ML-based Face Morphing & Age Progression Application for a Leading Biopharma Company
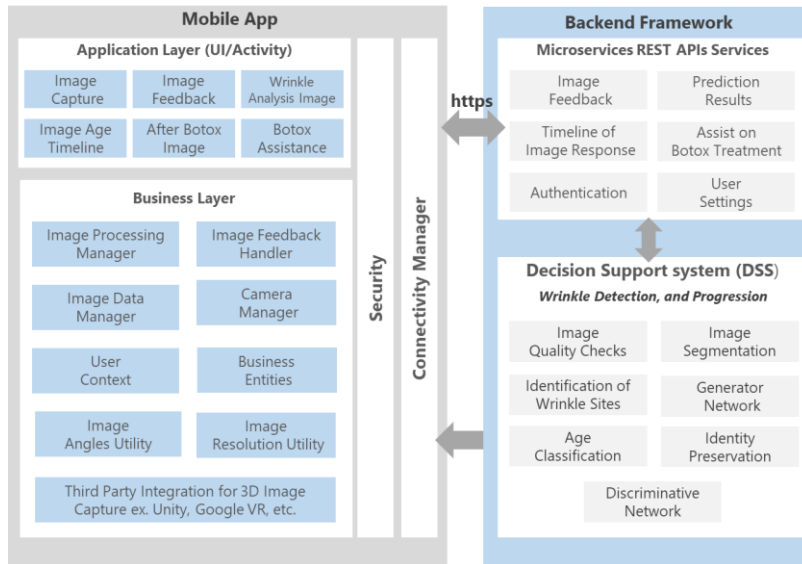
Client Requirement

The client is a leading US-based bio-pharmaceutical company focusing on specialty medicines and treatments. It wanted to provide its customers with a consumer-friendly application to make informed decisions on skin treatments. To meet this requirement, it needed to develop an algorithm that could localize subtle discontinuities/cracks in skin texture, caused by wrinkles, across various skin surfaces and skin tones. The algorithm was based on a deterministic approach, incorporating prior knowledge of wrinkles, and other factors, to generate a progression timeline with significant accuracy.

CitiusTech Solution

CitiusTech put together a team of domain-experts, data scientists, mobile developers, QA specialists and AI engineers to develop a mobile application and integrate it with back-end services using Machine Learning (ML) APIs. The team utilized public data-sets with clustering-based ML algorithms and statistical concepts for wrinkle measurement, pre-trained models for facial landmark detection, and GAN based models for age progression functionality.

Solution Highlights

- An iOS mobile application was developed and tested for face morphing. The mobile app can capture face image, show wrinkle analysis and provide face-image timelines

- Images were pre-processed on mobile using iOS APIs to control brightness, face angle, distance from camera, etc.

- A Python Flask framework used to integrate the ML functionality to the application.

- The region-of-interest detection algorithm achieved 90% accuracy, proven on 60+ unique images. IOU (Intersection over union) concept was used for evaluation.

- HDBSCAN clustering based algorithm, OpenCV filters were used for accurate wrinkle-scale measurement.

- Scale detection model was used to classify the glabellar region wrinkles into 4 classes based on severity.

- Random Forest classifier along with Gabor features used to accomplish hyper parameter tuning, using sklearn library.

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Solution Architecture

Mobile App

Application Layer (UI/Activity)

Image Capture	Image Feedback	Wrinkle Analysis Image
Image Age Timeline	After Botox Image	Botox Assistance

Business Layer

Image Processing Manager	Image Feedback Handler
Image Data Manager	Camera Manager
User Context	Business Entities
Image Angles Utility	Image Resolution Utility

Third Party Integration for 3D Image Capture ex. Unity, Google VR, etc.

Security

Connectivity Manager

https

Backend Framework

Microservices REST APIs Services

Image Feedback	Prediction Results
Timeline of Image Response	Assist on Botox Treatment
Authentication	User Settings

Decision Support system (DSS)

Wrinkle Detection, and Progression

Image Quality Checks	Image Segmentation
Identification of Wrinkle Sites	Generator Network
Age Classification	Identity Preservation
Discriminative Network	

Solution Architecture

Value Delivered

- Enabled patients to self-analyze wrinkle-stage and seek medical advice for treatment through remote consultation

- Leveraged a predictive algorithm to show age-progression images and improve outcomes

- Removed prediction bias by evaluating models against industry standard fairness metrics

- Provided an integrated solution for patient engagement, that focused on user empowerment and satisfaction

About CitiusTech

CitiusTech is a specialist provider of healthcare technology services and solutions to healthcare technology companies, providers, payers and life sciences organizations. With over 4,000 professionals worldwide, CitiusTech enables healthcare organizations to drive clinical value chain excellence - across integration & interoperability, data management (EDW, Big Data), performance management (BI / analytics), predictive analytics & data science and digital engagement (mobile, IoT). CitiusTech helps customers accelerate innovation in healthcare through specialized solutions, platforms, proficiencies and accelerators. With cutting-edge technology, world-class service quality and a global resource base, CitiusTech consistently delivers best-in-class solutions and an unmatched cost advantage to healthcare organizations worldwide.

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