



INNOVATING HEALTHCARE WITH AI

Certificate Programme



清華大學
Tsinghua University

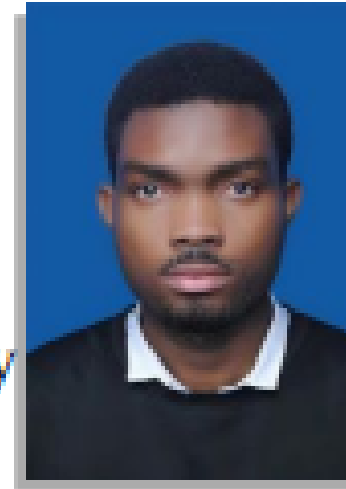
Course Title:

INNOVATION AND
ENTREPRENURESHIP FOR
DIGITAL ECONOMY

Group Members



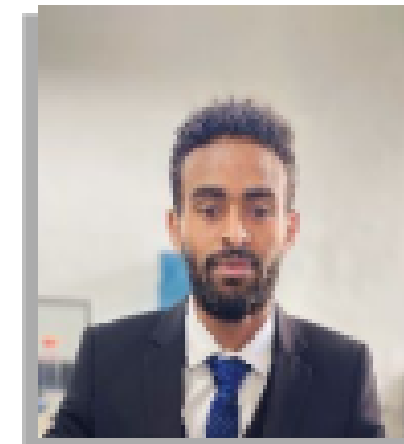
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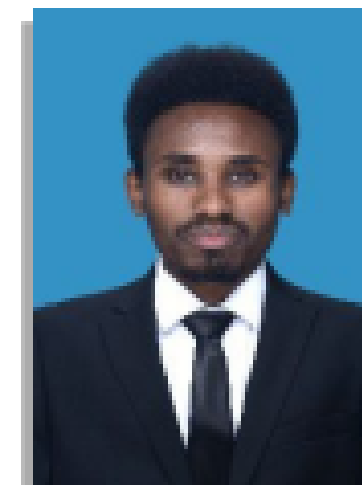
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PRESENTATION OUTLINE

- Background and Overview of Project
- Uses of AI in Healthcare
- Automating Disease Diagnosis Process
- Advantages of Using AI in healthcare
- Challenges and Solutions in Implementation of AI
- Automating Skin diseases diagnosis process

Background and Overview of Project

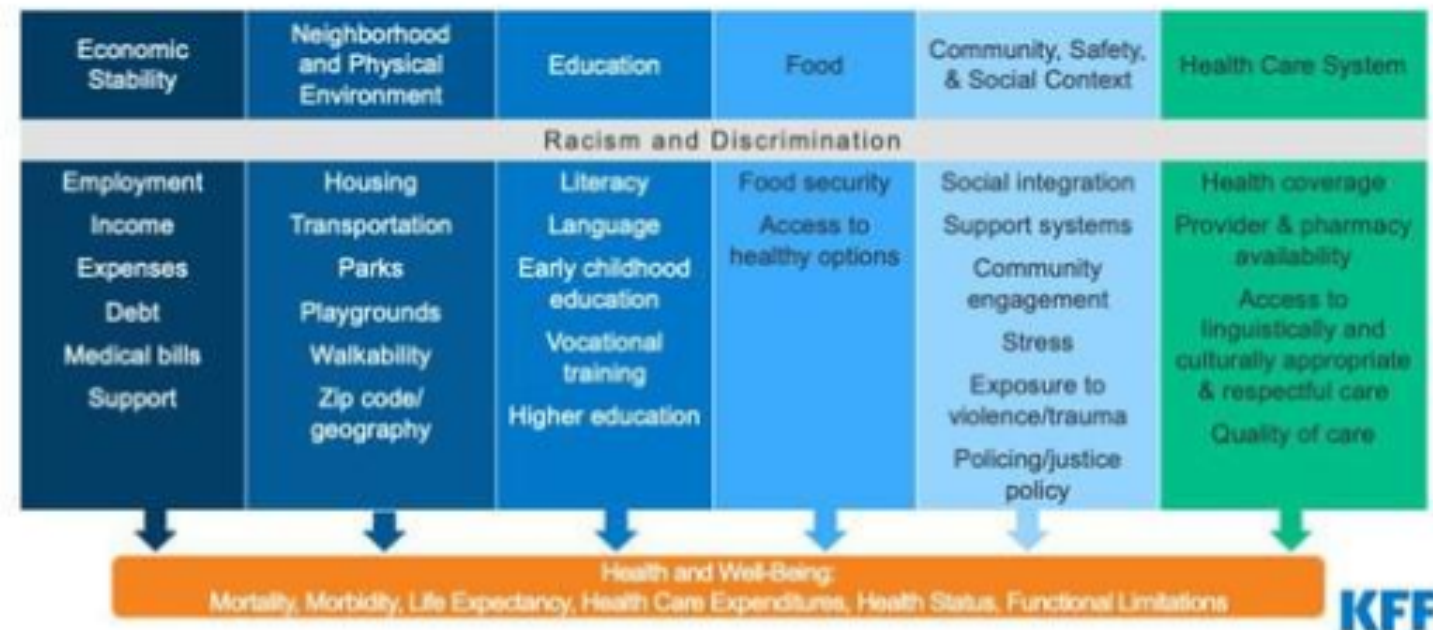
Problems of healthcare

8 Major Problems With the U.S. Healthcare System



1. Preventable Medical Errors
2. Poor Amenable Mortality Rates
3. Lack of Transparency
4. Difficulty Finding a Good Doctor
5. High Costs of Care
6. Lack of Insurance Coverage
7. Nursing and Physician Shortage
8. Inefficiencies

Figure 1

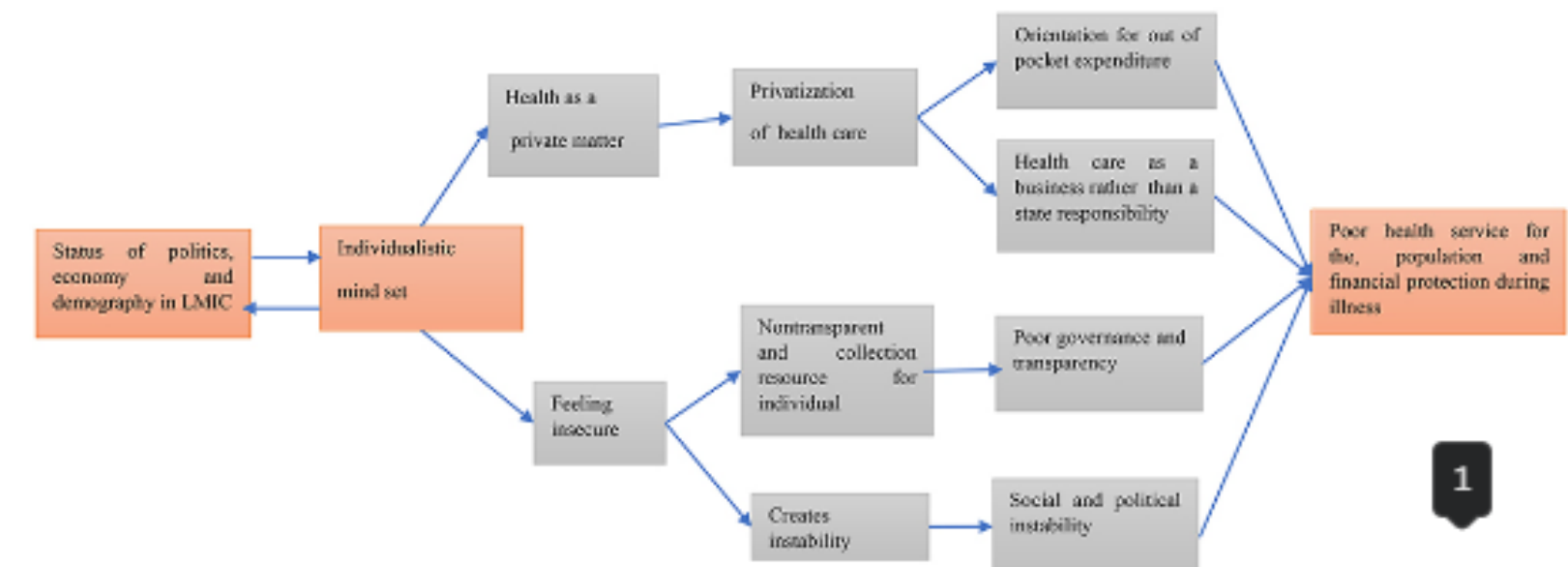
Health Disparities are Driven by Social and Economic Inequities



Personalized Medicine

CURRENT SICK-CARE SETUP	FUTURE HEALTH DELIVERY	PRECISION + PERSONALIZED MEDICINE
Treating SICKNESS	Focussing on PREVENTION	Customization of healthcare with medical decisions, treatments, practices or products being tailored to the individual patient
Procedure based REIMBURSEMENT (no procedure, no reimbursement!)	Value (Outcome) based REIMBURSEMENT	VALUE BASED HEALTHCARE  $\text{VALUE} = \frac{\text{HEALTHY}}{\text{COST}}$ <p>Healthcare providers are compensated for the health and well-being of their patient population rather than for services rendered</p>
Evidence based Medicine with a one-size fits all approach	PERSONALIZED MEDICINE	PATIENT CENTRIC HEALTHCARE  <p>Prioritize patient outcomes and meet consumer expectations for on-demand care delivered on THEIR terms.</p>
Lots of INVASIVE Therapies	Focus on MINIMAL-INVASIVE THERAPIES	
Treatment / Healthcare provision is CENTERED around the PROVIDER	PATIENT CENTRIC MEDICINE	

Poor Health service



Artificial Intelligence in Healthcare

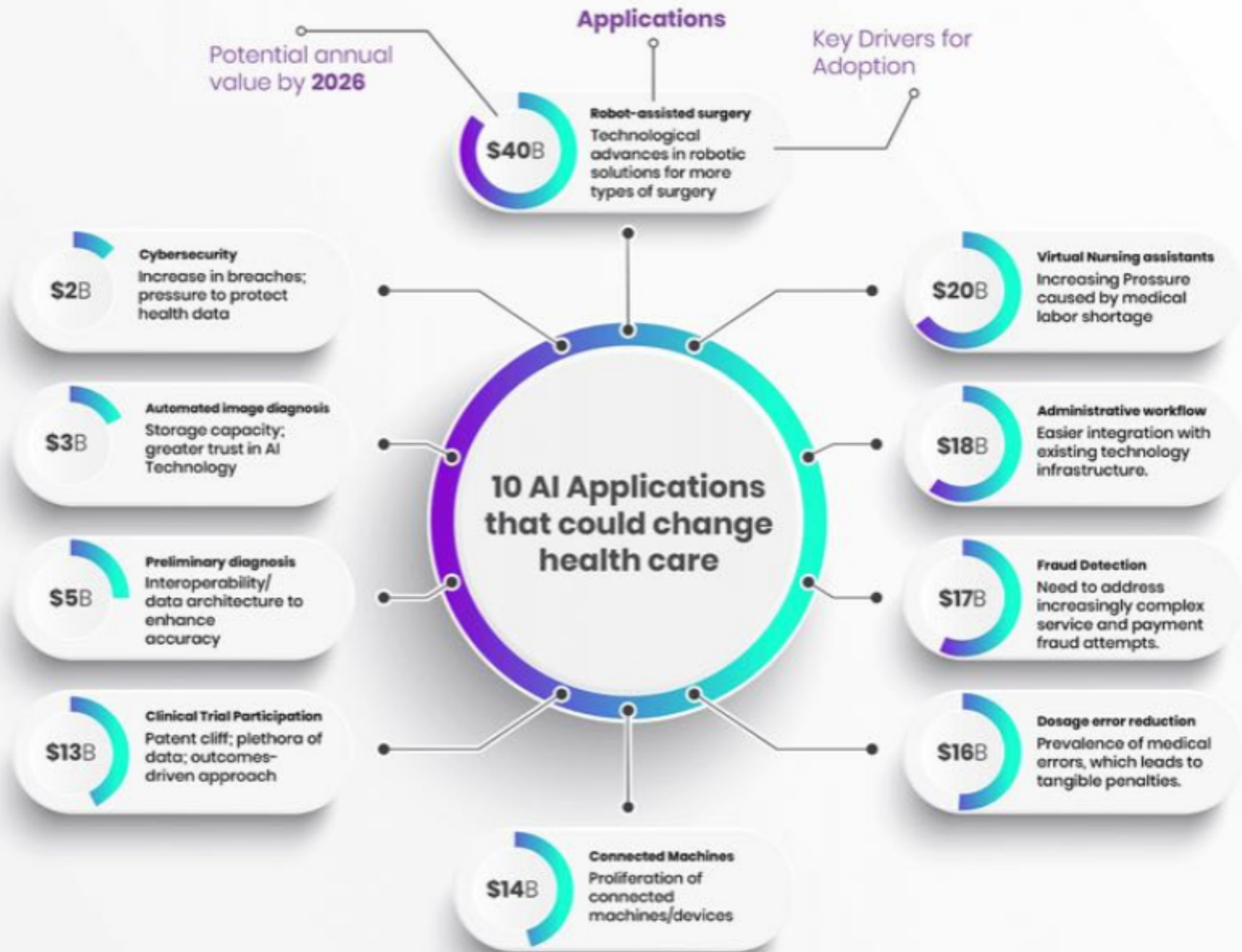
Studies by **accenture** predict that growth in the AI healthcare space is expected to touch \$6.6 billion by 2021 with a CAGR of **40%**



“The new technology aims to enhance interactions between patients and caregivers to both improve the consumer experience and reduce physician burnout.”

AI also holds promise for **helping** the healthcare industry **manage costly back-office problems and inefficiencies**. Activities that have nothing to do with patient care consume over **51%** of a **nurse's workload** and nearly **16%** of **physician activities**.

AI-based technologies, such as **voice-to-text transcription**, can **improve administrative workflows** and **eliminate time-consuming non-patient-care activities**, such as writing chart notes, filling prescriptions, and ordering tests. It is estimated that these **applications** could **save** the industry **\$18 billion annually**.



Artificial Intelligence in Healthcare can be deployed across these use cases



Virtual Assistants for Staff



Robot-Assisted Surgery



Automated Image Diagnosis with AI/ML



AI in Pathology



Personal Health Companions Powered by AI



Rare Diseases Detection with AI



Oncology – Detecting Cancer with AI



Cybersecurity Applications of AI in Healthcare



AI-Powered Chatbots



Medication Management with AI and ML



Robots for Explaining Lab Results



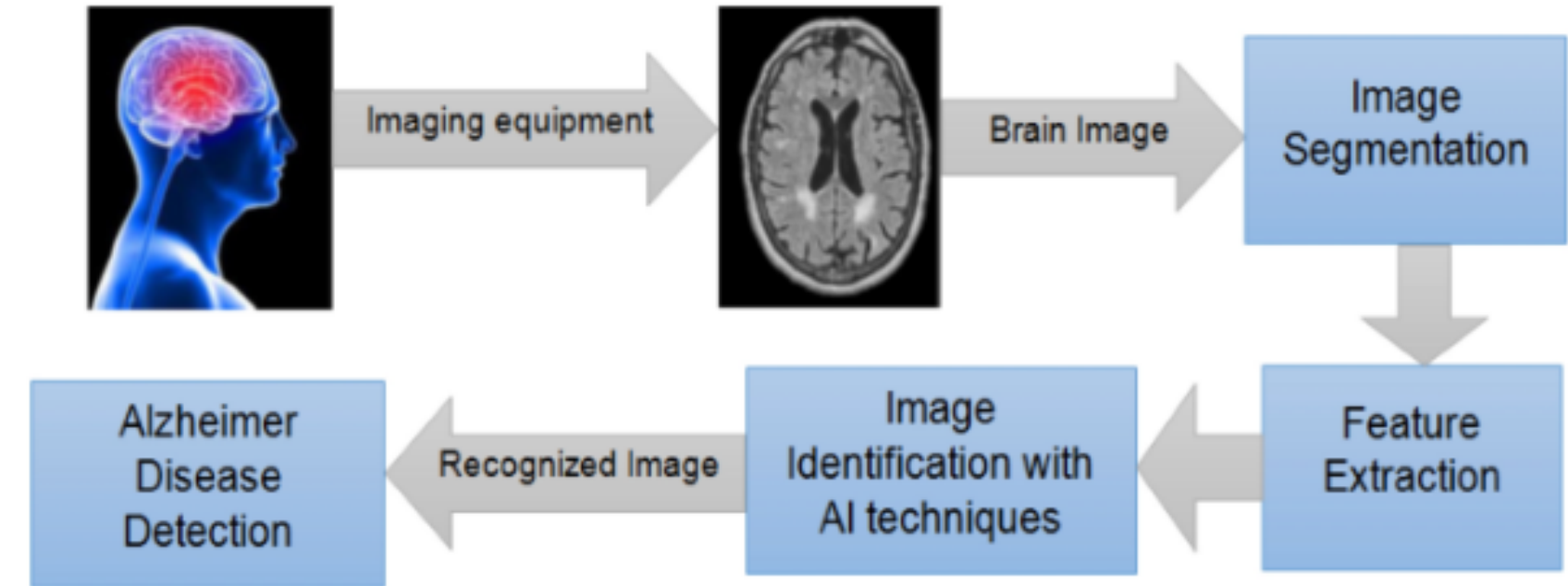
Health Monitoring with AI and Wearables



AI chatbots in healthcare will be a **crawl-walk-run endeavor**, where the easier tasks will move to chatbots while **awaiting the technology** to **evolve** enough to **handle more complex tasks**

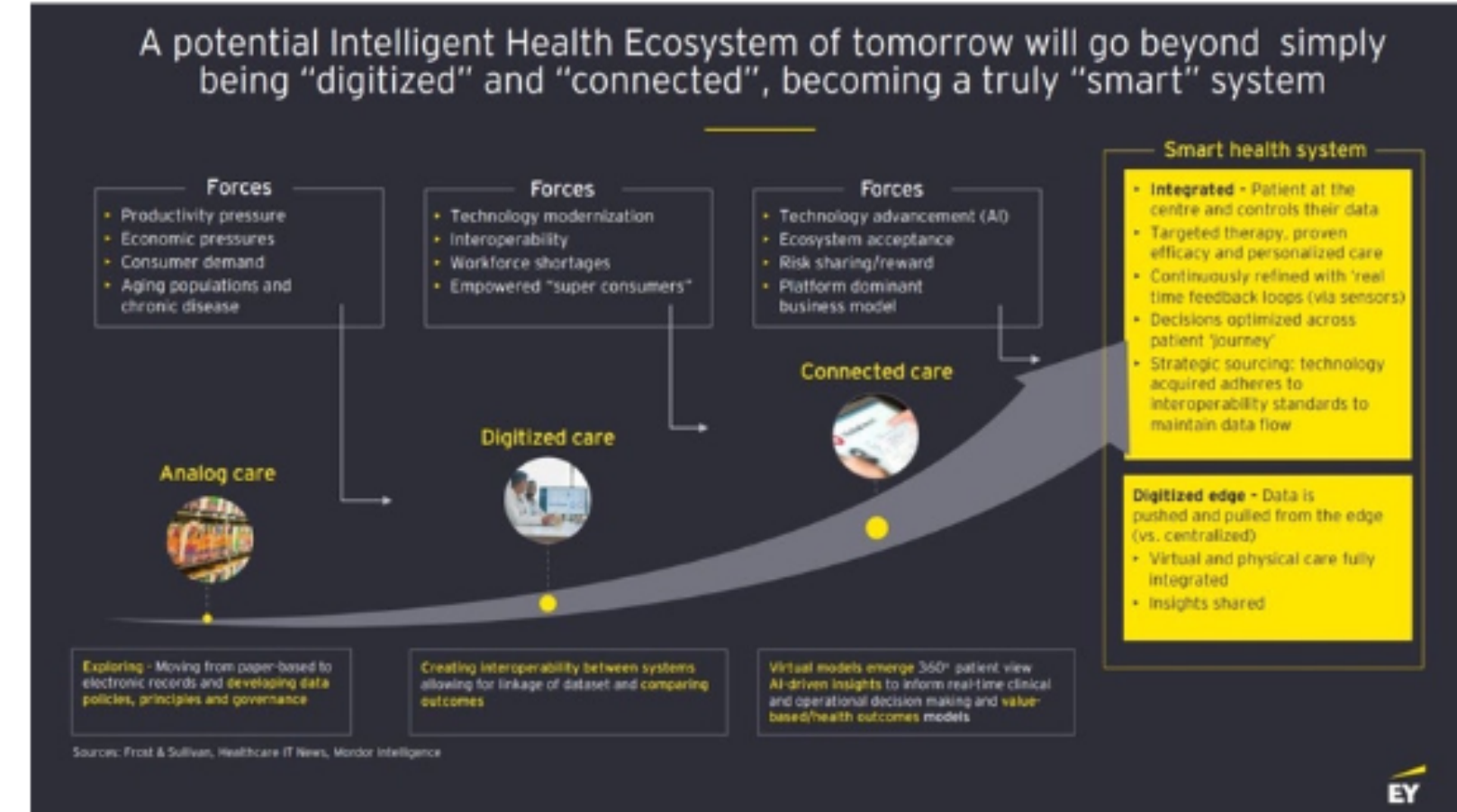
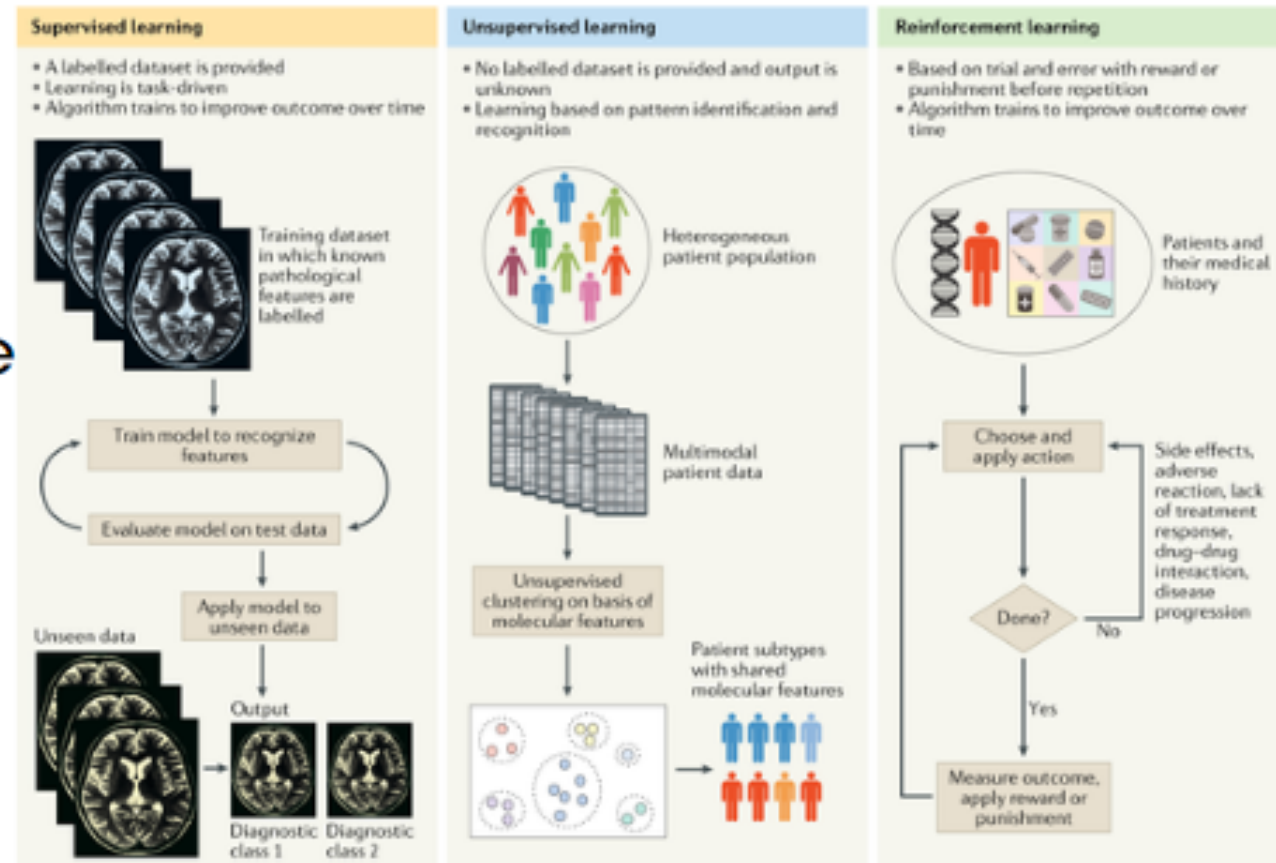
Automating Disease Diagnosis Process

Diagnostic process	Traditional	Automatic	Examples
History Taking	Doctors taking history	Chatbots or Symptom checkers to take history	Symptoma WebMd symptom checker
Physical Exam	Doctor doing Physical Exam	AI assisted devices to do physical exam	Eko stethoscope Dermassist
Labs	Labs analyzed by doctors	AI algorithms to evaluate labs	Smart Blood Analytics Swiss
Diagnosis	Diseases diagnosed by doctor	AI algorithms to diagnose diseases	EndoScreener GI Genius
Treatment	Drugs prescribed by doctors	AI algorithms to prescribe drugs	
Follow Up	Doctor doing Follow up	Chatbots or symptom checkers to follow up	Your.MD Babylon Health

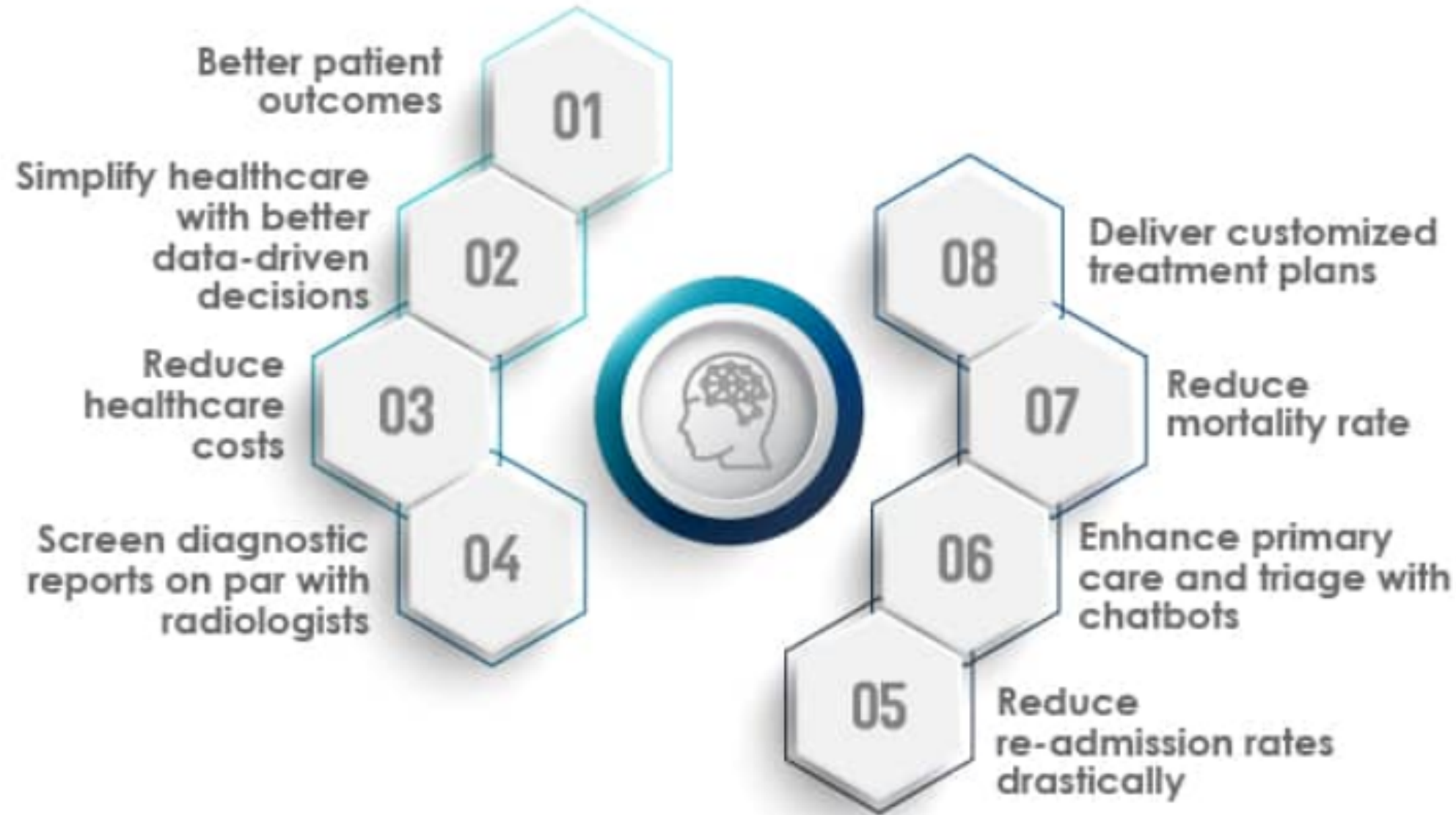


Future Health system design:

Diagnosing
Neurodegenerative
diseases



Advantages of AI in Healthcare



AI will not replace doctors but doctors who use AI will replace those who do n't
Berci Mesko

Challenges and Solutions of AI in healthcare



Gathering data

- › Challenge - data preparation
- › Solution - finding reliable data from patients' historical and current medical records



Maintaining compliance

- › Challenge - cyber security breaches and handling patient data
- › Solution - amalgamation of ai and blockchain to protect data



Identifying use cases

- › Challenge - complexity of different machines (X-ray machines, ECG machines, etc.)
- › Solution - build AI solutions that can be easily integrated with existing workflows



Eliminating black box

- › Challenge - difficult to understand how systems actually solve problems
- › Solution - bringing transparency in systems



Educating staff and patients

- › Challenge - lack of awareness of the potential of AI
- › Solution – creating awareness among patients and educating the staff

Implementing AI in Healthcare of developing countries: **PROBLEMS AND SOLUTIONS**

Lack of Infrastructure

Develop public-private partnerships to invest in infrastructure, leverage low-cost and open-source hardware and software solutions, and prioritize infrastructure development in policy and planning.

Lack of expertise

Develop training programs and capacity building initiatives, leverage remote learning and collaboration tools, and encourage partnerships and knowledge sharing with AI experts in other countries.

Cultural and social barriers

Engage with local communities and stakeholders to understand cultural and social perspectives on AI, tailor AI solutions to local contexts, and ensure that AI benefits are communicated and accessible to all members of society.

Limited access to data

Encourage data sharing and collaboration among institutions, leverage crowdsourcing and citizen science, and use transfer learning and data augmentation techniques to increase the amount and diversity of available data.

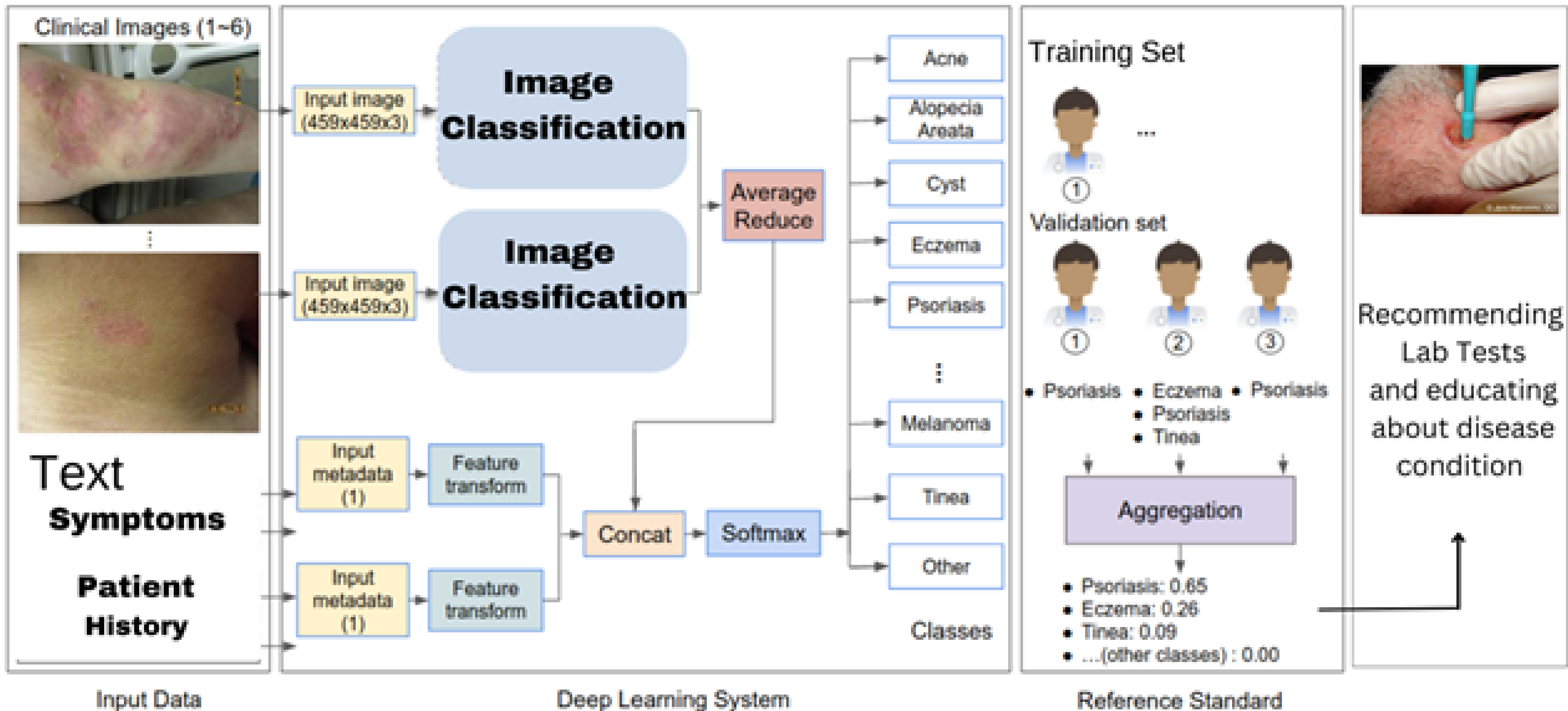
Cost and affordability

Prioritize funding and investment in AI development and implementation, leverage open-source and low-cost solutions, and consider public-private partnerships and collaborations to share resources and expertise.

Ethical and regulatory challenges

Develop and implement ethical principles and guidelines for AI use, leverage existing frameworks and guidelines from other countries, and encourage collaboration and partnerships with regulatory bodies and experts.

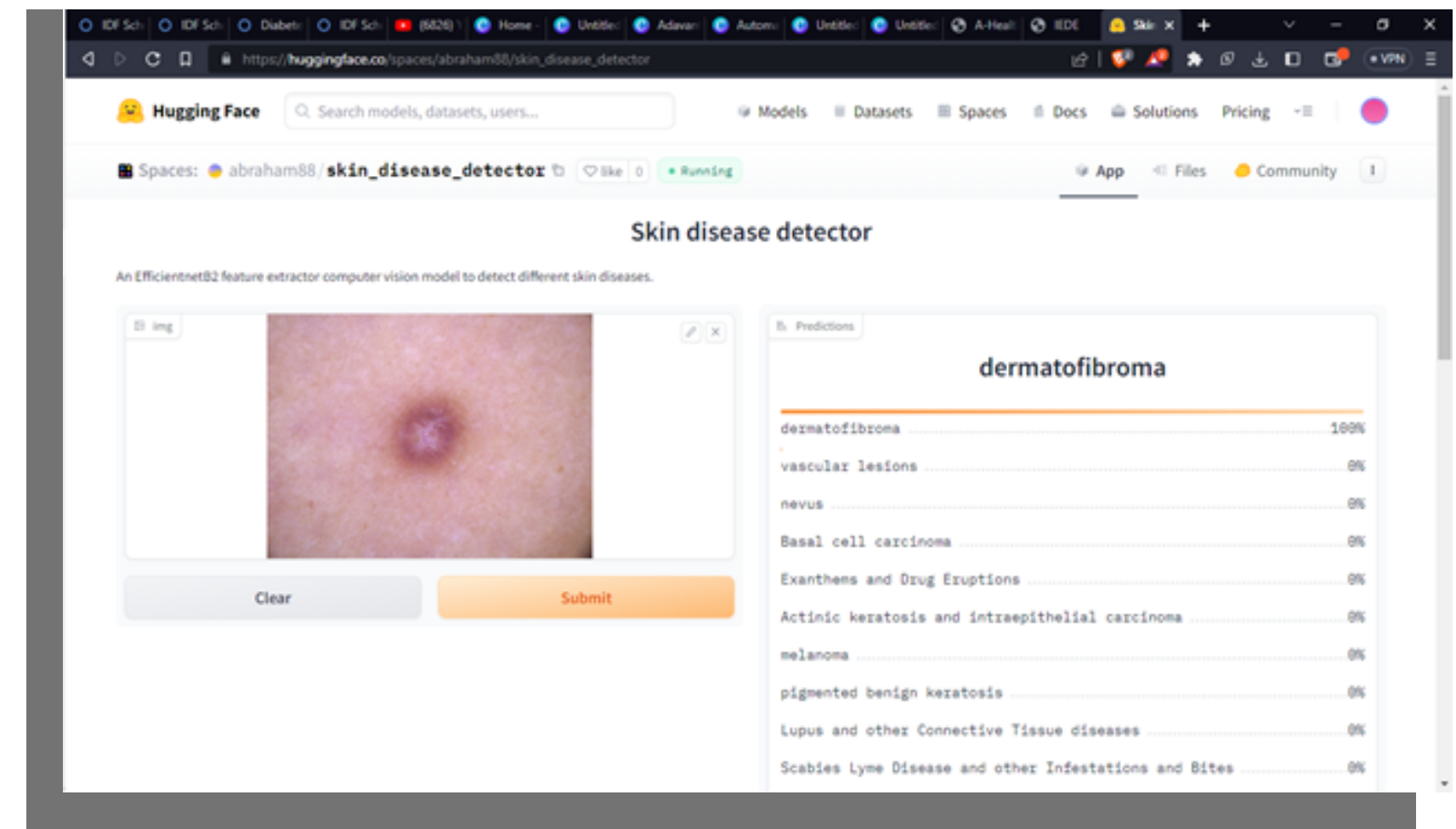
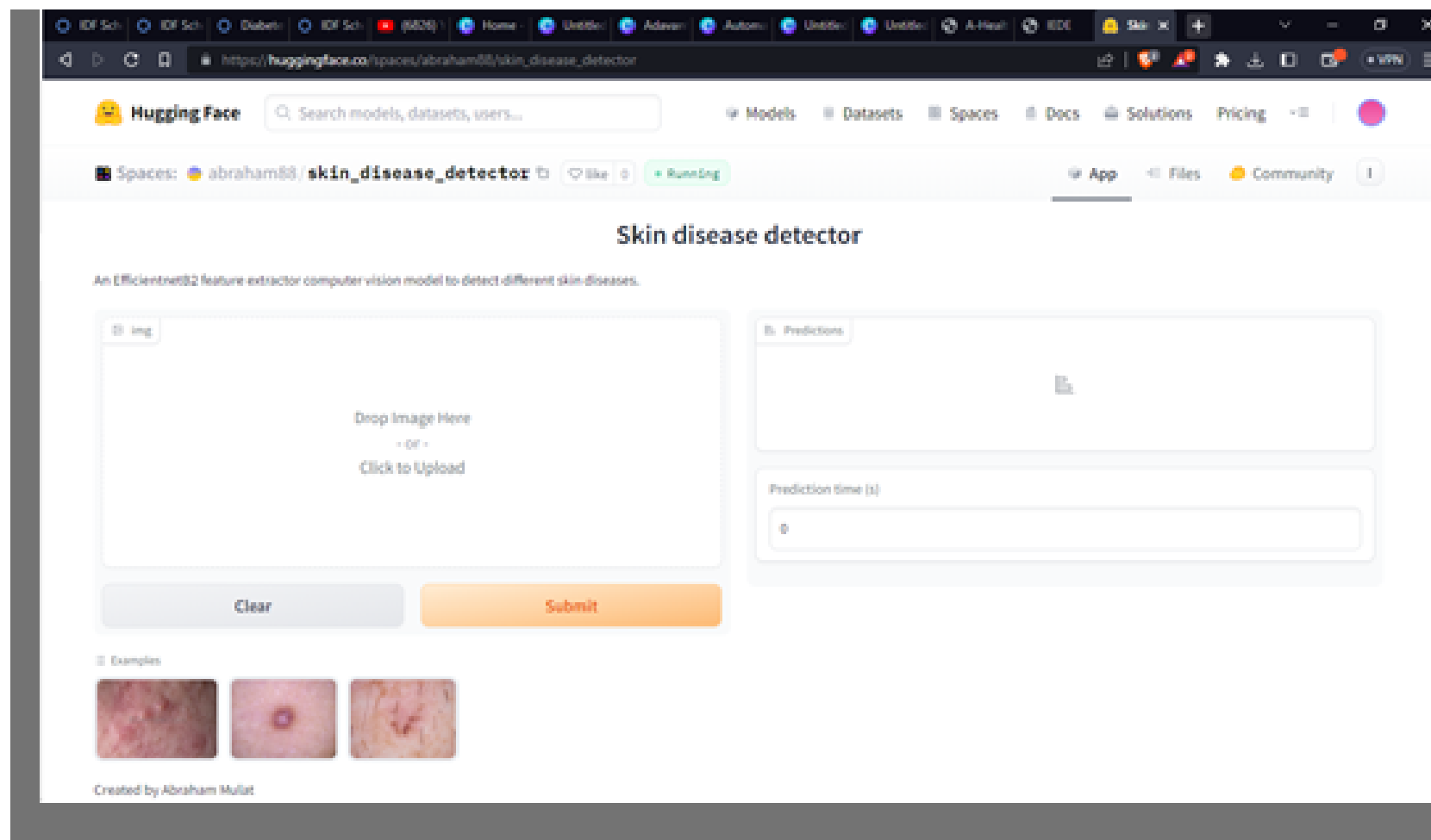
Automating Skin Diseases Diagnosis



Skin Diseases Diagnosis using image classification

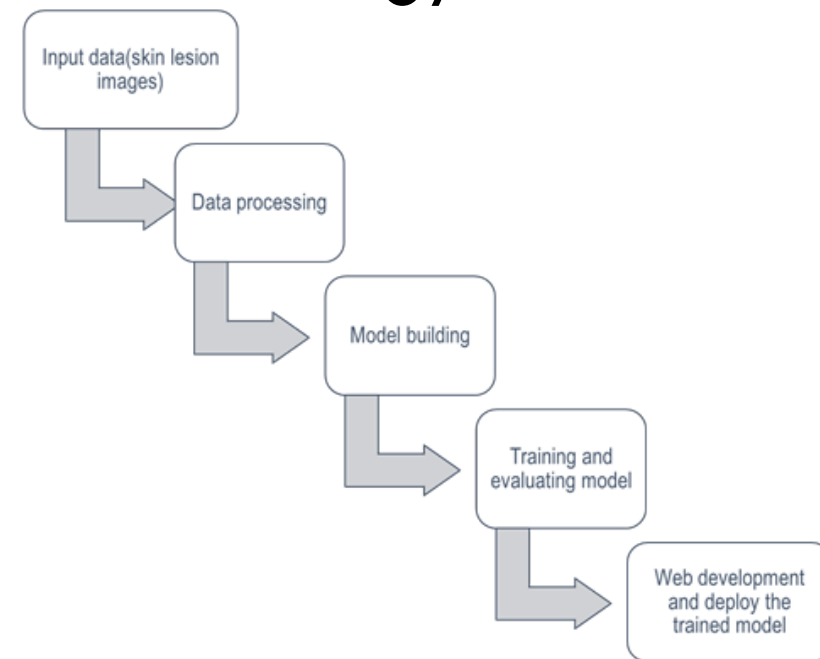
Working Prototype of Skin Diseases classifier

https://huggingface.co/spaces/abraham88/skin_disease_detector

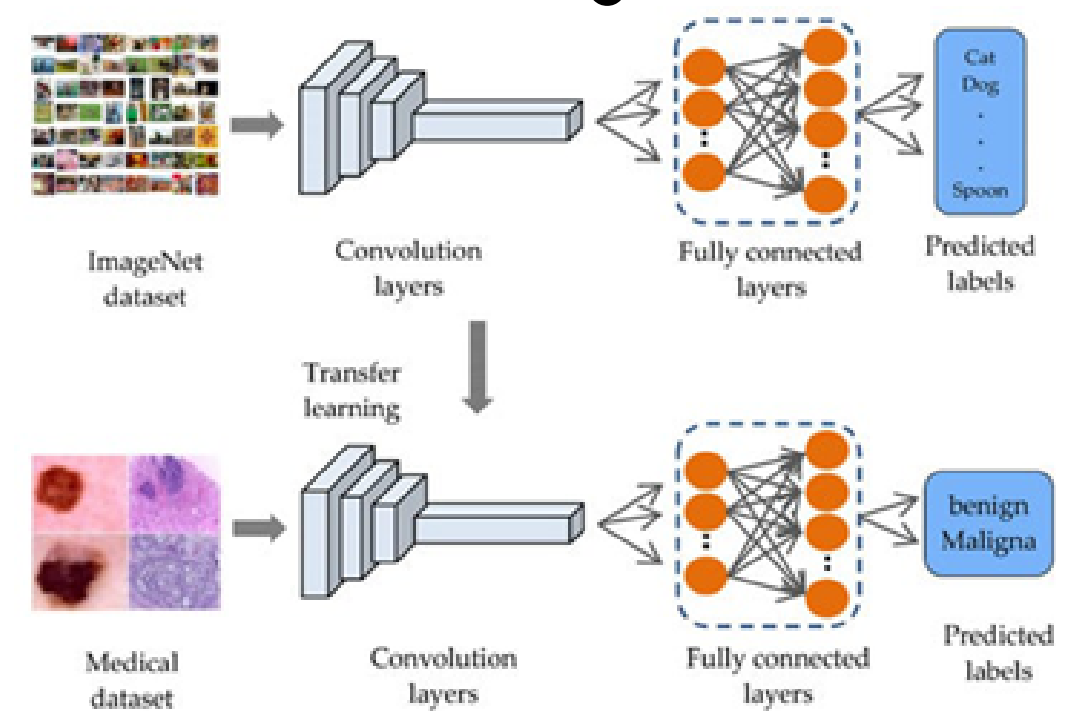


Methodology of Image Classifier

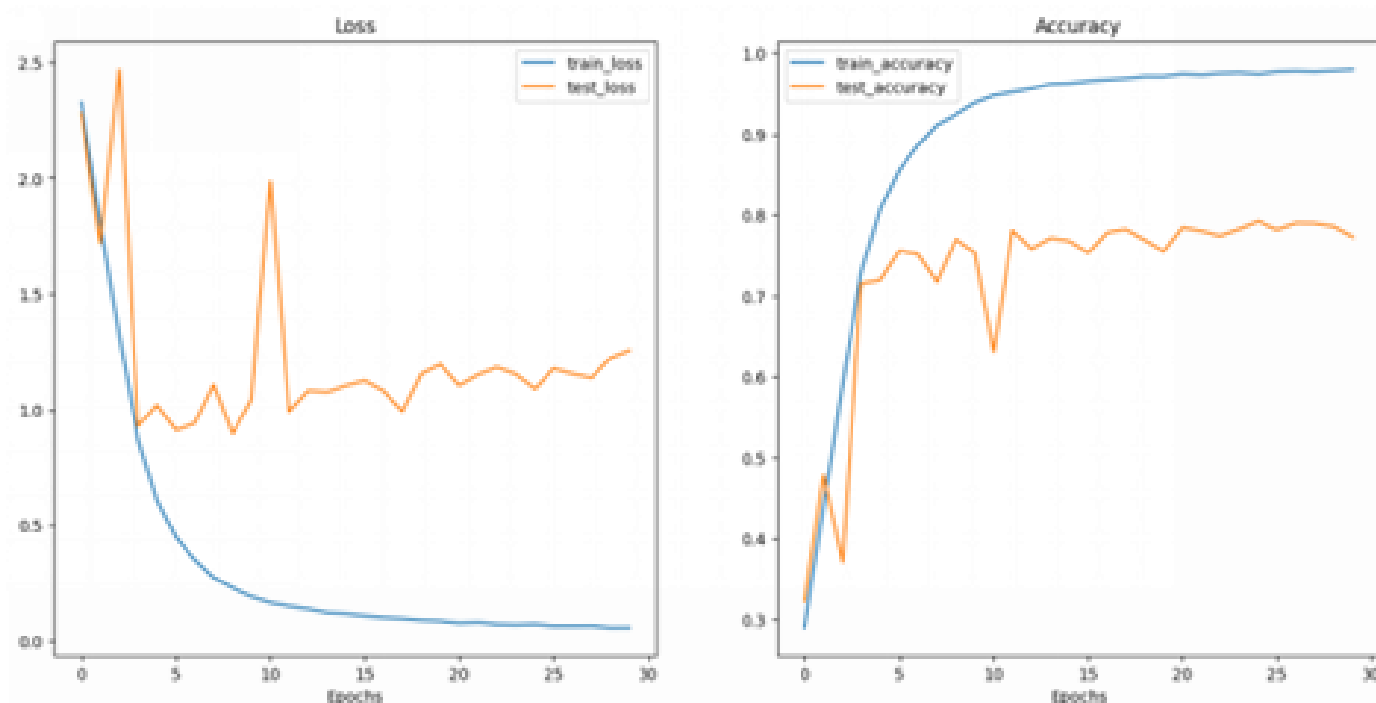
Methodology Flowchart



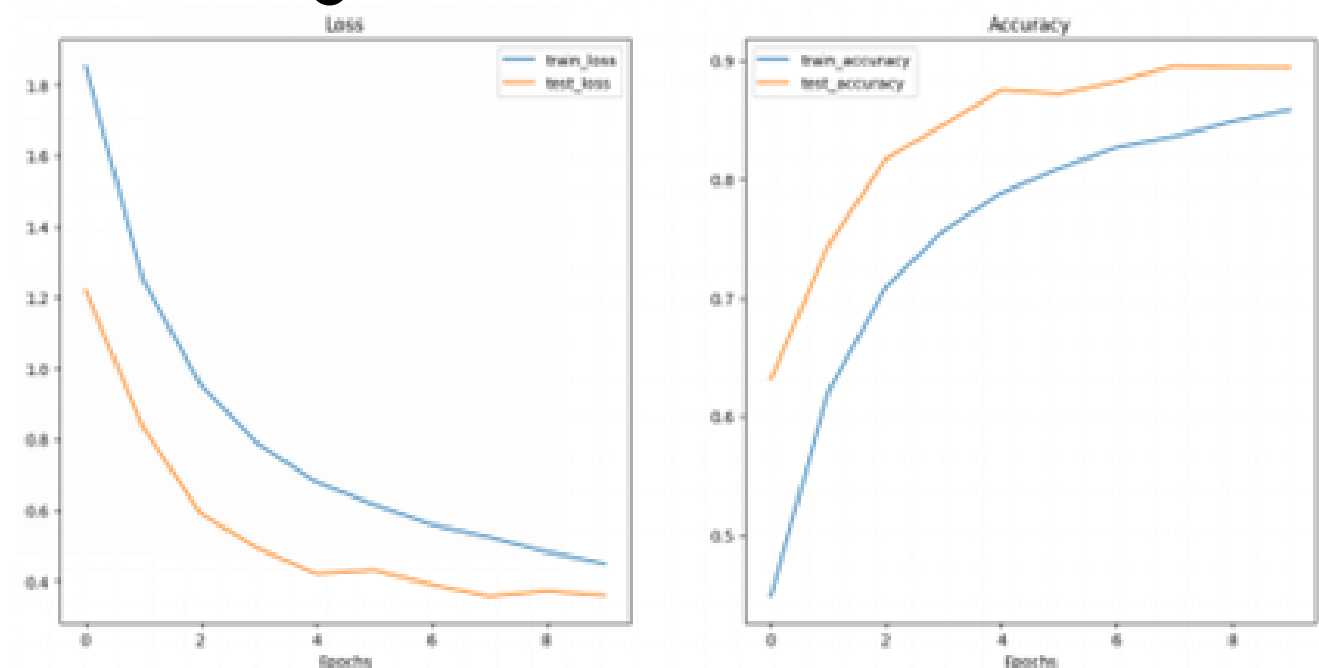
Transfer Learning



Training result of Resnet50



Training Result of EfficientNet-b2



AI IN HEALTHCARE STARTUPS

Patient-Facing

AI Chatbots



Wearables & Devices



Personalized Genetics



Mental Health



Women's Health



Skin



Telehealth

Telemedicine



Lifestyle Management



Disease Management



Doctor-Facing

Medical Records



Data Analytics



Medical Imaging



Hospital



AI in Healthcare

Research

Drug Discovery



Information & Clinical Trials



Genetic Research



**THANK YOU SO MUCH
FOR LISTENING**



3 GOOD HEALTH
AND WELL-BEING



**INNOVATING HEALTHCARE WITH
AI CAN CONTRIBUTE TO SDG 3:**

"GOOD HEALTH AND WELL BEING"