



**AI for Healthcare  
Hackathon**  
#HealthHack

# HEALTHY SKIN AI SOLUTION FOR EARLY SKIN CANCER DETECTION

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GitHub Repo: <https://bit.ly/2JW9iNJ>

*ISIC Challenge: Skin Lesion Analysis  
Towards Melanoma Detection*

**accenture**

# PREPARED FOR JUDGES



**Clare A. Wefelmeyer**

**Dadong Wan**

**Davide Olivieri**

**Matt David**

**Monika Sawyer**

**Sumeet B. Mahajan**

Judging Criteria and scoring. Final score is the total awarded in each of the categories

Criteria Possible	Points
Innovation	1-10
Technical Achievement	1-10
Application	1-10
Total Possible	30



# CASE

Data set: 23,000 images

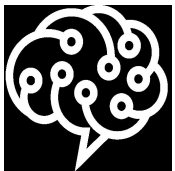
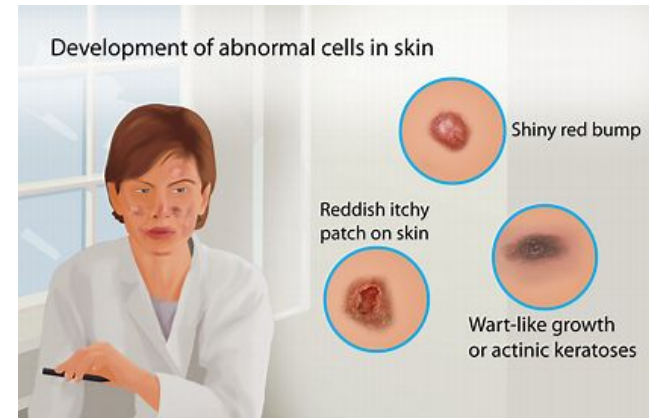
Metadata:

- Unstructured
- Date of JPEG
- Localization of body part
- Lesion Diagnosis: Benign or Malignant



World Health  
Organization

UN SDG #3 Health

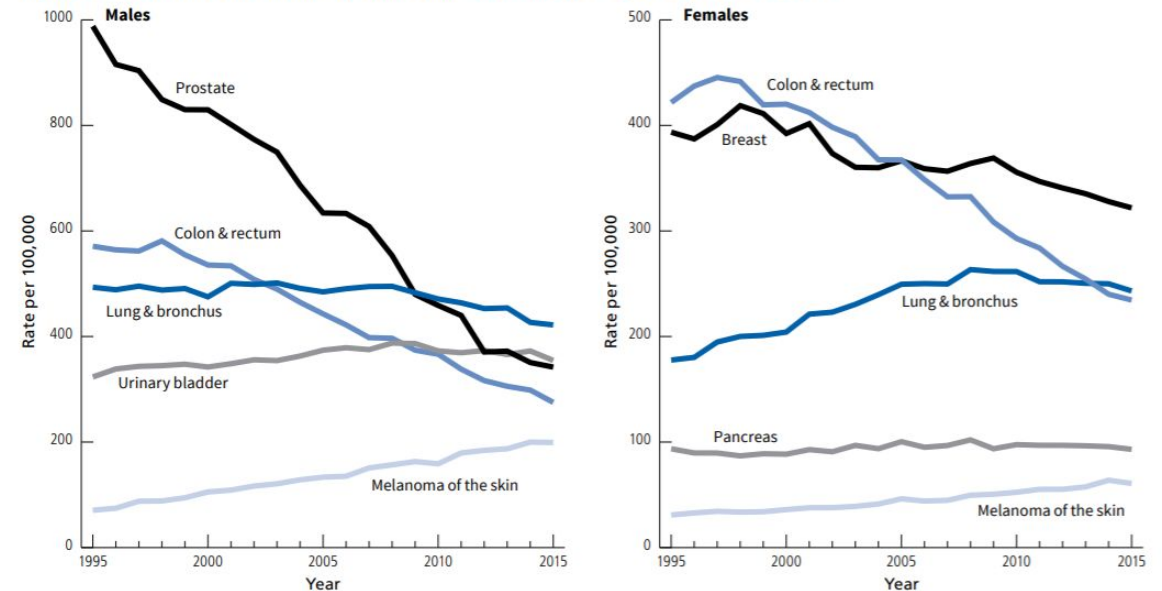


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# SKIN CANCER FACTS & STATISTICS

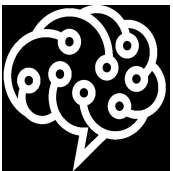
- One in five Americans will develop skin cancer by the age of 70<sub>1</sub>
- Melanoma is predicted to become the second most commonly diagnosed cancer among men 85 and older by 2030
- UN WHO - Annually:
  - 2-3 million non-melanoma skin cancers
  - 132,000 melanoma skin cancers
  - 10% decrease in ozone levels: additional ~300,000 non-melanoma, ~4,500 melanoma skin cancer cases

Figure S5. Trends in Cancer Incidence Rates for Selected Sites, Ages 85+, US, 1995-2015



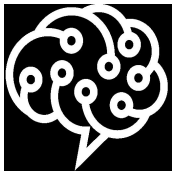
Note: Rates have been adjusted for reporting delays using delay ratios from the SEER 18 registries.  
Sources: NAACCR, 2018.

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# SKIN CANCER FACTS & STATISTICS CONTD..

- U.S. more skin cancer diagnoses than all other cancers combined (e.g., basal cell carcinoma (BCC), squamous cell carcinoma (SCC))
- Annual cost of treatment:
  - ~\$8.1 B (~\$.48 B non-melanoma, ~\$3.3 B melanoma)
  - ~\$343.1 M attributed to indoor tanning
- Organ transplant patients 100x more likely SCC
- Ozone level related (non-melanoma): ~90%
  - 5+ sunburns doubles melanoma risk



# SKIN CANCER FACTS & STATISTICS CONTD..

- **Melanoma estimates for 2019**

- ~7.7% increase in case diagnoses
- ~22% increase in melanoma related deaths
- ~7,230 deaths expected (4,740 men, 2,490 women)

- **Invasive melanoma case diagnoses (2008-2019)**

- ~54% increase/annually

- **Treatment of stage I melanoma**

- <30 days of biopsy
- 30-59 days of biopsy: 5% higher risk of death
- >199 days of biopsy: 41% higher risk of death

- **Survival rate**

- 92% avg. 5-year survival rate
- 98% avg. 5-year survival rate for early detection
- 64% when lymph nodes are reached
- 23% disease metastasizes to distant organs



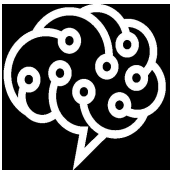
# EXISTING ALTERNATIVES IN THE MARKET & UNMET NEEDS

## Apps – e.g., VisualDX, SkinVision

- Not designed for continuous monitoring
- Some are “Awareness raising” apps
- Even where the technology is efficient, if it has not been combined with specialist input from a dermatologist, it may not pick up on all red-flag symptoms – missing the learning loop.

## Doctors –

- Limited practice in treating skin cancer patients
- Human error (false +ve/-ve)



# OUR SOLUTION

**Tools used** - Google Cloud Platform  
– AutoML, Vision API, Cloud Storage

## Training -

- We performed preliminary Training with 200 images
- Additional training time required to train with the entire data set



Image fed to our model

```
1 {
2   "id": "5436e3acbae478396759f0d1",
3   "modelType": "image",
4   "created": "2014-10-09T19:36:12.070000+00:00",
5   "creator": {
6     "id": "5450e996baa47865794e4d0d",
7     "name": "User_6VSN"
8   },
9   "dataset": {
10    "accessLevel": 0,
11    "id": "5a2ec5e1165975c945942a2",
12    "description": "Moles and melanomas.\nBiopsy-confirmed melanocytic lesions. Both malignant and benign lesions are included.",
13    "license": "CC-0",
14    "name": "UDA-1",
15    "updated": "2014-11-10T02:39:56.492000+00:00"
16  },
17  "meta": {
18    "acquisition": {
19      "image_type": "dermoscopic",
20      "pixelsX": 1022,
21      "pixelsY": 767
22    },
23    "clinical": {
24      "age_approx": 30,
25      "anatom_site_general": "anterior torso",
26      "benign_malignant": "benign",
27      "diagnosis": "nevus",
28      "diagnosis_confirm_type": null,
29      "melanocytic": true,
30      "sex": "female"
31    }
32  },
33 }
```

Metadata of the image

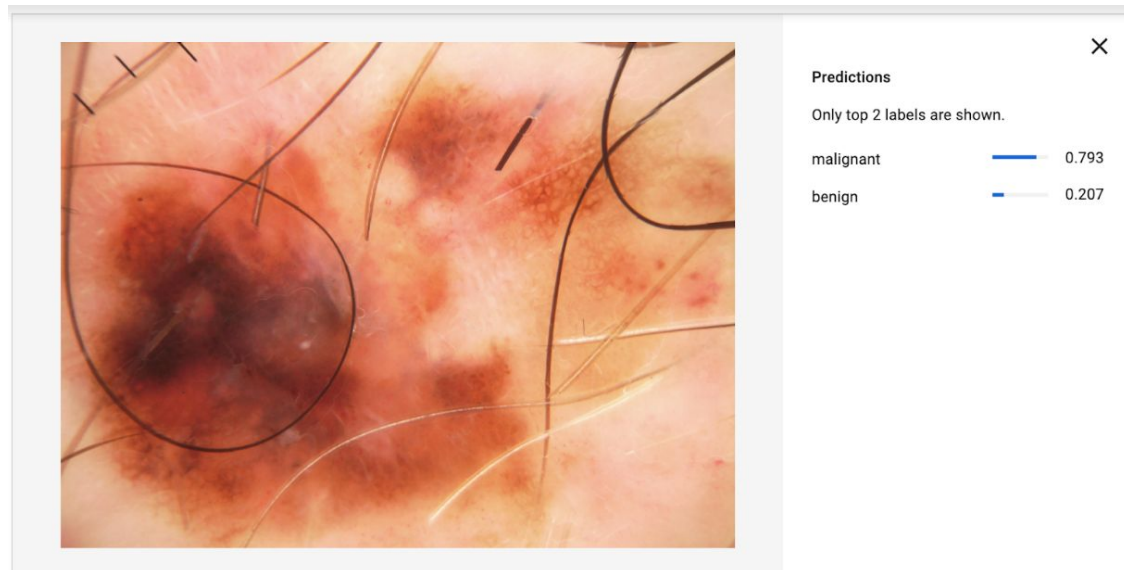
## Process –

We uploaded a new image not seen by AutoML during training.

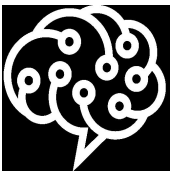


## Evaluation –

The image shows the probability of malignancy as seen.



Output of our Solution





# APP – HEALTHY SKIN AI

Home | Account | Articles | Medical Providers

## Healthy Skin AI

User Name/Mobile #:


Password:

Location:

Country:

Language:

ADA:



Home | Account | Articles | Medical Providers

## Healthy Skin AI

Gender:

Date of Birth:

Eye Color:

Hair Color:

**Medical History:**

You:

Your Family:

**Sun Tanning Preferences:**

Frequency:

Past Sun Burns:

Sun Lotion's SPF:

Home | Account | Articles | Medical Providers

## Healthy Skin AI

Today's Date:

Resolution of Image:

Body Location:

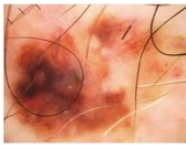
First Observation:

First Submission:



Home | Account | Articles | Medical Providers

## Healthy Skin AI



Evaluation Feedback:

Key:

Share:

Medical Providers:

Archive This Lesion:

Home | Account | Articles | Medical Providers

## Healthy Skin AI

Your or Preferred ZIP:

Provider comparison:

Treatment:

Your estimated co-pay:

Estimated costs without insurance :

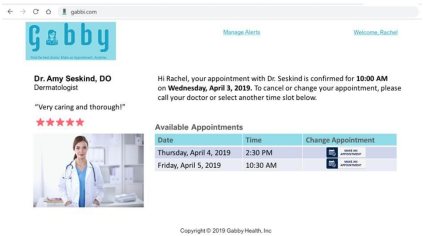
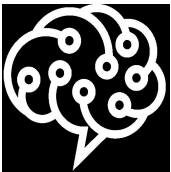
Page 1 - UserInfo

Page 2 – Medical History

Page 3 – Skin Image

Page 4 – App results

Page 5 – Provider info



# UNIQUE VALUE PROPOSITION

## User

- Registration with user's mobile #
- User account allows updating profile
- Allows frequent monitoring & comparison of individual moles
- Privacy (e.g, PII, GDPR)

## App

- Trained with 23K images + continuous learning
- Improves intelligence due to Network effect
- Combines cutting edge Google AutoML with latest data to accurately predict skin cancer



# REFERENCES

Darknet  
<https://pjreddie.com/darknet/>

International Skin Imaging Collaboration  
<https://www.isic-archive.com/#!/topWithHeader/onlyHeaderTop/gallery>

Lean Canvas  
<https://leanstack.com/leancanvas>

The School of AI  
<https://www.theschool.ai/>

Skin Cancer Foundation  
<https://www.skincancer.org/>

UN Sustainability Developmental Goals 2030  
<https://www.un.org/sustainabledevelopment>

<https://cloud.google.com/vision/automl/docs/beginners-guide>

<https://medium.com/@dstepp2/using-gcp-automl-vision-to-predict-firearm-make-model-from-ballistic-images-55a7ca6086db>

<https://cloud.google.com/vision/automl/docs/tutorial>

<https://www.sciencedaily.com/releases/2018/07/180705113940.htm>

