VIEWER DISCRETION IS ADVISED

Leveraging Computer Vision Techniques to Measure the Total Burn Surface Area of Pediatric Patients in Ghana.

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Outline of Presentation

- Introduction
- Problem Statement
- Objectives
- Methodology
- Results
- Validation
- Recommendation and Conclusion



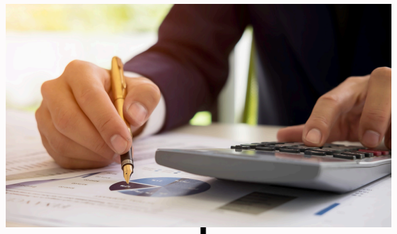
Introduction

- According to the WHO, 11 million skin burn cases are recorded annually. [2][3]
- Of this alarming figure, **90%** occur in **LMICs** with about **180,000** leading to death.
- **Children** are the most vulnerable since their defence mechanisms are not fully developed [1]
- The Total Burn Surface Area (TBSA) is a visual estimate of the size of a burn wound done by clinicians.
- Accurately measuring the TBSA is necessary for other burn management procedures like fluid resuscitation, wound healing monitoring, burn severity assessment etc.

Ship Broiler Explosion, ***1876***

Used square inches

Weindenfel and Zumbsuch, ***1905***



Used Von Meeh's calculations

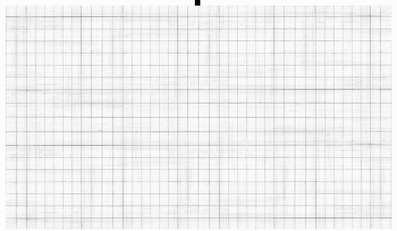
Dr. Bekow

Introduced Percentages

Wallace Rule of Nines, ***1951***

Rule of Palms, ***1954***

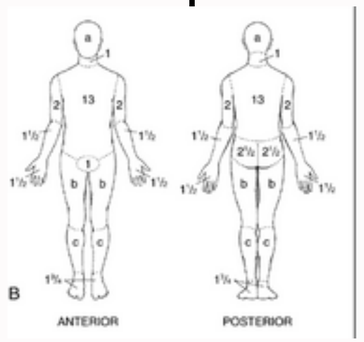
Graph Paper



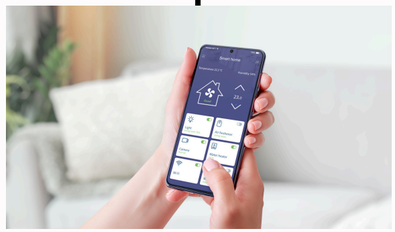
Von Meeh, ***1879***

Papier Mache body moulds

Dubois and Dubois, ***1915***



Lund and Browder Chart, ***1944***

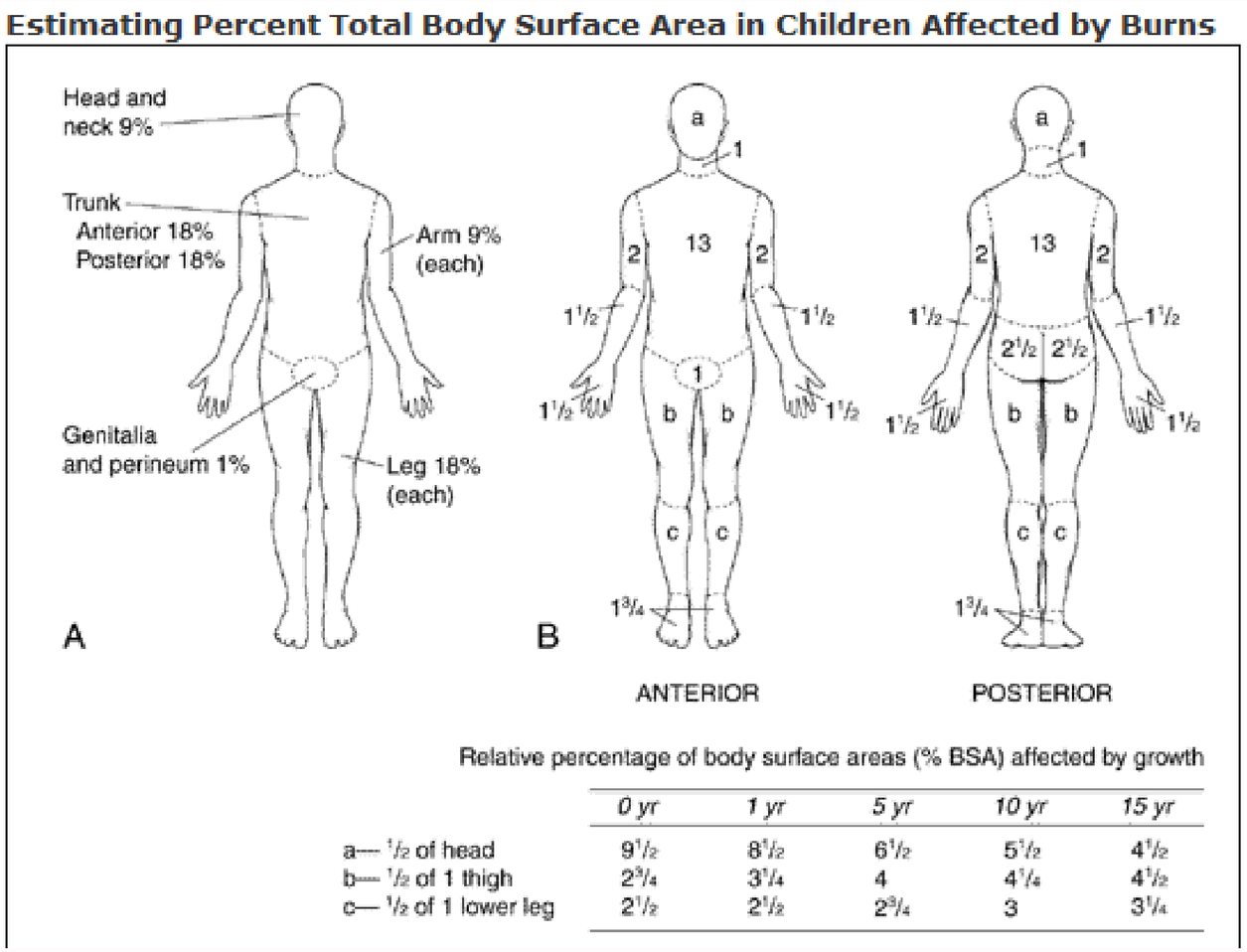


2018 - Present

- *Drawing and Shading apps*

Problem Statement

The TBSA is **subjective** and prone to error and variability. Studies have been done [4][5][6] to deal with subjectivity but unfortunately, **they do not include African datasets.**



Lund-Browder Chart

Objectives

To create a semi-automated model that **segments burns** from an African image dataset.

To create a model that **objectively measures** the TBSA of children on a part-by-part basis using an African burn image dataset.

Data

- 226 images from Komfo Anokye Teaching Hospital.

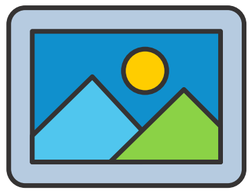
Exclusion:

- Images with non-lateral views.
- Images with dressing on the wound.
- Images that did not show a full body part with a burn.
- Used 120 of the 226 images.

Excluded

Included

Methodology



1 Background removal

- Grabcut & Thresholding
- CDCL Algorithm
- Deep Learning Algorithms
  - Python “rembg” library ✓

2 Human part segmentation

- CDCL Algorithm ✓

3 Burn Identification and Segmentation

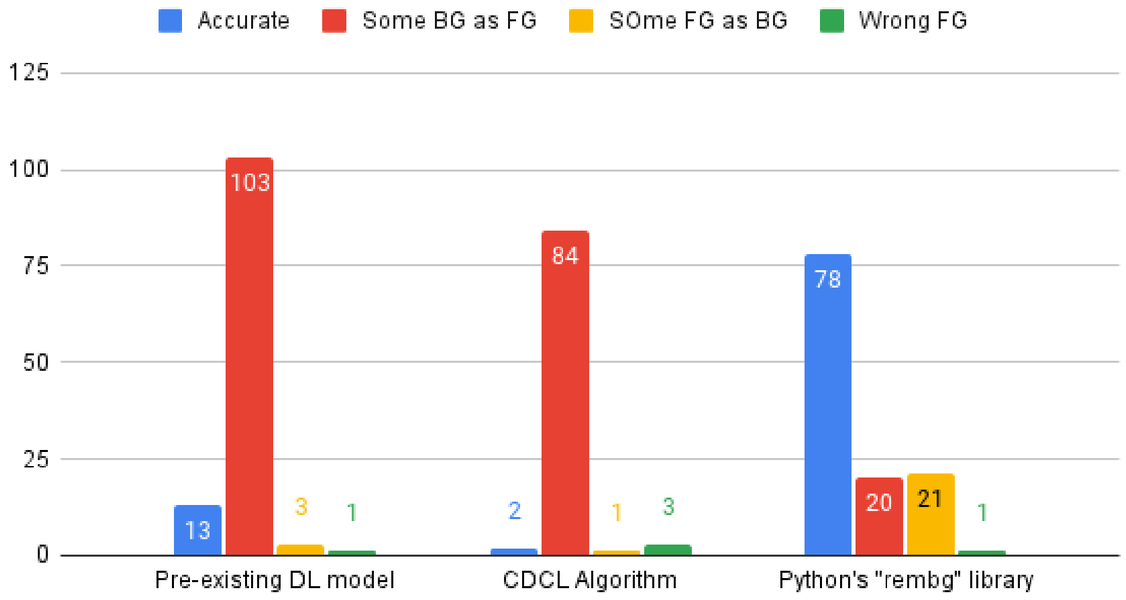
- Region Growing
- Pixel segmentation in CIELAB colour space ✓
- SLIC with K-means ✓

4 Burn Size Measurement

1. Pixel Binarization ✓
2. **Pixel Count** ✓
3. Burn calculation with simple ratios ✓

Results

Background Removal

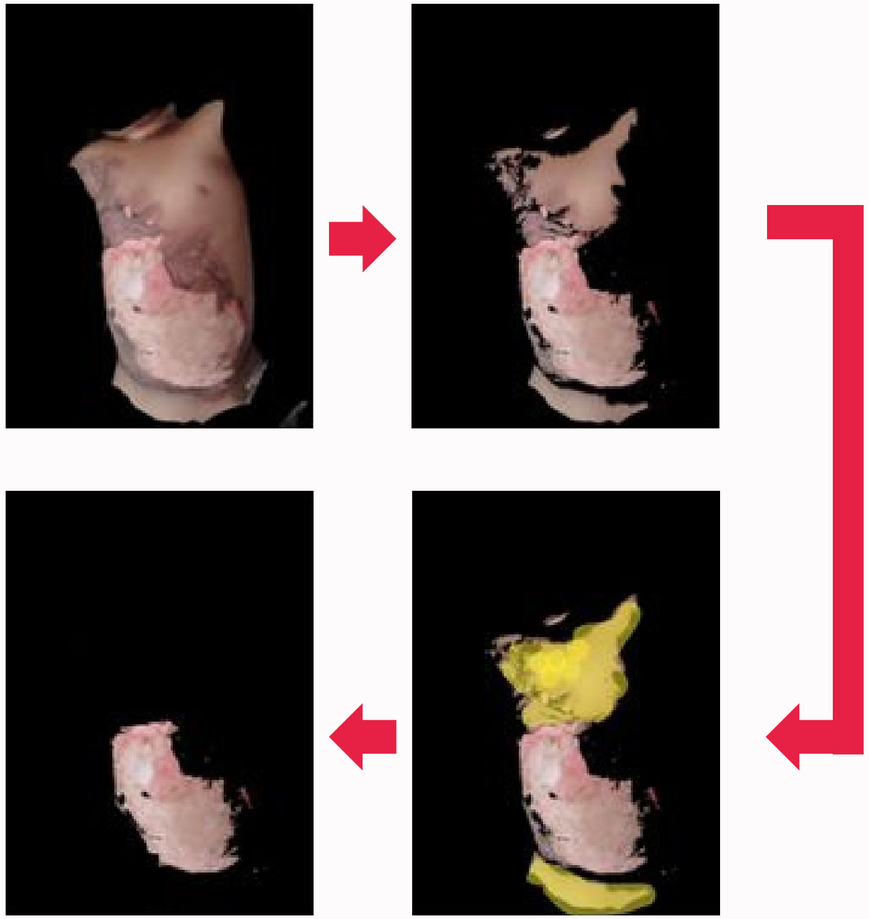


Body Part Segmentation

Achieved high accuracy with head segmentations (95.77%) and least with arms and feet (69.84% and 44% respectively).

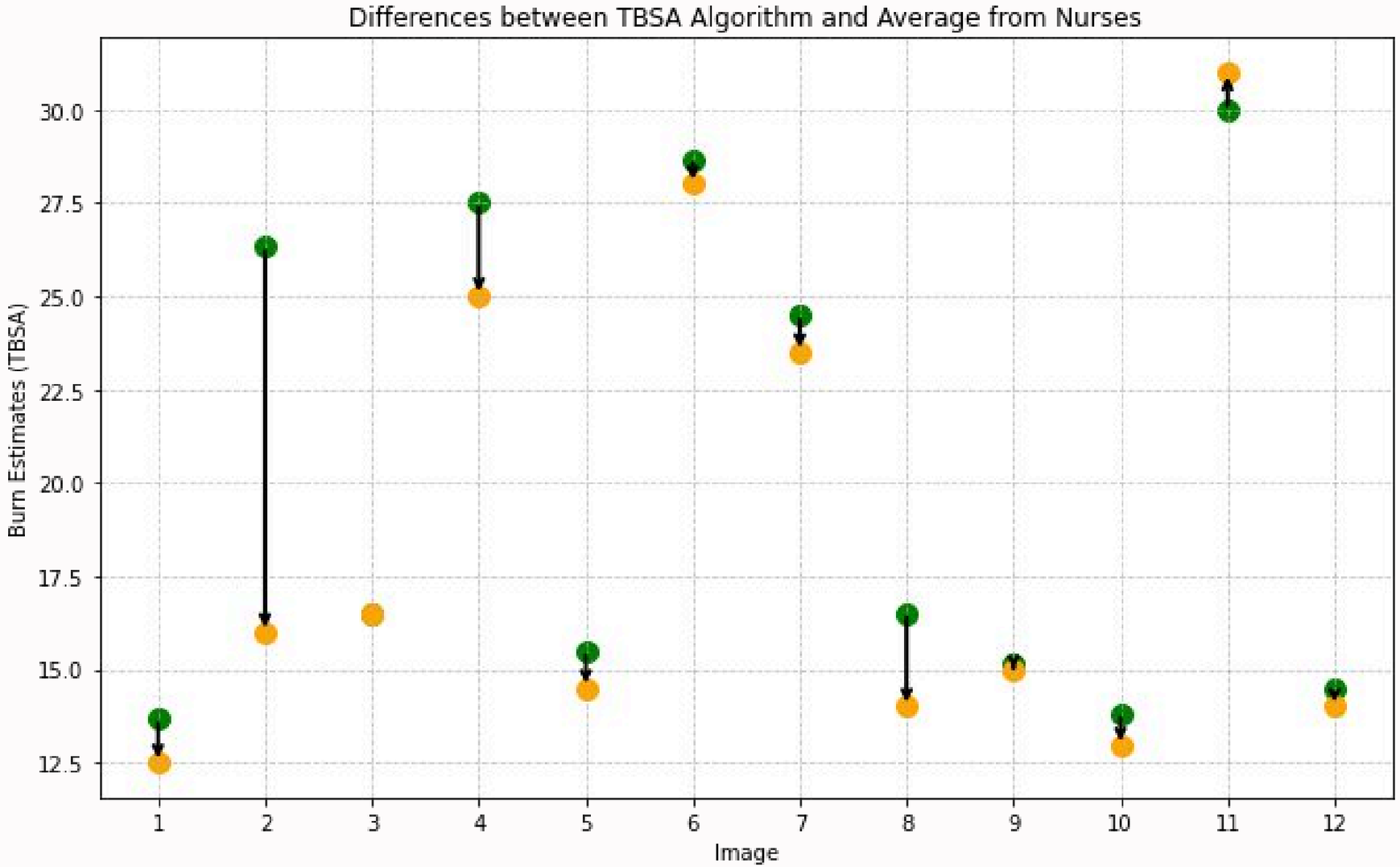
Results

Burn Segmentation



Dice Scores for Burn Segmentation	
Automated (CIELAB)	0.55
SLIC with K-Means	0.92
Automated + SLIC	0.86

Validation



MAE = 1.77

Recommendations and Conclusion

- Consider using data that captures all views of the patient so that circumferential burns can also be measured.

- Computer vision has the potential to objectively measure the total burn surface area of burn wounds which can reduce problems with over and under-resuscitation and also help in burn wound healing monitoring.

References

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THANK YOU!