Project Brief
Product-based Capstone Project

[SkinSense]

[Product Capstone]

Team ID : **C242-PS427**

Selected Themes/Case : Health Innovation: Empowering Vulnerable Communities for Hea...

Mentor Name : **M Rifqi Jundullah,** November 29, 2024 17.15-18.05
Arsy Opraza Akma, December 11, 2024 15.30-16.15

Member Name :

1. (ML) M117B4KY0818 – Bathara Bisma Saputra – Institut Teknologi Nasional Bandung - [Active]
2. (ML) M320B4KX0889 – Calista Valentina Shen – Universitas Surabaya - [Active]
3. (ML) M117B4KY3840 – Riffaldi Rahmat – Institut Teknologi Nasional Bandung - [Active]
4. (CC) C547B4NY1802 – Hubbal Kholiq Habbaza – UIN Sunan Gunung Djati Bandung - [Active]
5. (CC) C117B4KY2874 – Muhammad Hammam Mudhaffar – Institut Teknologi Nasional Bandung - [Active]
6. (MD) A547B4NY1680 – Haikal Mufid Mubarok – UIN Sunan Gunung Djati Bandung - [Active]
7. (MD) A547B4NY1700 – Handal Khomsyat – UIN Sunan Gunung Djati Bandung - [Active]

Project Brief
Product-based Capstone Project

BACKGROUNDER:

1. Machine Learning:
   Deep Learning: Development of a melanoma classification model in TensorFlow with a backbone for transfer learning from MobileNetV2. The pipeline will contain efficient preprocessing-image resizing, normalization, and data augmentation to make the model more robust. Use autotune to optimize data pipelines by caching, shuffling, and prefetching. The architecture leverages MobileNetV2 with a fine-tuning approach, unfreezing select layers for domain-specific adaptation, and adding a custom classification head.
   Early stopping will prevent overfitting during training, while accuracy and AUC are evaluation metrics for its robust performance evaluation. Also, it includes visualization for training dynamics and example augmented images to check the integrity and efficiency of the augmentation process. This will be an end-to-end work process with an optimized version of image classification with key considerations toward scalability and interpretability. The model fitting process resulted in an accuracy 95.09% and a loss of 0.1315 for the training dataset at step 20 epochs. For the validation accuracy rate is 93.91% and loss 0.1519.

2. Mobile Development:
   a. Core Features
      i. Real-Time Skin Analysis: Users can upload skin images captured via their device cameras or galleries. The images are sent to a cloud-based API that hosts the TensorFlow model for prediction. Results are fetched and displayed on the app in real-time, ensuring minimal latency and maximum convenience.
      ii. Save and Manage Scan Results: The app incorporates Room Database for local data management. Users can save their scan results, including detailed predictions and suggestions, for offline access. The saved results are neatly organized and can be reviewed anytime through a dedicated "Saved Results" section.
      iii. Detailed Result Presentation: Each scan result includes not just the prediction but also recommendations or insights to help users understand and address their skin condition. Results are displayed using an engaging and user-friendly design.
   b. Offline Functionality with Local Storage
      i. Room Database allows users to save scan results locally, making the app functional even without a constant internet connection. This

Project Brief
Product-based Capstone Project

ensures users can access previous scans and maintain a history of their skin health progression without relying on cloud connectivity.

c. Integration with Cloud-Based Machine Learning
   i. The app uses a RESTful API to interact with a cloud-hosted machine learning model deployed via TensorFlow. This decoupled architecture enhances scalability and keeps the mobile app lightweight. Image preprocessing (resizing and normalization) occurs on the cloud side, reducing the computational load on the device and improving app performance.

d. Modern UI/UX and Codebase
   i. Built using Kotlin, the app leverages ViewBinding for a clean and maintainable codebase. The interface prioritizes simplicity and accessibility, ensuring a seamless user experience across all devices. Features like RecyclerView enable easy navigation of saved results, while interactive buttons allow users to rescan or delete past entries.

3. Cloud Computing:

   a. Web Server (Express.js):
      i. RESTful API: This will handle HTTP requests and responses, providing endpoints for image uploads, model predictions, and data retrieval.
      ii. Authorization and Authentication: Secures the application using JWT for login and verification, with Bcryptjs for password hashing before storage.
      iii. TensorFlow.js (Tfjs-node): Runs TensorFlow models in Node.js for real-time server-side inference.

   b. Cloud Storage:
      i. Image Storage: This service will store user-uploaded images, making them accessible for model processing and retrieval.

   c. Cloud SQL (PostgreSQL):
      i. Data Storage: This managed database service will store structured data, such as user information, model training logs, and prediction results.

   d. Cloud Run:
      i. Serverless Deployment: This fully managed compute platform will deploy and scale your web server without requiring server management.
      ii. Backend Repository Integration: This ensures seamless deployment and updates from your version control system.

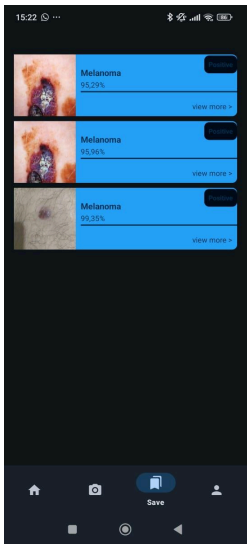
Project Brief
Product-based Capstone Project

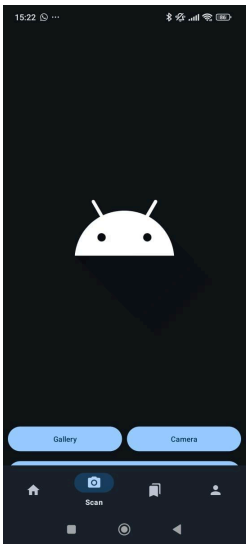
e. Identity Access Management (IAM):
   i. Security: IAM provides fine-grained access control to your GCP resources, protecting sensitive data and preventing unauthorized access.

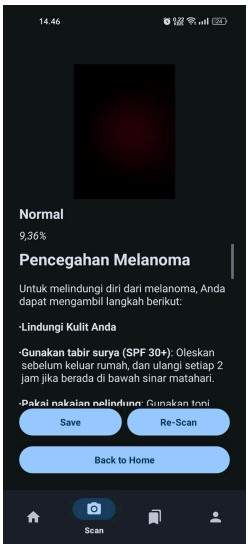
PROJECT STATUS:

100% Completed based on the Project Plan

SCREENSHOTS/DEMO VIDEO:







DATASET LINK:
[Melanoma vs Non Melanoma]

DEPLOYED LINK:
https://skinsense-be-63760737120.asia-southeast2.run.app

GITHUB REPO LINK:
https://github.com/habbazettt/SkinSense-App

10-MIN VIDEO PRESENTATION LINK:

Project Brief
Product-based Capstone Project

https://youtu.be/hQSx9nFZWtQ

SLIDE PRESENTATION LINK:
https://www.canva.com/design/DAGY4_OCMEY/cAISgKgVc1iy3pXpusZPhw/edit

GO-TO-MARKET PROPOSAL

a. TARGET MARKET

Age Range	18–60 years old
Profession	• Dermatologists, general practitioners, and healthcare professionals • Patients or individuals concerned about skin health.
Roles	• Healthcare Providers: Medical professionals who can integrate the model into their diagnostic workflows. • Health-conscious Individuals: People who want to monitor their skin health.
Specific Attributes or Interests	Interest in health monitoring and preventive healthcare
Hobbies	• Outdoor activities where skin health is a concern • Technology enthusiasts who explore health-related

- Why does your target market need your solutions?
  1. Purpose-driven
  2. Data-driven
  3. Government Reasoning
  4. Stakeholders related to and benefitted from your solutions

1. Purpose-driven	• To provide early detection of melanoma and improve survival rates through timely diagnosis. • Offers a convenient and accessible solution for skin health monitoring
2. Data-driven	• Model outputs are based on trained data from

Project Brief
Product-based Capstone Project

	real cases, providing credible results for users • Empowers medical professionals with an AI-powered assistant to enhance diagnostic accuracy.
3. Government Reasoning	• Supports public health initiatives by reducing the burden on healthcare facilities through early self-assessment tools.
4. Stakeholders related to and benefitted from your solutions	• Patients: Gain access to a tool that provides peace of mind and encourages proactive health management. • Healthcare Providers: Improved efficiency and accuracy in diagnosing skin-related conditions. • Hospitals and Clinics: Reduced workload on dermatology departments and better resource allocation.

b. MARKETING STRATEGY

We will position our app as an AI-powered tool for early skin cancer detection, highlighting its flexibility by allowing users to upload photos from their gallery and emphasizing its user-friendly design that makes skin health monitoring accessible to everyone. For digital marketing, leverage social media platforms like Instagram and TikTok for educational posts. Partnerships with dermatologist and cancer awareness organizations to expand credibility and reach.

c. COMPARISON WITH SIMILAR SERVICE/APPS (if any)

Comparison Point	Skin Sense	Skin Vision	Miiskin
Persistent Login	YES	YES	YES
Attractive UI/UX	YES	YES	YES
Prevention & Solution	YES	YES	YES
User History Tracking	YES	YES	YES
Photo Upload Flexibility (Camera & Gallery)	YES	NO	NO

Project Brief
Product-based Capstone Project

Free Access All Features	YES	NO	NO
Booking appointments with dermatologists	Future Feature	NO	NO

d. Sustainability: Profit Projection per Year

Format

No	Description	Total
INCOME		
1	Cash	0
2	Sales (penjualan)	10.000.000
3	Project (proyek)	10.000.000
4	Subscription (langganan)	0
5	Grants (hibah)	70.000.000
6	Soft Loan (pinjaman)	0
	Total Income (A)	**90.000.000**
EXPENSES		
A	**Additional Budget for Team Salary**	
1	Developer Salary	20.000.000
2	Marketing Team	5.000.000
B	**Additional Budget for Research/Ops**	
3	Operational Costs	5.000.000
4	App Development	20.000.000
C	**Marketing and Sales**	
5	Partnerships	10.000.000
6	Social Media Ads	10.000.000
	Total Expenses (B)	**70.000.000**
	Total Revenue (A-B)	**20.000.000**

Project Brief
Product-based Capstone Project

e. SWOT Analysis of the project

- **Strengths**

Strong model architecture	This project has utilized the work of MobileNetV2, a lightweight, high-throughput model for image classification, appropriate for being run on devices with less computational power.
Structured Dataset	The separation into train, validation, and test folders makes the whole process of training and evaluation simpler.
Scalable Deployment	Ensures the application can handle varying workloads efficiently, providing seamless performance during high-demand periods.

- **Weaknesses**

Dataset Dependence	The model's performance may be poor on a real-world dataset if the data set is not diverse or biased in some manner.
Deployment Complexity	MobileNetV2 is lightweight, in its original form, it is still not suitable for mobile or edge devices and requires further optimizations

- **Opportunities**

Collaboration with Healthcare Facilities	The model can then be tested and refined with real data from hospitals or medical institutions to expand its impact.

Project Brief
Product-based Capstone Project

- **Threats**

Collaboration with Healthcare Facilities	Poor quality images, with variations in light or conditions different from those in the training dataset, may lead to poor performance of the model.
Ethical and Privacy Issues	If the dataset contains real patients' data, there is a chance of a privacy breach if the data is not handled correctly.

MENTORING REMARK(S), IF ANY:

1. Advisor: M Rifqi Jundullah
   Date: November 29, 2024 17.15-18.05
   Highlight the features that have been obtained from the model. Try a different optimizer. Improve the data cleaning process. Try to use data samples to save training time.

2. Advisor: Arsy Opraza Akma
   Date: December 11, 2024 15.30-16.15
   Create a new VM, install postgreSQL on it to reduce billing cost, stop it when not in use. Try to use swagger for documentation.

Did the implemented capstone project differ from the original plan, and if so, how did these changes impact the project's success and outcomes?
Yes, the implemented capstone project did differ from the original plan, and these the changes impact the project's success and outcomes:

1. Switch from App Engine to Cloud Run:

- Change: The original plan suggested using App Engine for hosting, but the implementation used Cloud Run for serverless deployment.
- Impact: Cloud Run provided greater flexibility for containerized applications and efficient scaling based on demand. This allowed the application to handle workloads more dynamically and potentially reduced operational costs.SS

Bangkit 2024 Final Transcript

Generated : 3 January 2025

Bangkit ID	:	A547B4NY1680	Transcript Status	:	Final
Name	:	Haikal Mufid Mubarok	Bangkit Completion	:	Partial Graduate
University	:	UIN Sunan Gunung Djati Bandung	Learning Path	:	Mobile Development
NIM	:	1217050059	Capstone Team	:	C242-PS427
Supervisor	:	Nur Lukman, S.T., M.Kom.	Capstone Status	:	Finished

Courses/Specialization/Activities	Course Codes	Hours	Suggested SKS	Score (0-100)	Score (A-E)
Memulai Pemrograman dengan Kotlin	B24MDDC01	50	1	80.5	B
Belajar Membuat Aplikasi Android untuk Pemula	B24MDDC06	60	1	80.5	B
Belajar Fundamental Aplikasi Android	B24MDDC02	140	3	0.0	E
Belajar Pengembangan Aplikasi Android Intermediate	B24MDDC04	150	3	0.0	E
Belajar Dasar AI	B24MDDC08	10	2	72.0	C
Belajar Penerapan Machine Learning untuk Andorid Developer	B24MDDC09	60		78.5	B
Capstone / Final Project	B24CAPP01	212	5	85.6	A
Soft skill & Career Development	B24SSCE01	230	5	77.8	B
Total (Hours, SKS) / Average (Score)		**912**	**20**	**56.43**	D

Student's Attendance (Mandatory Meeting)	86.96%
Student's Attendance (All Meeting)	91.89%

1. This is Bangkit-system-generated transcript and valid without signature
2. This Transcript acts as a recommendation. Final Decision on conversion is strictly Academic Counselor / Study Programme Prerogative.

Grade conversion:

A : 85 - 100 **| B** : 75 - 84 **| C** : 60 - 74 **| D** : 50 - 59 **| E** : 0 - 49

Month	Activity	Count of Words	Feedback by Mentor	Verdict by Mentor
Month 1 6 Sep - 5 Oct 2024	It's been about a month since the start of the Bangkit Academy 2024 Batch 2 program, and I've learned a lot during this time, from new lessons to experiences, and even making new friends from other universities. During the opening of Bangkit 2024 Batch 2, there were many alumni who shared their inspirational and motivational stories, encouraging us to become better versions of ourselves. At the Bangkit technical briefing, they explained the learning stages and processes, as well as how we can succeed after graduating from Bangkit Academy. The Bangkit program itself aims to develop Indonesia's digital talent, equipping them with skills in AI and the latest technologies, while also offering a broad learning opportunity for students from various backgrounds. One of the key learning components is the ILT (Instructor-Led Training). The ILT covers a range of topics, including the development of our soft skills. For example, the first ILT focused on Growth Mindset and The Power of Feedback. During this session, we learned how to develop a growth mindset, shifting our thinking from "I can't do it" to "Why can't I do it?"—a mindset that enhances our ability to analyze and solve problems. We also learned how to give positive feedback, both in our words and	341 words		Approved
Month 2 6 Oct - 5 Nov 2024	On October 6, I started learning the basics of Android app development, covering fragments, navigation, threads, networking, and architecture components. While practicing, I implemented fragments for navigating between pages in a basic app. This helped me understand how fragments work and how to maintain user state. On October 7, I attended the ILT MD 02 session on Android Fundamentals: Layouting, Lists & Navigation, which gave me new insights on creating responsive layouts and managing lists and navigation more effectively. I then tried creating a dynamic list using RecyclerView, although managing large data sets was challenging. On October 18, during the ILT-SS-03-DJ session on Adaptability and Resilience, I realized my personal struggle with adapting to new environments. This session highlighted the importance of flexibility, especially in Android projects involving team collaboration. On October 23, I attended ILT-MD-03-AO, which covered Networking, Architecture Components, and Data Persistence. I experimented with Retrofit to retrieve data from an API but initially struggled with complex data structures. This led me to delve deeper into JSON parsing and data caching. On November 1, the ILT-SS-04-DO session on Critical Thinking and Problem Solving helped me improve my analytical skills for tackling technical issues. I felt	271 words		Approved
Month 3 6 Nov - 5 Dec 2024	On November 6, I attended the ILT-MD-04-AS: Applied Machine Learning for Android Developer session, which covered the implementation of machine learning in mobile applications. This session provided valuable insights into integrating machine learning algorithms into Android apps. On November 7, I participated in the 8th Weekly Consultation, which helped me gain a deeper understanding of the challenges faced during the Bangkit program. Then, on November 13, I joined the ILT-EN-133: Giving Effective Presentations session. This session taught me how to deliver an effective presentation, including identifying key points to discuss and avoiding unnecessary details. On November 14, I attended the 9th Weekly Consultation. Following that, on November 15, I joined the ILT-SS-05-DM: Project Management session, which explained how to manage tasks, time, and collaboration within a project. On November 18, I participated in the [Mandatory] Bangkit 2024 Batch 2 - Student Team Meeting 3, which focused on our team project's progress. The next day, November 19, I attended the ILT-MD-05-AI: Android Intermediate - Advanced UI, Animation, & Localization session, which covered more advanced topics in Android development. On November 21, I joined the 10th Weekly Consultation, followed by the 11th Weekly Consultation on November 28.	353 words		Approved

Month 4 6 Dec - 31 Dec 2024	On December 6, I continued working on our capstone project, which had reached about 70% completion. However, several factors required extra attention, slowing down our progress. Despite these challenges, we maintained steady momentum toward finalizing the application. On December 9, I participated in the ILT-MD-07-AC: Android Intermediate - Advanced Database & Firebase session, which focused on optimizing database usage for mobile developers. This session was particularly beneficial as it provided insights into managing data more effectively, which we implemented in our capstone project. On December 11, my capstone team and I attended our second mentoring session, which addressed cloud computing. We encountered a significant issue where our database token expired prematurely, causing delays in development. During the session, we discussed this issue in detail and received guidance on how to manage resources more efficiently to avoid similar problems in the future. On December 12, I joined the 13th Weekly Consultation, which centered on project progress and challenges specific to mobile development. I shared my experience of implementing Firebase and managing UI/UX components for the capstone project. The consultation helped refine our approach and address existing challenges effectively. On December	356 words		Approved