Identifying and Surveilling Military Dermatoses in Field Settings with a Smartphone-Based Machine Vision Application

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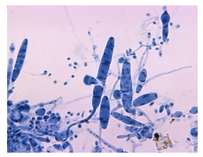
Introduction

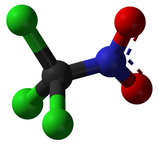
Dermatological diseases are common among deployed service members and impair force readiness and combat effectiveness by affecting morale and duty eligibility.

Bacteria



Fungus

Arthropod

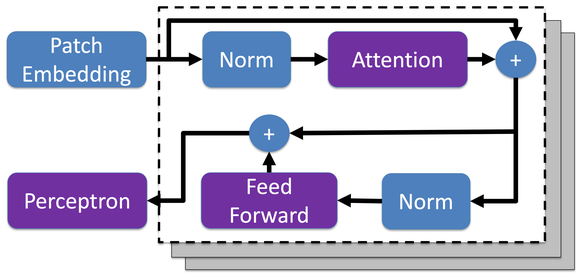


Chemical Agent

Prompt identification and treatment is essential to avoid rapid spread and safeguard servicemembers.

Methods

Our approach uses a vision transformer architecture to identify relevant areas of images and make classifications:



- Attention aims to identify important parts of the image.
- Feed Forward maps out features within important areas.
- Perceptron weights the features to make a classification.

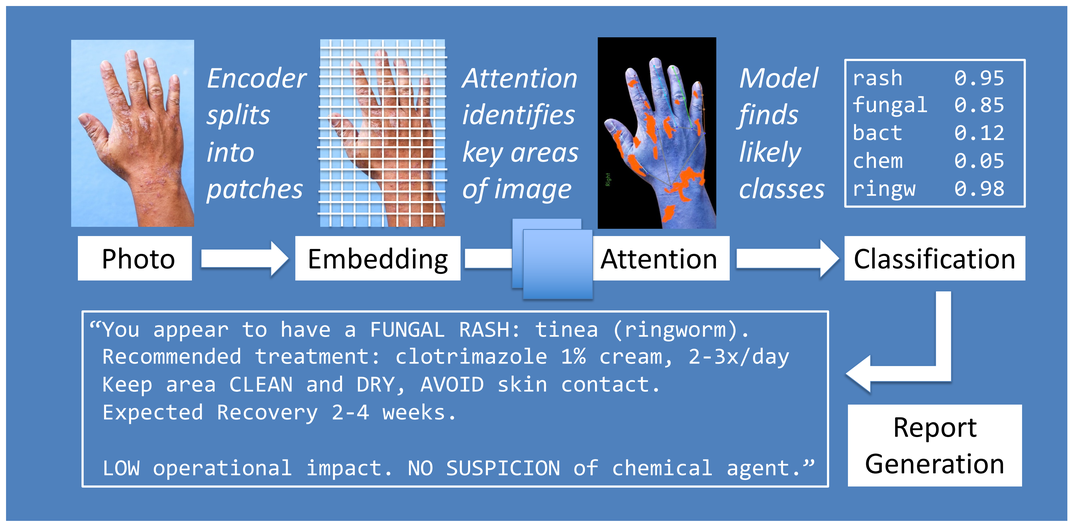
Models were trained using the Skin Condition Image Network (SCIN) dataset, which contains 10,000+ examples of skin lesions classified by Sanford Medicine clinicians.

Smartphone application to assess skin conditions

Skin condition is observed in the field

User takes photo on secure Android device

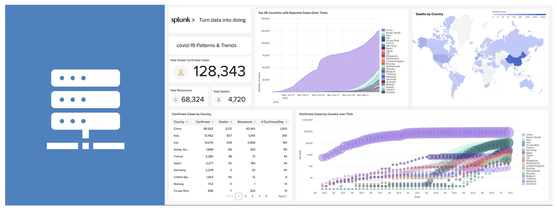
Immediate diagnosis and care instructions



Application running on Android Device classifies skin disease images and produces care instructions and appropriate warnings (e.g., chemical agent).

Open communication environment

Application updates surveillance system



Surveillance system provides dashboards to detect threat patterns and protect force health

Results and Limitations

Improves readiness of small teams

Actionable insights to protect force health

Our prototype was trained using images of civilian dermatoses. The model and recommendations can be customized using additional images of military dermatoses and incorporation of military-specific clinical guidelines.

Further Research

Empowering servicemembers with distributed, easy-to-use self-service health assessment tools linked to surveillance systems could be used to protect force health and improve readiness across many domains:

Integration of multiple tools on a shared Android application framework could provide leaders with a more comprehensive toolset to understand and protect force health and readiness.

Scan the QR Code to visit DLH Science and Research & Development

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