SkinCredible

Facial skin condition monitoring with deep learning

Consulting project with cureskin

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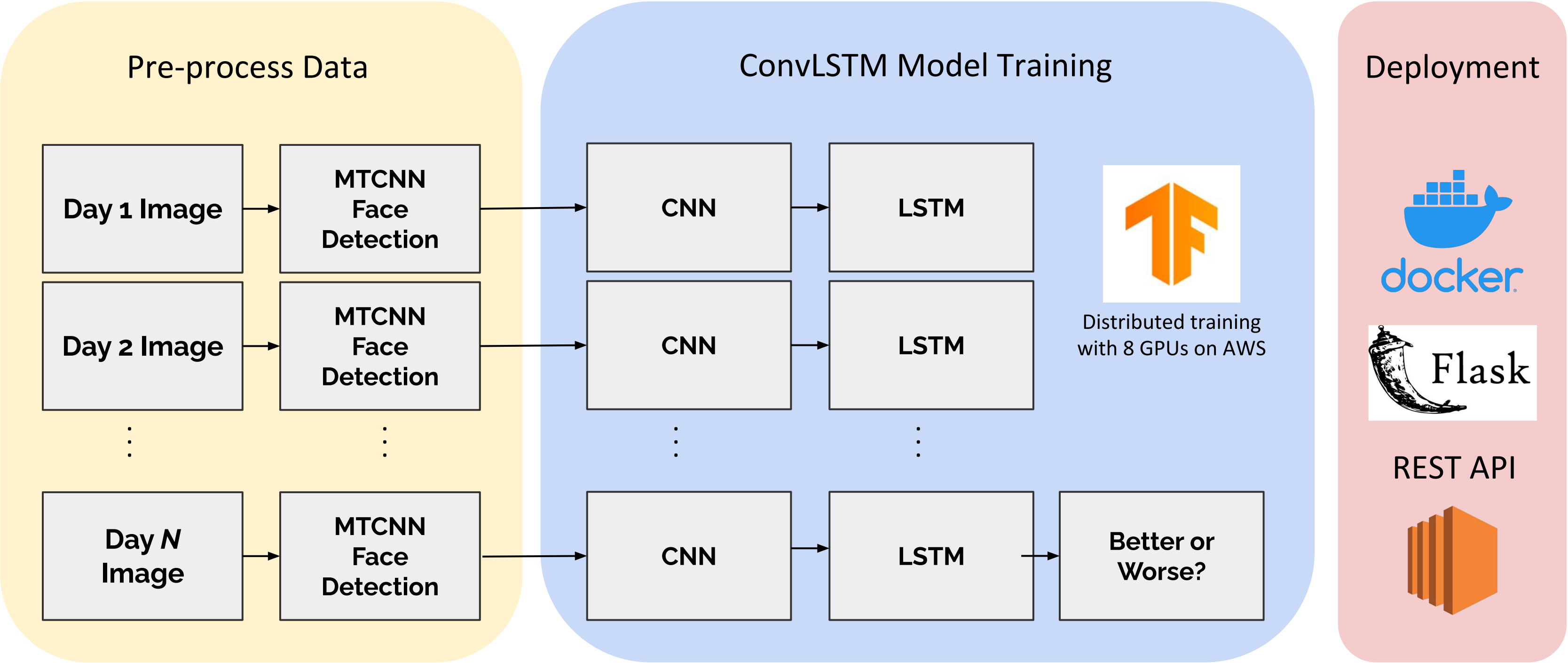
How To Monitor Facial Skin Conditions Over Time?

- Dermatologists at CureSkin carefully monitor app users’ facial skin conditions week by week.

Solution: **SkinCredible**

- An end-to-end pipeline to assist dermatologists in classifying whether or not an app user’s facial skin conditions have improved over time.

How It Works



Pre-process Data

Day 1 Image → MTCNN Face Detection

Day 2 Image → MTCNN Face Detection

⋮

Day *N* Image → MTCNN Face Detection

ConvLSTM Model Training

CNN → LSTM

CNN → LSTM

⋮

CNN → LSTM → Better or Worse?

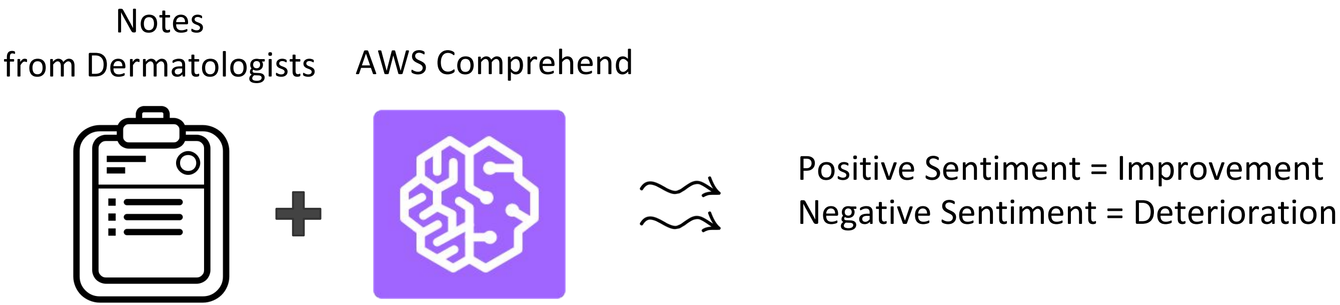
Distributed training with 8 GPUs on AWS

Deployment

REST API

- MTCNN = Multi-Task Cascaded Convolutional Neural Network
- Use masking to handle variable length input images

Unlabelled Dataset

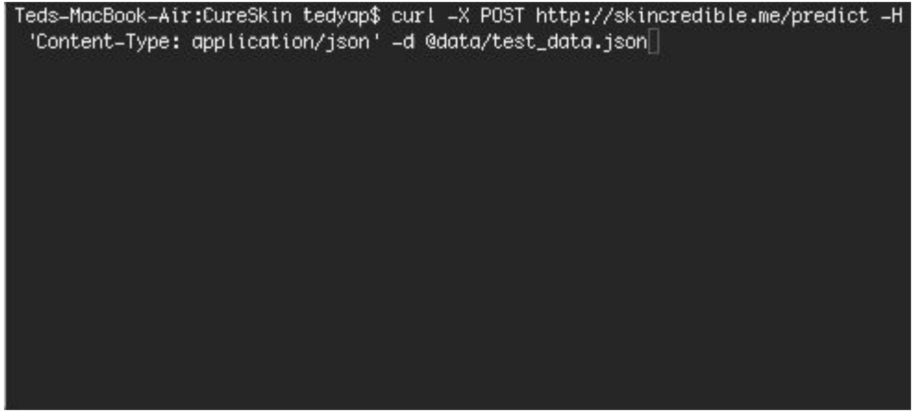


Notes
from Dermatologists

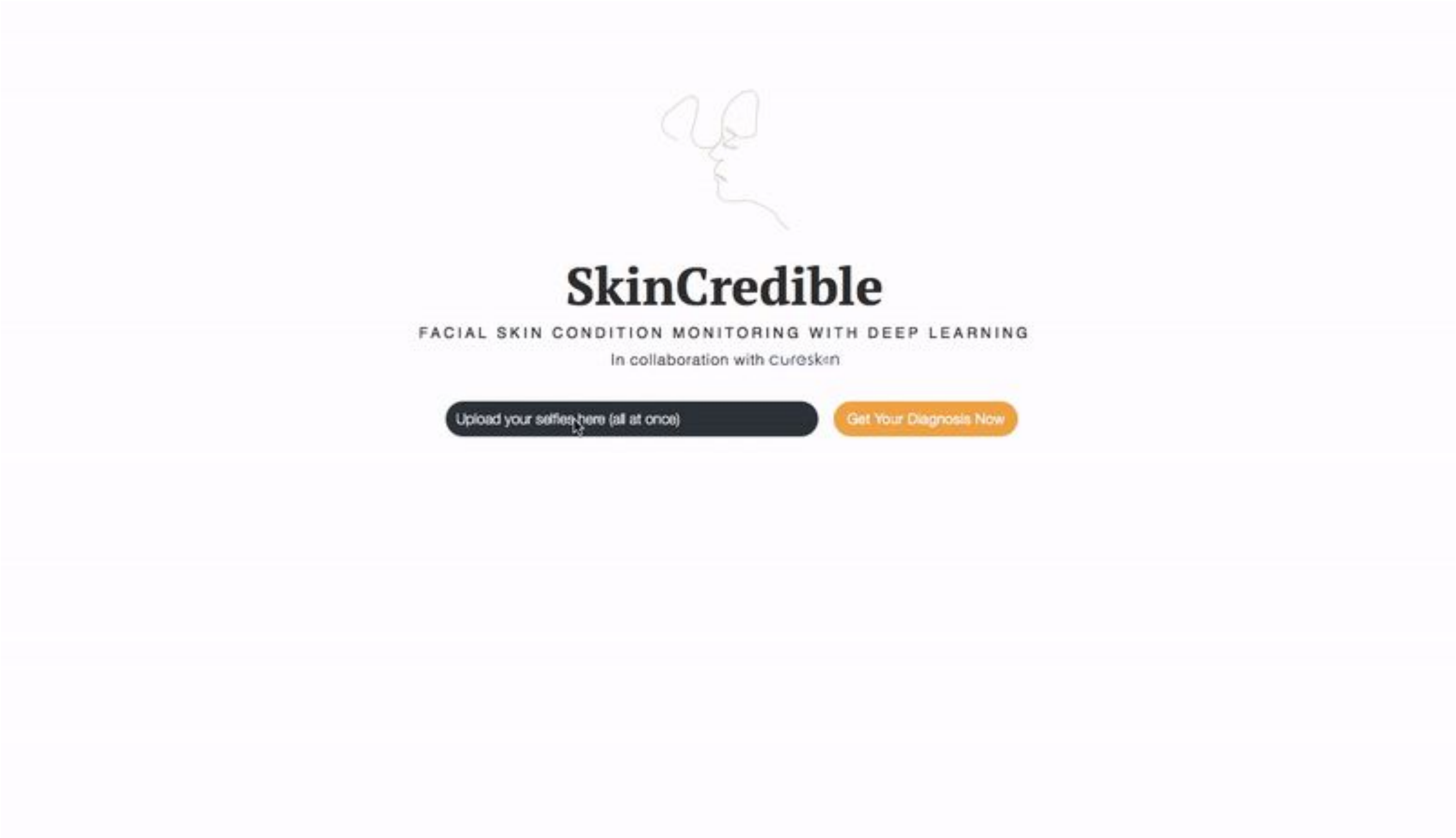
AWS Comprehend

Positive Sentiment = Improvement
Negative Sentiment = Deterioration

API Demo



```
Teds-MacBook-Air:CureSkin tedyap$ curl -X POST http://skincredible.me/predict -H
 'Content-Type: application/json' -d @data/test_data.json
```



SkinCredible

FACIAL SKIN CONDITION MONITORING WITH DEEP LEARNING

In collaboration with cureskin

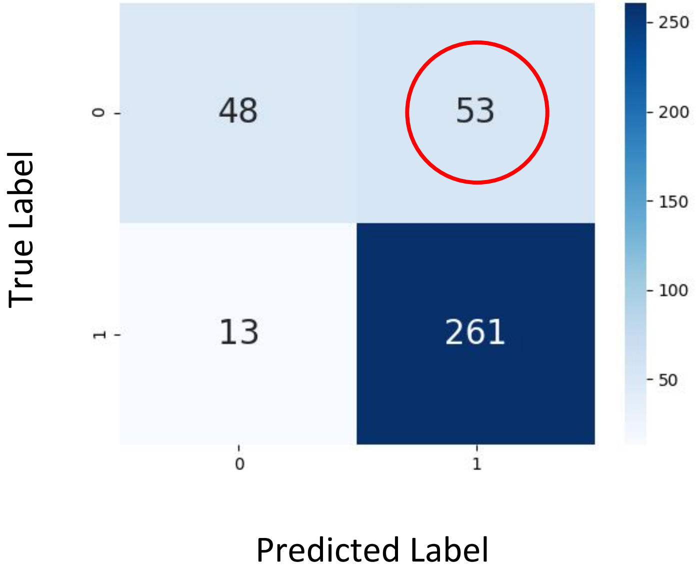
Available on skincredible.me

Results

- Accuracy = **82%**
  - Imbalanced dataset

    (70% improvement : 30% deterioration)
- Precision = **83%**
- Avoid misclassifying users with worse skin conditions (False Positives)

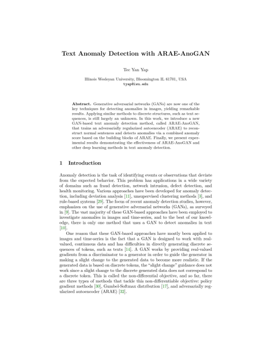
ConvLSTM Confusion Matrix



True Label \ Predicted Label	0	1
0	48	53
1	13	261

Positive = 1 = Improvement
Negative = 0 = Deterioration

Ted Yap



Text Anomaly Detection with ARAE-AnoGAN

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Abstract. Generative adversarial networks (GANs) are now one of the key techniques for detecting anomalies in images, yielding remarkable results. Applying similar methods to discrete structures, such as text sequences, is still largely an unknown. In this work, we introduce a new GAN-based text anomaly detection method, called ARAE-AnoGAN, that trains an adversarially regularized autoencoder (ARAE) to reconstruct normal sentences and detects anomalies via a combined anomaly score based on the building blocks of ARAE. Finally, we present experimental results demonstrating the effectiveness of ARAE-AnoGAN and other deep learning methods in text anomaly detection.

1 Introduction

Anomaly detection is the task of identifying events or observations that deviate from the expected behavior. This problem has applications in a wide variety of domains such as fraud detection, network intrusion, defect detection, and health monitoring. Various approaches have been developed for anomaly detection, including deviation analysis [11], unsupervised clustering methods [3], and rule-based systems [29]. The focus of recent anomaly detection studies, however, emphasizes on the use of generative adversarial networks (GANs), as surveyed in [9]. The vast majority of these GAN-based approaches have been employed to investigate anomalies in images and time-series, and to the best of our knowledge, there is only one method that uses a GAN to detect anomalies in text [10].

One reason that these GAN-based approaches have mostly been applied to images and time-series is the fact that a GAN is designed to work with real-valued, continuous data and has difficulties in directly generating discrete sequences of tokens, such as texts [14]. A GAN works by providing real-valued gradients from a discriminator to a generator in order to guide the generator in making a slight change to the generated data to become more realistic. If the generated data is based on discrete tokens, the "slight change" guidance does not work since a slight change to the discrete generated data does not correspond to a discrete token. This is called the non-differential objective, and so far, there are three types of methods that tackle this non-differentiable objective: policy gradient methods [30], Gumbel-Softmax distribution [17], and adversarially regularized autoencoder (ARAE) [32].

Research
Text anomaly detection with GANs

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Background
CS, Math, Finance

Hobbies
Photography, Travel

Why ConvLSTM?

- Proposed in this paper Convolutional LSTM Network: A Machine Learning Approach for Precipitation Nowcasting
- Performs great on data with spatiotemporal structure
- Achieves better performance than FC-LSTMs
- Less trainable parameters with the use of CNNs

Challenges & Lessons Learned

- Distributed training with multiple GPUs
- Write code that uses resources efficiently
- Getting everything set up on AWS with Docker
- Working with a budget on AWS and deadlines