Skin Cancer Detection Using AI

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2020

About Me / Bio

- Mobile Communications Engineer by Day
- ML and Computer vision enthusiast by Night
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- Masters in Computer Inter-Networking UTS

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Agenda

1. **Intro & Overview**
   Melanoma Facts, Awareness
2. **Define our Challenge**
   Business Question, Data Question
3. **Data Process**
   Data ,EDA, Features, Modelling
4. **Recap our Challenge**
   Results and Review
5. **Conclusion & Next Steps**
   Conclusions , Next Steps
6. **Questions**

Melanoma Facts

- Melanoma , Cancer impacting skin pigment cells
- The third most common Cancer in Australia
- The most common Cancer affecting 15 to 39-year-olds
- According to ABS Melanomas caused 2,094 deaths in 2018
- In 2019 there were 15,229 cases of Melanoma

"In Australia, the annual estimated cost for treatment of melanomas was AU$201 million".

2017 Elliott TM, Whiteman DC, Olsen CM, Gordon LG. Estimated Healthcare Costs of Melanoma in Australia Over 3 Years
https://www.melanoma.org.au/

EARLY DETECTION MAKES A DIFFERENCE

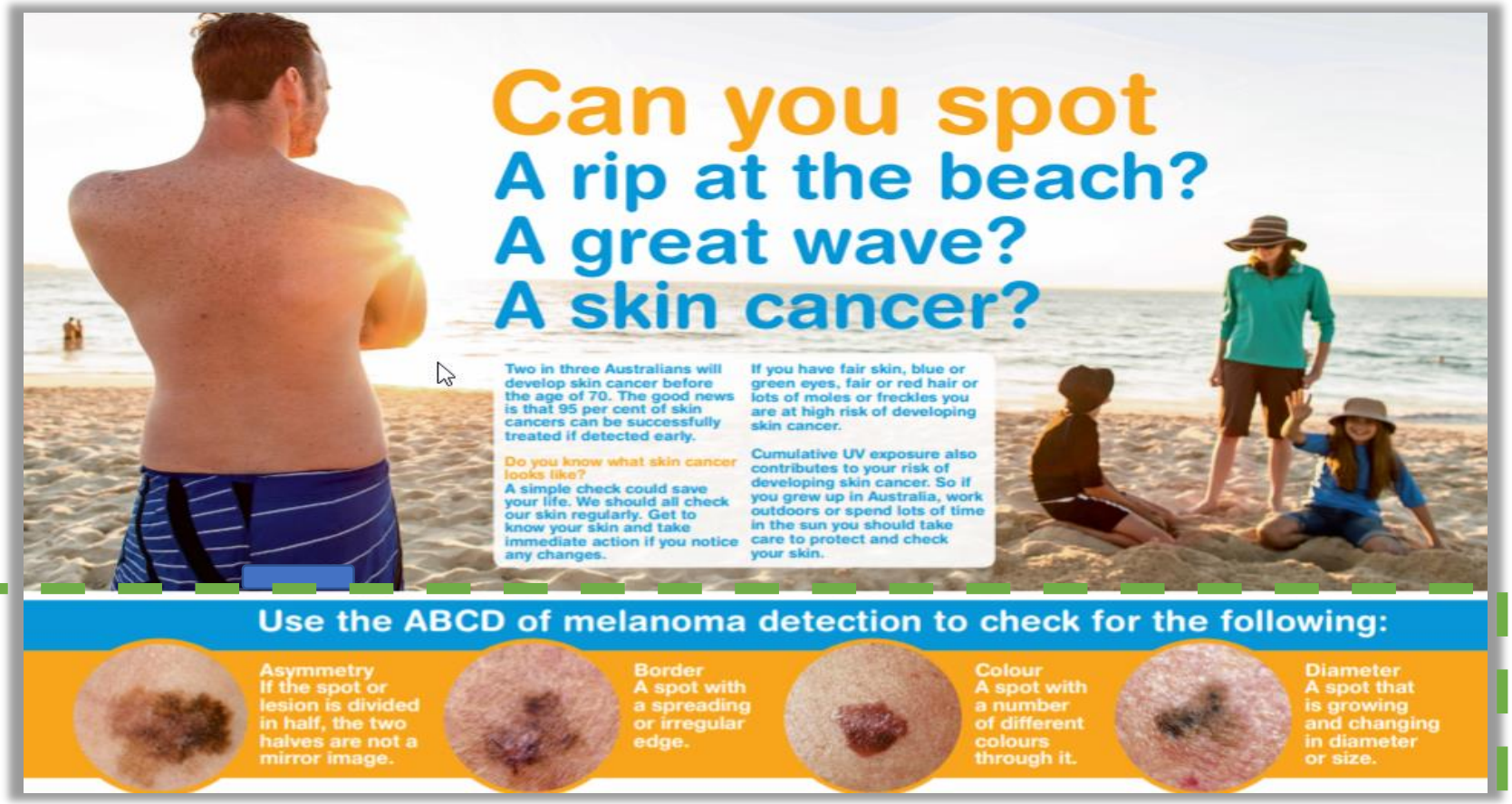
99%

5-Year survival rate for patients whose melanoma is detected early.

The Survival rate drops to 65% if the disease reaches the lymph nodes and 25% if it spreads to distant organs.

https://www.skincancer.org/

Awareness Campaign



AI Automation Opportunity !?

Published online 2019 Dec 31. PMCID: PMC6936633 PMID: 31921498

An Observational Study of Diagnostic Accuracy, found GPs Scored 79.9% & Dermatologist 87.5% on Sensitivity Score for Visually Detecting a Melanoma.

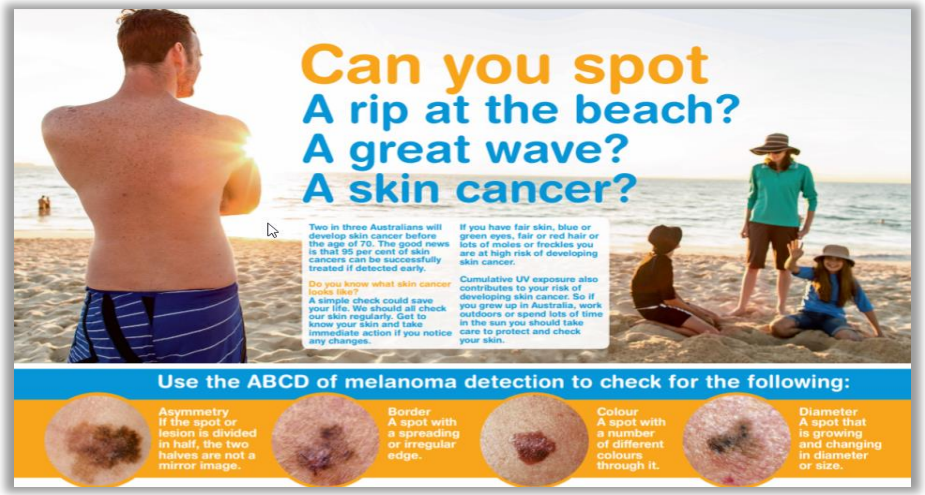
Our Challenge

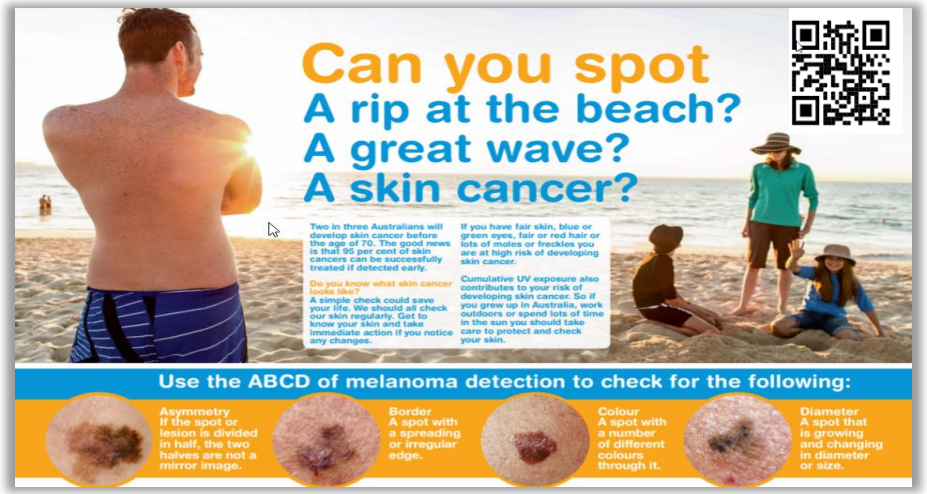
Business Domain

Can we use an AI Powered APP as part of the “Can you Spot” Campaign?

Data Domain

“Can we use Computer vision & ML to Detect Melanoma as well as the Human eye?”

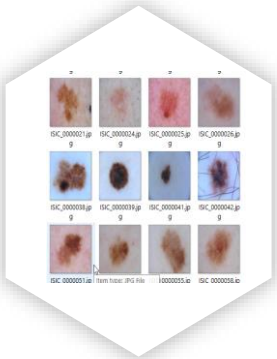




Data Process

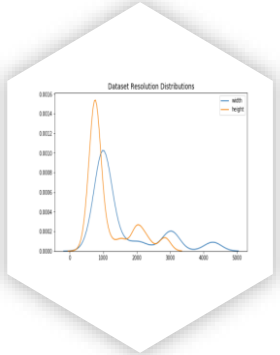
Data Questions

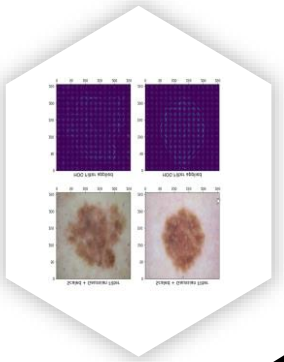
Business Question



Data Collection
& Research

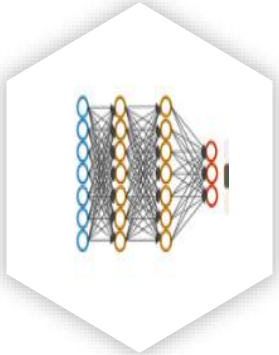
EDA





Feature
Engineering
Preprocessing

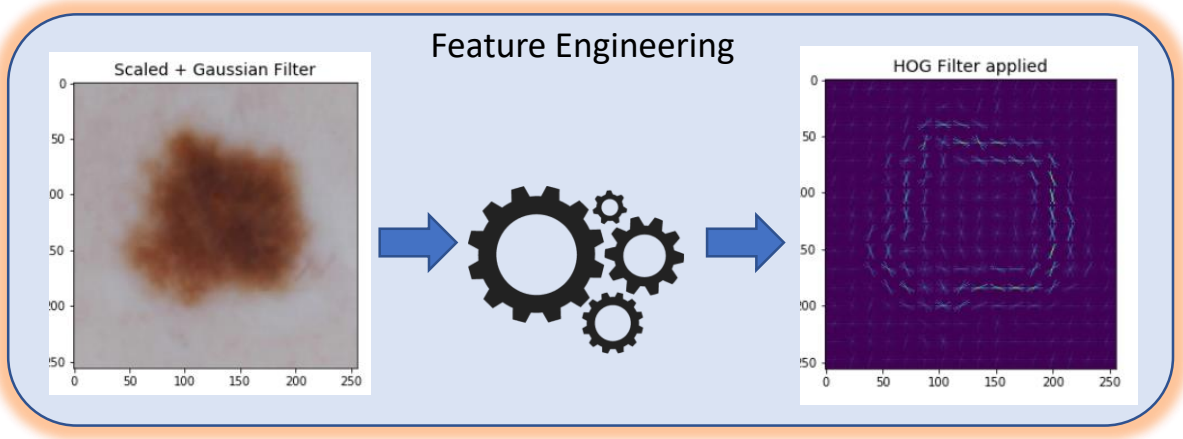
Modelling

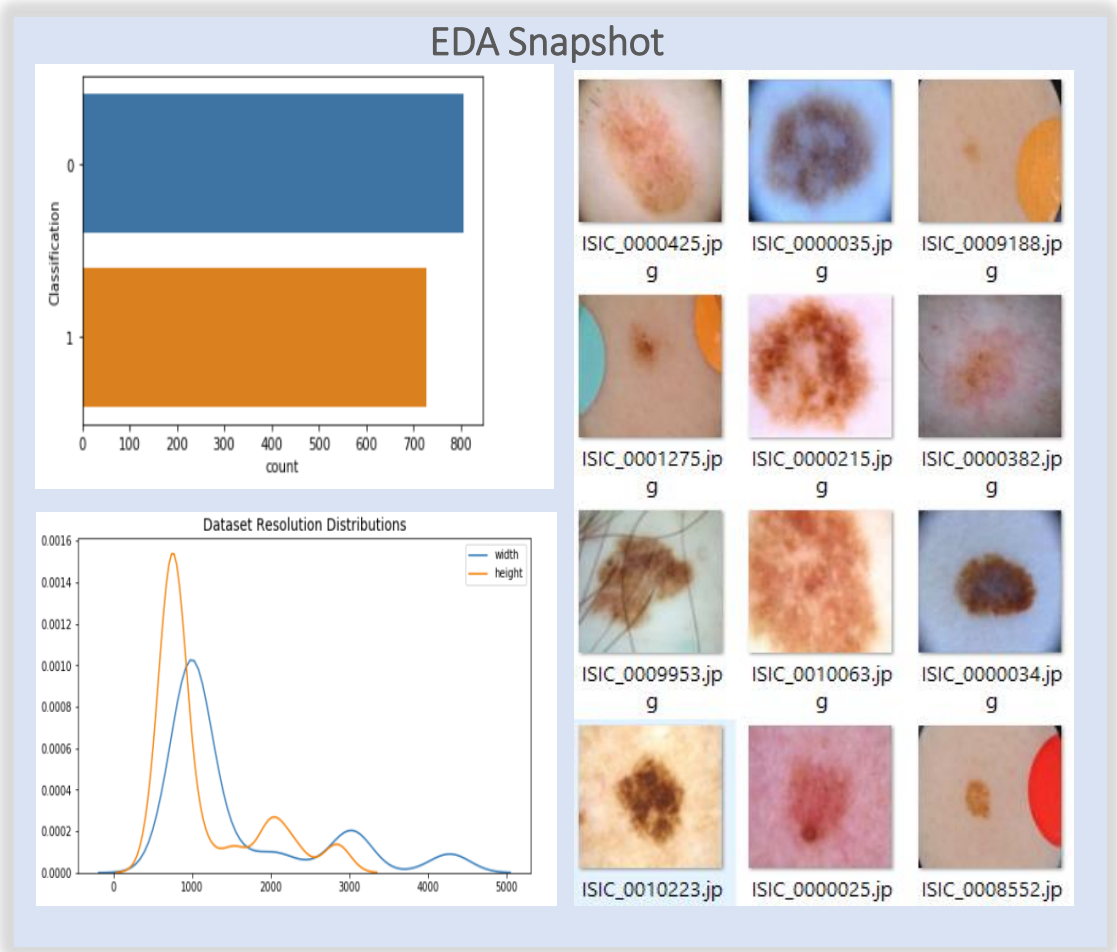


Testing & Validation

EDA & Feature Engineering

- Data Source: ISIC https://www.isic-archive.com/
- Total Images 1543
- Classification , Supervised Learning Models
- Scaled 256 x 256
- Filters & Cropping Applied

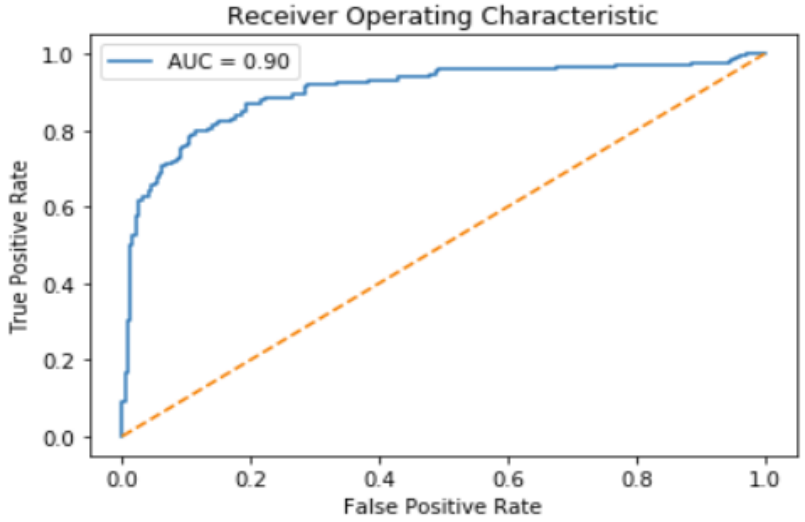




Modelling

Model I : SVM

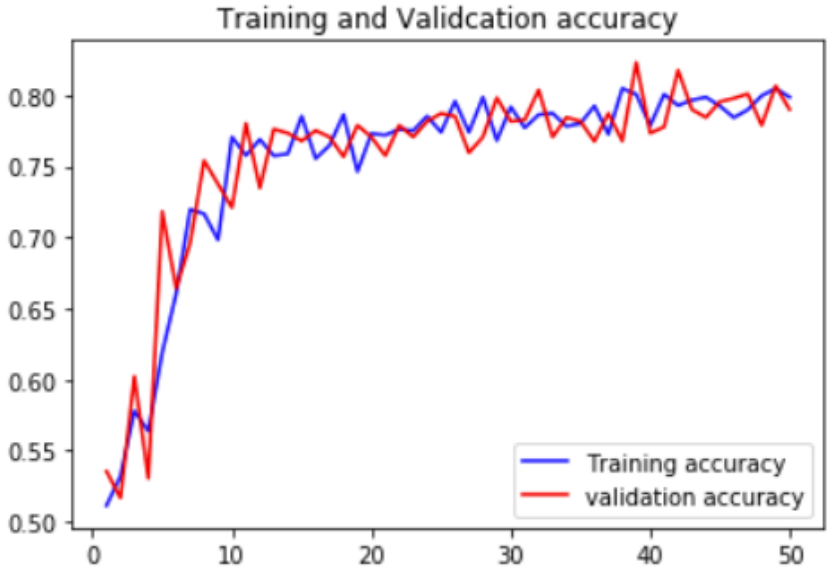
- Support Vector Machines + Principal Component Analysis **PCA**
- Some Feature Engineering. Based on the “ABCD”



Model	ACC	AUC	Sensitivity	Specificity
Model I	0.84	0.90	89.1%	78.7%

Model II : CNN 12 Layers

- Convolutional Neural Network
- No feature engineering applied beyond scaling



Model	ACC	AUC	Sensitivity	Specificity
Model II	0.86	0.87	94.2%	78.4%

Summary

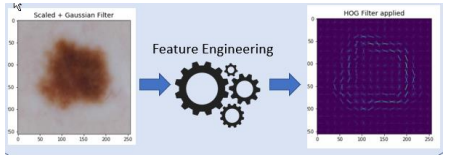
Challenge & EDA

- Melanoma is the third common Cancer in Australia

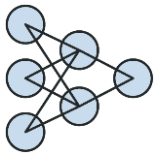
- Can we use an AI Powered APP as part of the "Can you Spot" Campaign?
- "Can we use Computer vision & ML Detect to Melanomas as well as the Human eye?"
- Data Sourced from ISIC and Resarch

Modelling

- Feature Engineering & Model Selection



- Tested 2 Models SVM & CNN



- Model II CNN had best result for our Data

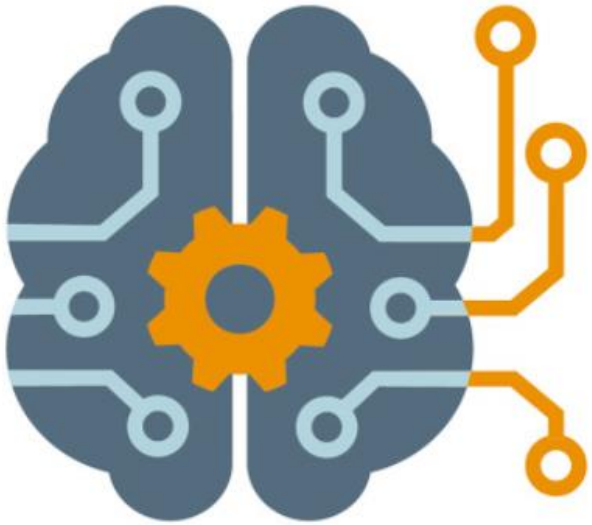
Model	ACC	Sensitivity
Model II	0.86	94.2%

Insights

- AI can Detect Melanoma
- Automation Potential
- Model deployment
  - APP , Web
  - Imaging centres

- APP Campaign more interesting
- Raises more Awareness
- Reduce Medical Costs from advanced stages
- Ease suffering.

Next Step



- Deploy Model as POC WEB APP, using Flask + API for E2E test.
- Collect more Data Samples from Smartphones to train Model.
- Investigate smartphone Camera APIs.
- Explore CNN layer feature visualisation in search of more insights.
- Seek feedback.

Thank You

"If I have seen further it is by standing on the shoulders of Giants.
— Isaac Newton"

References

https://pubmed.ncbi.nlm.nih.gov/28756584/
https://actcancer.org/
https://www.isic-archive.com/
https://www.cancer.org.au/
https://www.healthline.com/health-news/ai-may-be-better-at-detecting-skin-cancer-than-your-derm#1
https://www.statista.com/statistics/730101/australia-smartphone-ownership-by-age/
https://news.stanford.edu/2017/01/25/artificial-intelligence-used-identify-skin-cancer/

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