

Machine Learning-Powered Skin Cancer Detection System for Dermatology Department

EXECUTIVE SUMMARY

Our Data Science team has developed a ML powered system to support early skin cancer detection in the dermatology department. This solution **instantly analyses lesion images and flags high-risk cases, helping clinicians prioritize attention where it matters most**. It transforms our current manual workflow into a faster, smarter process that reduces diagnostic delays, improves patient safety, and expands care capacity **without requiring additional staff**.

Executive Summary of the Issue

The current screening process relies entirely on manual review, creating multiple clinical and operational challenges:

- **15% of early-stage cancers** are initially missed during routine triage
- **Diagnostic Pressure:** Experienced Dermatologists are better equipped to identify the reasons for skin lesions, but their experience comes with a price. Practitioners need to document high-definition images and analyse them individually before sending them for biopsy, which is time-consuming, especially when it's a false alarm.
- **Delayed diagnoses** increase treatment costs and legal risk

THE SOLUTION: SMART IMAGE TRIAGE

We've developed a diagnostic **tool** that analyses images and flags those most likely to be cancerous. It doesn't replace the doctor. Instead, it acts as a **digital assistant**, helping prioritize reviews and giving clinicians **more time for complex cases**.

This system empowers the dermatology team to work with precision, unlocks capacity, and significantly reduces the risk of missed or delayed cancer diagnoses.

Our ML solution reviews lesion images in **seconds**, providing:

- A **malignancy risk score** (0–100%)
- A **recommendation** for biopsy review
- Visual guidance for clinicians to support their assessments

SEAMLESS INTEGRATION with Clinical Workflow

Our ML system has been designed for immediate compatibility with existing infrastructure:

- **Total Body Photography Integration:** TBP will continue to capture high-resolution images of the entire skin surface and can be integrated with the Machine Learning system to identify cases in early stages.
- **Instant screening** – clinicians receive ML risk assessments and biopsy recommendations within seconds
- **Minimal training required** – 2 hours per clinician

This means there will be **no workflow disruption**. The system sits alongside our existing tools, supporting dermatologists in real time, flagging high-risk cases early, and enabling the department to **process more patients, faster**—without changing how they work.

PERFORMANCE RESULTS

We tested 10+ models on 7,818 real image cases. The model **VGG16** emerged as our recommended solution:

Metric	VGG16 Performance	Clinical Benefit
Cancer Detection Rate	93.4%	Catches 93 out of 100 cancers
False Alarm Rate	68%	Reduces unnecessary biopsies by 48%
Processing Time	<5 seconds	60x faster than manual review

BENEFITS - Immediate Impact:

- **Faster Screening:** Results available instantly vs. 7-10 days
- **Increased Capacity:** Process 4,000+ cases annually (67% increase)
- **Risk Reduction:** Identifies 74% of cancers vs. current 65%

IMPLEMENTATION:

1. **Pilot** it in our dermatology review pipeline (2 weeks to onboard).
2. **Compare AI flags vs clinician decisions**—refine the thresholds.
3. **Expand use** in triage and intake, freeing hours for every 100 cases screened.

RISK MANAGEMENT

- ML provides decision support only - final diagnosis remains with physician
- All high-risk cases automatically flagged for specialist review
- System performance continuously monitored with monthly quality reports
- Performance exceeds current diagnostic standards
- Compliant with medical device regulations

RECOMMENDATION

Proceed with VGG16 system deployment. The technology delivers immediate clinical benefits, and the system enhances (not replaces) physician decision-making, providing the dermatology team with powerful diagnostic support to improve patient outcomes.

Next Steps: Once approved by the board, a **clinical pilot** will start, where dermatologists can compare ML recommendations with their own assessments. This will validate the tool’s impact on **diagnostic speed, safety, and workflow efficiency**. Integration requires **minimal IT overhead** and no disruption to current processes.