Less is More: Sample Selection and Label Conditioning Improve Skin Lesion Segmentation

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Handling the Inter-Annotator Agreement for Automated Skin Lesion Segmentation

Available at arXiv e-prints

The Impact of Annotation Quality on Deep Learning for Skin Lesion Segmentation

Available at Unicamp's Scientific and Intellectual Production Repository

Links at

https://vribeiro1.github.io/publications/
Sample Selection & Inter-annotator Agreement
Lesion Attributes
Different Levels of Annotation

Different levels of granularity for image annotation

1. Flood fill controlled by the annotator
2. Manual polygon tracing
3. Fully automated validated by human
Different Opinions by Physicians

Kappa = -0.0907
Kappa = -0.0424
Kappa = 0.5326
Kappa = 0.5676
Kappa = 0.9102
Kappa = 0.9772

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Data Elimination with Label Conditioning
Sample Conditioning

<table>
<thead>
<tr>
<th>Original ground truth</th>
<th>Opening</th>
<th>Opening + Convex Hull</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Original ground truth" /></td>
<td><img src="image2" alt="Opening" /></td>
<td><img src="image3" alt="Opening + Convex Hull" /></td>
</tr>
<tr>
<td><img src="image4" alt="Original ground truth" /></td>
<td><img src="image5" alt="Opening" /></td>
<td><img src="image6" alt="Opening + Convex Hull" /></td>
</tr>
<tr>
<td><img src="image7" alt="Original ground truth" /></td>
<td><img src="image8" alt="Opening" /></td>
<td><img src="image9" alt="Opening + Convex Hull" /></td>
</tr>
</tbody>
</table>
Sample Selection

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Materials & Methods
Dataset

**ISIC Archive**

13,779 images with segmentation

2,233 images with multiple segmentations

**Two train datasets:**

All samples - 2,233 images

Best samples - 1,808 images ($\kappa \geq 0.5$)

**Three test datasets:**

ISIC Archive - 2,000 images with single segmentation

PH² - 200 images

Dermofit - 1,300 images
Dataset

ISIC Archive

- 13,779 images with segmentation
- 2,233 images with multiple segmentations

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Validation

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Testing

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Results
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Conclusion
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- Segmentation ground-truths for skin lesion imaging present substantial **inter-annotator disagreement**.
- Withholding **samples with the largest disagreement** may result in significantly improved performance.
- **Removing details** from the segmentation masks may improve the results.
- In the future, we hope to extend our findings to samples with single ground-truth masks, increasing its applicability.
All the skin lesion images and segmentation masks from this presentation were extracted from the ISIC Archive dataset, available at [https://isic-archive.com/](https://isic-archive.com/)
Thank you!

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Code & Data: Less is More: Sample Selection and Label Conditioning Improve Skin Lesion Segmentation, Ribeiro et al., ISIC Workshop @ CVPR 2020