

Grand Rounds

Rigshospitalet



Fremtidsdage

Grand Rounds

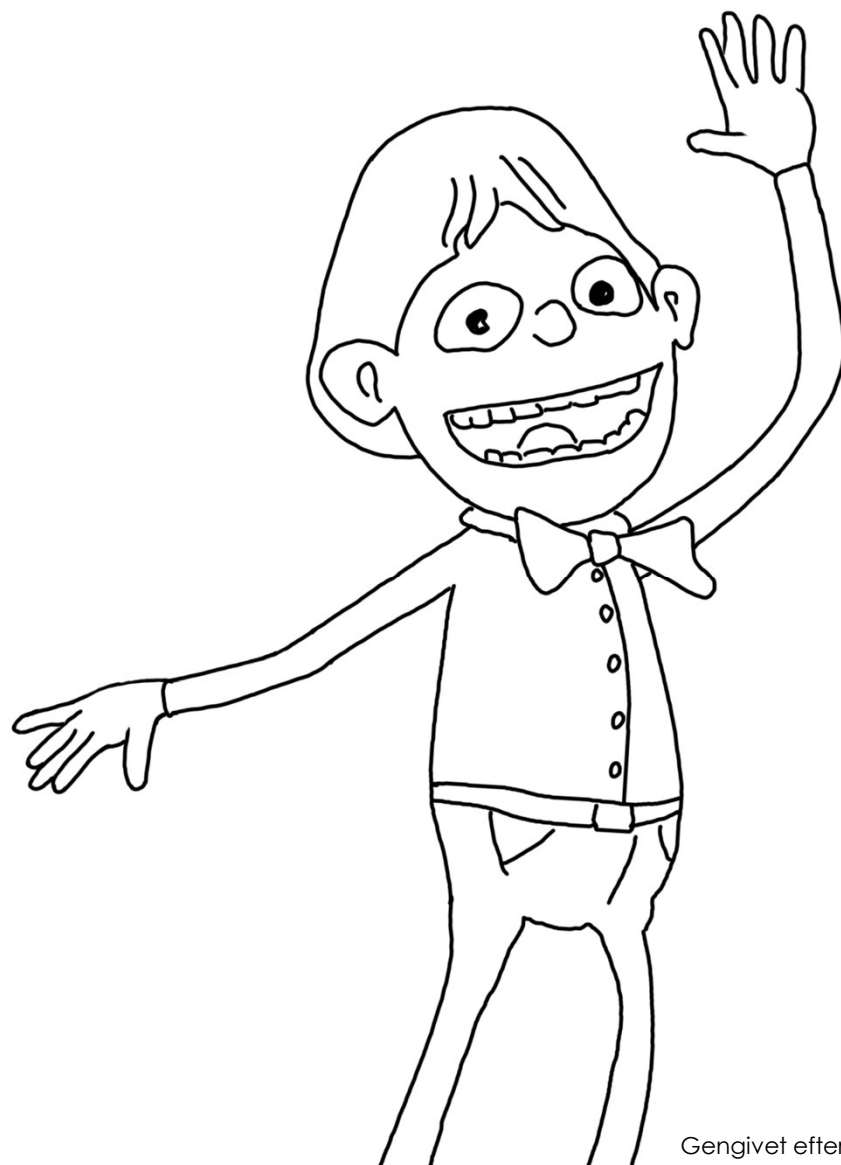
Grand Rounds

Rigshospitalet



The Future with AI – an Image Analysis Perspective

May, 2024



Gengivet efter "Terkel i knibe"

General vs. Narrow

AGI – Artificial General Intelligence:

Intelligence like human

Self-aware

Can solve problems

Learn to plan the future

Theoretical – we don't have!

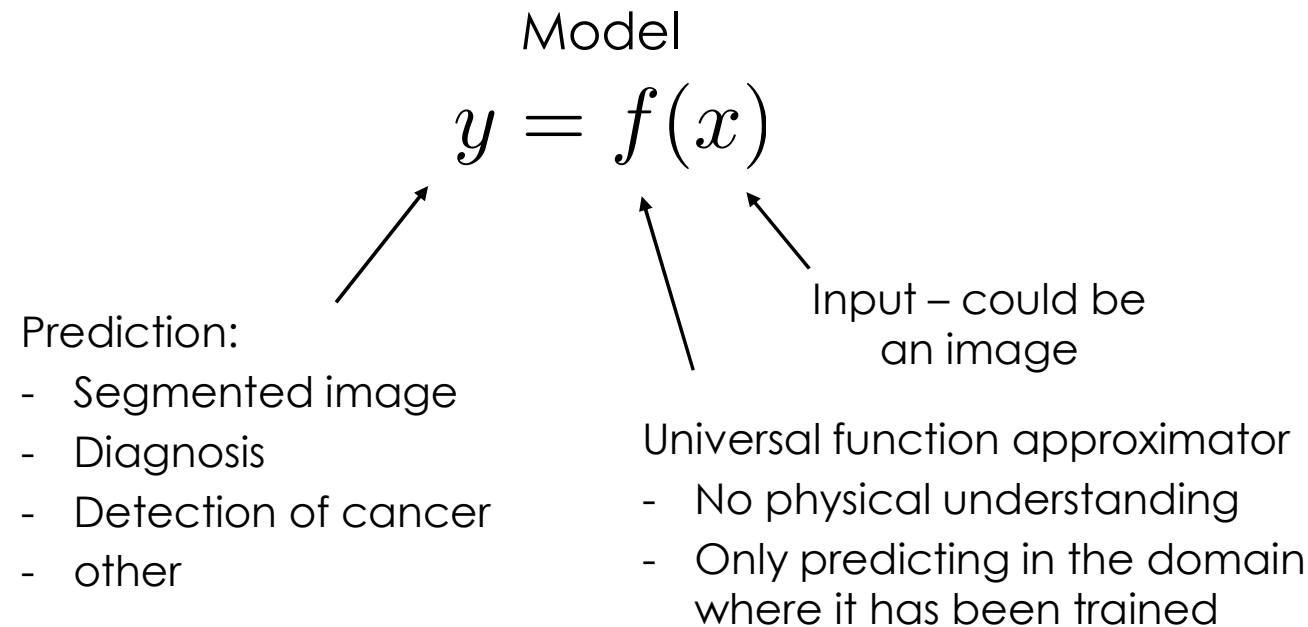
Narrow AI:

Learning-based

Solve one specific task

What we have!

AI core – deep learning



Data for training

(x_i, y_i) where $i = 1, \dots, n$ and n is large

Fooled by Generative AI?

Generate content – text, images, audio, combinations, etc.

A sense of human intelligence – generates complex content



Towards Large Foundational Models

SAM – Segment Anything Model



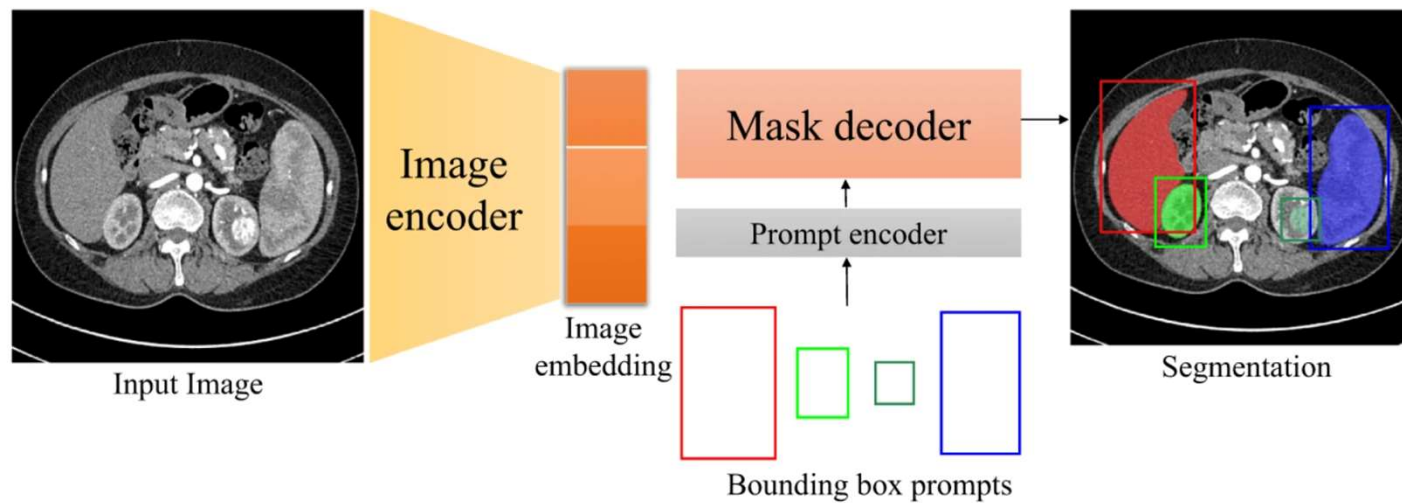
Foundational model

Trained on 11 million images and more than 1 billion labels

Source: <https://segment-anything.com/demo>
Kirillov, Alexander, et al., ICCV, 2023

Foundational Medical Models

MedSAM – Segment Anything in Medical Images



1,570,263 images – 10 imaging modalities
CT, MRI, endoscopy, histology, etc.

Source: Ma, Jun, et al. Nature Communications, 2024

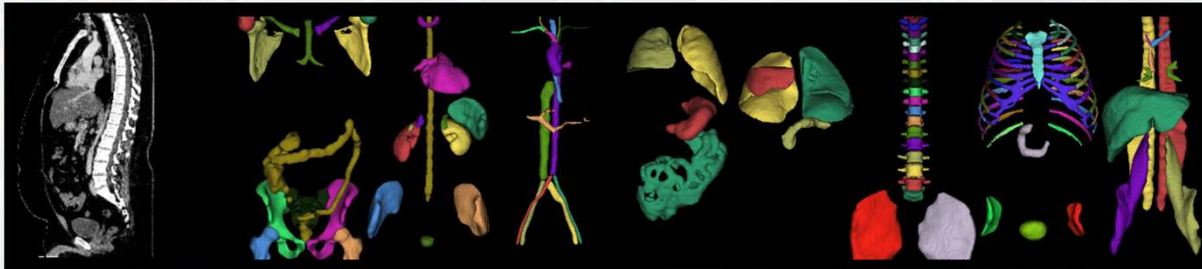
TotalSegmentator

If used for research purposes, please cite our [Radiology AI paper](#).
The results of the models appendicular bones, tissue types, heart chambers highres and face may not be used commercially.
All other results are open for any usage.
If this website does not work, please create a issue on [github](#).

Please help us continue providing TotalSegmentator.com by sharing your thoughts through this quick [form](#). Thank you!

Download results

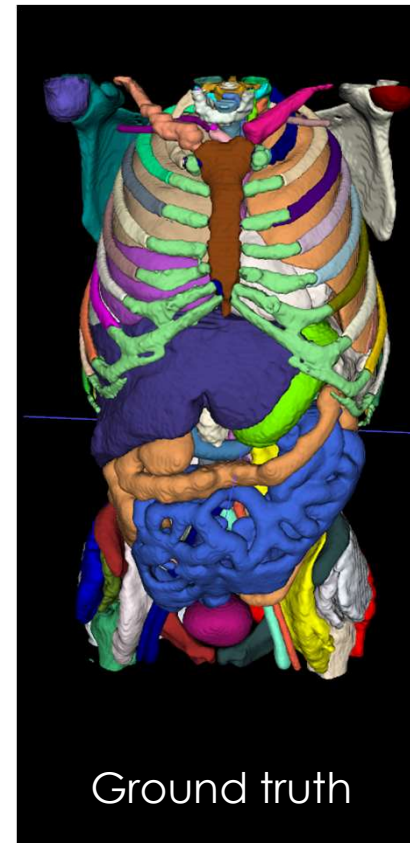
Upload a new case



Preview rendering of all segmentations

#	Segmentation Mask (nifti)
1	adrenal_gland_left.nii.gz
2	adrenal_gland_right.nii.gz
3	aorta.nii.gz
4	atrial_appendage_left.nii.gz
5	autochthon_left.nii.gz

Facts: Trained from 1240 annotated CT scans – 104 anatomical structures



Ground truth



Segmentation

TotalSegmentator^{v2.0.0}

Try out the [TotalSegmentator](#) by uploading any CT data. The upload must meet the following criteria:

- Only a single CT dataset, maximum size is 400 MB
- Upload should be either a zip file of DICOMs or a single NIFTI image

By using this online service you agree that the data can be used to improve the model.

Drop **DICOM.zip** or **NIFTI.nii.gz** here
or click to upload

Selected task
total (default)

Choose a subset to avoid long runtime (if none is selected all are selected)

- ☒ Enable fast processing
- ☐ Calculate statistics (volume and intensity)

Process data

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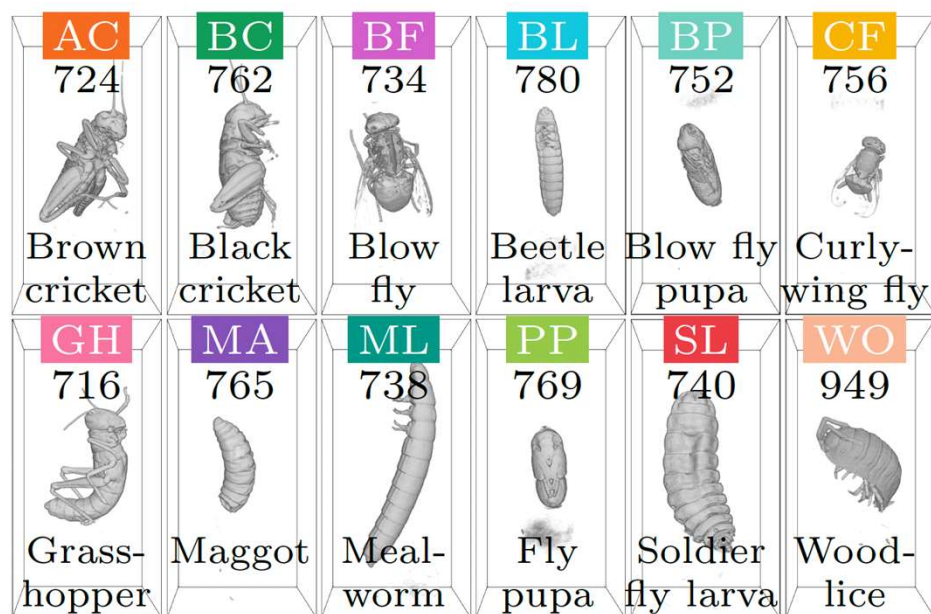
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AI for Medical Imaging

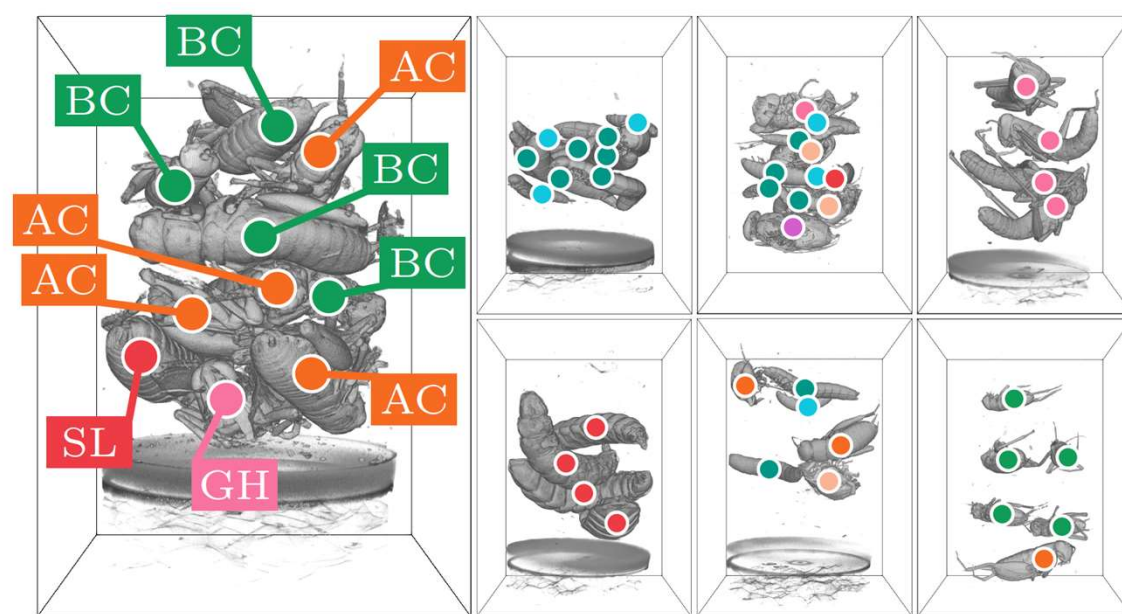
- 692 FDA-approved AI Medical Devices
- 122 within the last year
- 530 in Radiology

Date of Final Decision	Submission Number	Device	Company	Panel (Lead)	Primary Product Code
07/27/2023	K231195	Brainomix 360 Triage ICH	Brainomix Limited	Radiology	QAS
07/26/2023	K231038	Global Hypoperfusion Index (GHI) Algorithm	Edwards Lifesciences, LLC	Cardiovascular	QNL
07/25/2023	K223473	ME-APDS™; MAGENTIQ-COLO™	Magentiq Eye LTD	Gastroenterology/Urology	QNP
07/25/2023	K230365	Sonio Detect	Sonio	Radiology	IYN
07/25/2023	K230913	ANDI	Imeka Solutions, Inc.	Radiology	QIH
07/24/2023	K223347	UltraSight AI Guidance	UltraSight Inc	Radiology	QJU
07/21/2023	K230150	OptimMRI	RebrAln, SAS	Radiology	QIH
07/21/2023	K223288	Cranial Navigation Navigation Software	Brainlab AG	Neurology	HAW

Small Change – Catastrophic Consequences



Training
Single objects (μCT volumes)



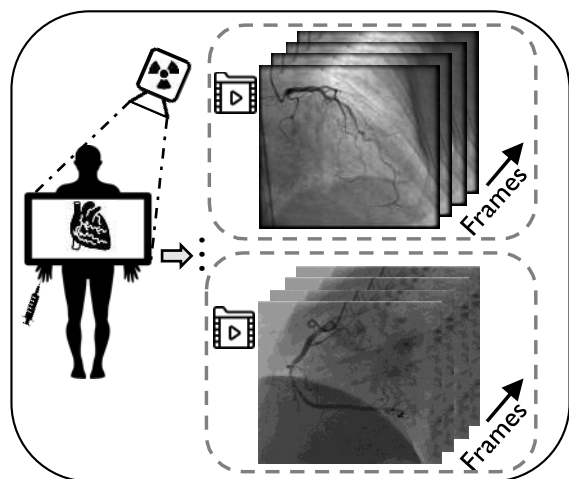
Test
Mixed objects (μCT volumes)

Source: Jensen et al., in prep.

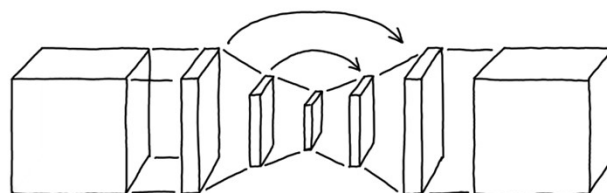
AI in Medicine

Data needs:

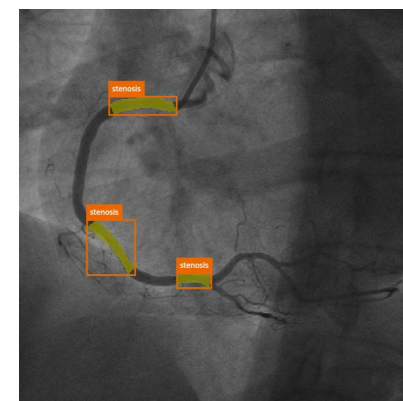
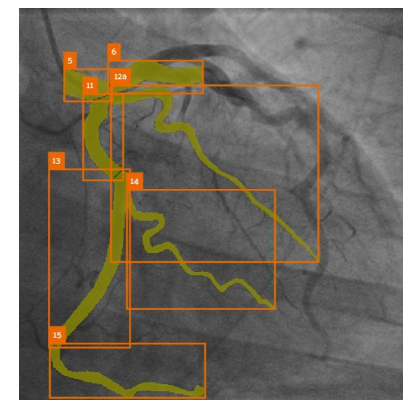
Data for training
Data for validation
Data for adjustment



Data acquisition



AI model



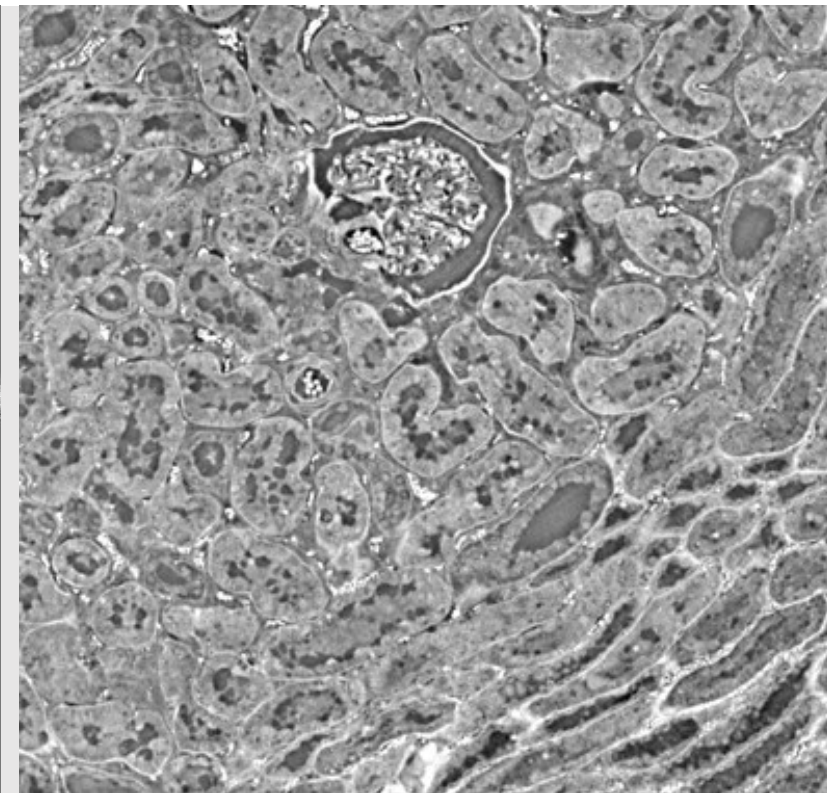
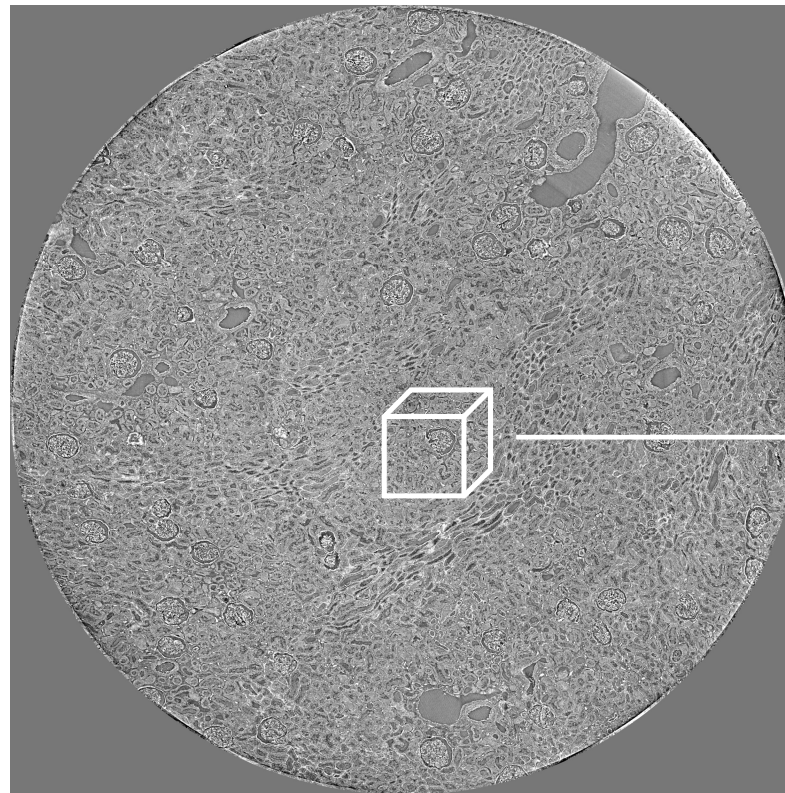
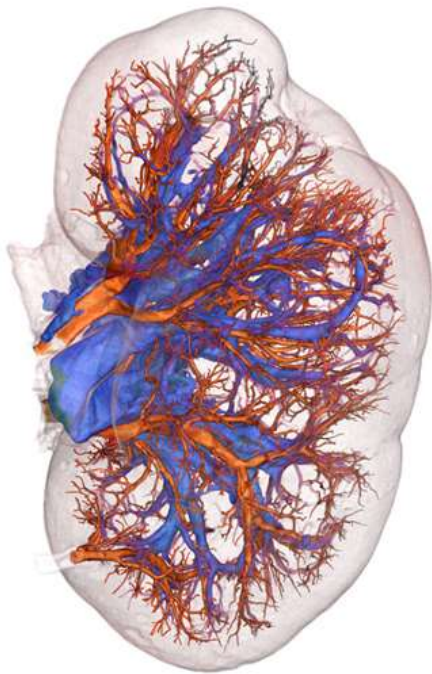
Predictions

Human Organ Atlas Project



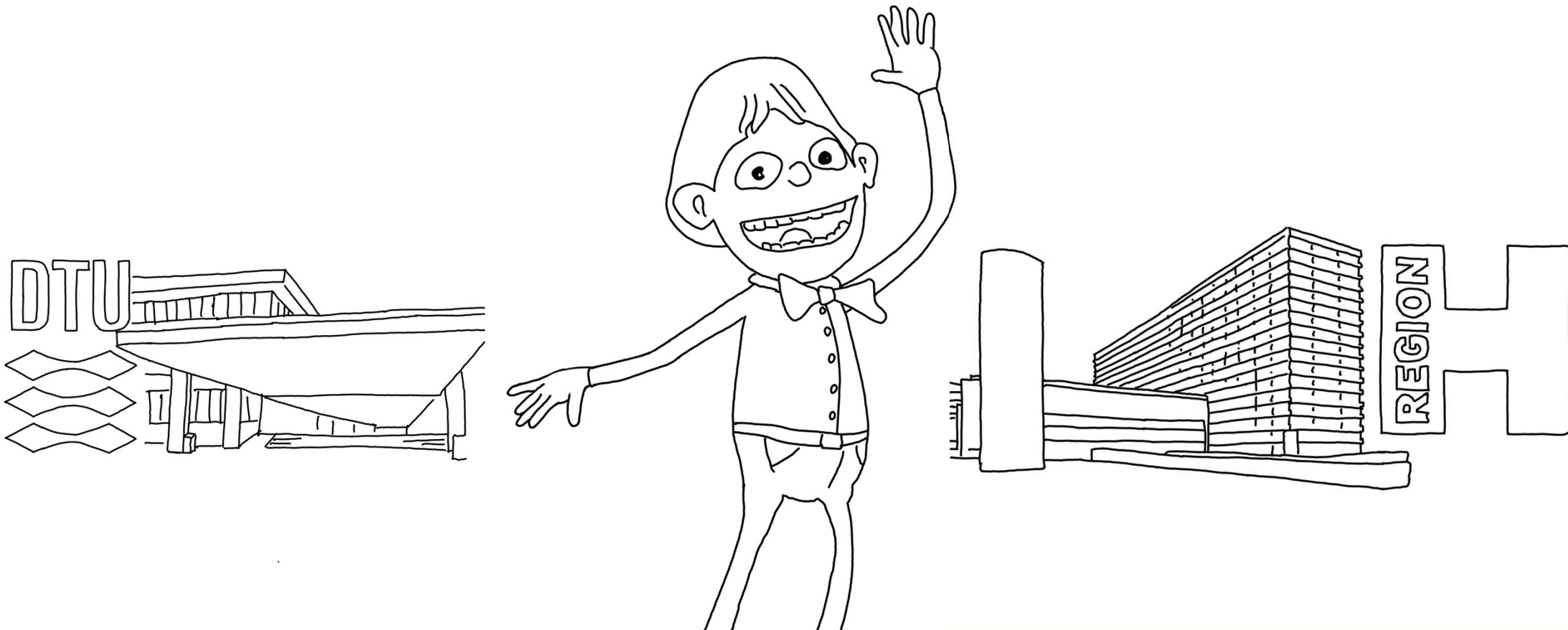
AI for the Human Organ Atlas

Synchrotron CT – from whole organ to nano-meter resolution



Schmidt-Christensen et al. 2023

TUH – Technical University Hospital of Greater Copenhagen



AI & SP



The Spectrum of Artificial Intelligence



Rule-Based Logic

Expert-defined and explicitly coded



Predictive Analytics

Statistically-derived to predict a pre-defined event



Generative AI (Large Language Models)

Generally-trained to generate novel content



Deterministic
Targeted

Probabilistic
More generalized



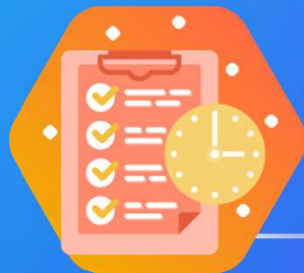
Uses of Generative AI *in Epic*



Generate
Summaries



Draft
Text



Automate
Actions



Transform
Content

Considerations for Responsible Use of AI



Accuracy



User Experience



Ethics

Draft Answers to Patient Responses

The screenshot displays the Epic MyChart interface. On the left, a sidebar shows 'My Messages' with categories like Results, Pt Medical Advice, Rx Request, My Open Charts, Chart Completion, E-Visits, and Video Visit. The main area shows a 'Pt Advice Request' table with columns for Status, Date, Time, and Patient. A 'Drafted Response' window is open, showing a message to George Adams. Below the draft, a 'New grandpa' message from George Adams is visible, asking a question about his granddaughter's health.

Status	Date	Time	Patient
Read	07/10/23	4:42 PM	Miller, Patricia Phone: 218-555-9657 Subject: FW: nausea
Read	07/10/23	4:42 PM	Marzotto, Harold Phone: Subject: FW: Rash
Read	07/10/23	4:54 PM	Katz, Yousef Phone: 910-555-0015 Subject: FW: Letter for Work
Read	07/10/23	4:55 PM	Adams, George From: 608-270-4567 Subject: FW: New grandpa
Read	07/09/23	8:15 AM	Cobb, George Phone: 916-234-2072 Subject: FW: heartburn meds

Drafted Response

Hello George,

Congratulations on becoming a new grandpa! It's wonderful to hear about your adorable granddaughter. Regarding your concern about your aortic valve, it's important to maintain good hygiene practices such as washing your hands frequently and avoiding close contact if she is sick. However, if you have specific concerns about your aortic valve or your overall health, I would recommend scheduling an appointment to discuss this further.

Please don't hesitate to reach out if you have any more questions or concerns.

Best,
Dr. Walker

[Start with Draft](#) [Start Blank Reply](#)

New grandpa

George Adams (Patient) → P Triage Nurses (supporting Drew Walker, MD) Just Now (4:55 PM)

Hi Dr. Walker, I forgot to tell you I'm a new grandpa! She's adorable but also is frequently sick. Do I need to be concerned that being around her germs will hurt my aortic valve?

>1M

Replies Drafted
Monthly

Piloting

BFH Endokrinologi
HGH Hjertemedicinsk

Catch Up on the Patient's

Notes

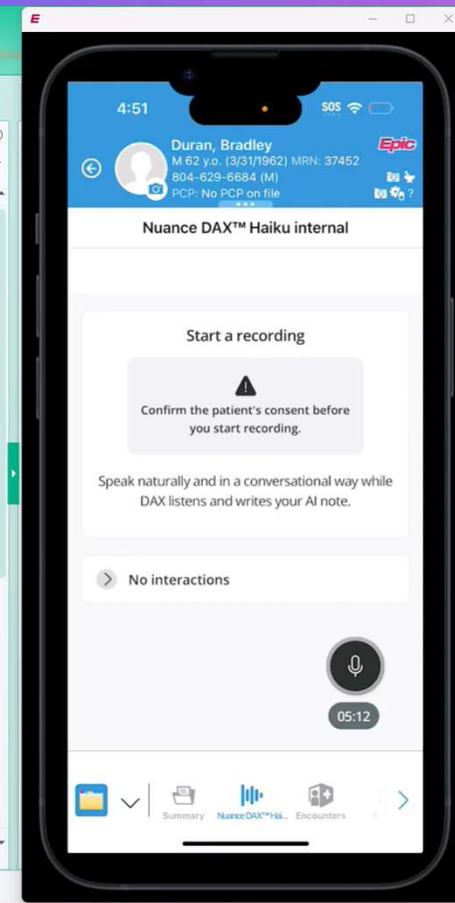
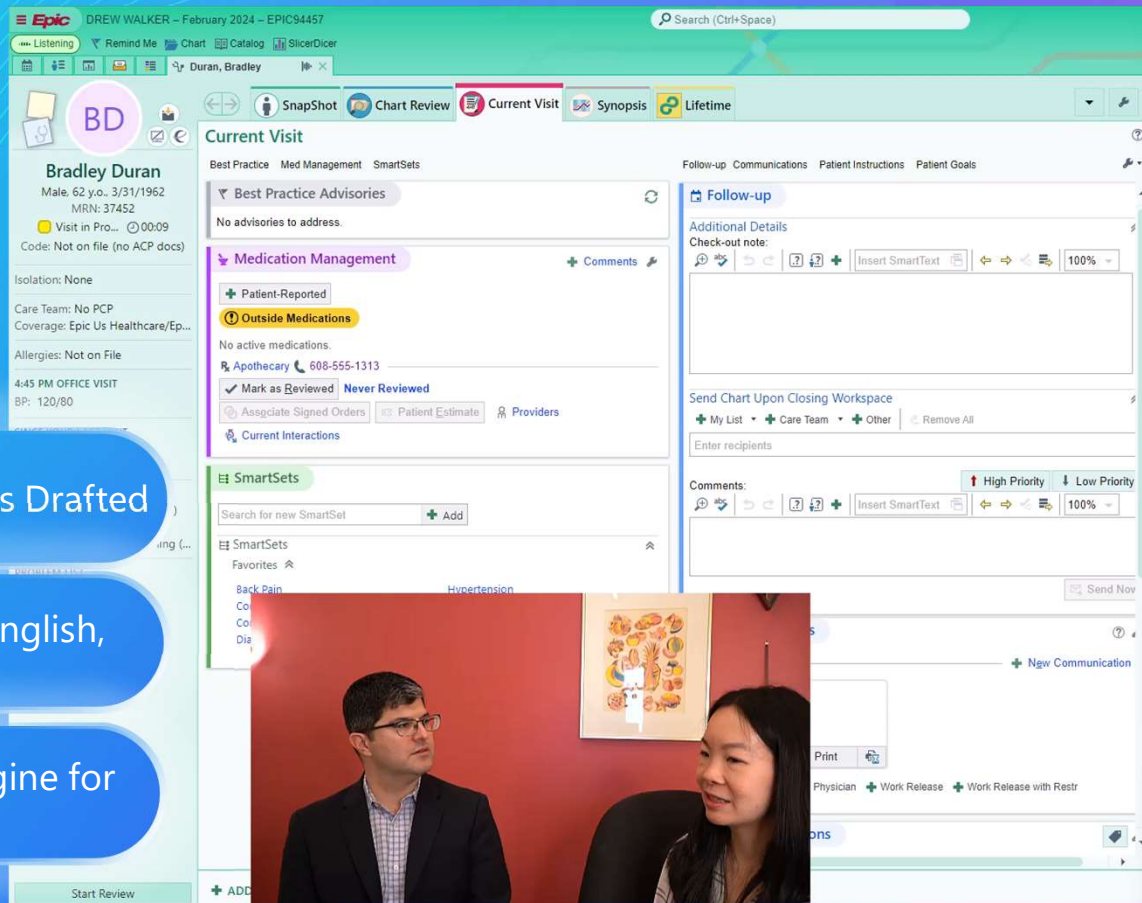
Hospital stay

Summer Pilot

In Testing This Autumn

© 2024 Epic Systems Corporation

Focus on the Patient with Ambient Notes



Ambient for Nurses

8:30

Belton, Peter
M 31 yo (3/8/1992) MRN: 11261
609-987-2143 (H)
Penicillins

8:30 today Pain

Pain Screening

Currently in Pain

Pain Assessment

Pain Score

Pain Type Tap to enter data

Pain Location

Pain Orientation

Pain Radiating Towards Tap to enter data

Pain Descriptors

✓ File

Future



“My pain is a 4 out of 10”

“Your pain is consistent and is still achy in your lower back.”

Up Next...

Generate Summaries

MyChart Patient Summary	Specialty Note
Inpatient Event	Research Summary
Get To Know Patient	ED Discharge
First-time Consult	Social Care Needs
Key Details From Imaging	

Automate Actions

Radiology Follow-ups	Phenotype Assistant
Scheduling Chatbot	Draft SQL Queries
Clinical Trial Chatbot	Clinical Trial Matching
Update Care Plan Goals	Discrete Refill Requests
Conversational Search	Keyboard-less Nursing Assessments

Draft Text

- Generate Cardiology Case Narratives
- Drafting Study Descriptions
- Ambient Suggestions
- Patient Instructions
- Inline Note Suggestions

Transform Content

- Adjust Reading Levels
- Language Translation
- SlicerDicer Sidekick
- Chart Abstraction

60+
In Development

[Roadmap.epic.com](https://roadmap.epic.com)



Planned for Sundhedsplatformen

Happening now

In Basket Draft Reply Pilot
Patient Note Summaries Prewrite

Planned for 2024

In Basket Draft Reply Rollout
Patient Note Summaries Pilot
Hospital Summaries Testing

Exploring 2025+

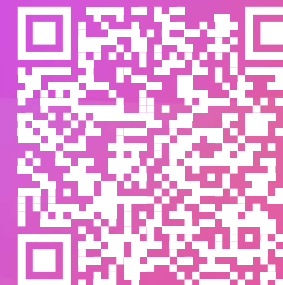
Hospital Summaries Pilot
Dashboard Summarization
Care Plan End of Shift Note
Ambient
Conversational Search

How to Get Involved

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Grand Rounds

Rigshospitalet

Paneldebat



Grand Rounds

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rigshospitalet.dk/grandrounds

Grand Rounds

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Tak for i dag

