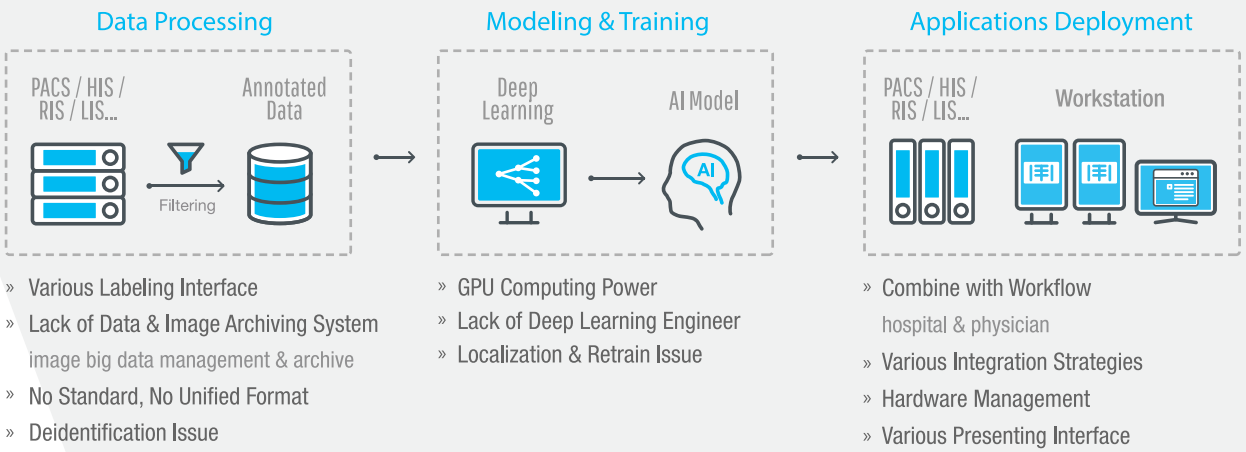
All About Workflows

AI Workflow

Why Workflow Matters

These days, deep Learning research in medical imaging is booming with improved models being developed day by day to enable AI-assisted diagnosis. However, most of this AI research is being done in isolation and with limited datasets which may lead to "overly simplified models". Apart from that, even when a fully validated model is available, it is still a challenge to deploy the algorithm in a local environment with existing settings because creating a new specialized workflow for AI is probably expensive and compartmentalizes the workflow and breaks its smoothness.



- Various Labeling Interface
- Lack of Data & Image Archiving System
  image big data management & archive
- No Standard, No Unified Format
- Deidentification Issue

- GPU Computing Power
- Lack of Deep Learning Engineer
- Localization & Retrain Issue

- Combine with Workflow
  hospital & physician
- Various Integration Strategies
- Hardware Management
- Various Presenting Interface

figure : Obstacles in each step

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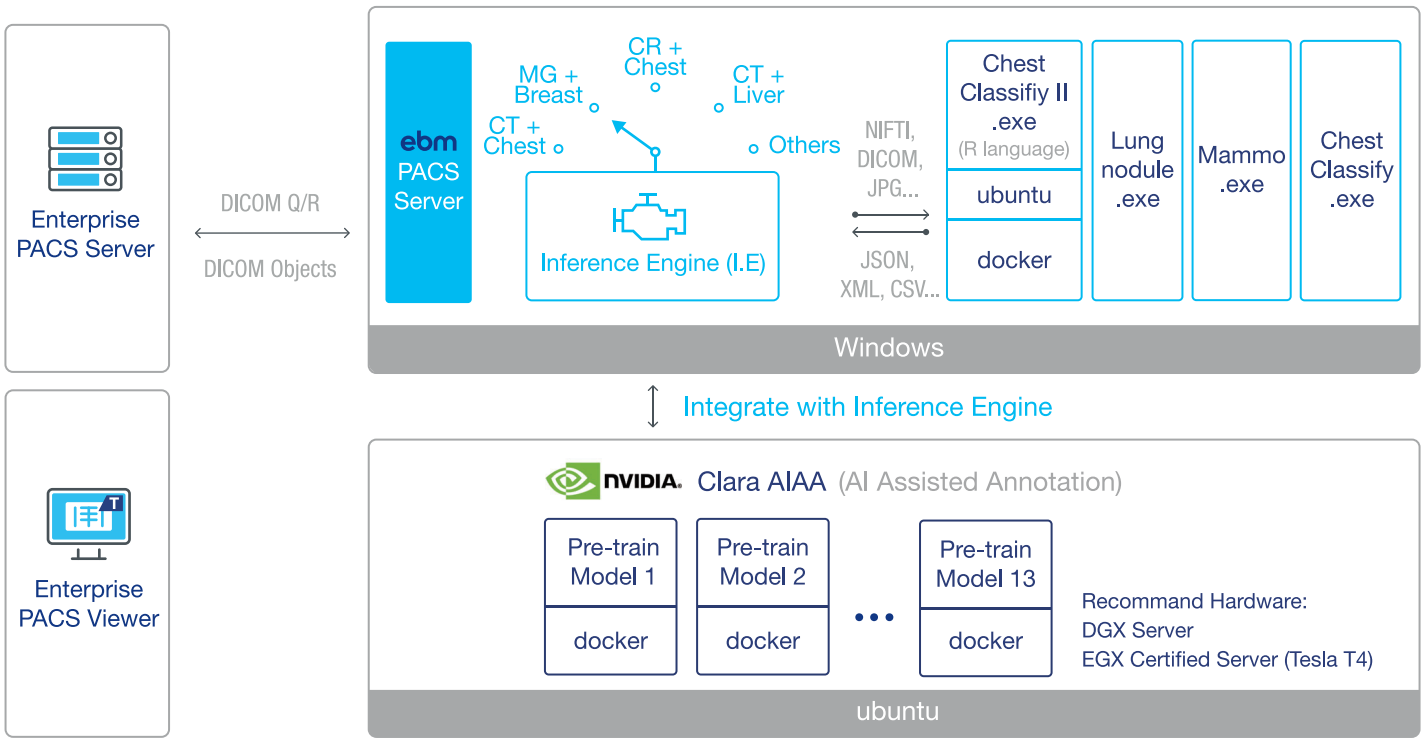
Connecting Healthcare

Inference Workflow



EBM AI Platform is a software platform for seamless data annotation, training, advanced visualization and deployment of AI based medical imaging applictions.

It includes PACS server capability which can withstand billion-level big data, an automatic process that can inference and generate AI outputs in the backend, a native unified labeling interface, as well as Nvidia Clara solution to leverage its pre-trained models and training pipeline.

Inference Engine

"Inference Engine (IE)", a total DICOM integrated solution for combining more than one AI models on one platform which allows AI to unleash their computing power and diagnostic support in the medical field.

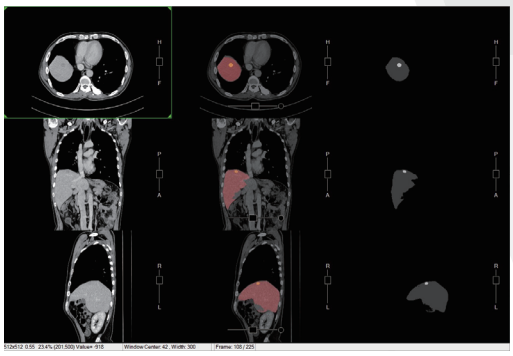
Mechanism

When EBM PACS Sever receives images from local enterprise PACS or modalities, Inference Engine will activate and analyze the images in order to call up the corresponding model for computing. And then encapsulate the outputs of AI as DICOM objects so that can be presented on EBM PACS viewer or any PACS viewers.

Additionally, we provide various easy-to-use integration interfaces such as APIs, URL links or SDKs for hospitals or other medical service providers to access AI inferences smoothly within their existing workflow.

Features

- Automated procedure in the backend
- Provide compatibility and scalability by applying PACS standard
- View all the AI inferences on one interface

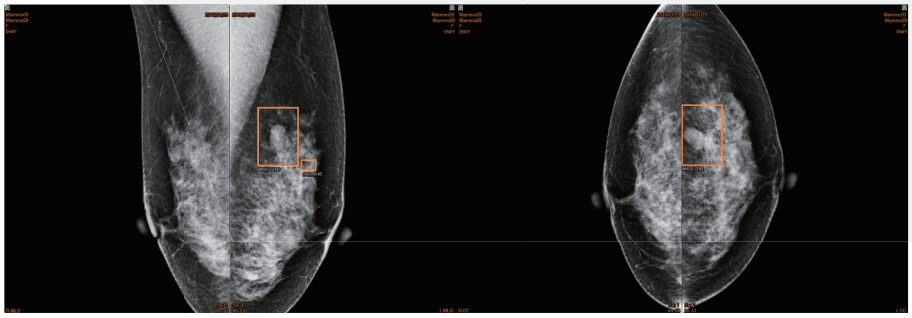


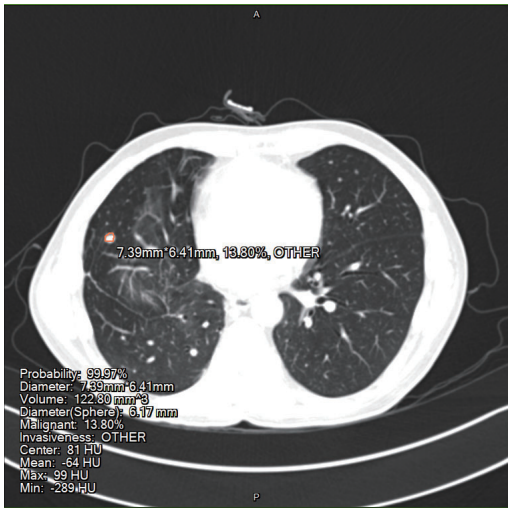
AIAA

We incorporate the Nvidia Clara SDK (AIAA) and their pre-trained models with our platform to develop a workflow for AI assisted annotation which can be used as a starting point to retrain the models using the newly incoming data from the patients.

Mammo AI

Acquire bonding boxes to indicate lesions.





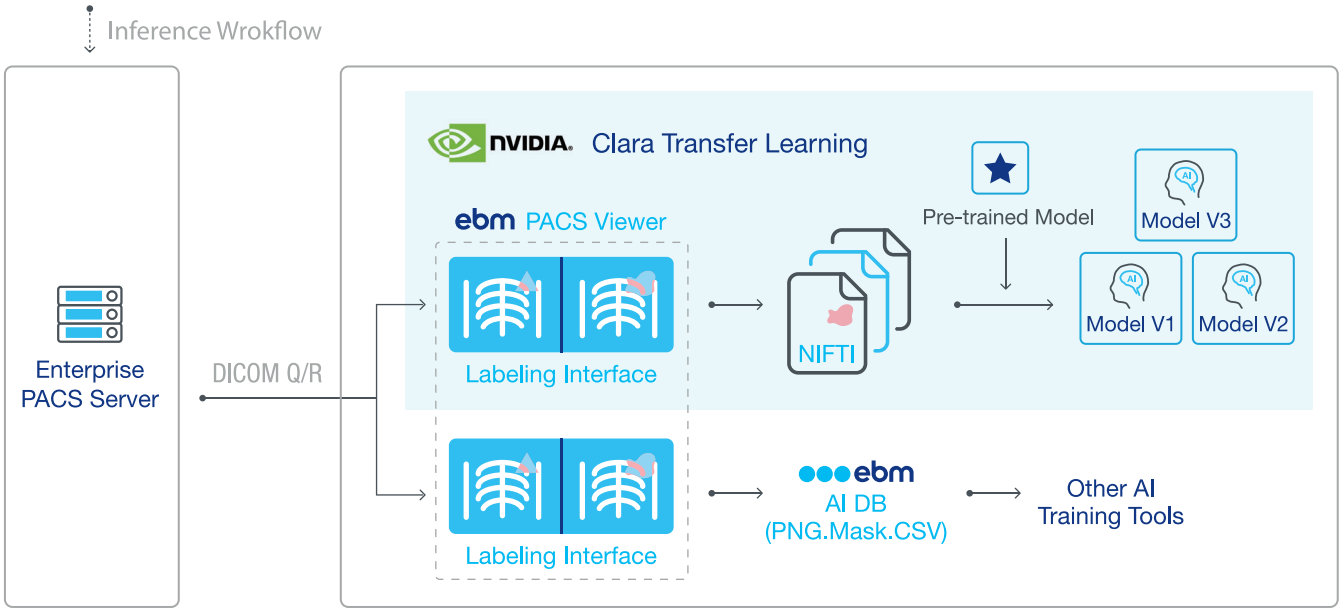
Lung Nodule Detection AI

Contains text information and nodule contour. Moreover, on EBM PACS viewer we offer customizable hotkeys to toggle on and off of the inference, to easily navigate through the images with lesions, and to copy-paste all the content and image information from the current frame.

Chest X-ray AI

Using Heat maps to classify 14 different conditions.

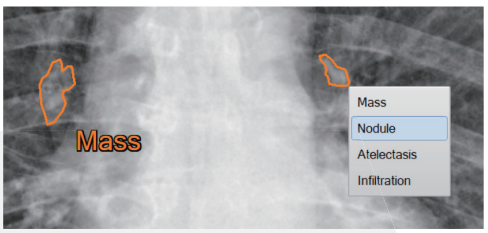
Training Workflow



Labeling Interface

Based on 3500 hospitals worldwide implementing our PACS system, we have developed a versatile and user-friendly “Labeling Interface (LI)”, a native labeling module on EBM PACS viewer, letting doctors create annotated outputs as well as AI DB in which patient information is deidentified and can be directly applied in deep learning.

The auto labeling and retrain idea is adopted as well. We utilize the AI models inclusive of Nvidia pre-trained models on previous mentioned Inference Engine as auto labeling process, and then use our Labeling Interface to modify the AI outputs on EBM PACS viewer to generate more accurate data for model optimization purpose.



Training Process

When it comes to construct and train AI models, we are inclined to cooperate with partners. On the EBM AI Platform, we also incorporate NVIDIA Clare SDK (TLT, transfer learning toolkit) to lower the barrier for retraining and make deep learning easier. For instance, hospitals can use the mechanism to adjust their models purchased from the market or created by themselves in order to keep improving and become more adaptive to the situations.

Features

- Direct communication with PACS system
- Conduct all annotation work on same interface
- Intuitive marking tools such as circle, square, arrow or polygons
- Customizable tags and study groups
- Auto labeling process reduce annotation time for doctors
- Produce AI DB with deidentified outputs

Reporting Workflow

We do not stop at using medical imaging AI for detection and viewing only.
We take advantage of AI abilities and expand toward RIS and other systems so that they can fit with the physicians' daily workflow in various application scenarios.

Sequence Management

Manage Report Priority

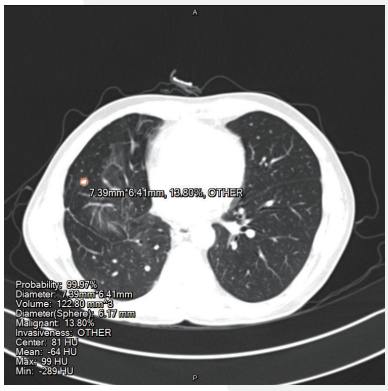
Make use of AI quantitative fast screening to conduct patient prioritization and reports queue management by difficulty or urgency of the conditions which letting doctors engage with more complicated cases proactively.

Report Worklist					Sequence Management
#	Patient Name	Patient ID	Modality	Exam Time	Difficulty (0~5)
3	Chest_Test 3	003	CR	09:11	5
5	Chest_Test 5	005	CR	09:44	4
4	Chest_Test 4	004	CR	09:15	3
1	Chest_Test 1	001	CR	08:00	2
2	Chest_Test 2	002	CR	08:07	1

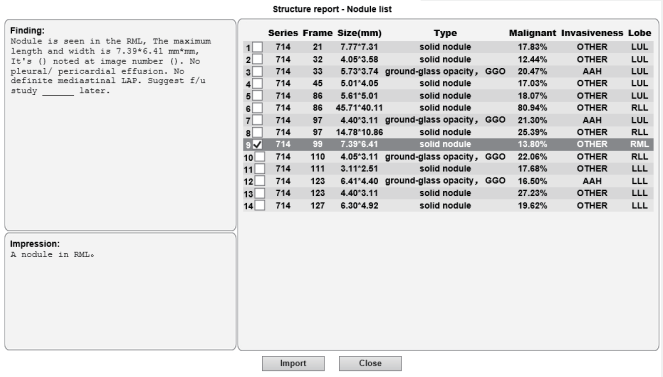
Structure Report Production

Fast Generation of Reports

The interactive lesions reviewing panel is linked with EBM PACS viewer. Doctors can walk through all the detected lesions at ease and by clicking the checkboxes to generate preliminary reports.



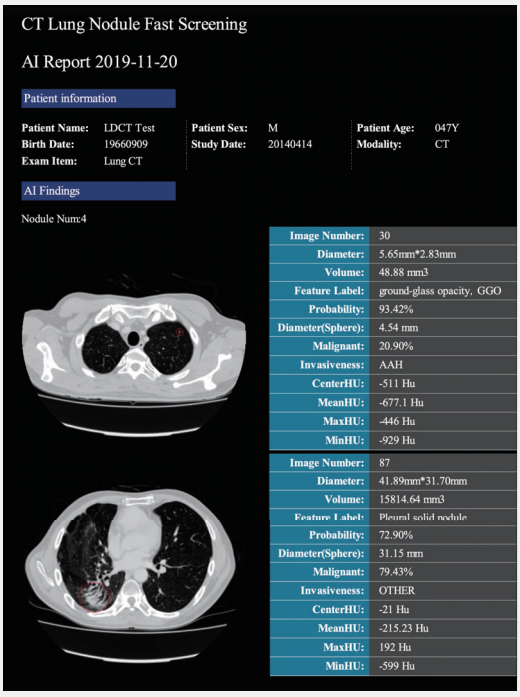
Interactive



PDF Report Production

create PDF reports with customized format

- Easy to integrate with other system
- Alternatively, use for cloud screening service



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Advantages

- EBM has dedicated to medical imaging technologies for over 30 years
- Market share of more than 3,500+ hospitals implementing EBM PACS
- Offer corresponding solutions in the different process of developing medical AI applications
- Integrate AI models into the workflow of hospitals and maximize AI capability based on PACS standard
- Provide compatibility and scalability

Comparison

	EBM AI Workflow	Other Solutions
Implementation Manner	Easy	Complicated
Labeling Interface	x1	xN
Viewing Interface	x1	xN
Nvidia Clara Support	Yes	-
Deploy Channel	Yes	-
		

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