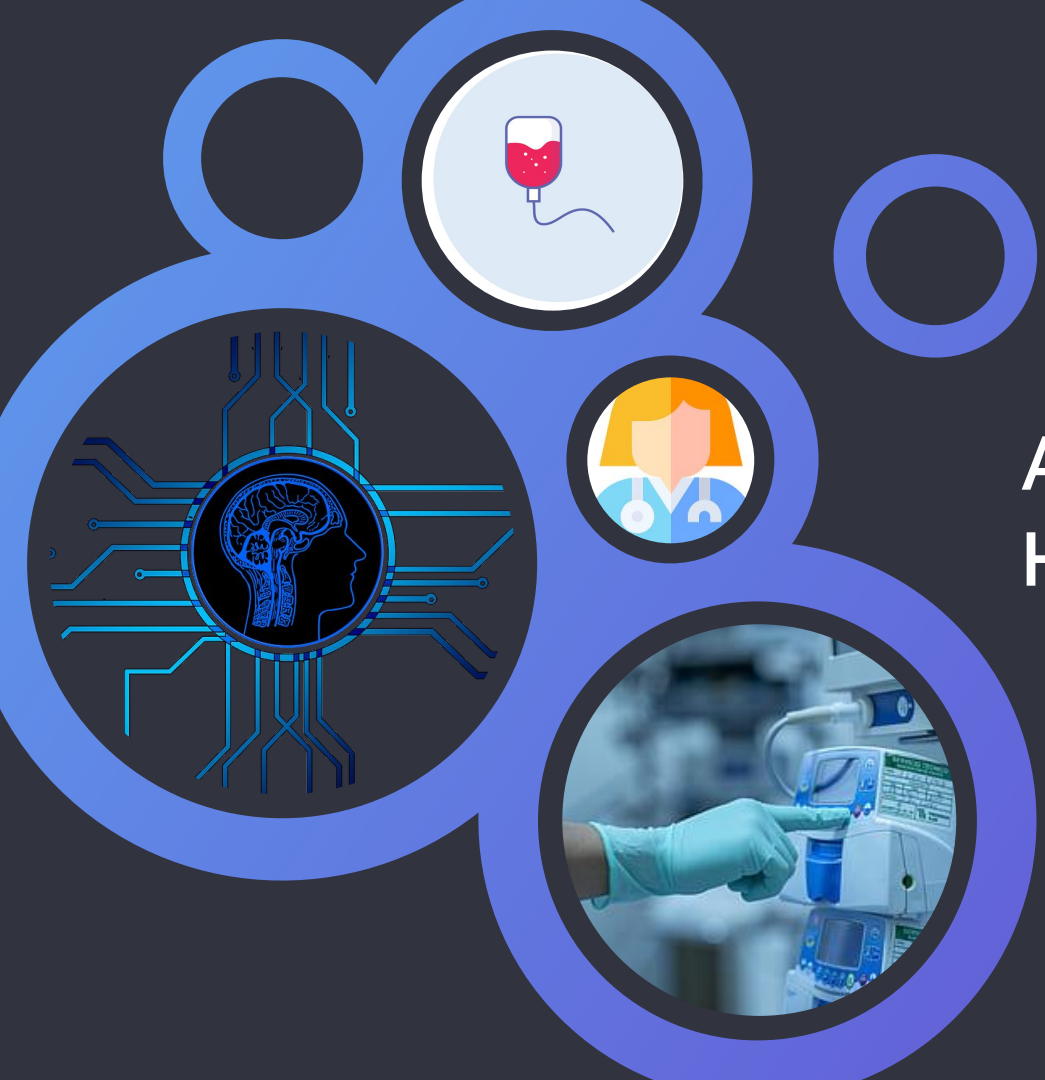
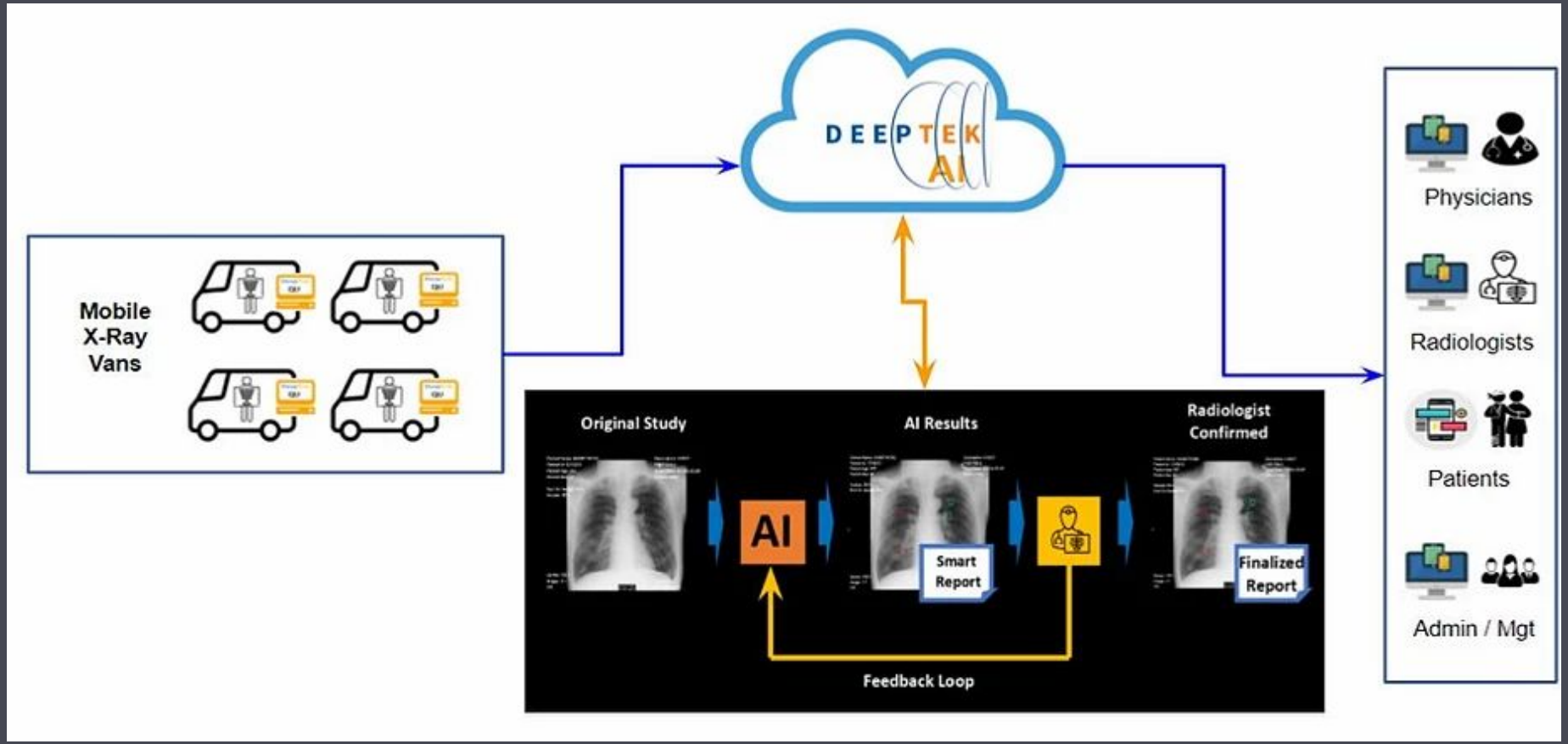
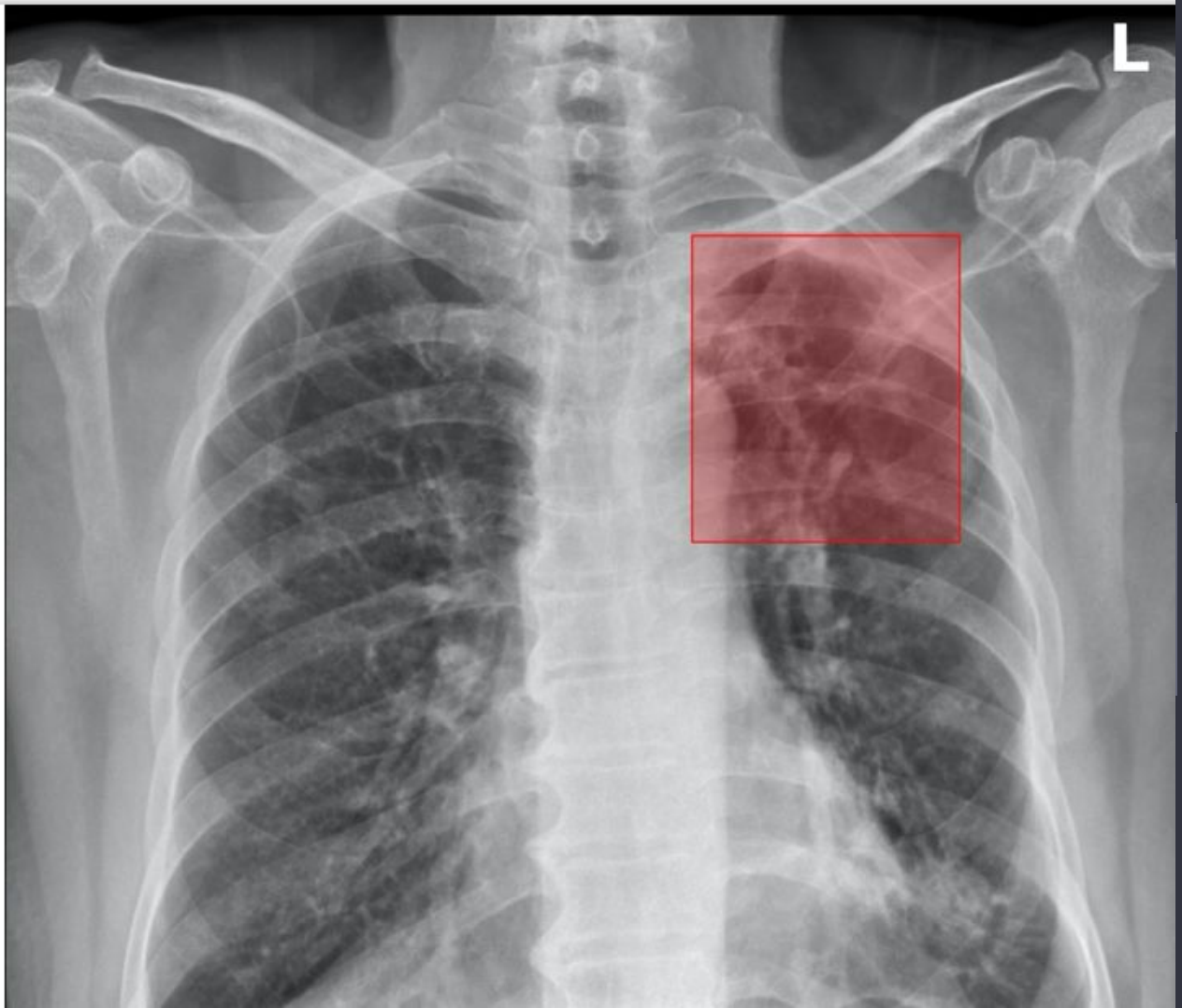


AI Applications in Healthcare

Genki : AI powered screening

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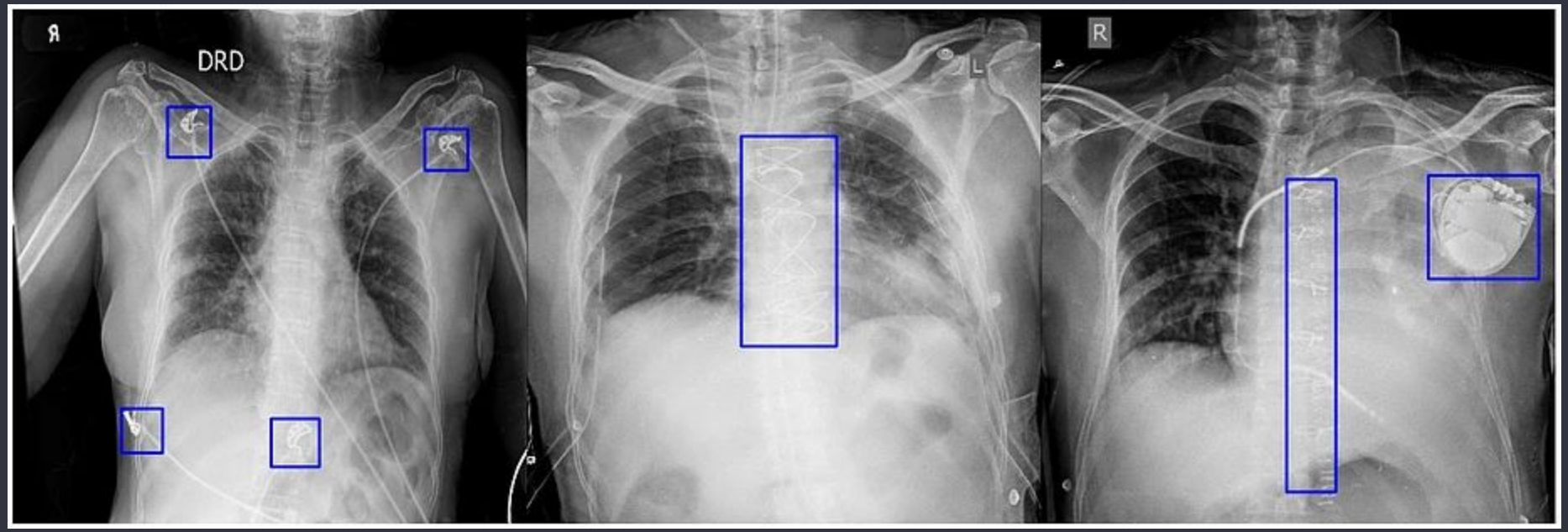
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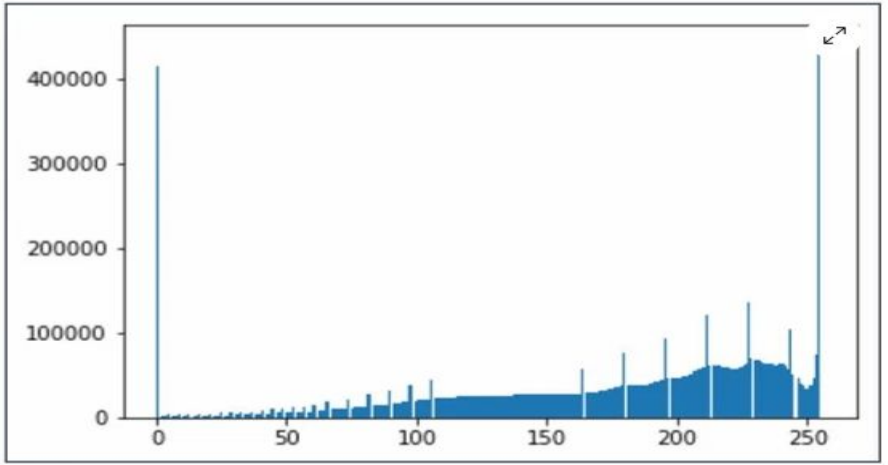
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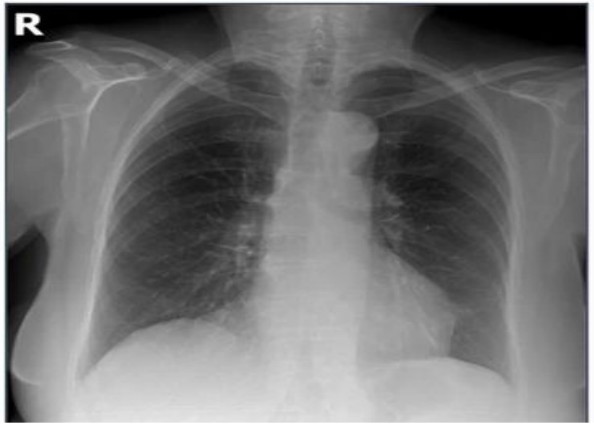
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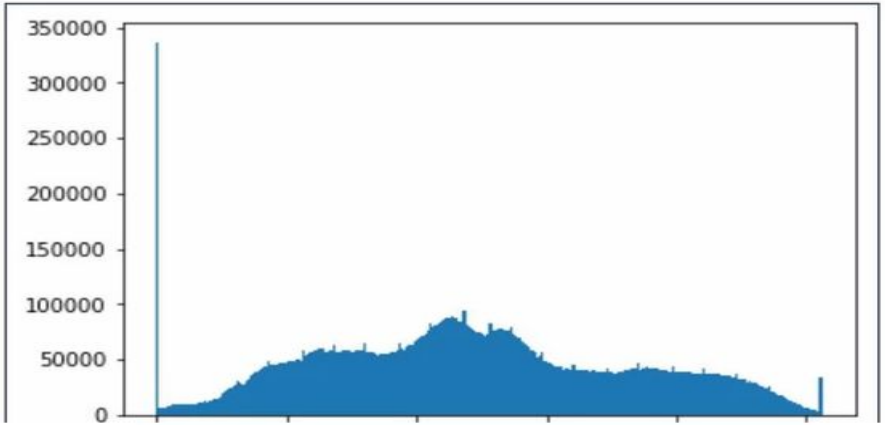
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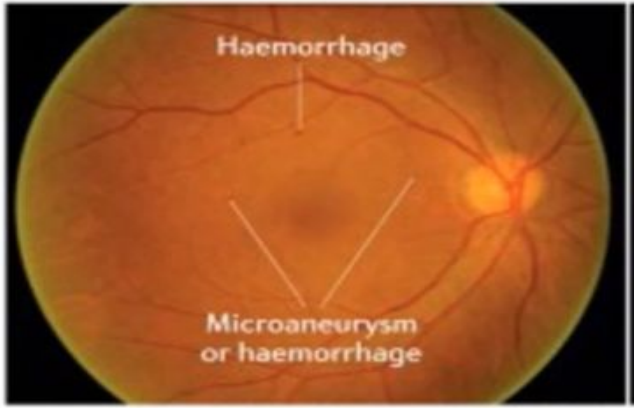
Normal Vision
Diabetic Retinopathy

DRISTi

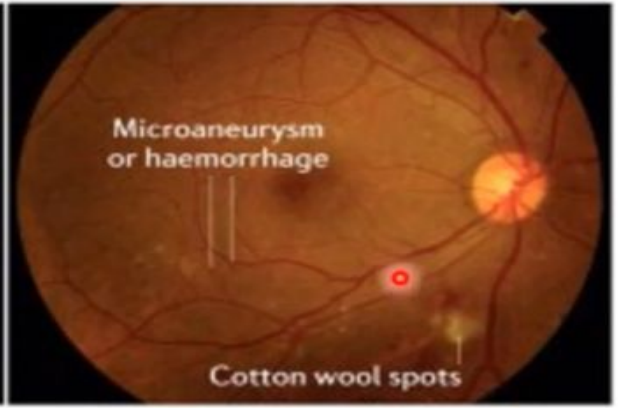
Diabetic Retinopathy Screening (DRISTi) (CE Class 1) is an AI product designed to detect the early presence of Diabetic Retinopathy (DR) in patients during eye check up screening process instantaneously.

By cutting the cord, and creating a first of its kind, AI on a Chip we have taken DR screeing to the remotest areas of the globe. Our offline solution does not depend on the internet or the cloud and brings Point of Care diagnostics to the forgotten billions who need this service.

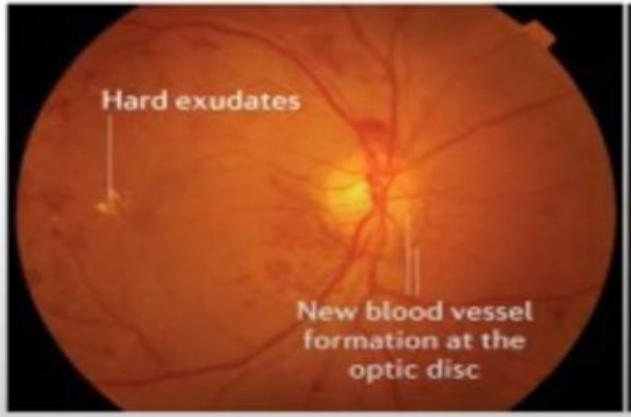
Diabetic Retinopathy (DR) affects over one third of all people with diabetes and is the leading cause of vision loss. Globally the prevalence of diabetes is increasing rapidly. Since Diabetic Retinopathy (DR) is a progressive disease, early detection and intervention can prevent blindness. Due to the alarming increase of Diabetes, screening for DR every year becomes important.



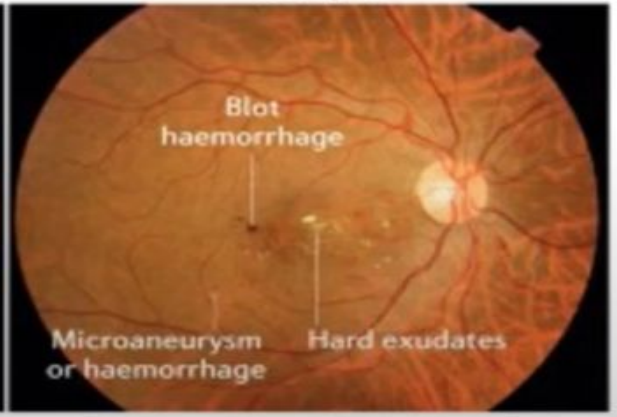
Mild non-proliferative DR with microaneurysms and haemorrhage



Moderate non-proliferative DR with microaneurysms, haemorrhage and cotton wool spots



Proliferative DR showing new blood vessels at the optic disc



Diabetic macular oedema showing hard exudates at the fovea centre

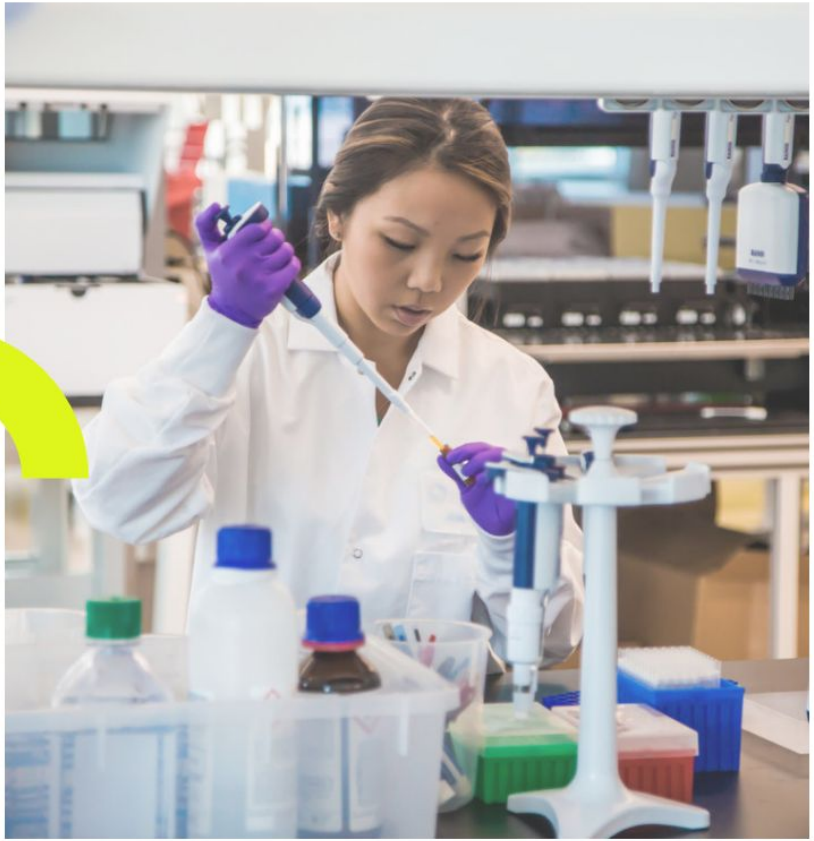
Freenome

Using a routine blood draw for early cancer detection

Freenome's blood tests look beyond mutations to detect the body's own early-warning signs for cancer, incorporating a multidimensional view of both tumor- and immune-derived signatures that enable the early detection of cancer.

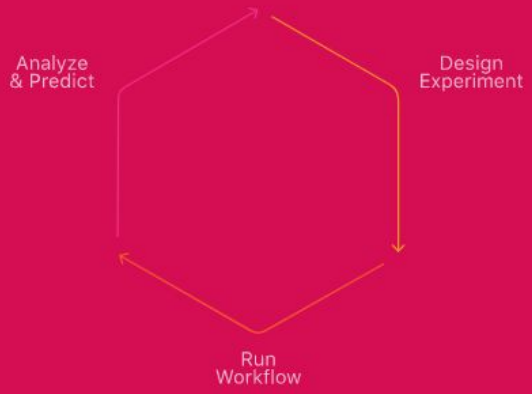
Decoding hidden patterns

By combining deep expertise in molecular biology and advanced computational techniques to recognize disease-associated patterns among billions of circulating, cell-free biomarkers, we are developing simple and accurate blood tests for early cancer detection and integrating the actionable insights into health systems to operationalize a feedback loop between care and science.



Recursion

Industrialized drug discovery **Re**quires an iterative experiment machine.



Our core platform is a continuous, iterative loop of "biology and bits" where wet lab biology experiments are executed automatically and results are produced by machine learning models in the cloud. Over and over, and at increasingly greater scale, our system gets 'smarter.'

ReChem

These software tools are designed to enable selection and design of chemical compounds to evaluate in our robotic laboratory. They can be applied throughout testing cycles, and are based on deep integration of computational chemistry, machine learning and previous screening results on our platform.

ReScreen

These tools facilitate a streamlined workflow for planning large, complex experiments that span hundreds of thousands of microwells and require application of precisely planned combinations of reagents. Notably, ReScreen generates scientific and statistical experiment variables that enable quantitative machine learning analysis and integrate automatically with our laboratory robotics.

ReScreenRun

Our robotic automation hardware and software let us screen hundreds of thousands of drug compounds and cellular disease models — such as models for rare genetic disorders, infectious disease, immuno-oncology and inflammation — quickly switching between experiments and allowing for rapid follow-on experiments based on the latest results.

ReRun

We create digital mathematical signatures, or *Phenoprints*, for each biological condition that is tested in ReScreenRun. Representation Learning is designed to allow us to quantitatively calculate high-dimensional representations of our human cell images. Ultimately, relationships between Phenoprints help uncover potential new drugs and novel biological relationships.

ReAnalyze

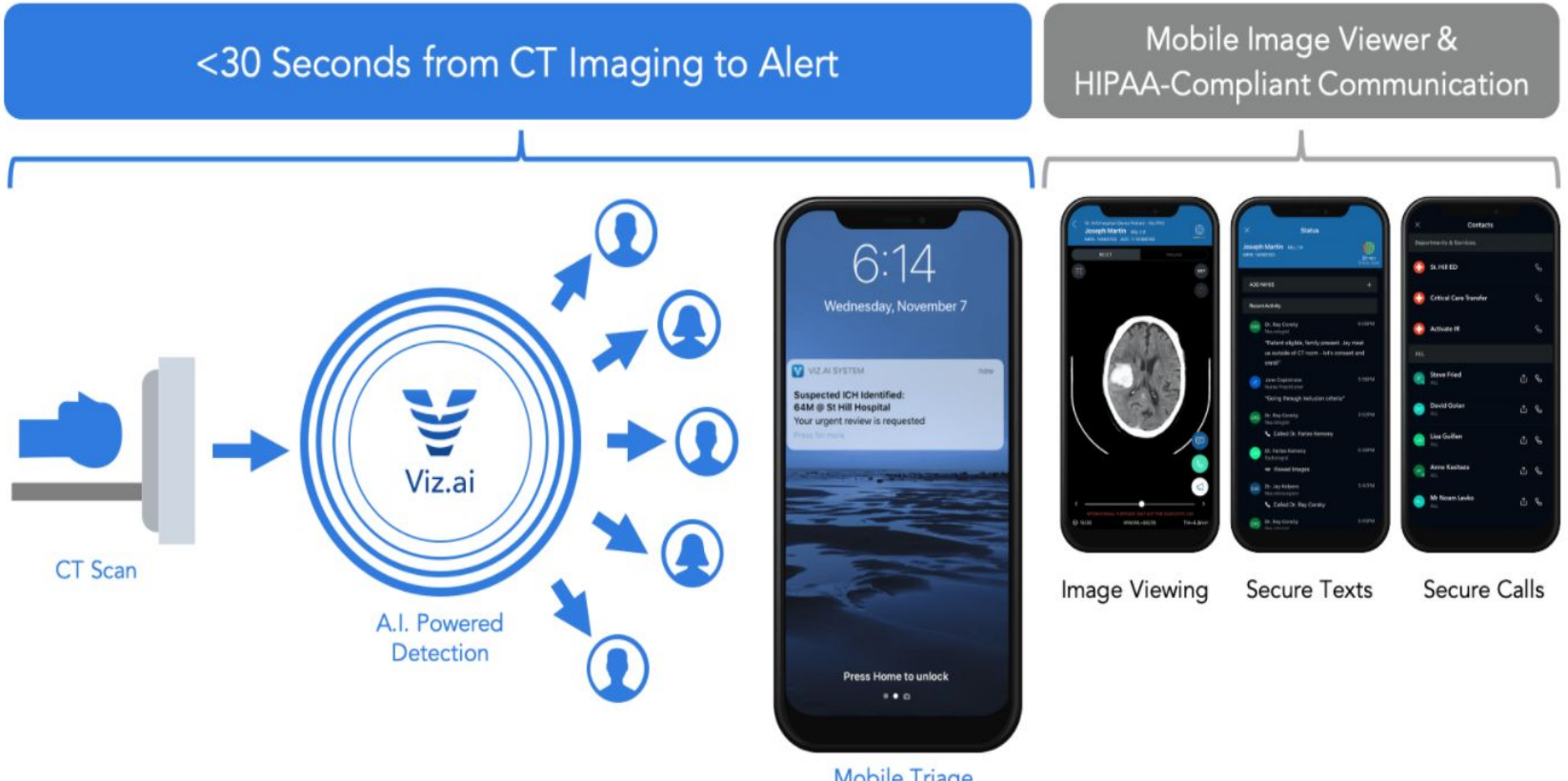
Our ReAnalyze tools use ReRun and are designed to use data science to compute the effectiveness of each drug compound in our assays, as well as any unintended effects (such as potential off-target liabilities). ReAnalyze helps drug discovery scientists to rapidly home in on the most promising drug compounds and generates details and visualizations to drive unbiased decision-making.

RePredict

A suite of machine learning solutions to model drug compound relationships using Phenoprints, chemical structure and pharmacological properties. These predictions will inform what screens we execute in ReChem through ReAnalyze, helping complete the iterative loop.

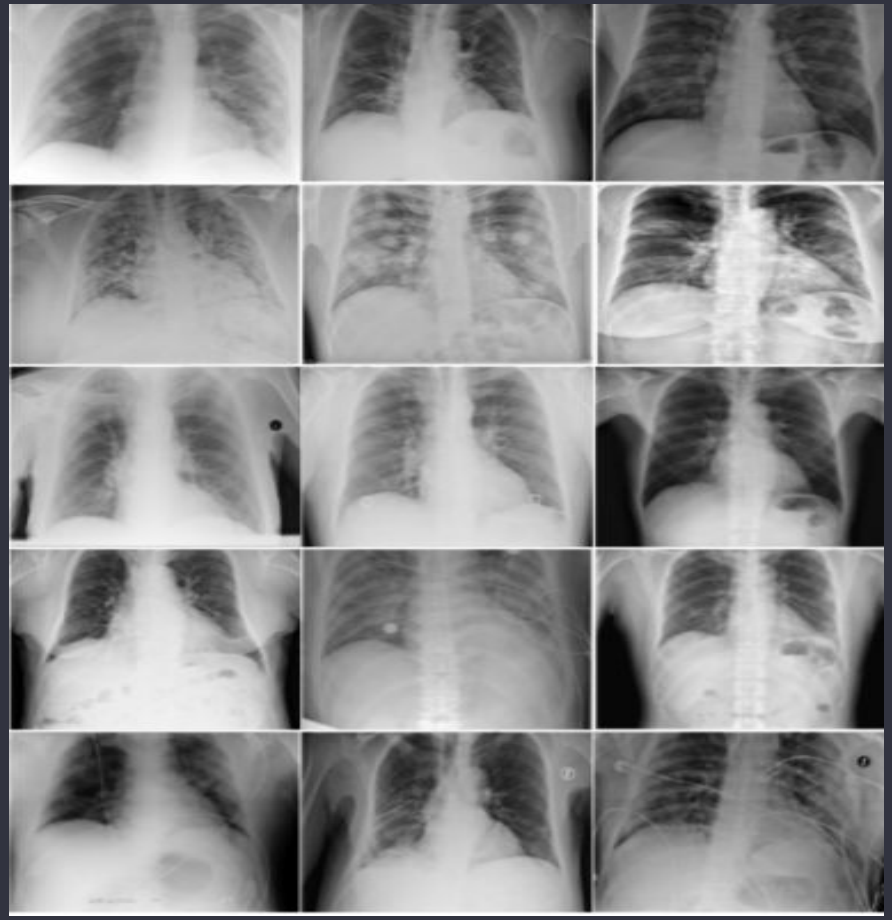
Early Suspected ICH Detection

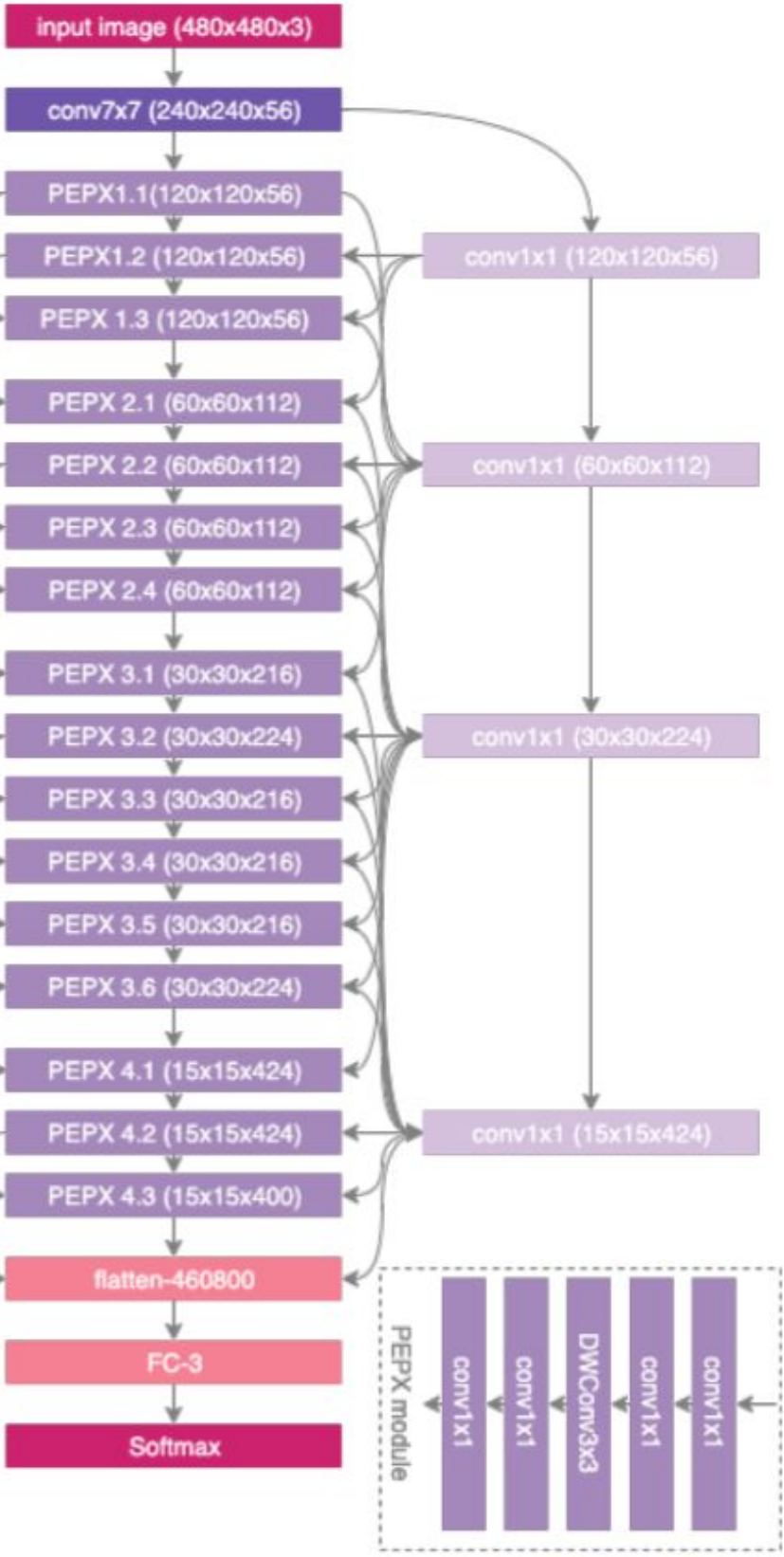
Viz ICH can analyze and alert stroke specialists within seconds



Some Interesting research papers

COVID-Net: A Tailored Deep Convolutional Neural Network Design for Detection of COVID-19 Cases from Chest X-Ray Images

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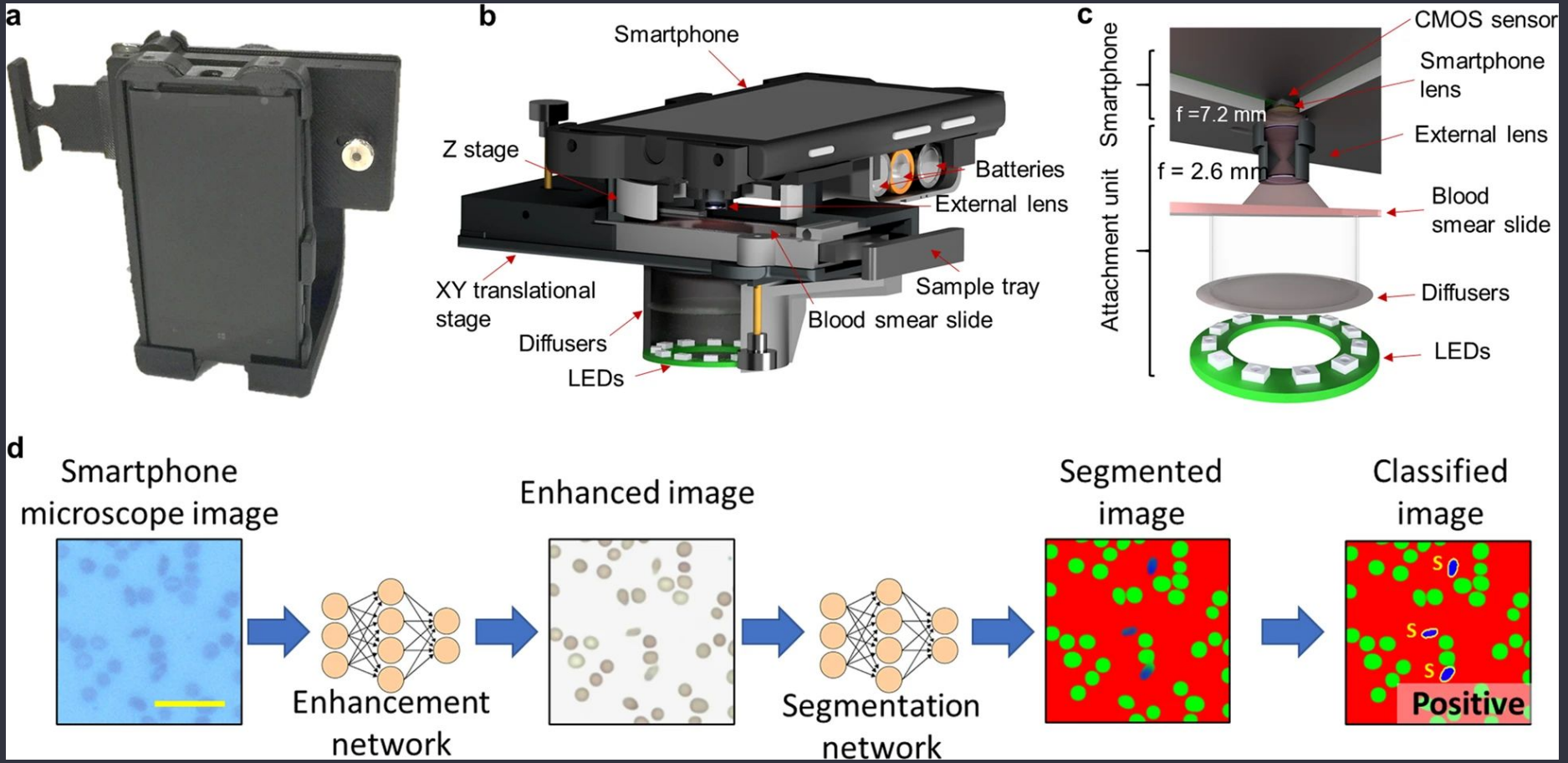
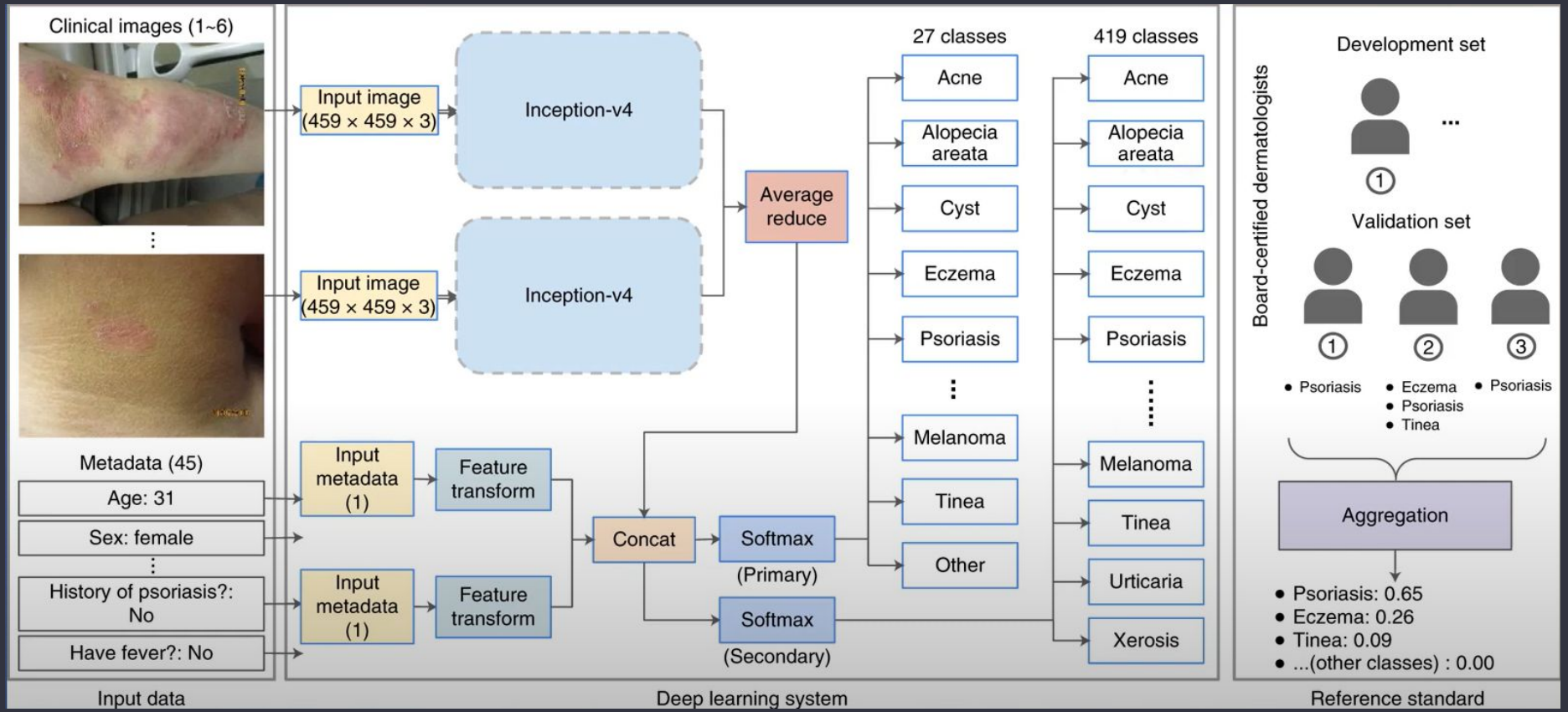
PEPX1.1(120x120x56)
PEPX1.2 (120x120x56)
PEPX 1.3 (120x120x56)
PEPX 2.1 (60x60x112)
PEPX 2.2 (60x60x112)
PEPX 2.3 (60x60x112)
PEPX 2.4 (60x60x112)
PEPX 3.1 (30x30x216)
PEPX 3.2 (30x30x224)
PEPX 3.3 (30x30x216)
PEPX 3.4 (30x30x216)
PEPX 3.5 (30x30x216)
PEPX 3.6 (30x30x224)
PEPX 4.1 (15x15x424)
PEPX 4.2 (15x15x424)
PEPX 4.3 (15x15x400)
flatten-460800
FC-3
Softmax
conv1x1 (120x120x56)
conv1x1 (60x60x112)
conv1x1 (30x30x224)
conv1x1 (15x15x424)
PEPX module
conv1x1
conv1x1
DWConv3x3
conv1x1
conv1x1

Automated screening of sickle cells using a smartphone-based microscope and deep learning



A deep learning system for differential diagnosis of skin diseases



Where we cannot use AI in healthcare

Where human intelligence works better

Challenges

Selecting the use.

Selecting appropriate training dataset.

Properly labelling them.

Properly testing them.

Where we can we use AI in healthcare

Decision space is small
There is not a large human penalty for a bad decision

Thank you!