



# CardioAI

Automated Medical Diagnosis from MRI and Patient Data using Deep Learning

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Ivo Everts  
AI specialist

# OUR STORY

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Making clients win  
by using data



42 data specialists:  
▪ 50% data engineer  
▪ 50% data scientist



Part of Xebia Group  
Headquartered in Amsterdam

**Xebia**

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 Xpirit

 **binx.io**

**XCCELERATED**

 **StackState**

 **instruqt**

# CLIENTS

E-commerce	Travel & Leisure	Financial Services	Utilities	Products	Media
					 nederlandse publieke omroep
					
					
					

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# Technical Partnering



University Medical Center Groningen

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# Technical Partnering



Google Cloud



University Medical Center Groningen

**SIEMENS**  
**Healthineers**

*Let's add Healthcare to our list of clients-by-industry!*

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# Overview

>> The CardioAI tool

>> The future of AI in healthcare

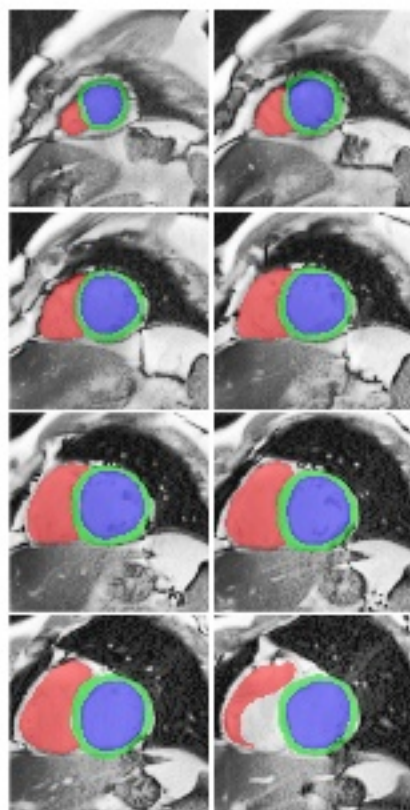


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# CardioAI

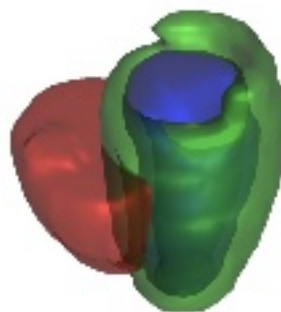
Slices



Volumes over Time



Volumes



Features

	Left	Right
End Diastolic Volume	225 mL (102)	190 mL (78)
End Systolic Volume	130 mL (53)	81 mL (31)
Ejection Fraction	57.8 %	45.8 %
Stroke Volume	85 mL (35)	77 mL (30)
Cardiac Output	4.27 L (1.84)	3.87 L (1.76)
Myocardial Mass	102 g (40)	

(= Indexed with Body Surface Area)



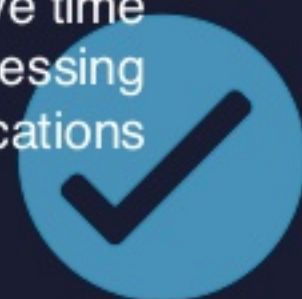
# CardioAI

Offering this as a service could:

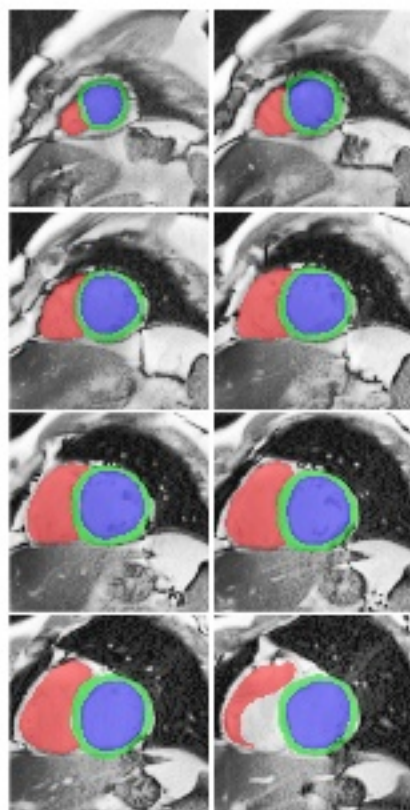
Save time

Enable large scale processing

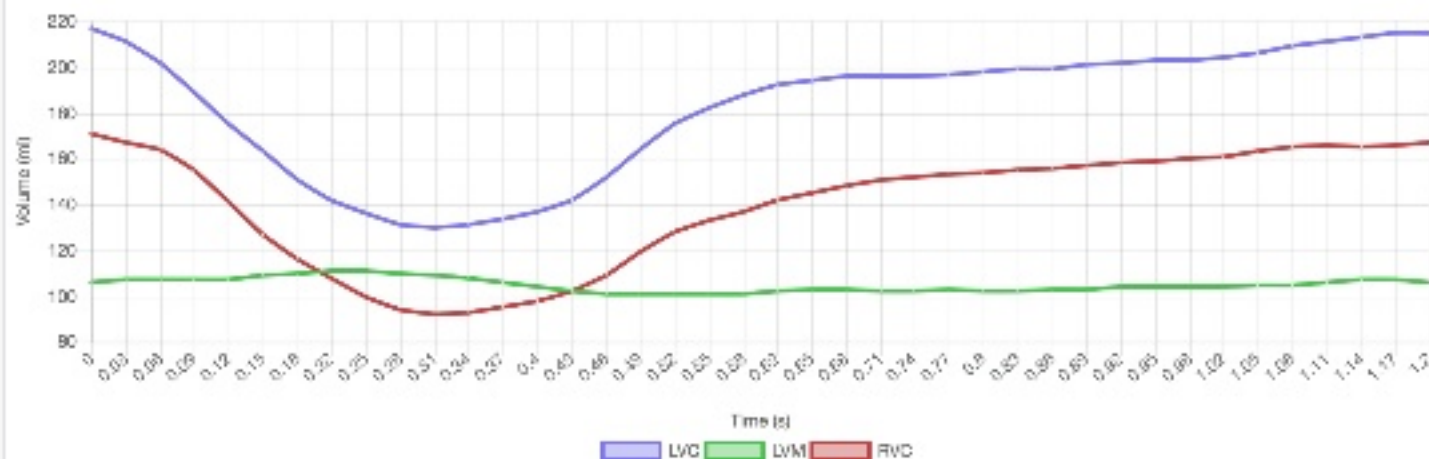
Unleash new research and applications



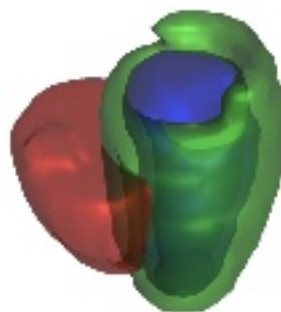
Slices



Volumes over Time



Volumes

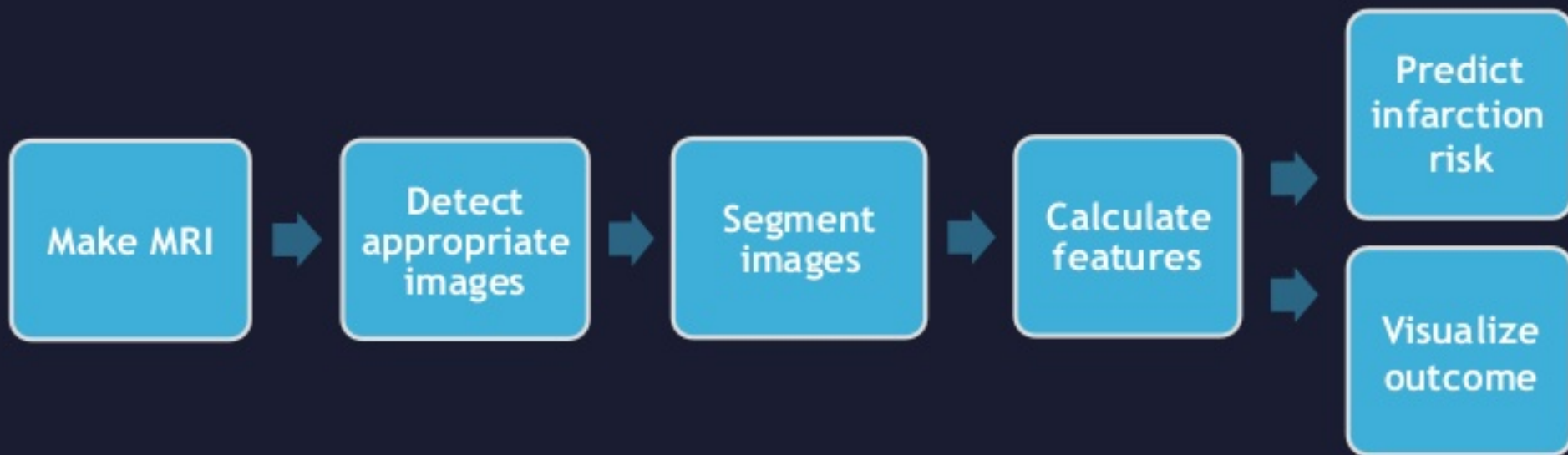


Features

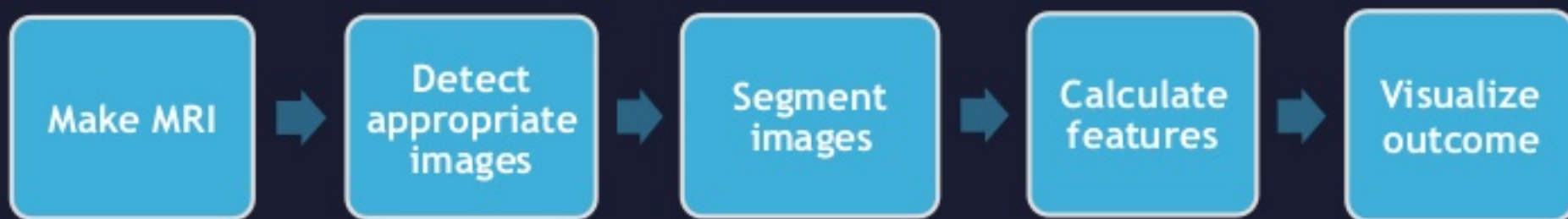
	Left	Right
End Diastolic Volume	225 mL (102)	190 mL (78)
End Systolic Volume	140 mL (63)	81 mL (31)
Ejection Fraction	57.8 %	45.8 %
Stroke Volume	85 mL (38)	77 mL (30)
Cardiac Output	4.27 L (1.84)	3.87 L (1.76)
Myocardial Mass	102 g (46)	

(= Indexed with Body Surface Area)

# CardioAI service

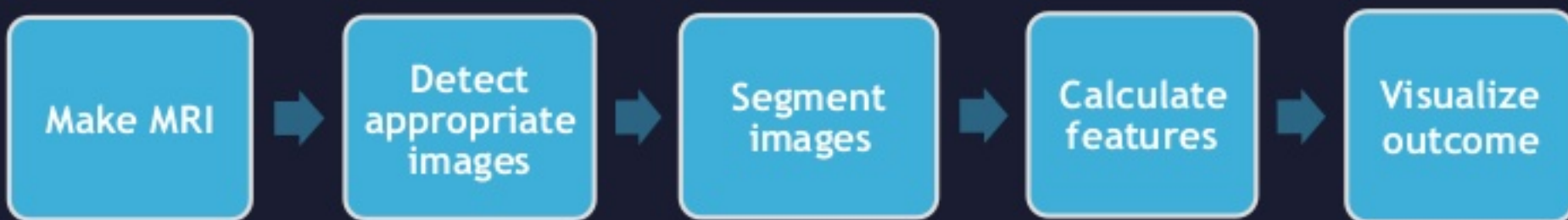


# CardioAI service



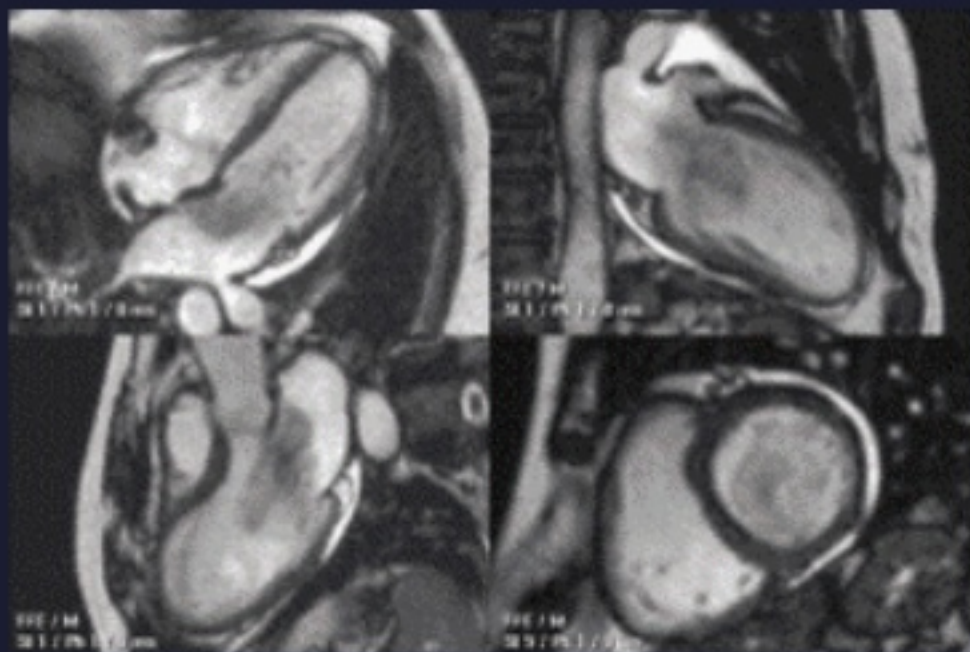
# CardioAI service

GCP / Python / Keras



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# CardioAI service



Make MRI

Detect  
appropriate  
images

Segment  
images

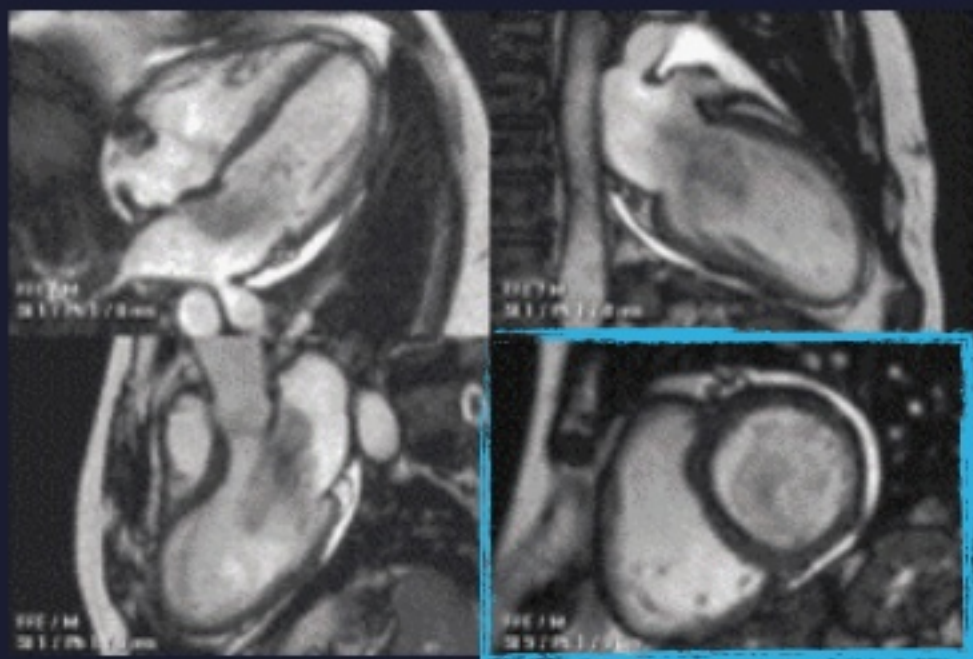
Calculate  
features

Visualize  
outcome

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# CardioAI service



Metadata or convnet

Make MRI

Detect  
appropriate  
images

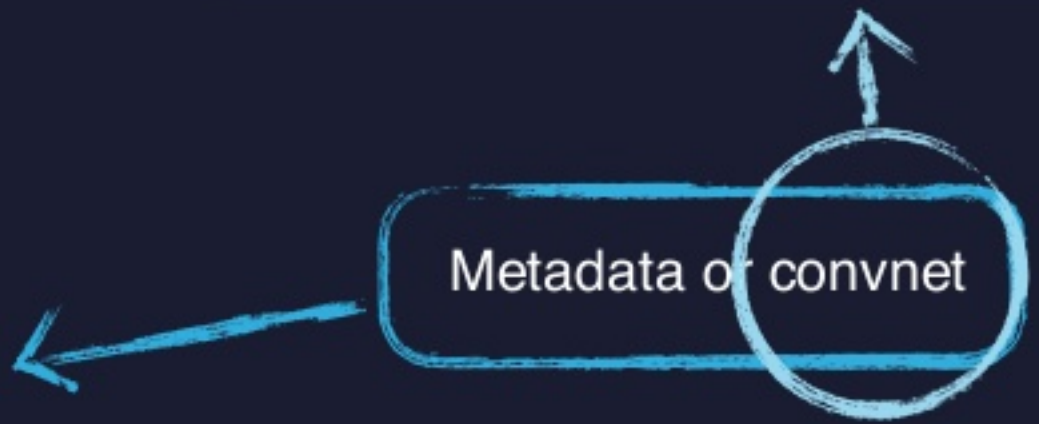
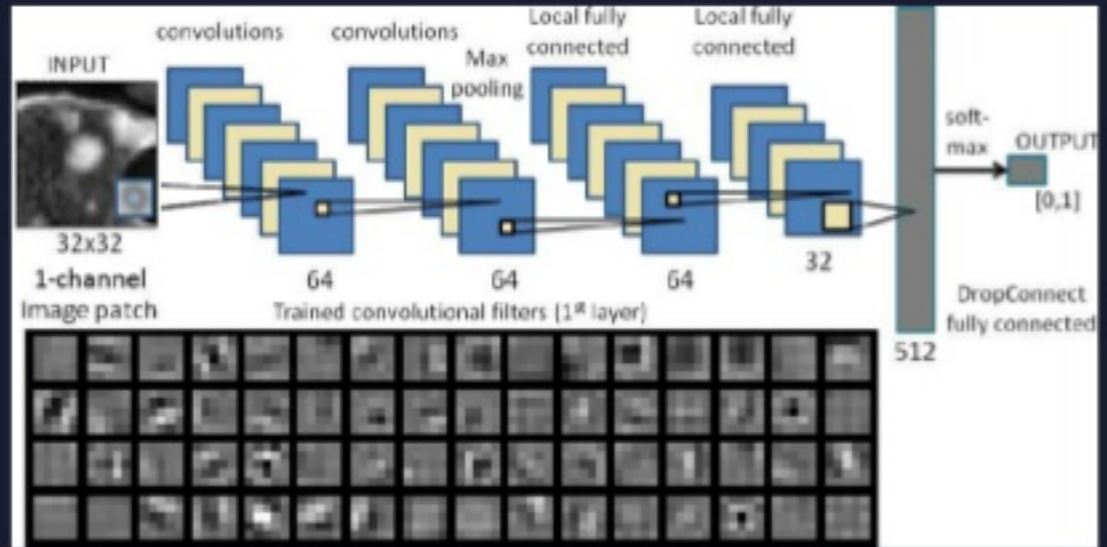
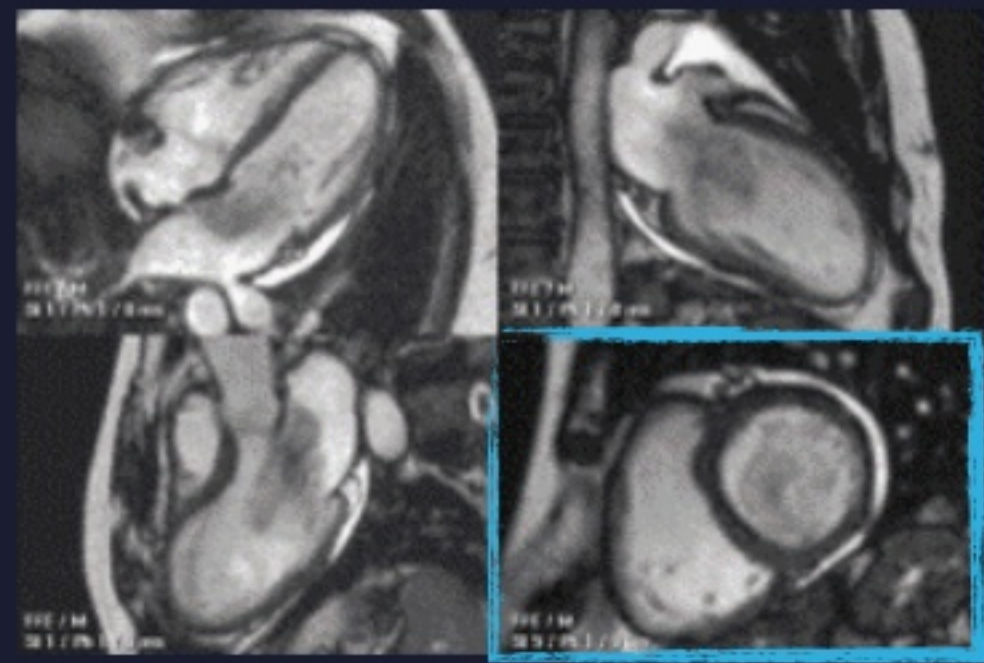
Segment  
images

Calculate  
features

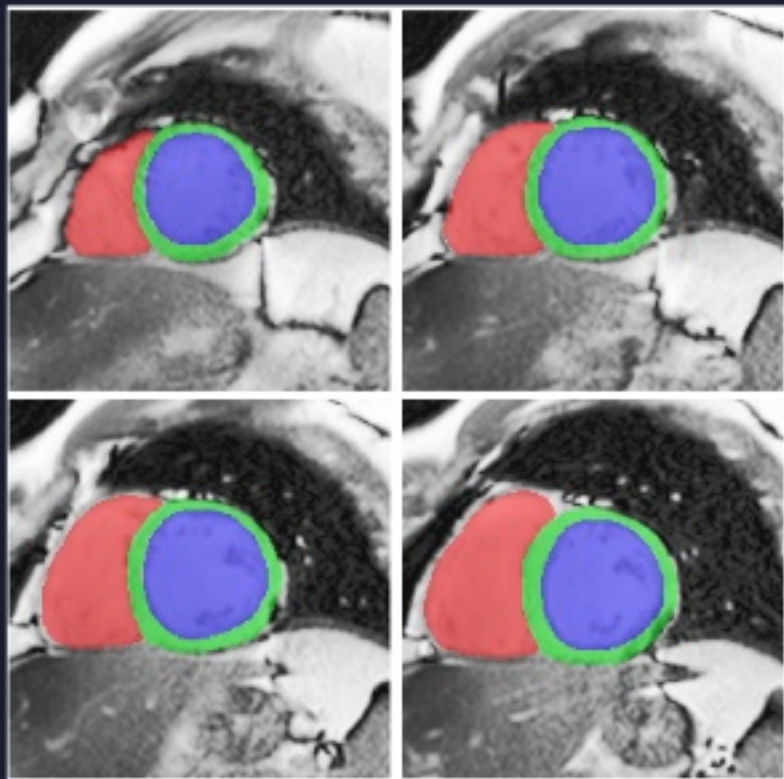
Visualize  
outcome

GO  
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# CardioAI service



# CardioAI service



Make MRI

Detect  
appropriate  
images

Segment  
images

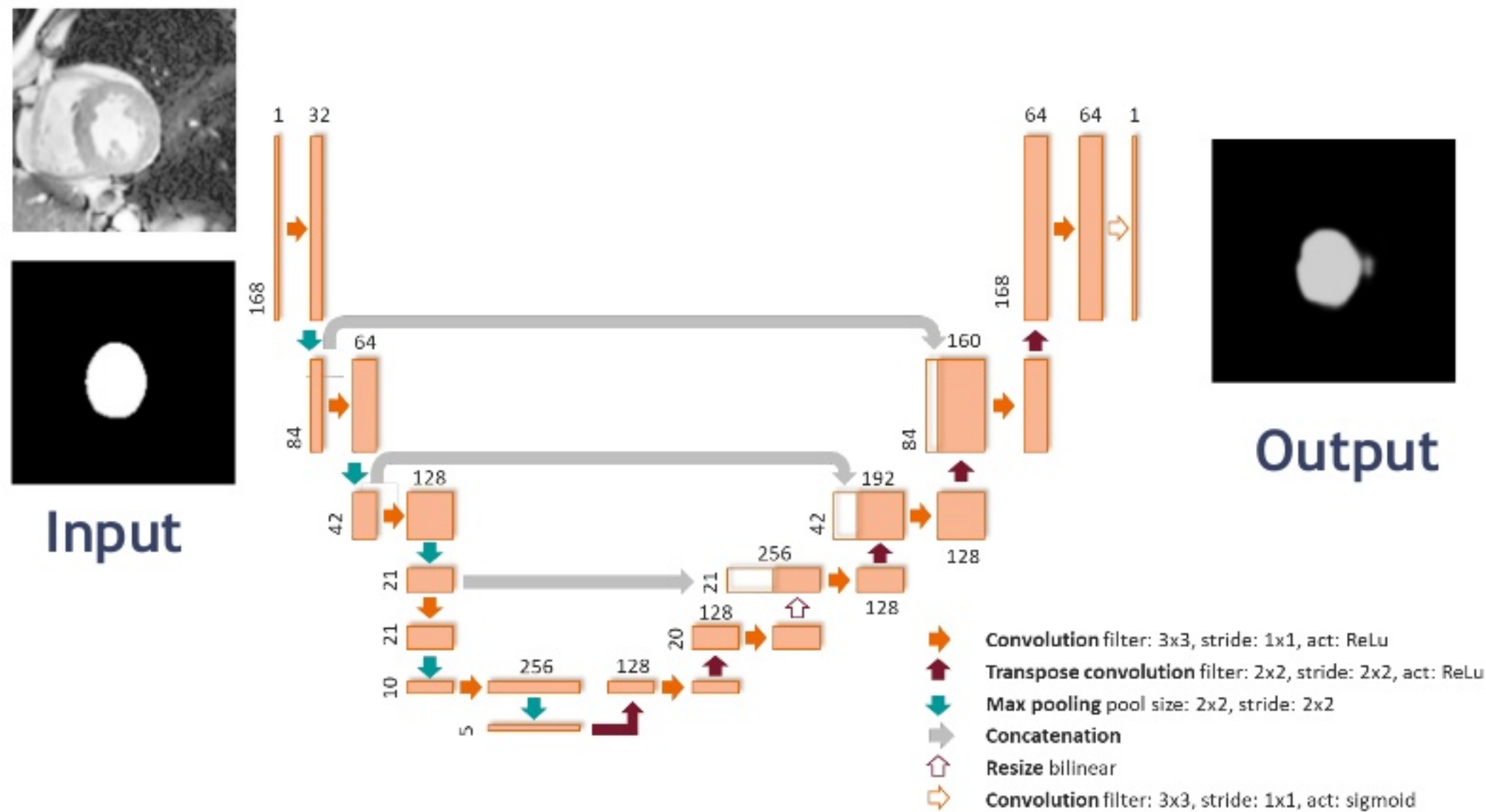
Calculate  
features

Visualize  
outcome

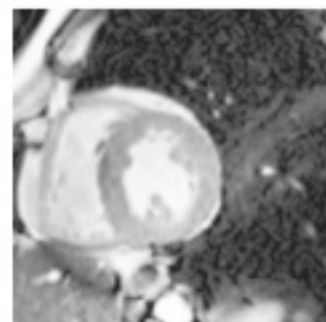
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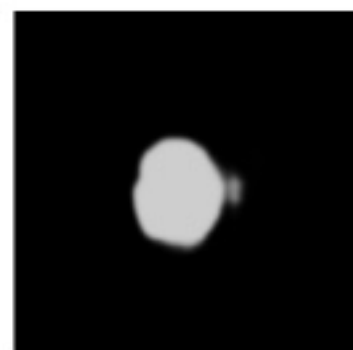
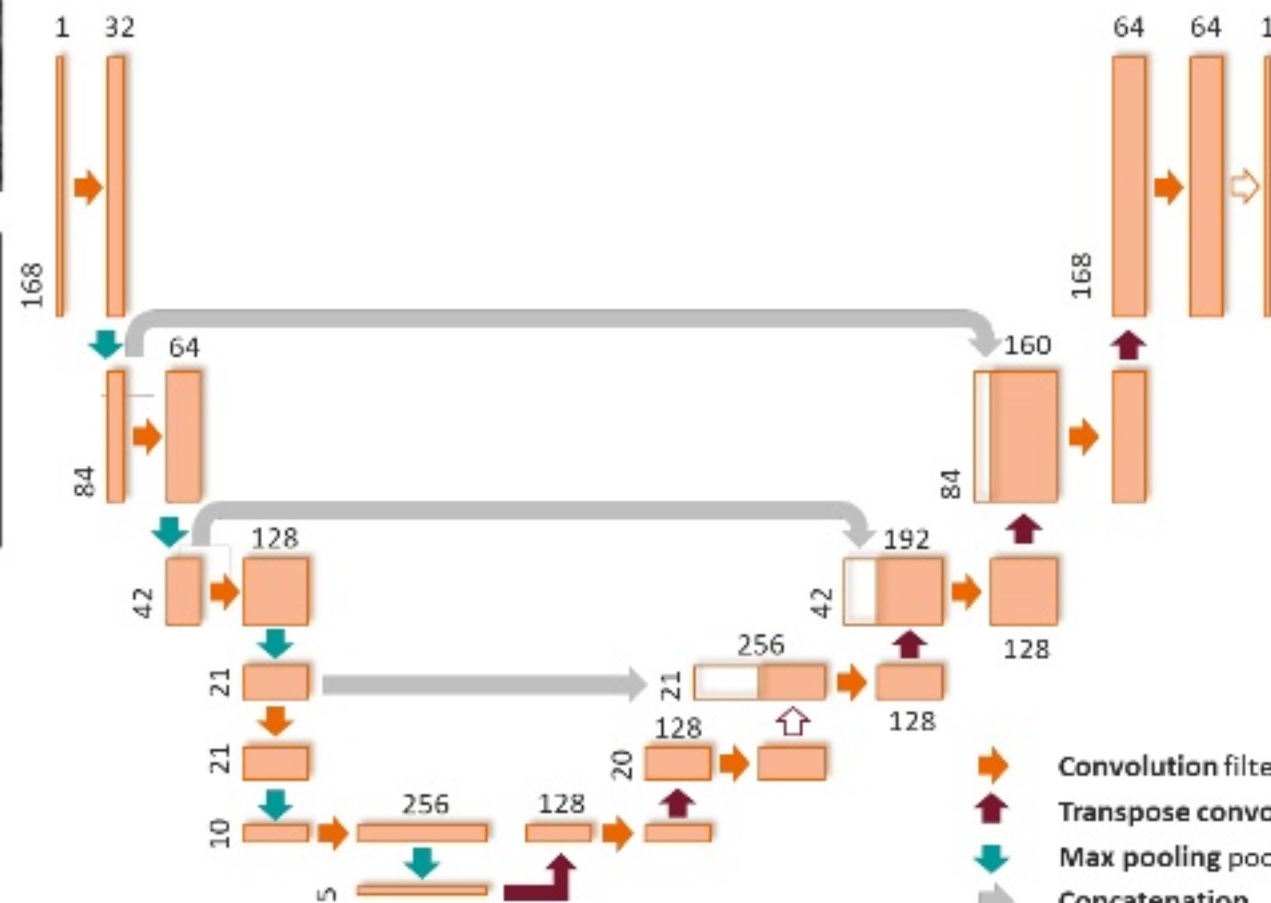
# CardioAI service



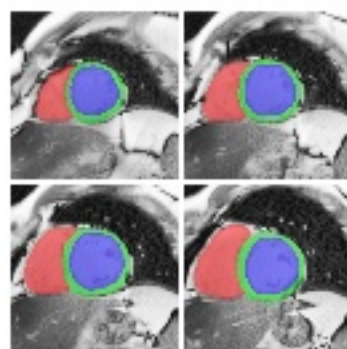
# CardioAI service



Input



Output

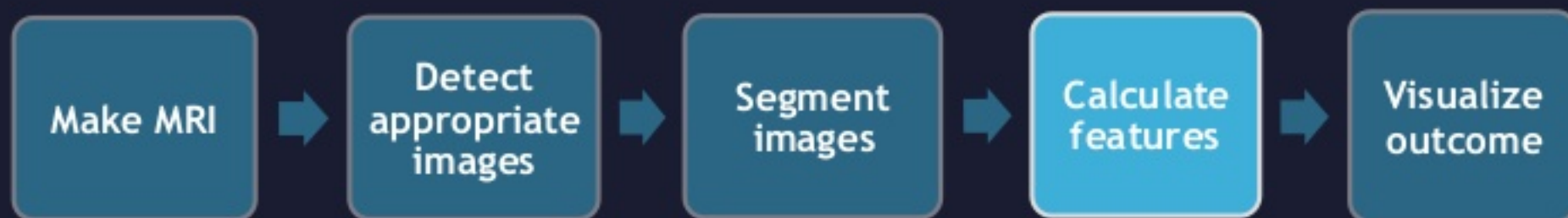


One Unet per class

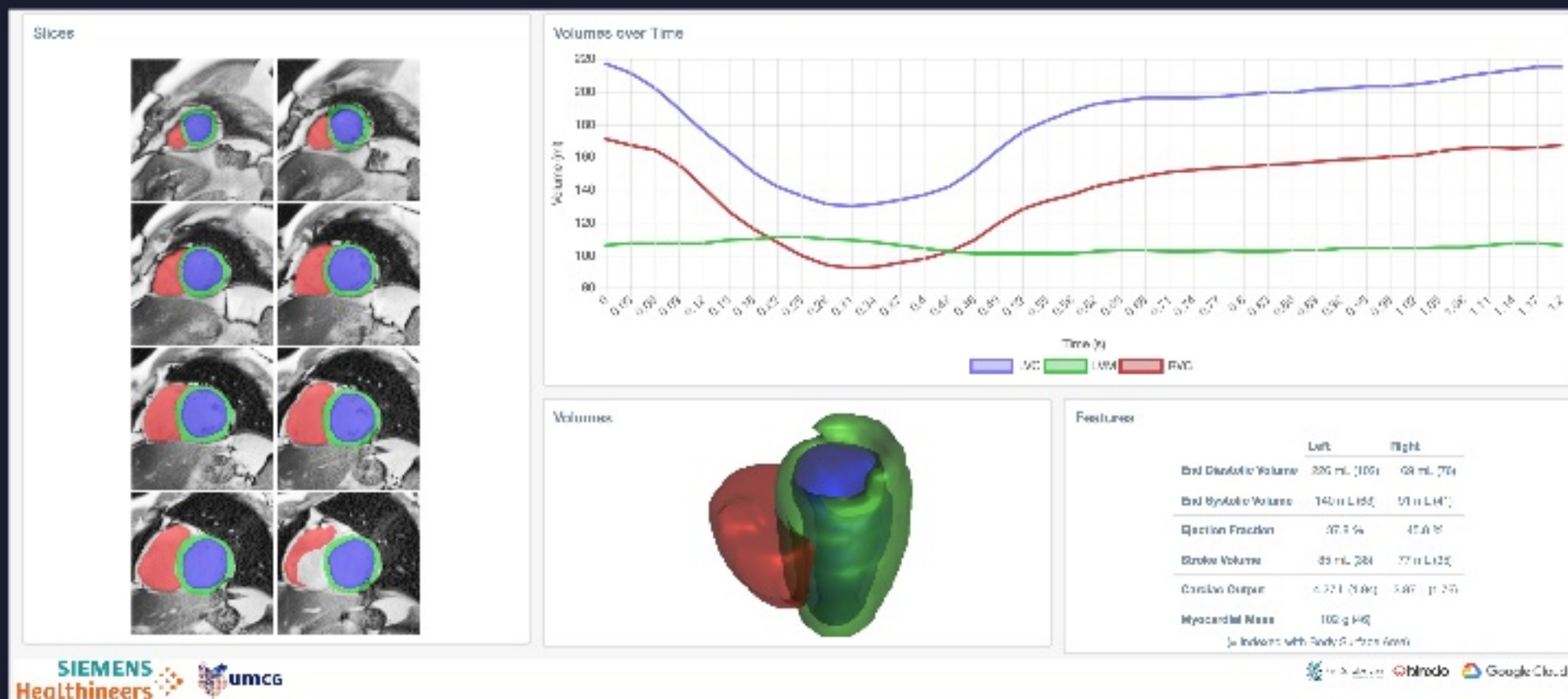


# CardioAI service

	Left	Right
End Diastolic Volume	226 mL (102)	169 mL (76)
End Systolic Volume	140 mL (63)	91 mL (41)
Ejection Fraction	37.8 %	45.8 %
Stroke Volume	85 mL (38)	77 mL (35)
Cardiac Output	4.27 L (1.94)	3.87 L (1.76)
Myocardial Mass	102 g (46)	
(= Indexed with Body Surface Area)		



# CardioAI service



Make MRI

Detect  
appropriate  
images

Segment  
images

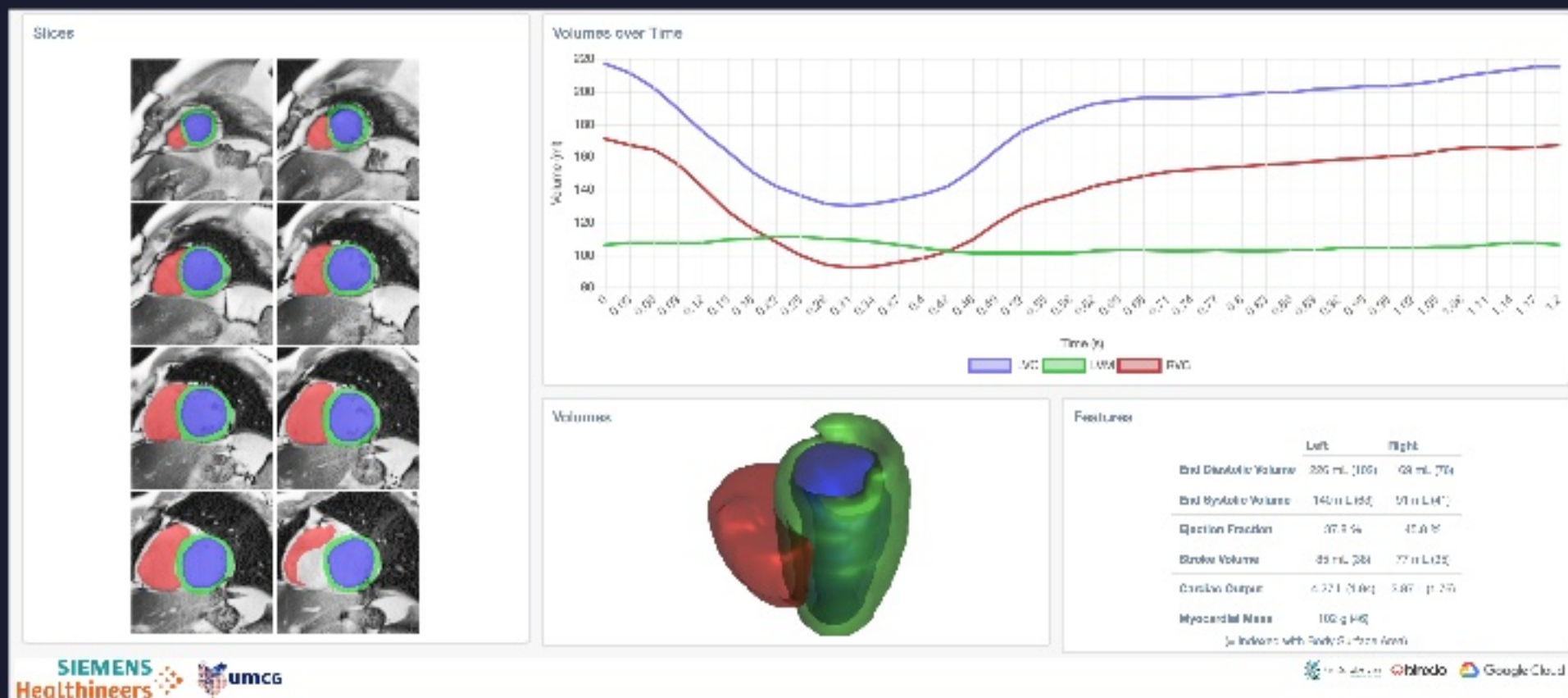
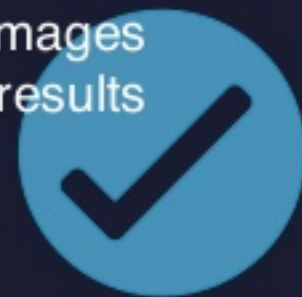
Calculate  
features

Visualize  
outcome

GO  
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# CardioAI service

Upload MRI images  
Download results



Make MRI

Detect  
appropriate  
images

Segment  
images

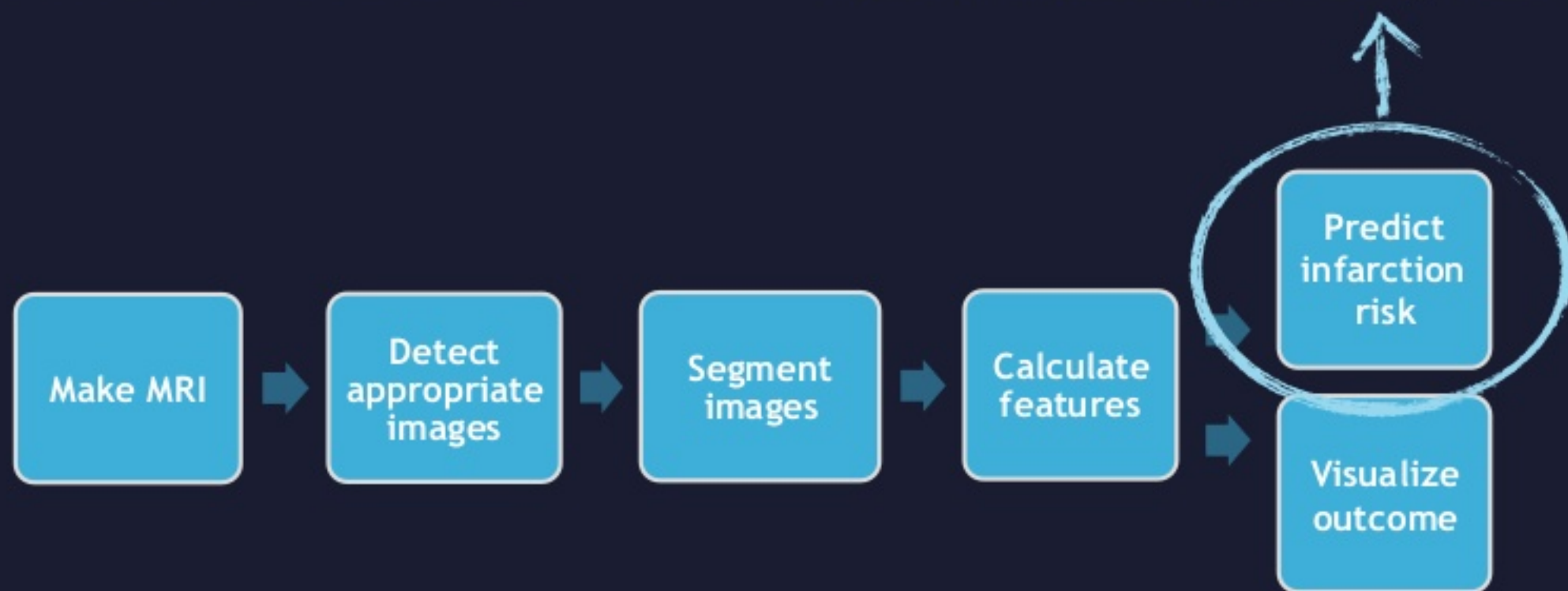
Calculate  
features

Visualize  
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GO  
DATA  
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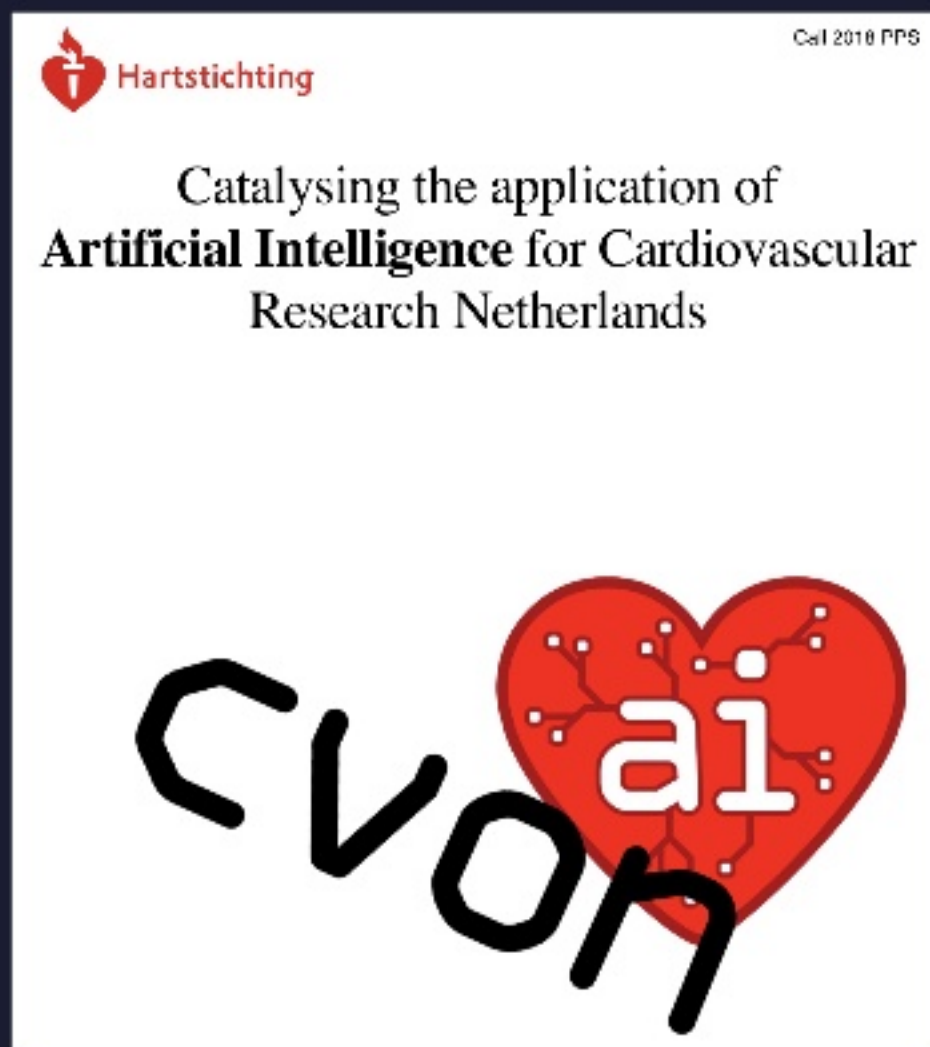
# CardioAI future

This - and many other things - are to be implemented based on datasets obtained by the CardioAI service





# CardioAI future



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# CardioAI

*Deep Learning MRI Google Cloud 3D Medical Awesomeness*

# CardioAI

*Deep Learning MRI Google Cloud 3D Medical Awesomeness*

When & how exactly!?

>> Still far fetched connection with daily ops in the clinic



# The future of AI in healthcare

**"The future is already here — it's just not very evenly distributed."**

**William Gibson**

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# MedicX.AI

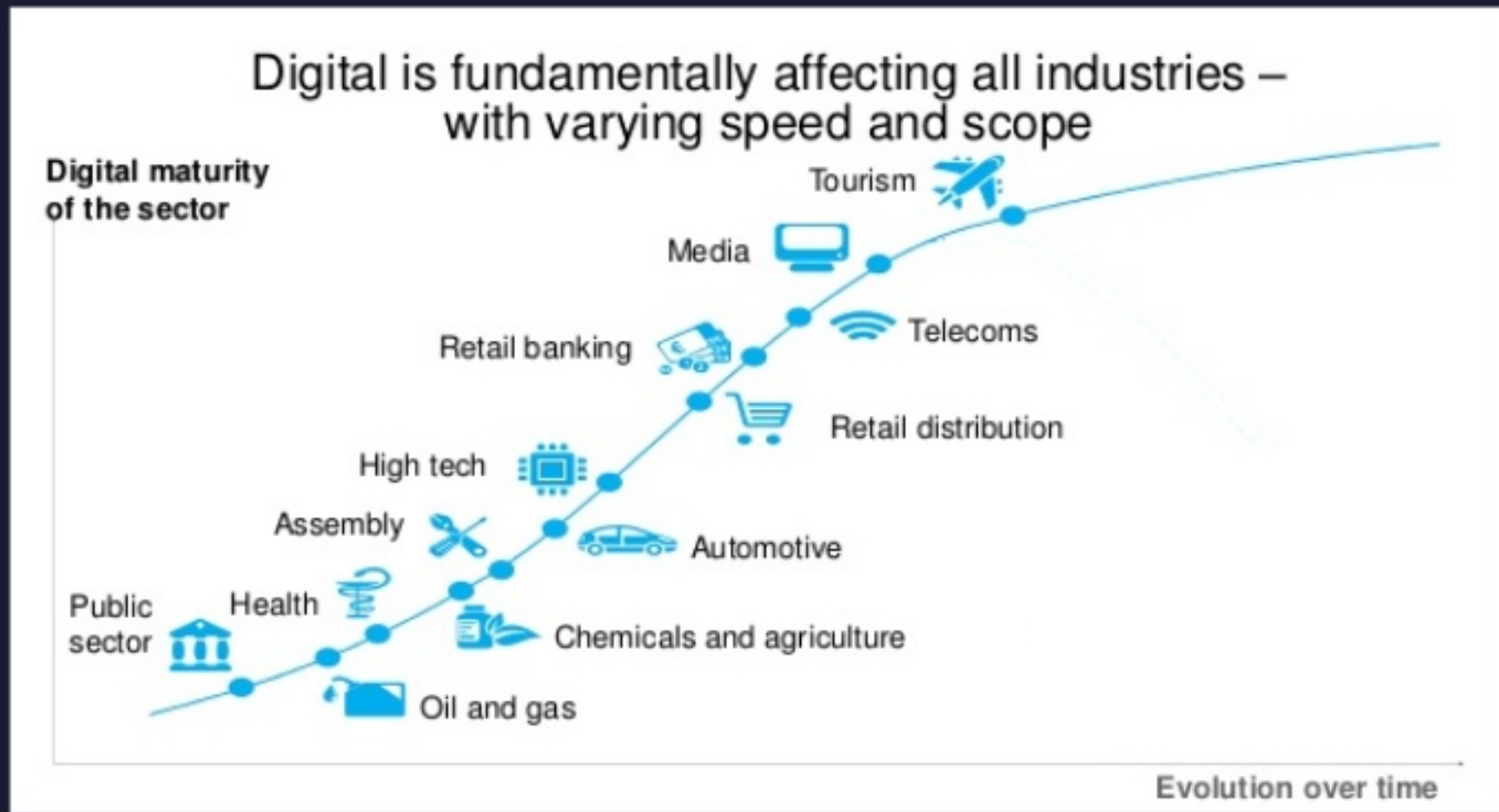
## The future of AI in healthcare

**"The future is already here — it's just not very evenly distributed."**

**William Gibson**

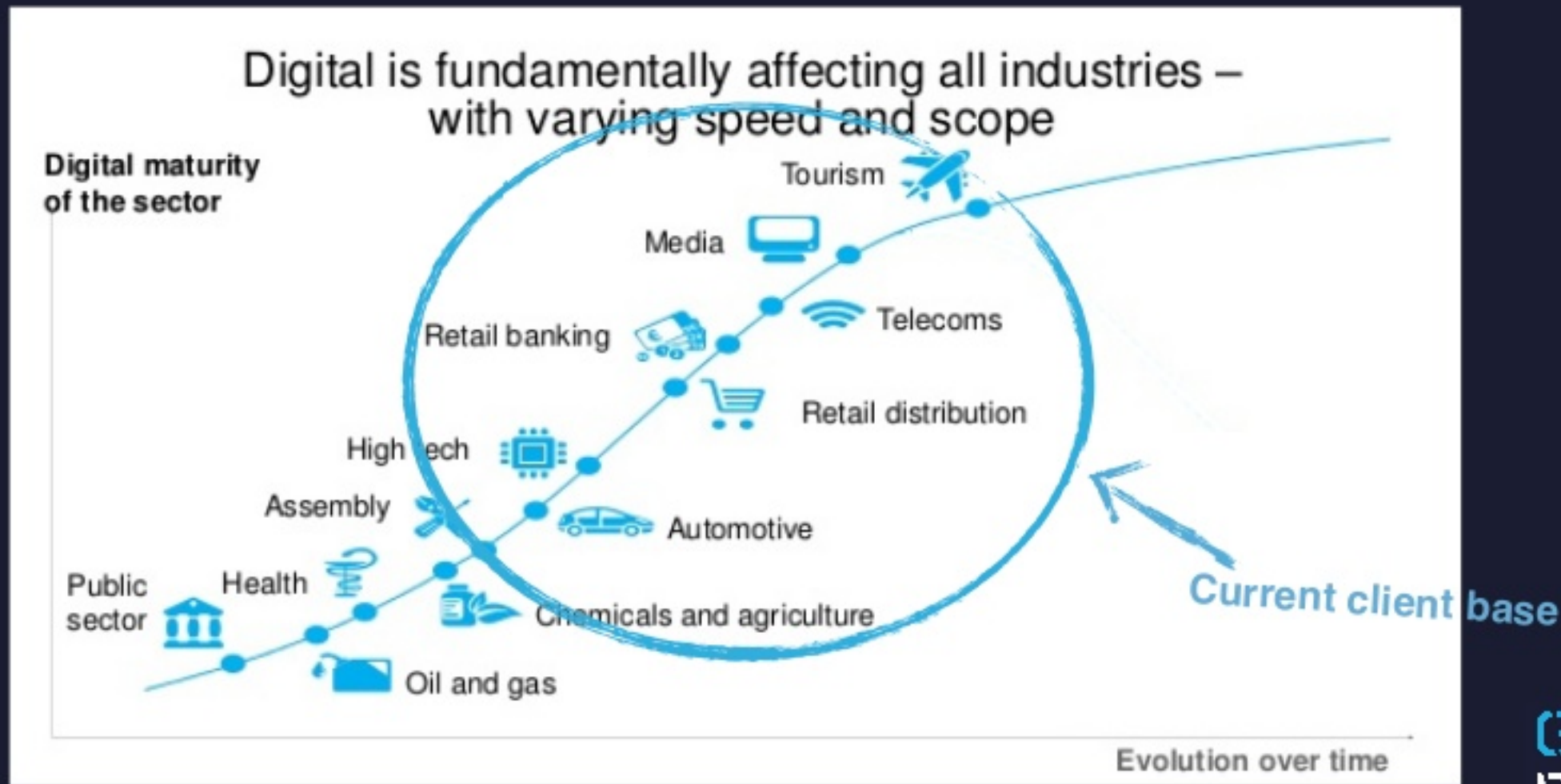
GO   
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# Let's consult McKinsey



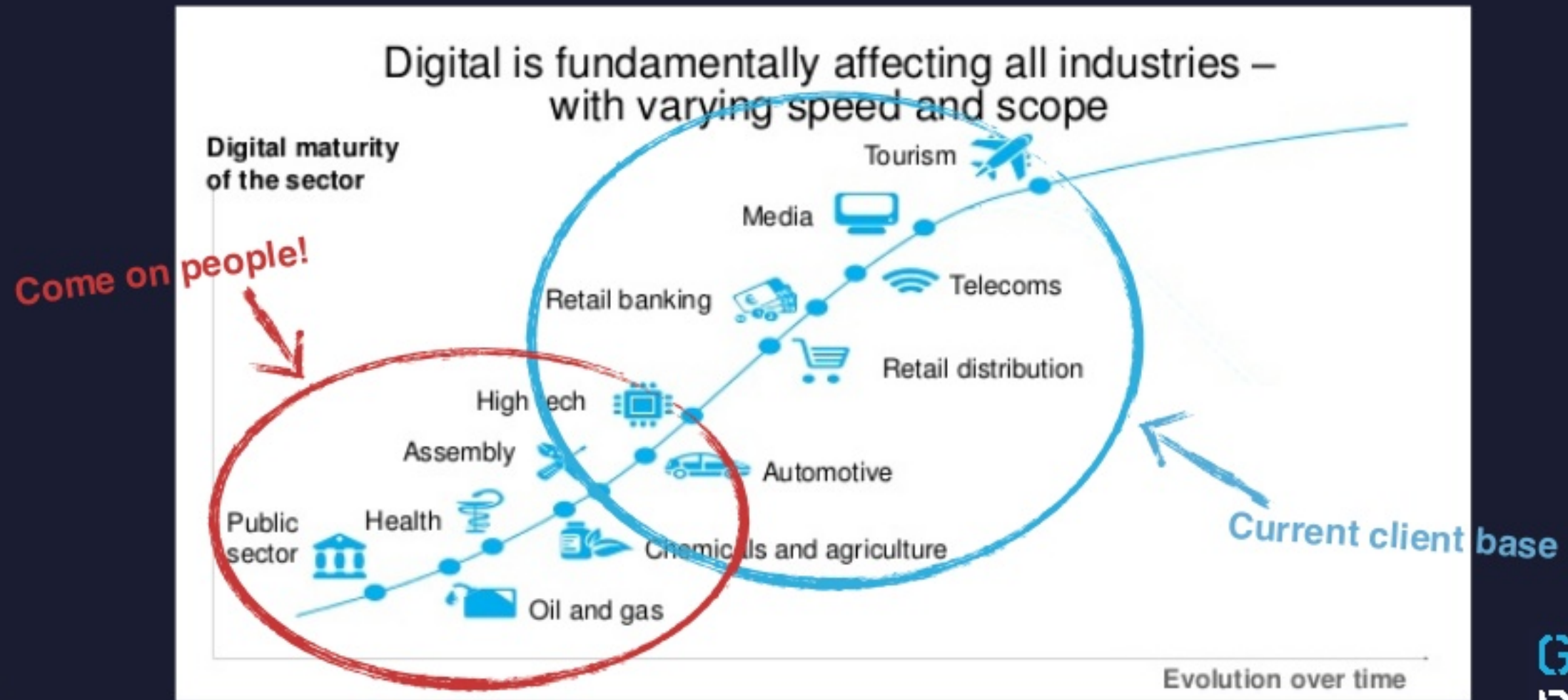


# Let's consult McKinsey



GO  
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# Let's consult McKinsey



X

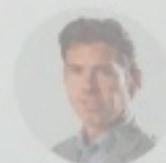
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Things  
are  
getting  
serious

COMMENT  
JUNE 15 2018, 5:00PM, THE TIMES

If NHS patient data is worth  
£10 billion, put it on the  
balance sheet and save lives  
too

PHILIP ALDRICK



Maxine Mackintosh @ NRClive zorgtech

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# Flip the ethical discussion



- >> Projects freeze because of privacy and security concerns
- >> Where would we be if we could add some defrost





# Flip the ethical discussion



- >> Projects freeze because of privacy and security concerns
- >> Where would we be if we could add some defrost

Cardiac function analysis on thousands of patients



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# Flip the ethical discussion



- >> Projects freeze because of privacy and security concerns
- >> Where would we be if we could add some defrost

Cardiac function analysis on thousands of patients

AI as a medicine:  
predicting stent urgency from blood pressure measurements



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# Flip the ethical discussion



- >> Projects freeze because of privacy and security concerns
- >> Where would we be if we could add some defrost

Cardiac function analysis on thousands of patients

ADHD profiling for early detection

AI as a medicine:  
predicting stent urgency from blood pressure measurements



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# Flip the ethical discussion



- >> Projects freeze because of privacy and security concerns
- >> Where would we be if we could add some defrost

Cardiac function analysis on thousands of patients

ADHD profiling for early detection

AI as a medicine:  
predicting stent urgency from blood pressure measurements

Hypoglycemia prediction based on heart rate variability



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# Explore new opportunities

Healthcare is

- >> relevant
- >> interesting
- >> difficult



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# Explore new opportunities

Healthcare is

- >> relevant
- >> interesting
- >> difficult

We must

- >> mutually benefit
- >> push forward
- >> team up



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# MedicX.AI

Make impact on patient care with AI  
based on years of experience





**Ivo Everts**  
AI SPECIALIST



**Kicky van Leeuwen**  
DATA SCIENCE & BUSINESS  
DEVELOPMENT



**Wietse Venema**  
CLOUD ENGINEER



**Albert Brand**  
SOFTWARE ENGINEER



**Fokko Driesprong**  
DATA ENGINEER



**Walter van der Scheer**  
MARKETING



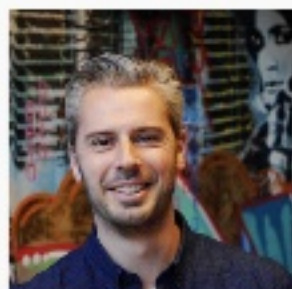
**Guido Hobbelijn**  
SALES



**Rob Diklemans**  
PROMOTER



**Bart Verlaet**  
PROMOTER



**Dennis Groenhuizen**  
PROMOTER

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# MedicX.AI

Check us out at [medicx.ai](https://medicx.ai) / LinkedIn

[ivoeverts@godatadriven.com](mailto:ivoeverts@godatadriven.com)

(I need to fix that;)

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