019
Disclosures

Alejandra M. Casar Berazaluce, MD
Nothing to disclose.

Brandon E. Colvin, MD

Richard A. Falcone Jr., MD

Todd A. Ponsky, MD
Consultant to ConMed.
“Injury is the #1 cause of death and disability in children.”

“Anatomical, physiological, and emotional differences between adults and children mean that children are not just scaled-down adults.”

“Almost 1 in 6 present to the ED for Trauma every year.”
“57% of the 73.7 million children in the U.S. during the period 2011 to 2015 lived within 30 miles of a Level I or Level II pediatric trauma center.”
“Approximately 3% of radiologists, some 800-900 physicians, are pediatric radiologists.”
The Nuts and Bolts of Machine Learning

Supervised Learning

Unsupervised Learning
Machine Learning in Visual Recognition

Classification

Classification + Localization

Object Detection

Instance Segmentation

Single object

Multiple objects
Methods (Screening)

Google

- TEST ITEMS: ? x 20
- POSITIVE: x 120
- NEGATIVE: x 40

IBM Watson

watson-vision-combined-ik
Results (Screening)

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<th>Dx+</th>
<th>Dx-</th>
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<tr>
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Spec: 1.00  Sens: 1.00  PPV: 1.00  NPV: 1.00

100% Accuracy
Methods (Classification)

- Epidual x 40
- Subdural x 40
- Intraparenchymal x 40
- Negative x 40

Google

IBM Watson

TEST ITEMS

watson-vision-combined-ik
### Epidural

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<tr>
<td>NPV</td>
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### Subdural

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<tr>
<td>Spec</td>
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<tr>
<td>Sens</td>
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<tr>
<td>PPV</td>
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<tr>
<td>NPV</td>
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**Results (Classification)**

- **Epidural**: 90% Accuracy
- **Subdural**: 85% Accuracy
Results (Classification)

**Intraparenchymal**

- Dx+  | Dx-  |
-Fx+  | 4    | 1   |
-Fx-  | 1    | 14  |

- Spec | 0.93 |
- Sens | 0.80 |
- PPV  | 0.80 |
- NPV  | 0.93 |

90% Accuracy

**Normal**

- Dx+  | Dx-  |
-Fx+  | 5    | 0   |
-Fx-  | 0    | 15  |

- Spec | 1.00 |
- Sens | 1.00 |
- PPV  | 1.00 |
- NPV  | 1.00 |

100% Accuracy

Average Results:
Specificity 92%, Sensitivity 90%, PPV 81%, NPV 97%.
SAMPLE IMPLEMENTATION:
-XR Triage
-Injury flags
-Preliminary reads
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