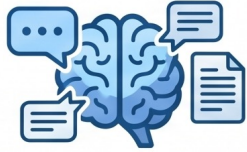


Inteligencia Artificial en Cirugía Bariátrica

Dr. Pablo Achurra T.
Profesor Asistente
Cirugía HPB, Innovación & Trasplante
Pontificia Universidad Católica de Chile



Inteligencia Artificial



Language & Reasoning



Computer Vision



Predictive Analytics



Robotics & Automation

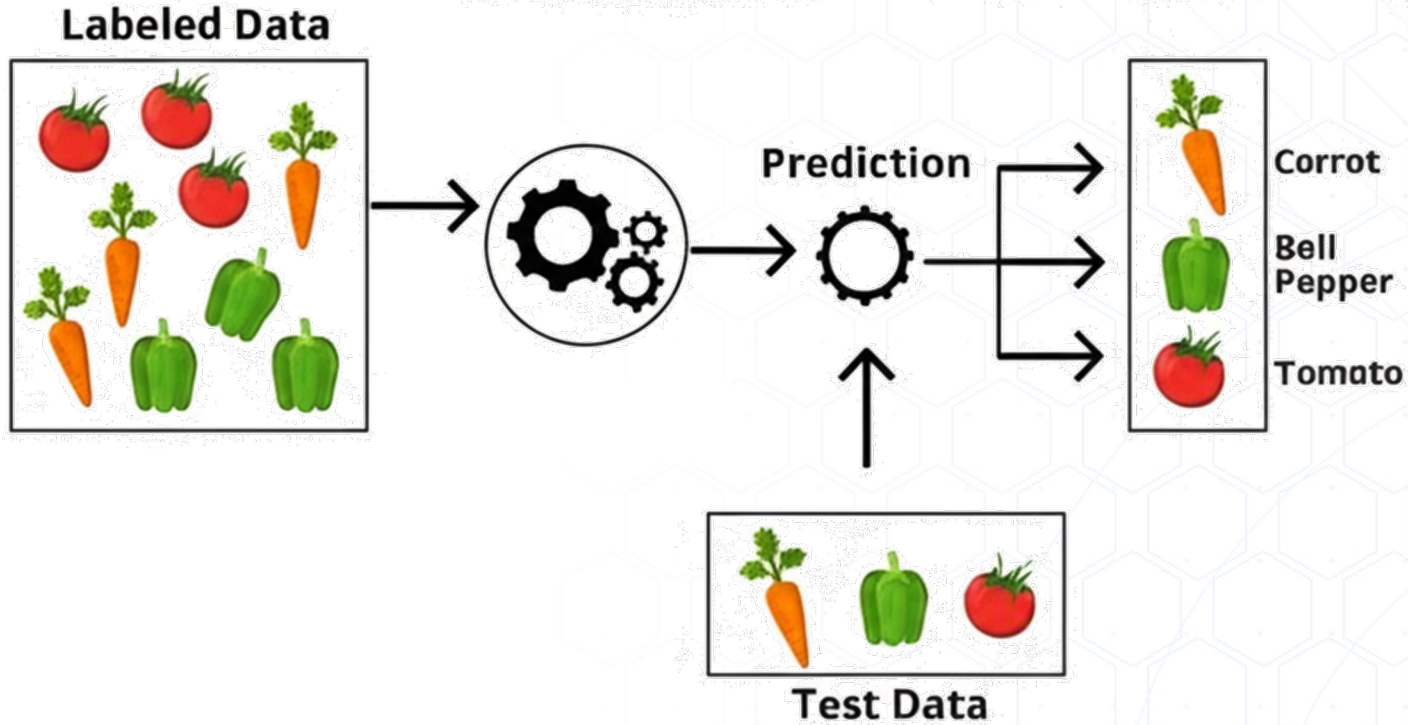


Generative AI

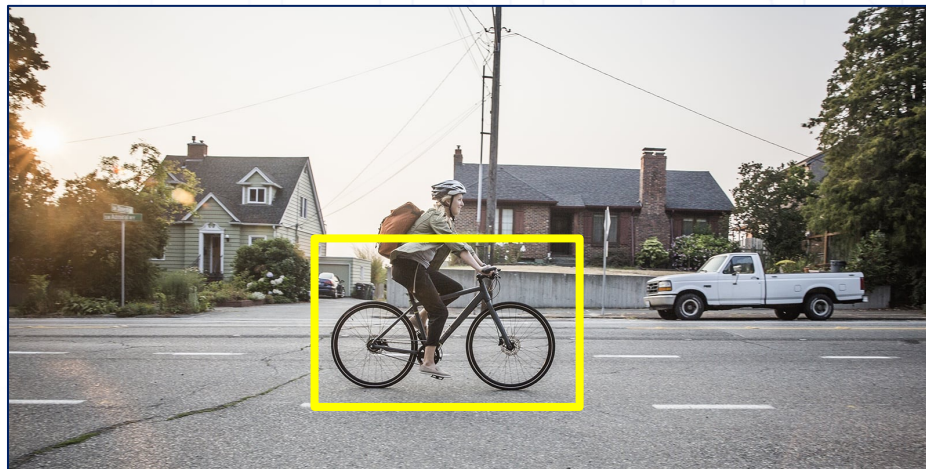


Autonomous Agents

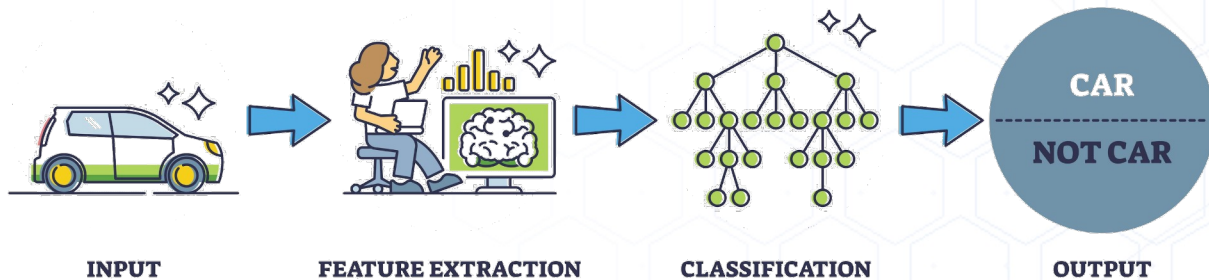
Datos y predicciones



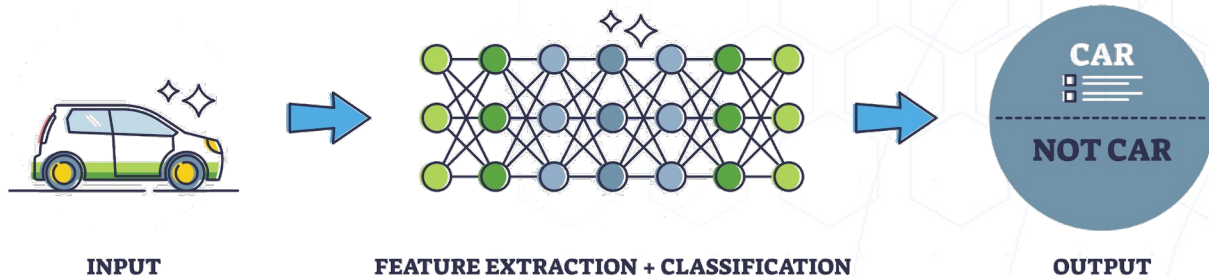
Labeled Data



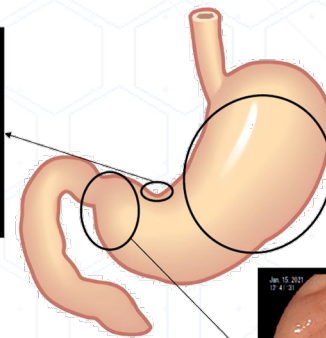
MACHINE LEARNING



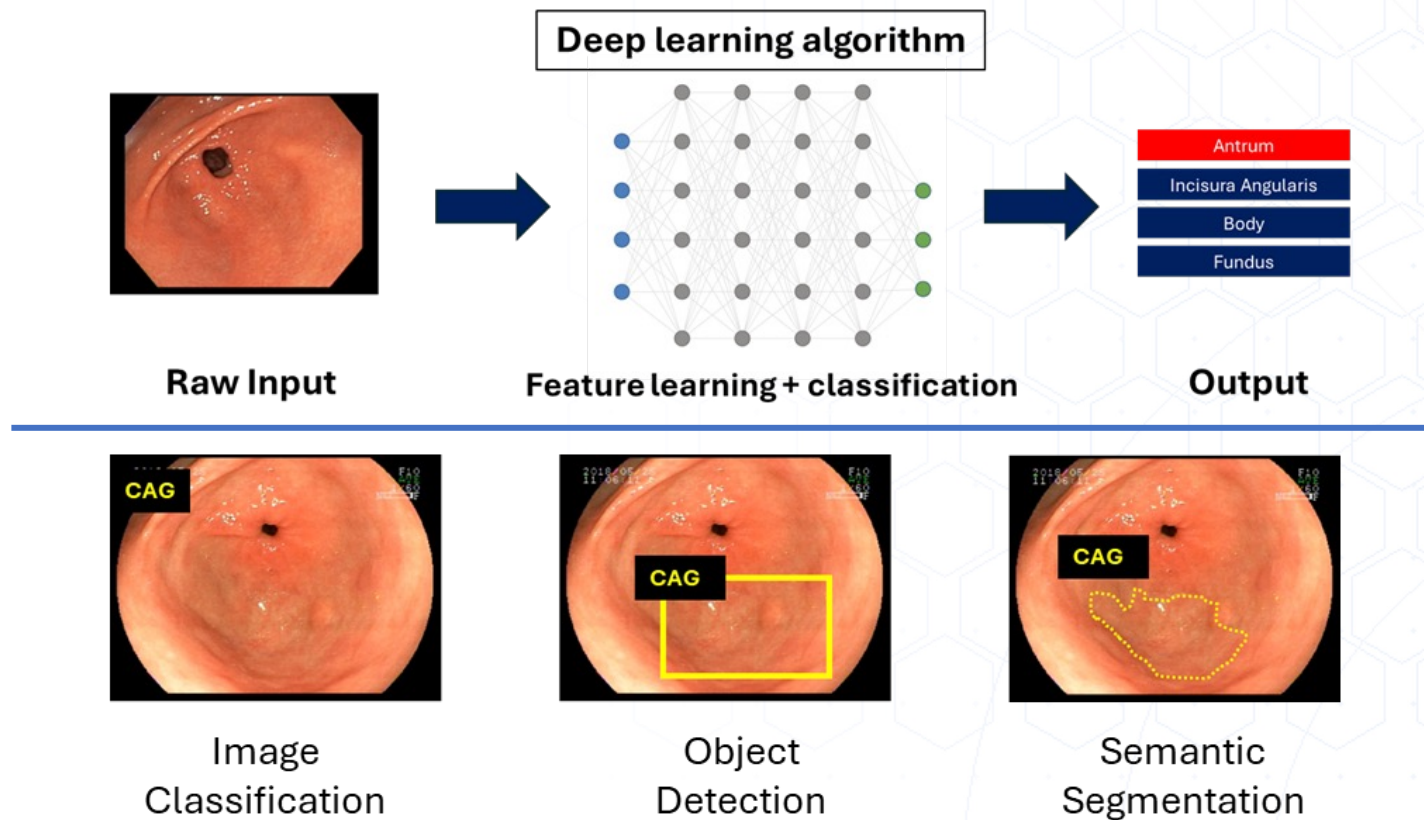
DEEP LEARNING

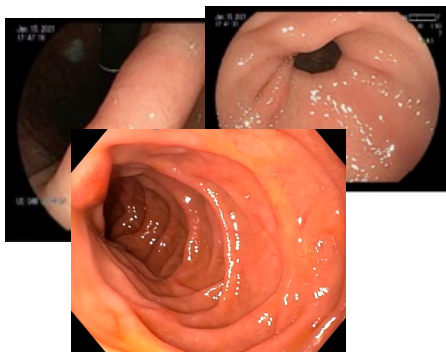


Partes del estómago



Atrophy Score		Corpus			
		No Atrophy (score 0)	Mild Atrophy (score 1)	Moderate Atrophy (score 2)	Severe Atrophy (score 3)
Antrium	No Atrophy (score 0) (including <i>incisura angularis</i>)	STAGE 0	STAGE I	STAGE II	STAGE II
	Mild Atrophy (score 1) (including <i>incisura angularis</i>)	STAGE I	STAGE I	STAGE II	STAGE III
	Moderate Atrophy (score 2) (including <i>incisura angularis</i>)	STAGE II	STAGE II	STAGE III	STAGE IV
	Severe Atrophy (score 3) (including <i>incisura angularis</i>)	STAGE III	STAGE III	STAGE IV	STAGE IV

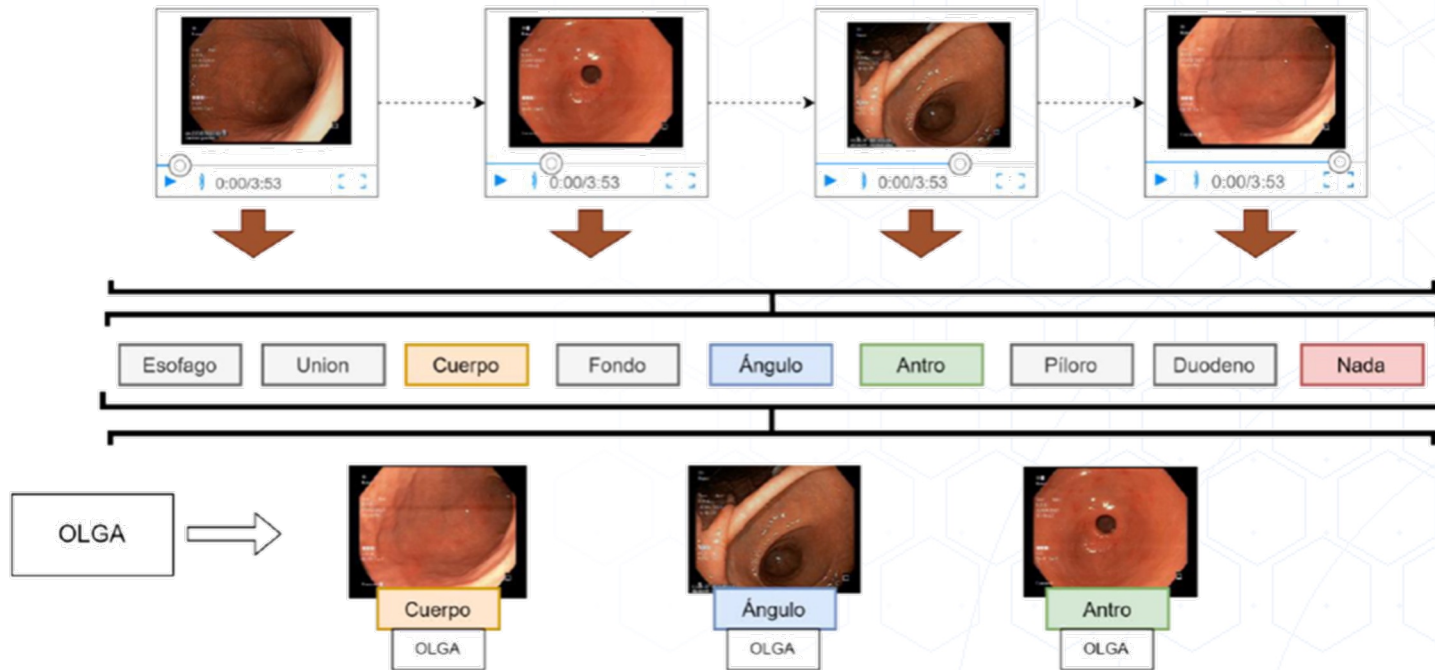




Lugar
OLGA



Cuerpo
OLGA 3



Detección endoscópica– Experiencia UC

ID: ■

Name: **Esophagus: 86.71%**

Sex: Age:

D.O.B.:

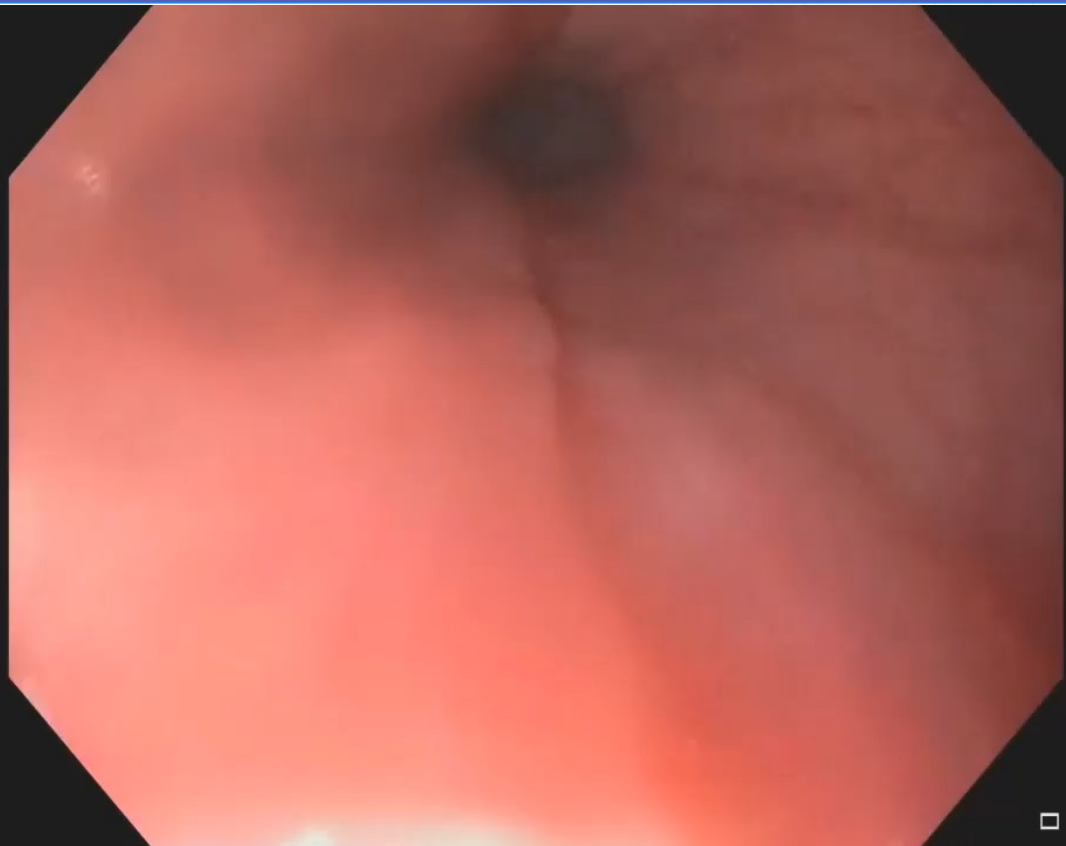
13/01/2022

15:52:59

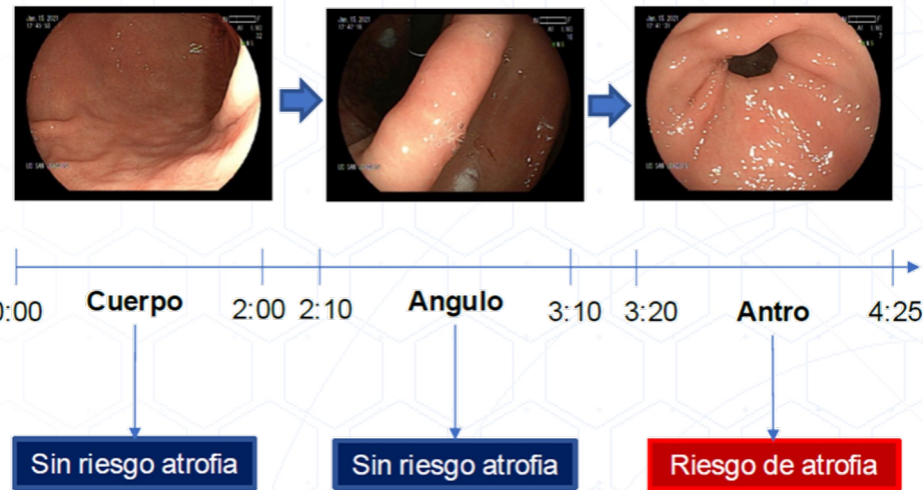
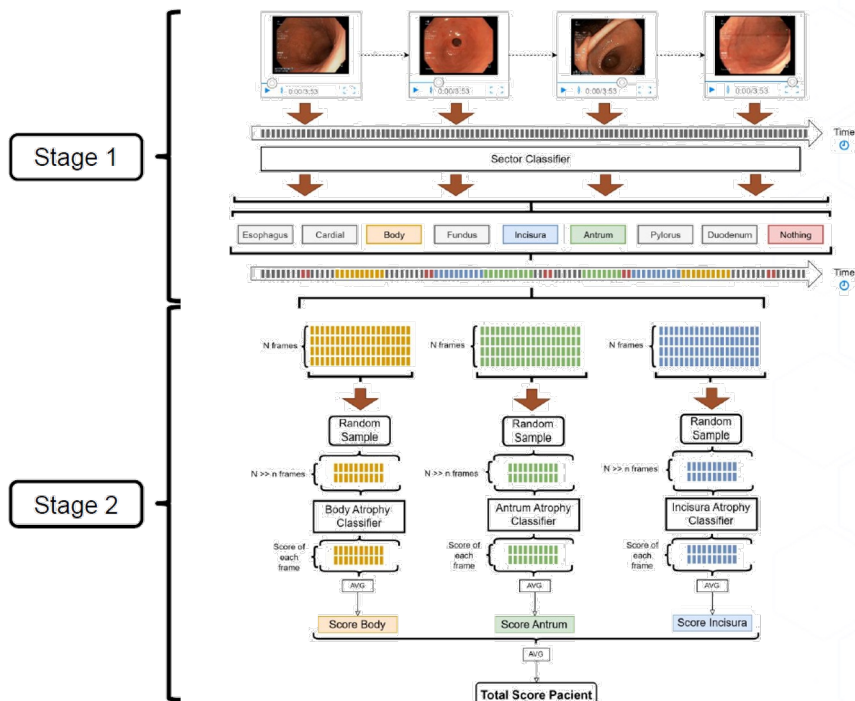
■■■/---(0/1)

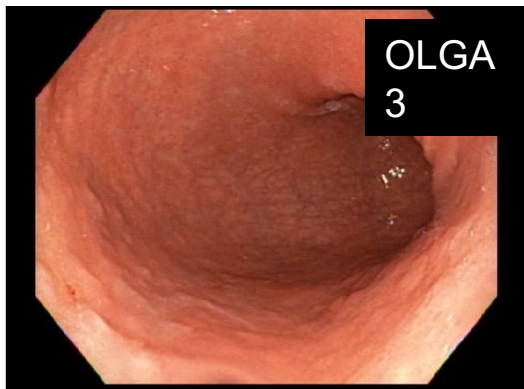
Eh:A1 Cm:1

Comment:



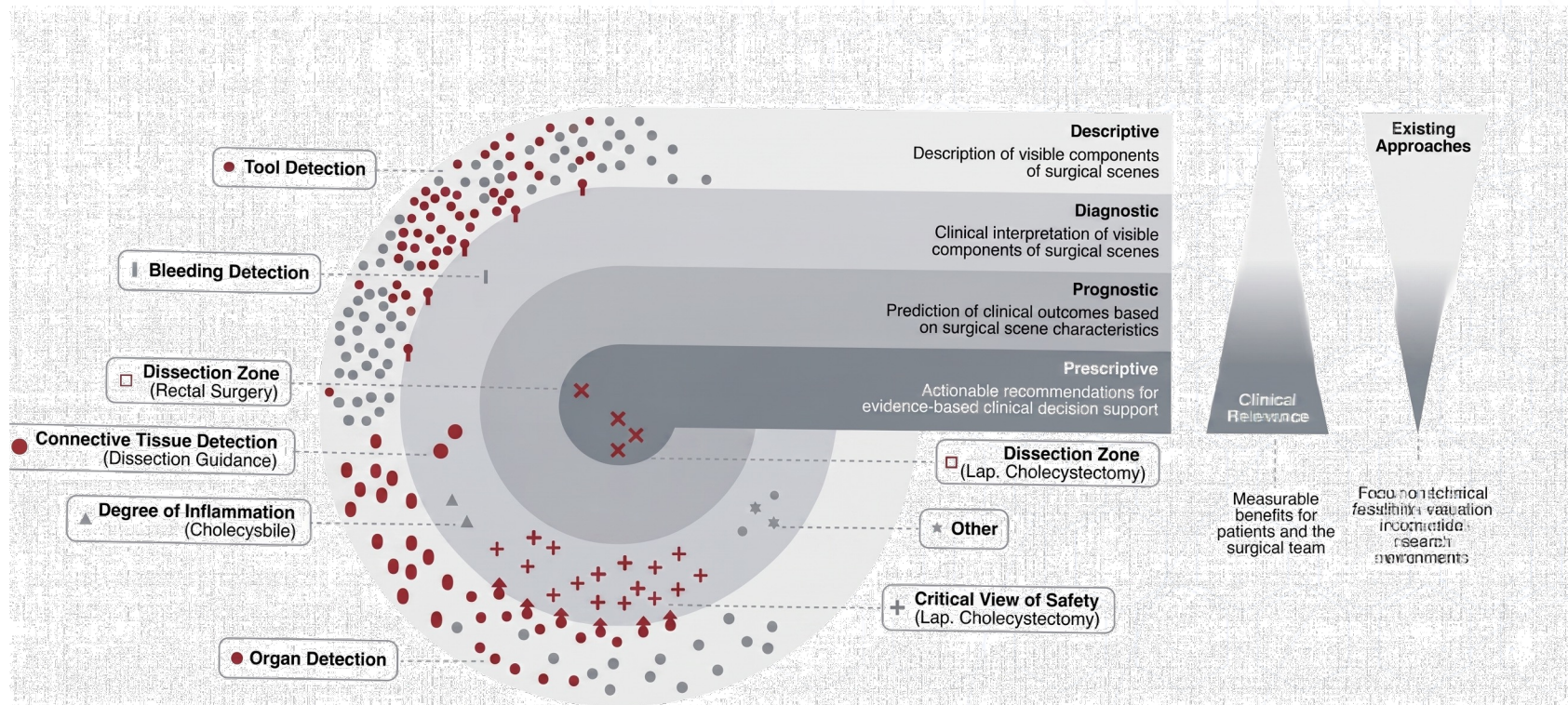
Detección De Atrofia – Experiencia UC

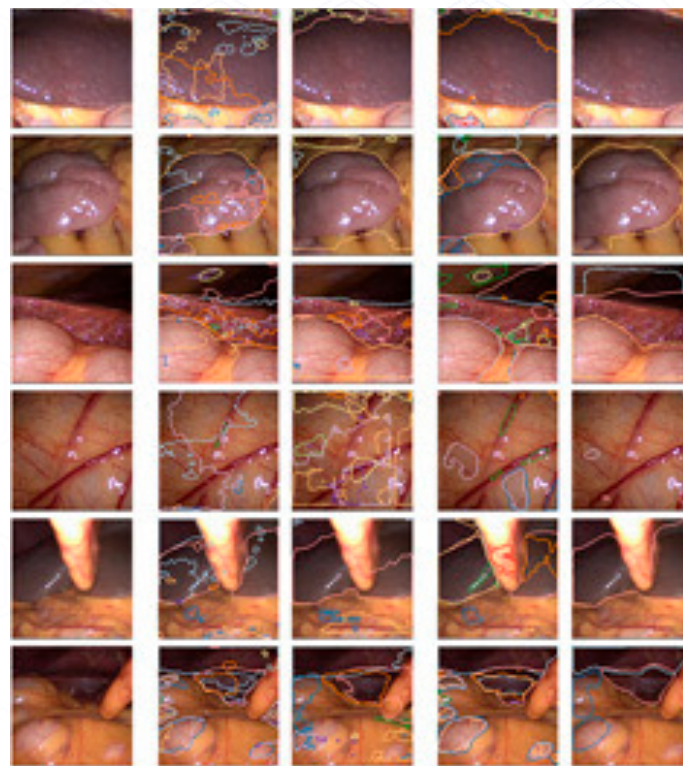
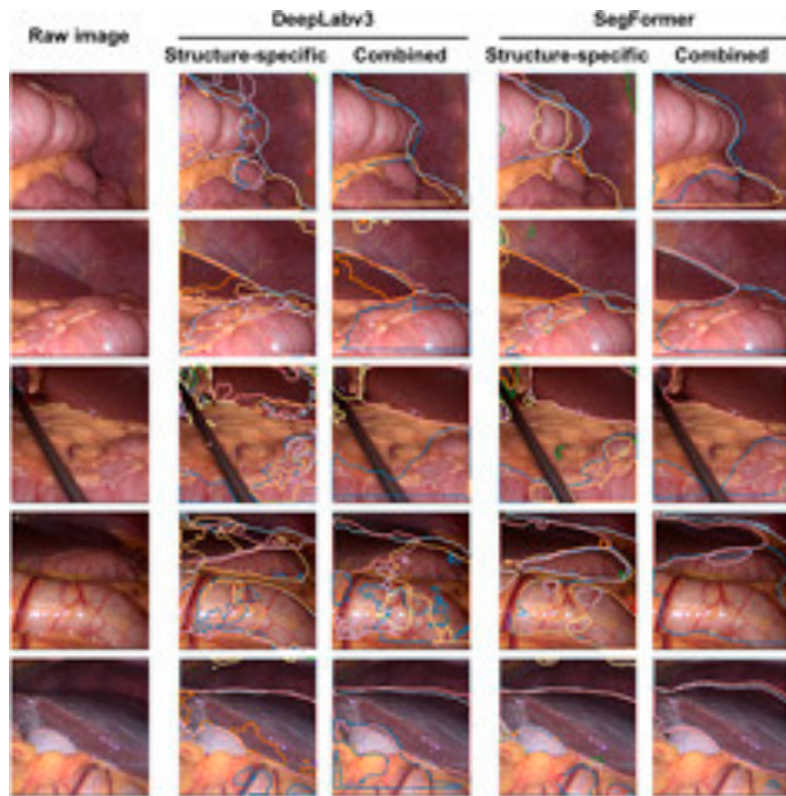




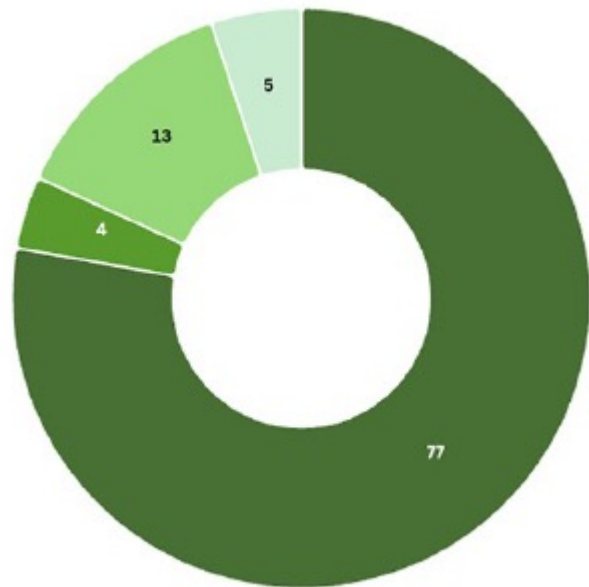
ViT - (TF2-TF1-TF2):
accuracy: **91.49%**

	Pred. Riesgo	Pred. No Riesgo
Endo. Riesgo	12	1
Endo. No Riesgo	3	31



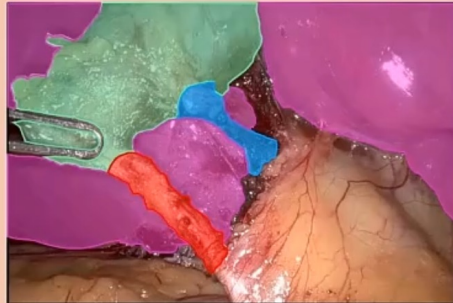
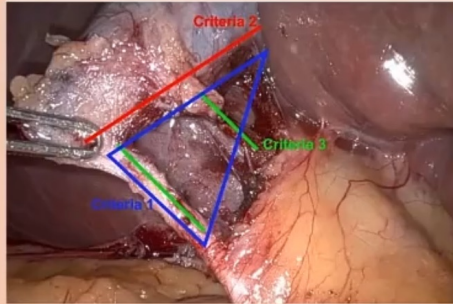


- Abdominal wall
- Colon
- Inferior mesenteric artery
- Intestinal veins
- Liver
- Pancreas
- Small intestine
- Spleen
- Stomach
- Ureter
- Vesicular glands



- No significant discrepancy
- omission of key steps from the operative report that were seen on video (false negative)
- inclusion of key steps in the operative report that were not seen on video (false positive)
- any error that implies a meaningful difference in technique

INTRAOPERATIVE COMPUTER VISION: THE CRITICAL VIEW OF SAFETY



Mechanism

Deep CNNs trained on thousands of surgical video frames operating at near real-time

Objective

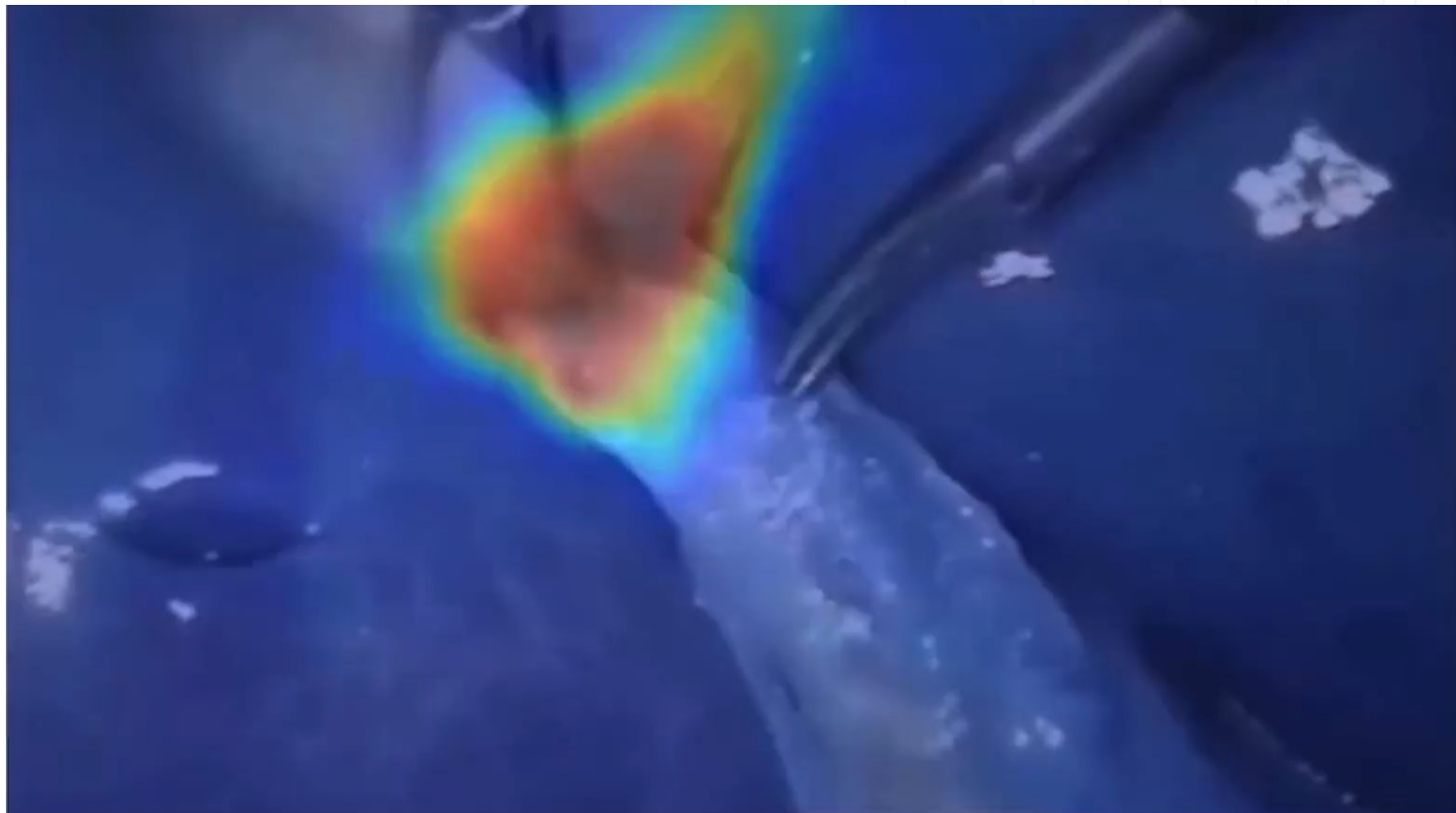
Automatically confirm the Critical View of Safety criteria prior to clipping and transection

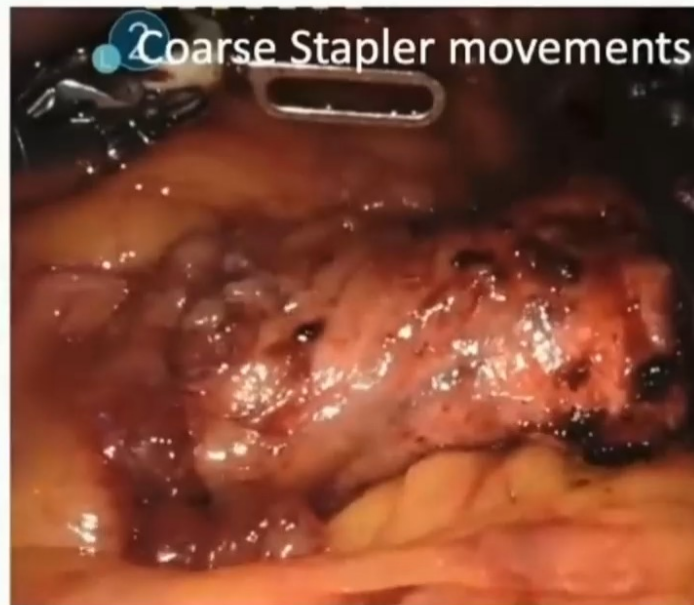
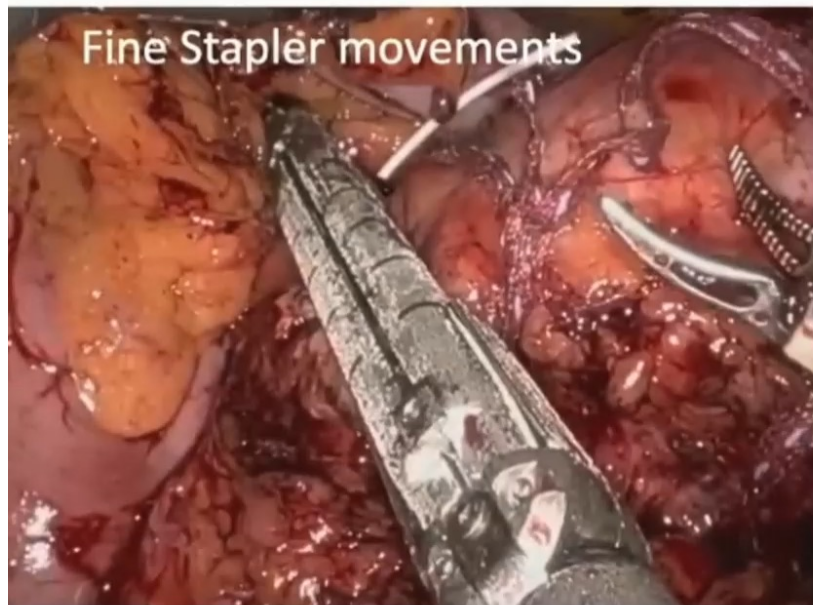
Clinical impact

Continuous and objective safety monitor, mitigating the risk of common bile duct injuries

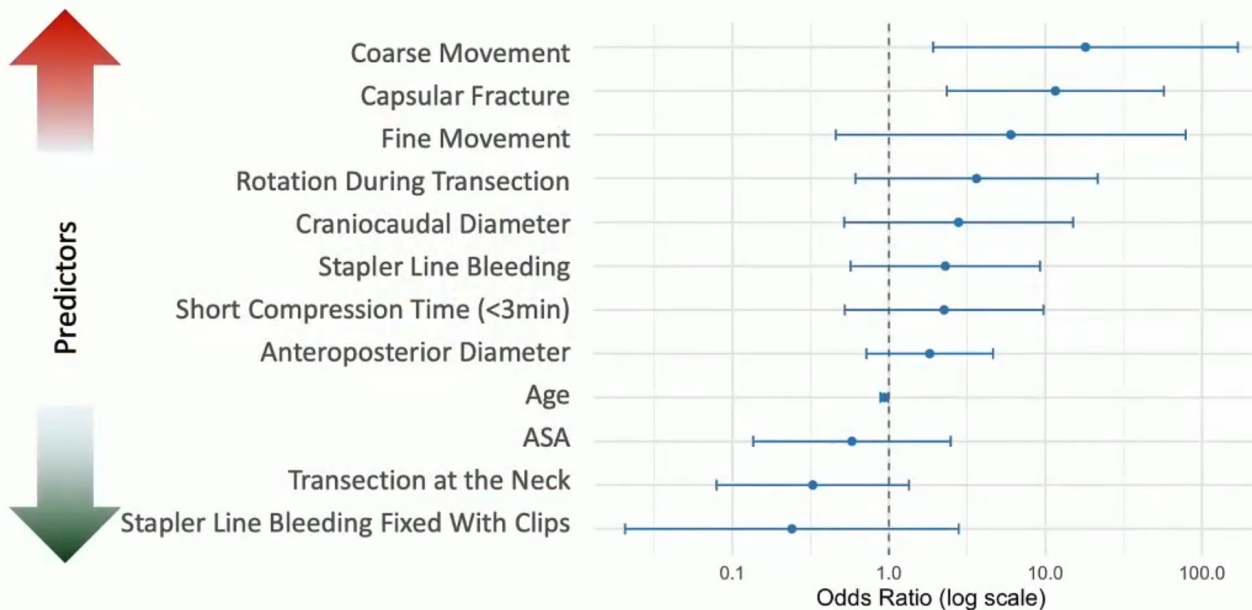


SAGES





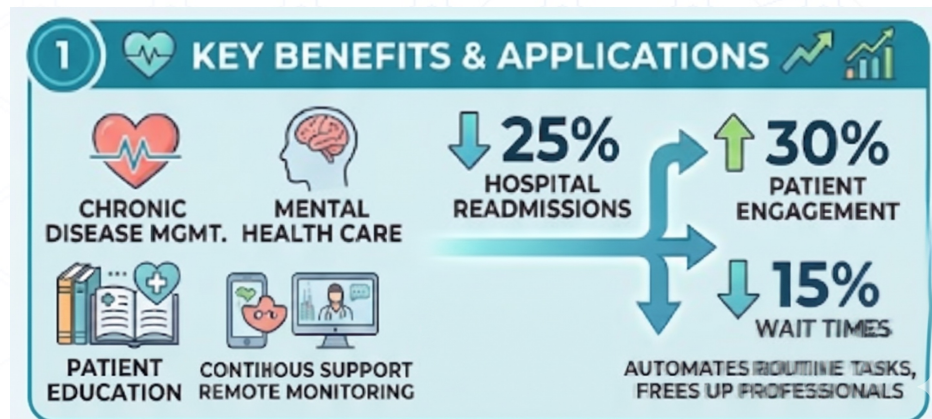
Fistula Predictors



Revolutionizing e-health: the transformative role of AI-powered hybrid chatbots in healthcare solutions

Jack Ng Kok Wah*

Multimedia University, Cyberjaya, Malaysia



CHRISTUS.
Excellence and Innovation Center

Red de Salud
UC • CHRISTUS

Bienvenido None al chatbot de trasplantes.

Login

Username
cjarry

Password

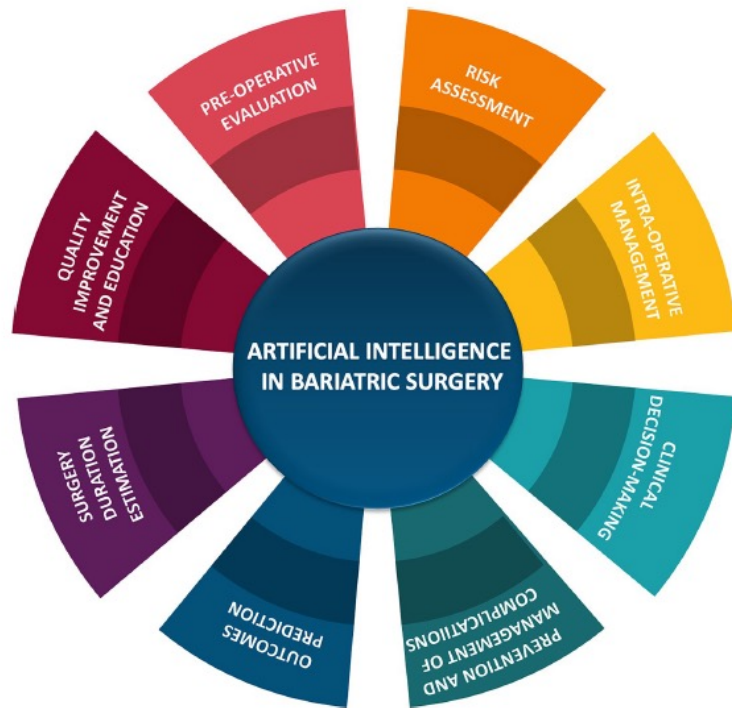
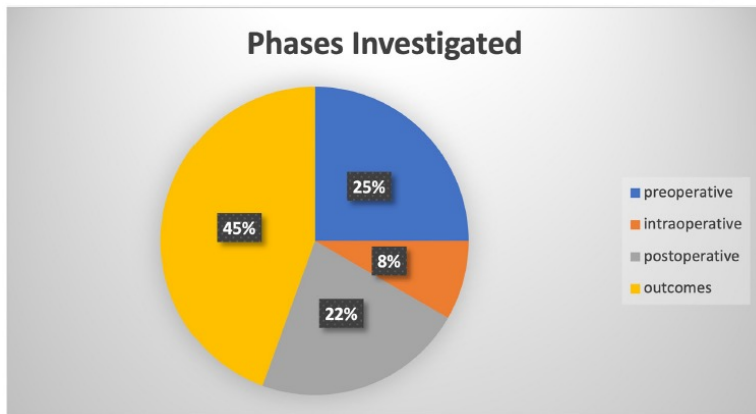
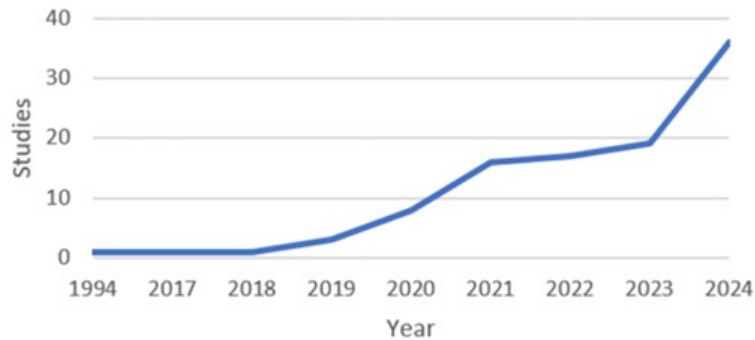
Login

Por favor, intro...

Sugerir contraseña segura...

Administrar contraseñas...

Y en Cirugía Bariátrica?



Predictor de baja de peso



Bariatric Weight
Trajectory Prediction

THE LANCET
Digital Health

Prediction About Partners

Contact

Metric
Imper.



Patient

Weight

120 ✓
kg

Height

170 ✓
cm

Age

36 ✓
years

Non-smoker



Smoker

Type 2 diabetes

No diabetes ✓

Surgery

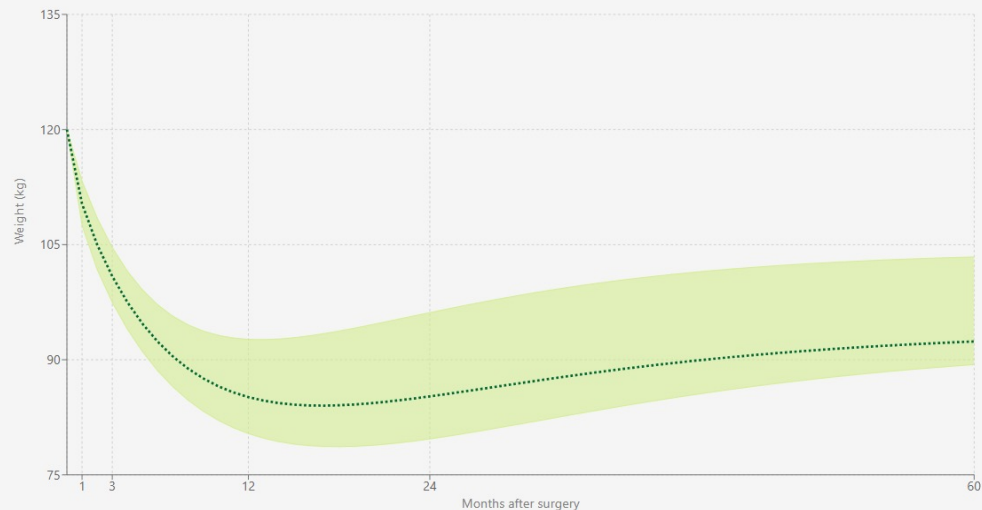
Type of intervention

Sleeve Gastrectomy ✓

Predict trajectory

	Weight (kg)	Height (cm)	Age (years)	Smoker	Type 2 diabetes	Diabetes duration (years)	Type of intervention
Current prediction	120	170	36	No	No diabetes	0	Sleeve Gastrectomy

Weight

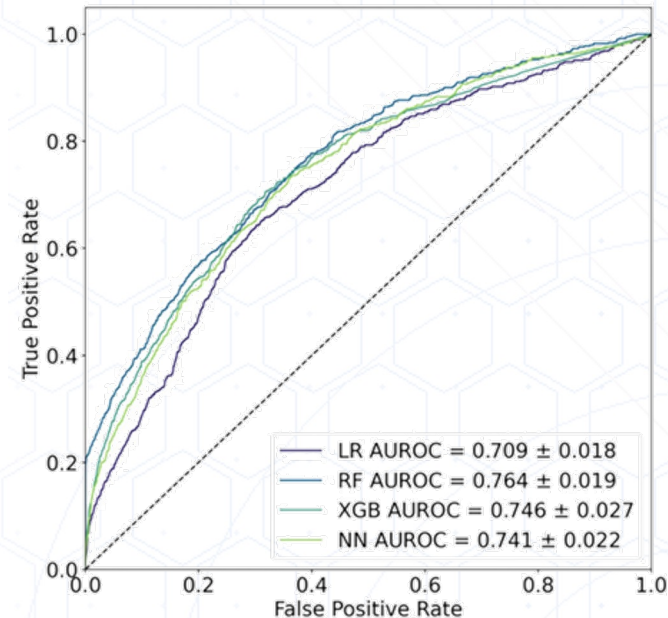


Prediction of weight trajectory after surgery

Application of machine learning to predict postoperative gastrointestinal bleed in bariatric surgery

Justin L. Hsu¹, Kevin A. Chen¹, Logan R. Butler², Anoosh Bahraini¹, Muneera R. Kapadia¹, Shawn M. Gomez³, Timothy M. Farrell¹

¹Department of Surgery, University of North Carolina School of Medicine, 4001 Burnett-Womack CB#7050, Chapel Hill, NC 27599, USA

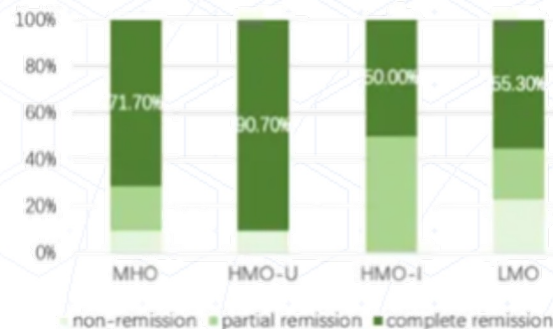
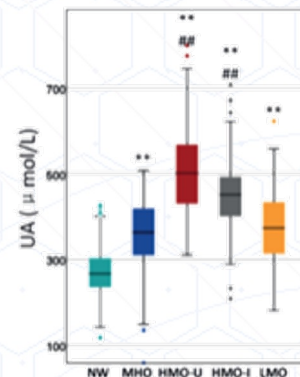
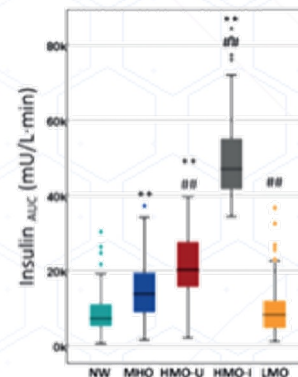
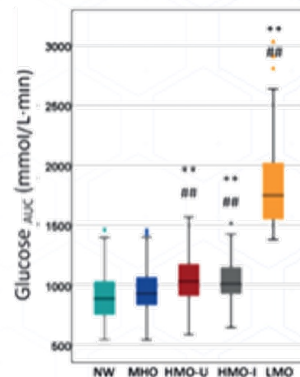
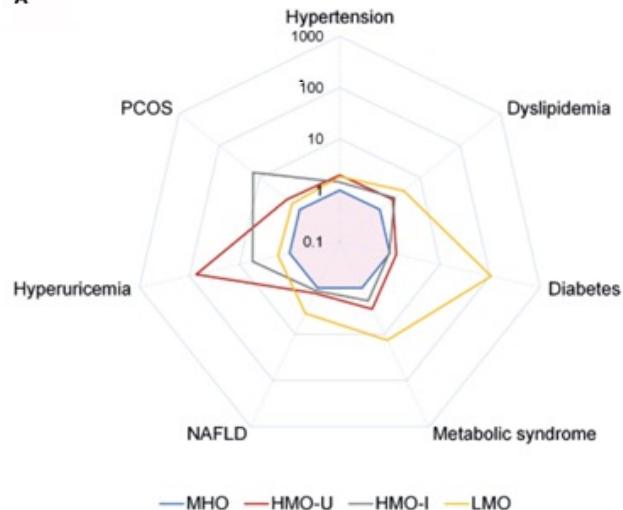


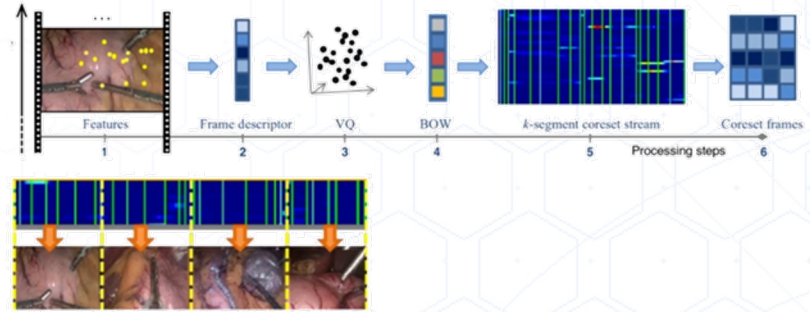
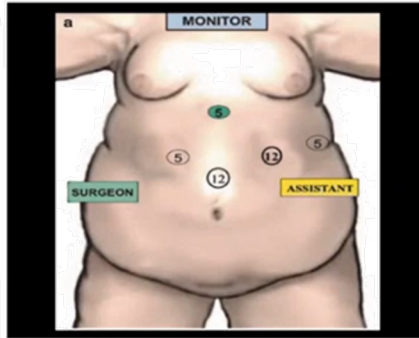
Insulina, Glucosa y ácido úrico durante TTOG



frontiers
in Endocrinology

A





STEP 1
ACCESS TO THE ABDOMINAL
CAVITY

Step 2
Dissection of the greater
curvature + Hiatal dissection +
Introduction/placement of the
calibration tube

Step 3
Stapling of the greater
curvature

Step 4
Removal of the gastric remnant

Step 5
Oversuture

Step 6
Leak test and final
inspection

Leveraging AI to transform surgery

AHPBA

Submitted image **AI infection detection**

0.8
0.6
0.4
0.2

Dataset

Data Curation

Manual annotation & review by trained surgeons
+
ACS NSQIP
SSI outcomes validated on a national database registry

AI Model

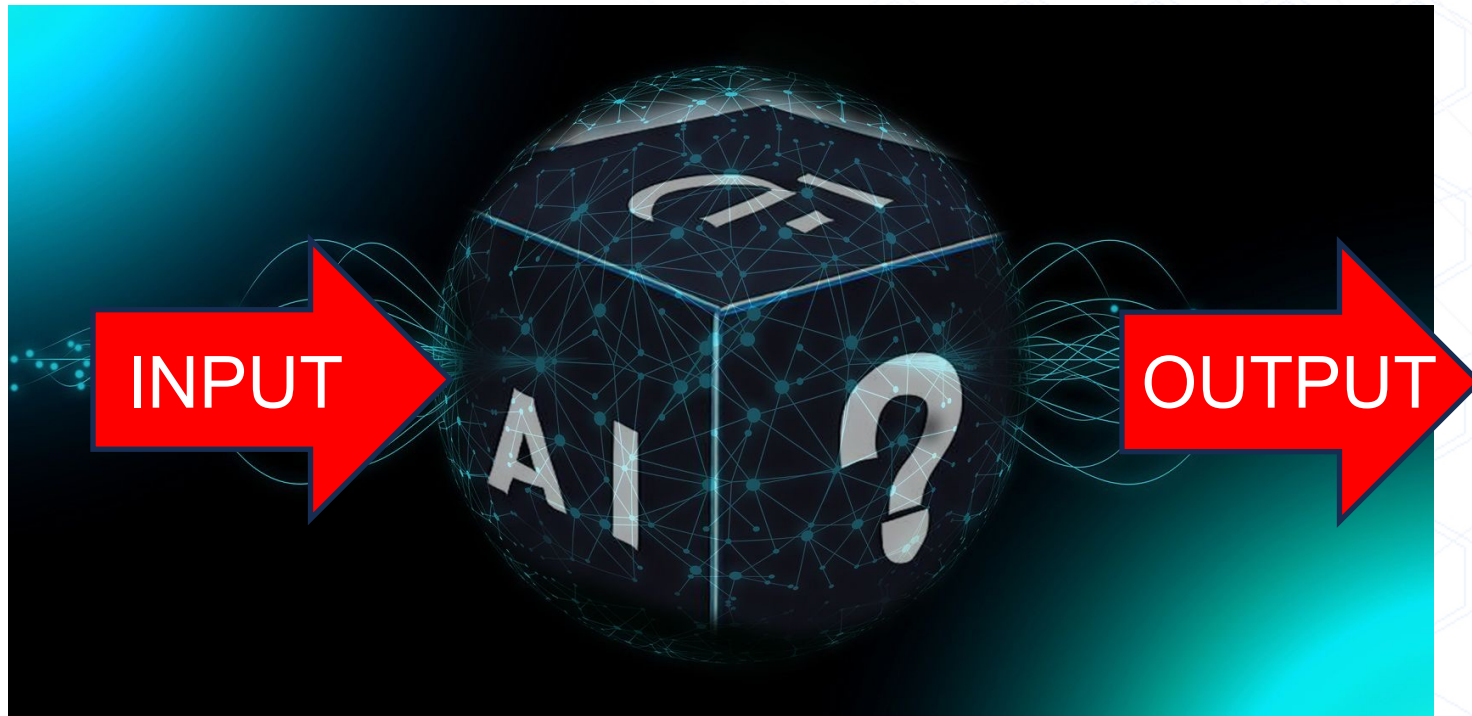
Custom Vision Transformer Model

Attention Maps (Grad-CAM)

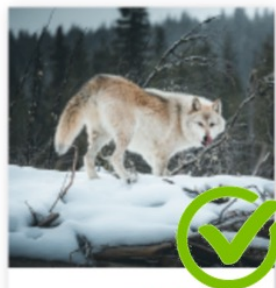
Prediction

✓
⚠

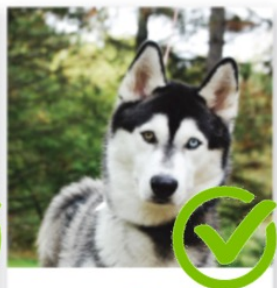
Muaddi et al, Ann Surg. 2025



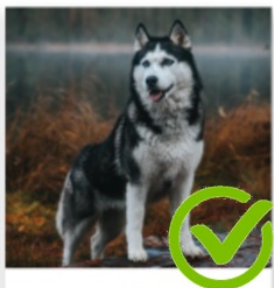




Predicted: **Wolf**
True: **Wolf**



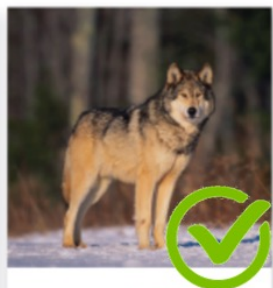
Predicted: **Husky**
True: **Husky**



Predicted: **Husky**
True: **Husky**



Predicted: **Wolf**
True: **Wolf**



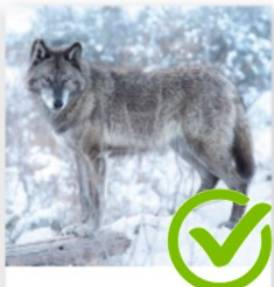
Predicted: **Wolf**
True: **Wolf**



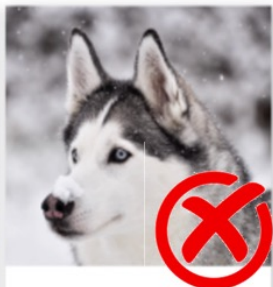
Predicted: **Wolf**
True: **Wolf**



Predicted: **Husky**
True: **Wolf**



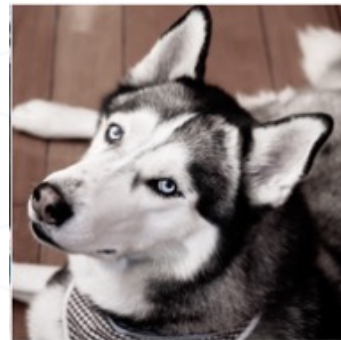
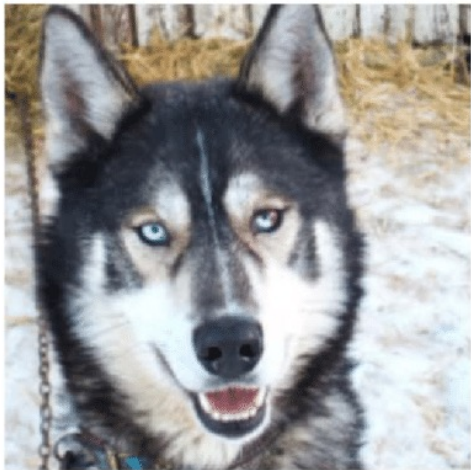
Predicted: **Wolf**
True: **Wolf**



Predicted: **Wolf**
True: **Husky**



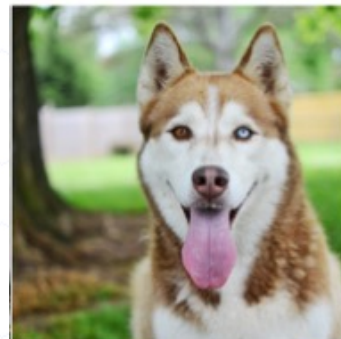
Predicted: **Husky**
True: **Husky**



TRUTH: HUSKY
PREDICTION: HUSKY



TRUTH: WOLF
PREDICTION: WOLF

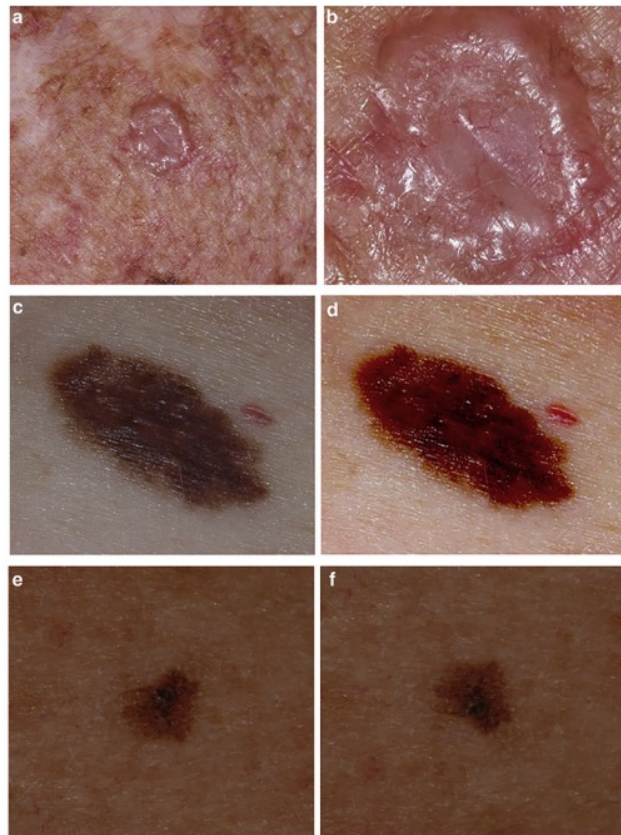


TRUTH: HUSKY
PREDICTION: HUSKY



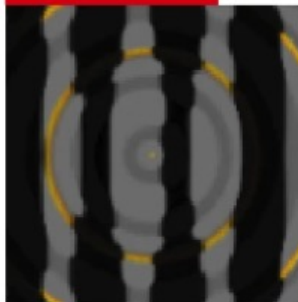
TRUTH: HUSKY
PREDICTION: WOLF





Scientists have evolved images that look like abstract patterns — but which DNNs see as familiar objects.

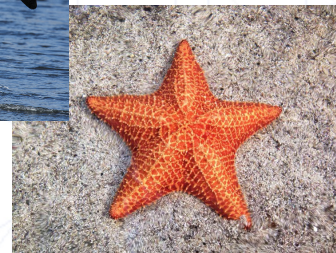
King penguin



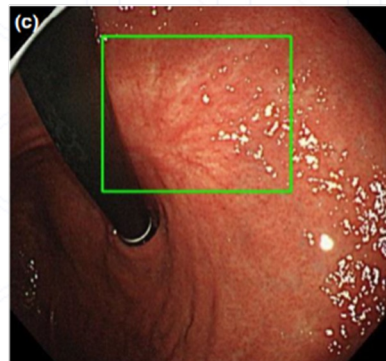
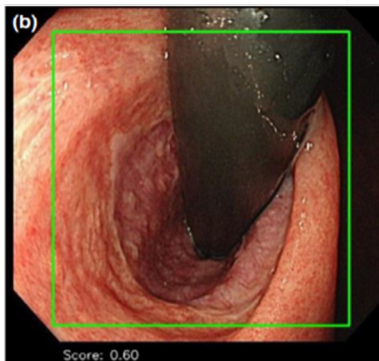
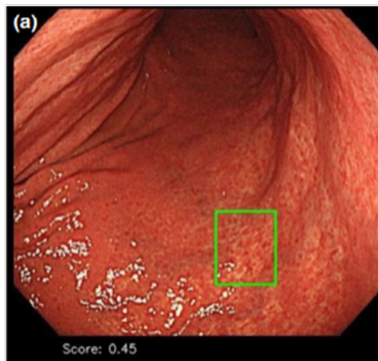
Starfish



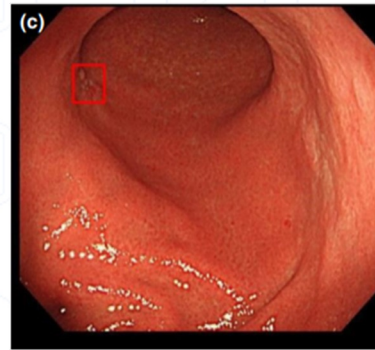
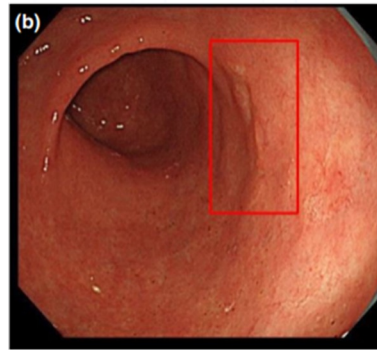
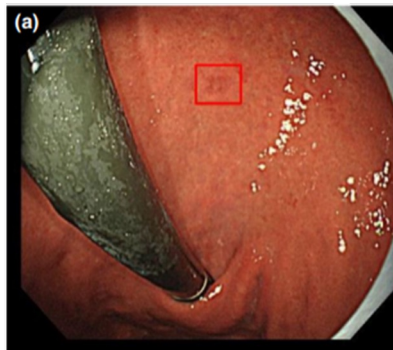
©nature



Falsos Positivos



Falsos Negativos

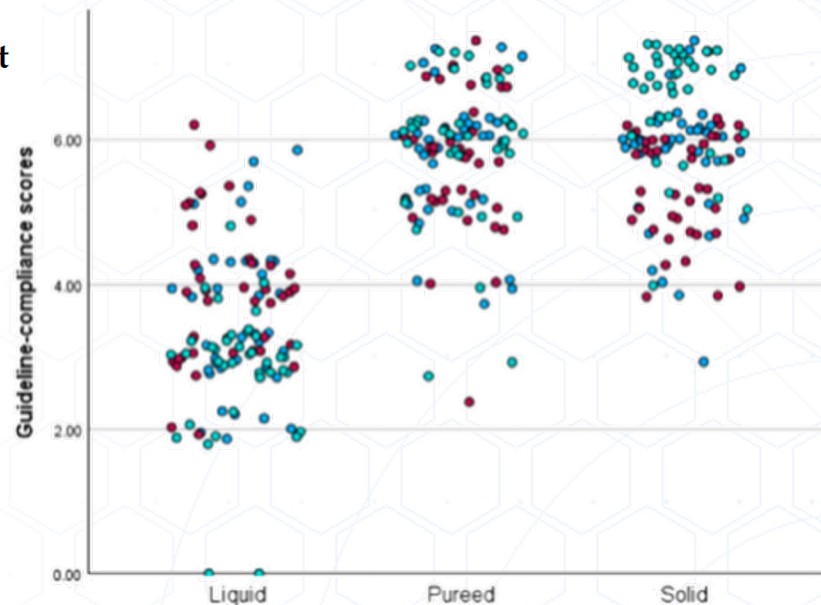
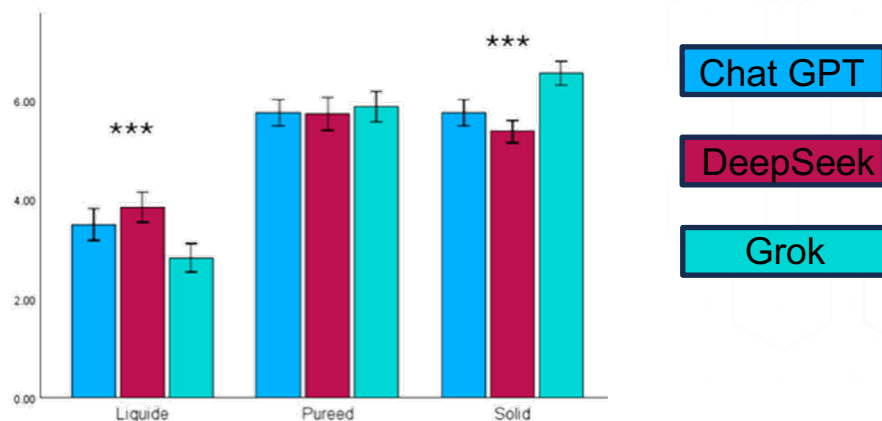




Article

Guideline Compliance of Artificial Intelligence–Generated Diet Plans After Bariatric Surgery: A Cross-Sectional Simulation Comparing ChatGPT-4o, DeepSeek and Grok-3

Aylin Bolat Yilmaz ¹, Emre Batuhan Kenger ², Tugce Ozlu Karahan ², Duygu Saglam ³ and Murat Bas ^{3,*}



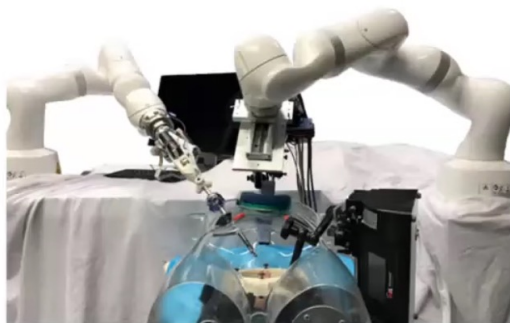




Model-based approach:

- ❌ Requires domain expertise
- ❌ One method, one task
- ❌ Difficult to scale

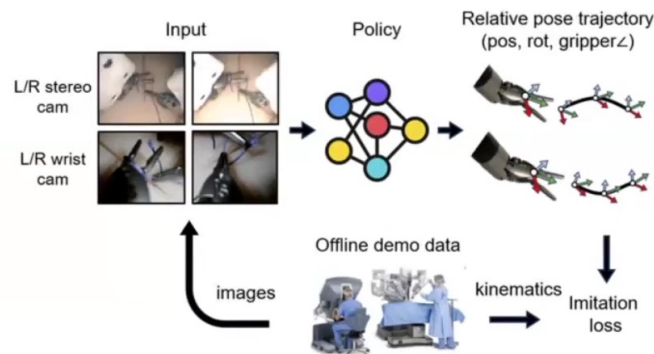
✅ Predictable and more safe



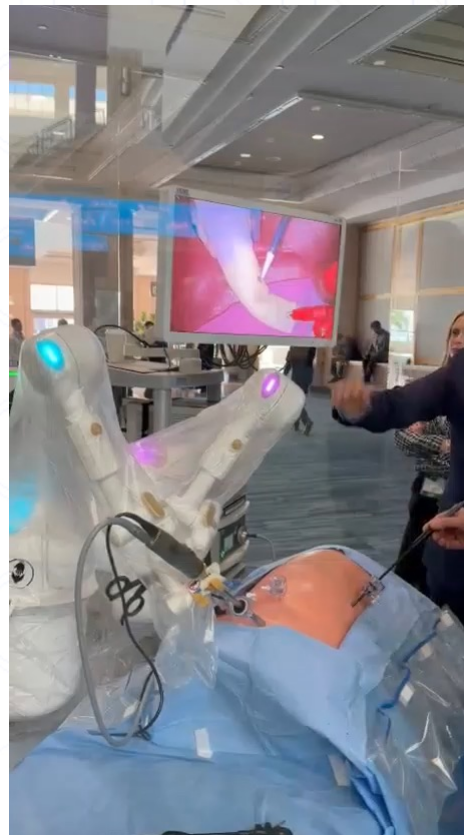
Learning-based approach:

- ✅ Only demonstrations required
- ✅ One method, many tasks
- ✅ Improves with more data

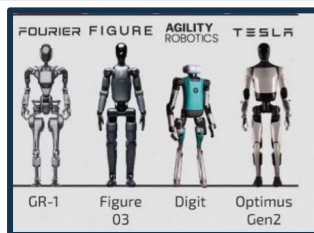
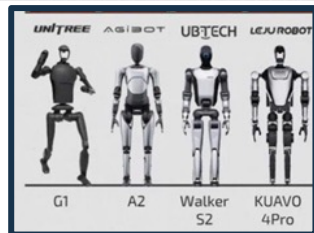
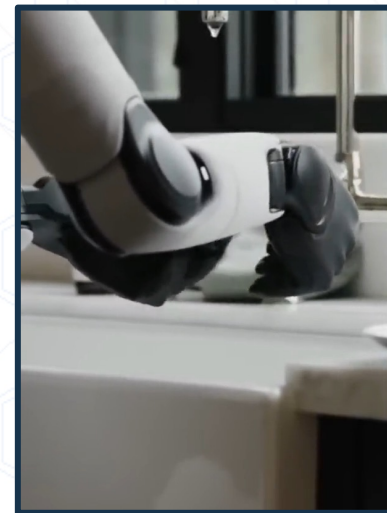
❌ Opaque model – could be unsafe



Needle Pickup & Retry Behavior

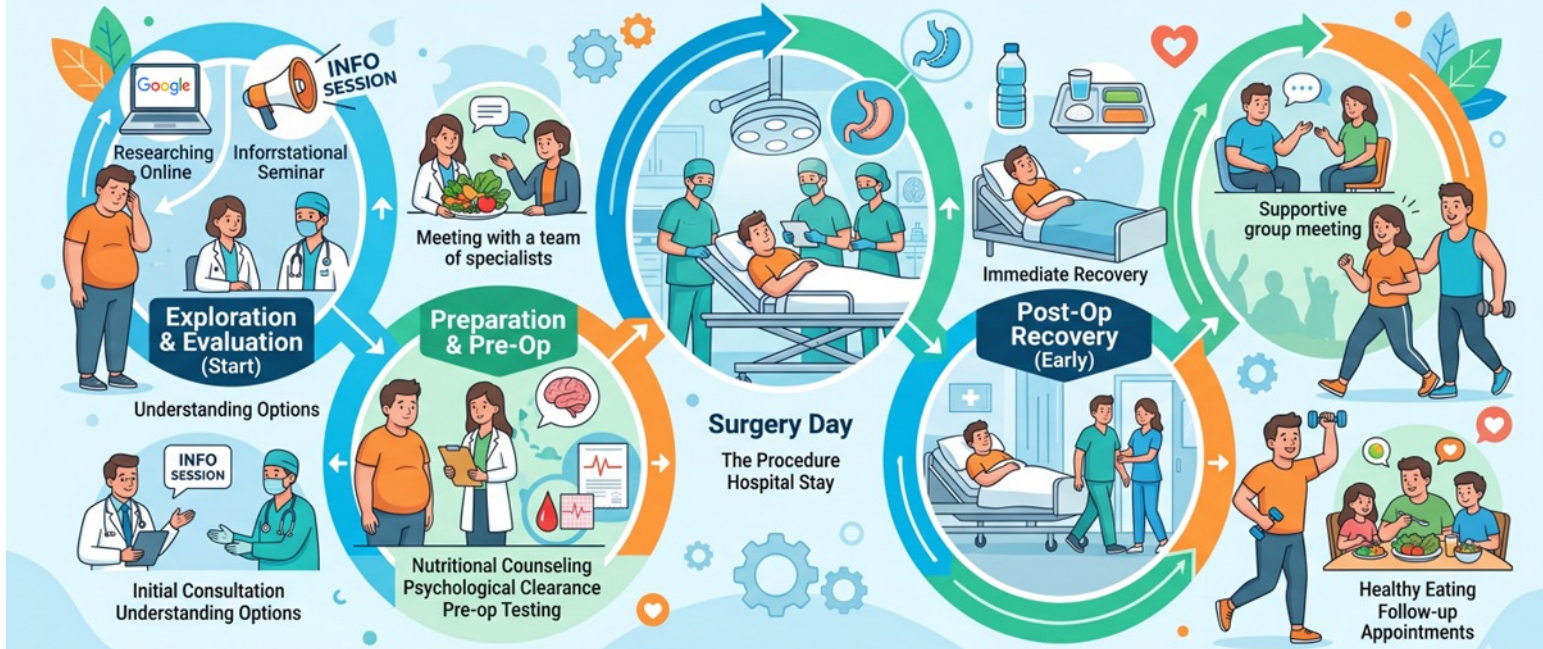


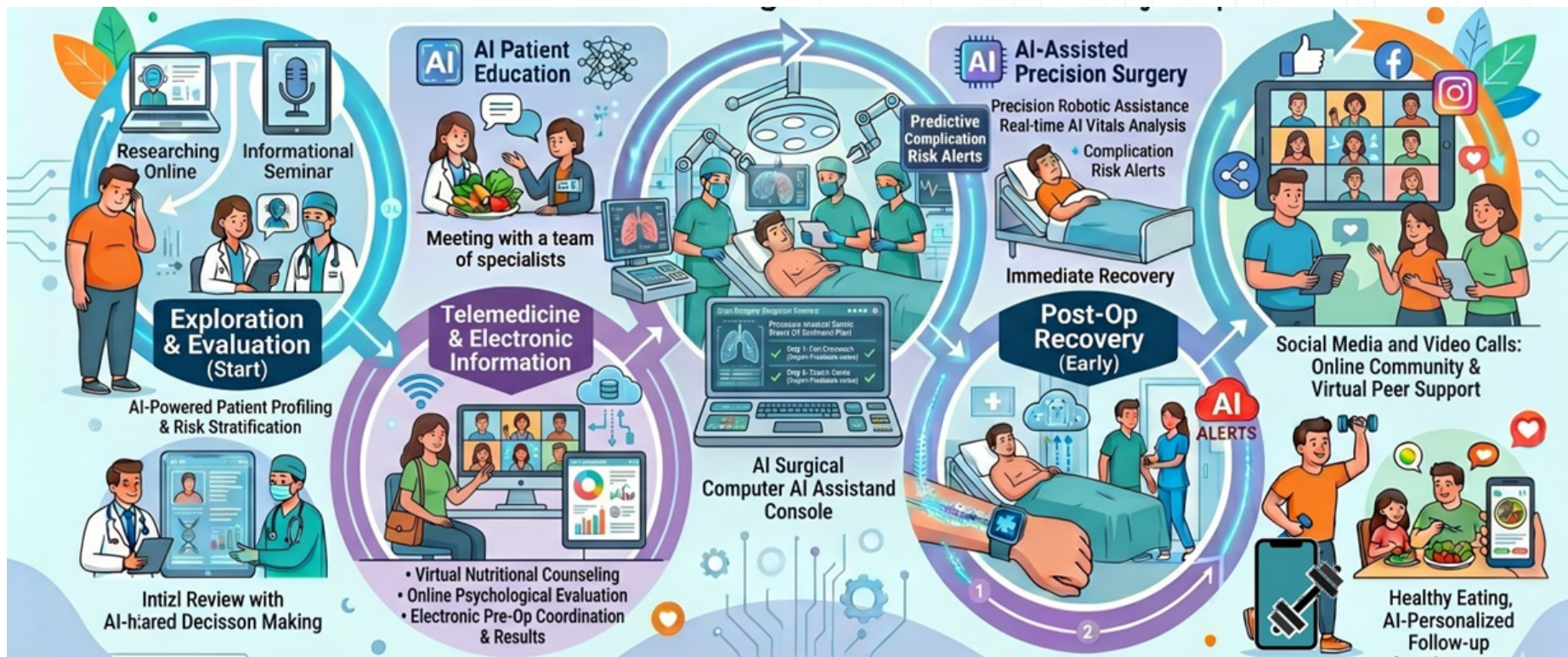
HUMANOID ROBOTICS





My Bariatric Surgery Journey: A Path to Healthier Living





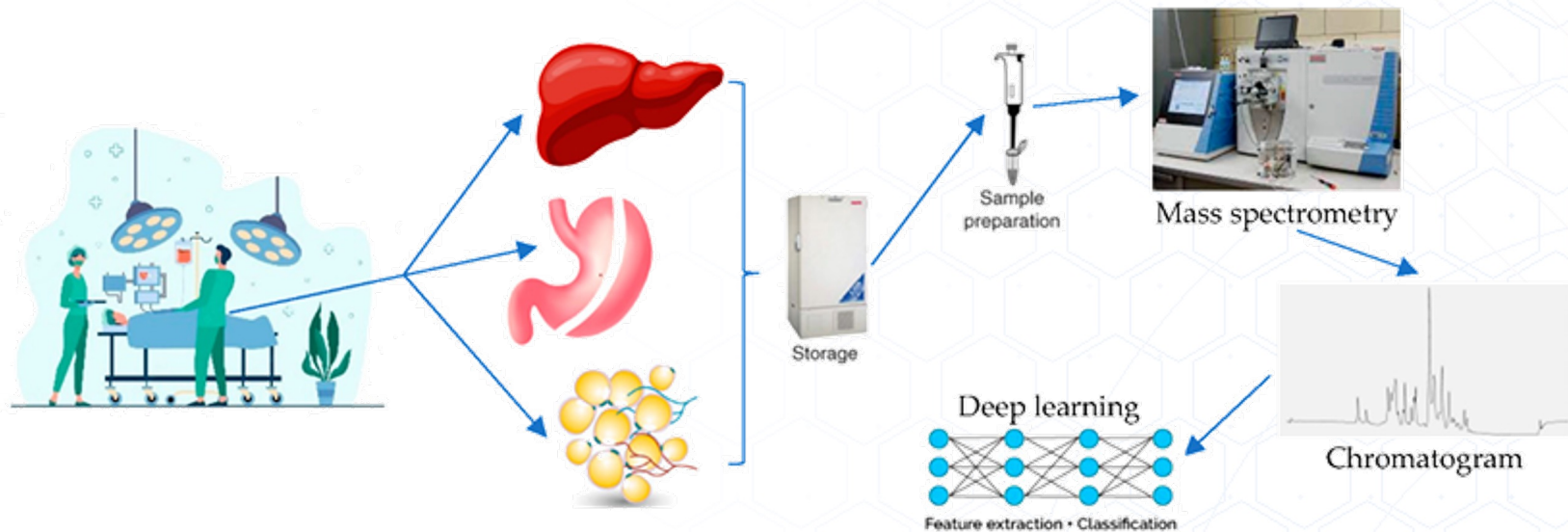
Curva de crecimiento exponencial de nuevas tecnologías

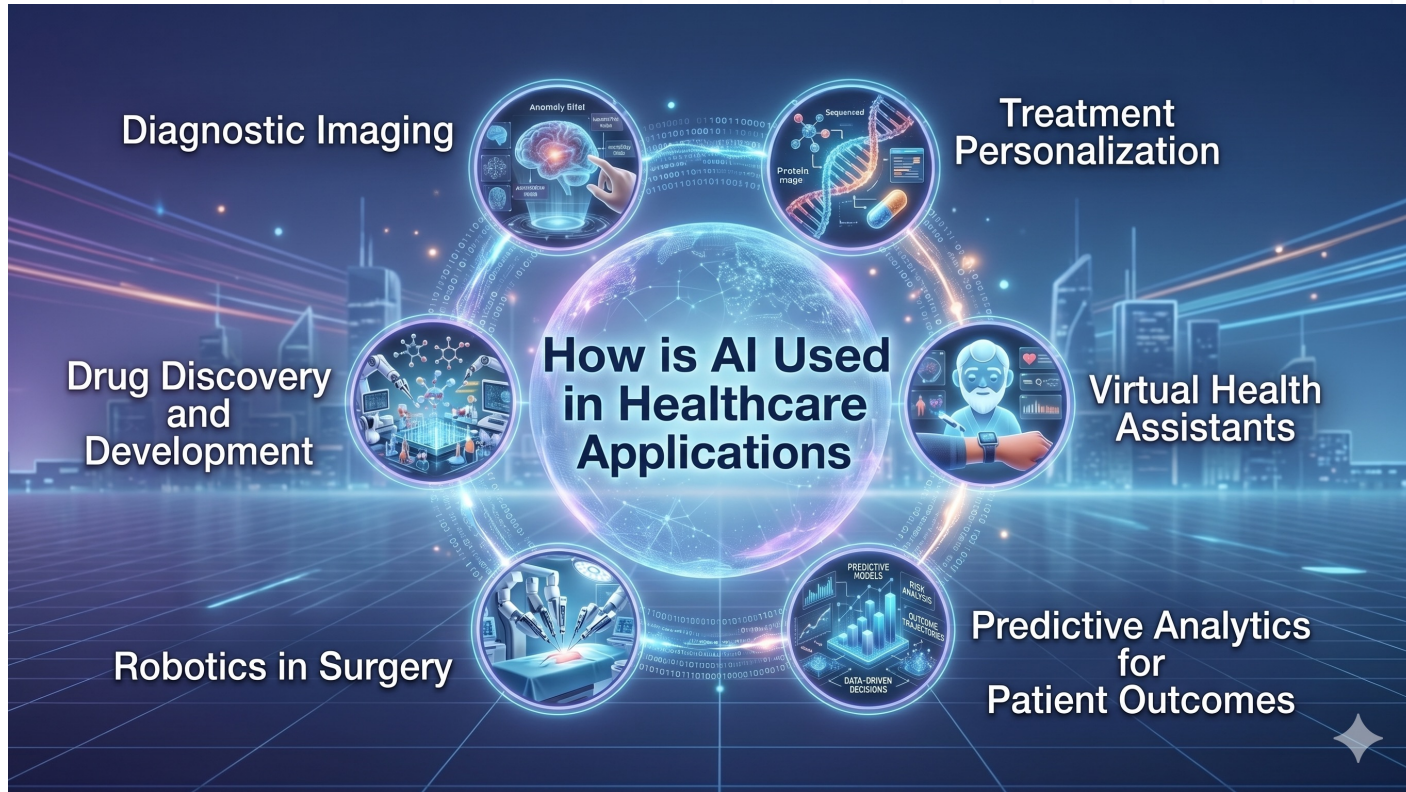


Inteligencia Artificial en Cirugía Bariátrica

Dr. Pablo A. Achurra, MD
Profesor Asistente
Cirugía HPB, Innovación & Trasplante
Pontificia Universidad Católica de Chile







Artificial intelligence:

Computer programs that mimic human cognitive functions such as learning and problem-solving.

Machine learning

Algorithms are trained to perform tasks by learning patterns rather than by explicit programming.

Artificial neural networks

Model of layers consisting of connected nodes, similar to neurons in a biological nervous system

Deep learning

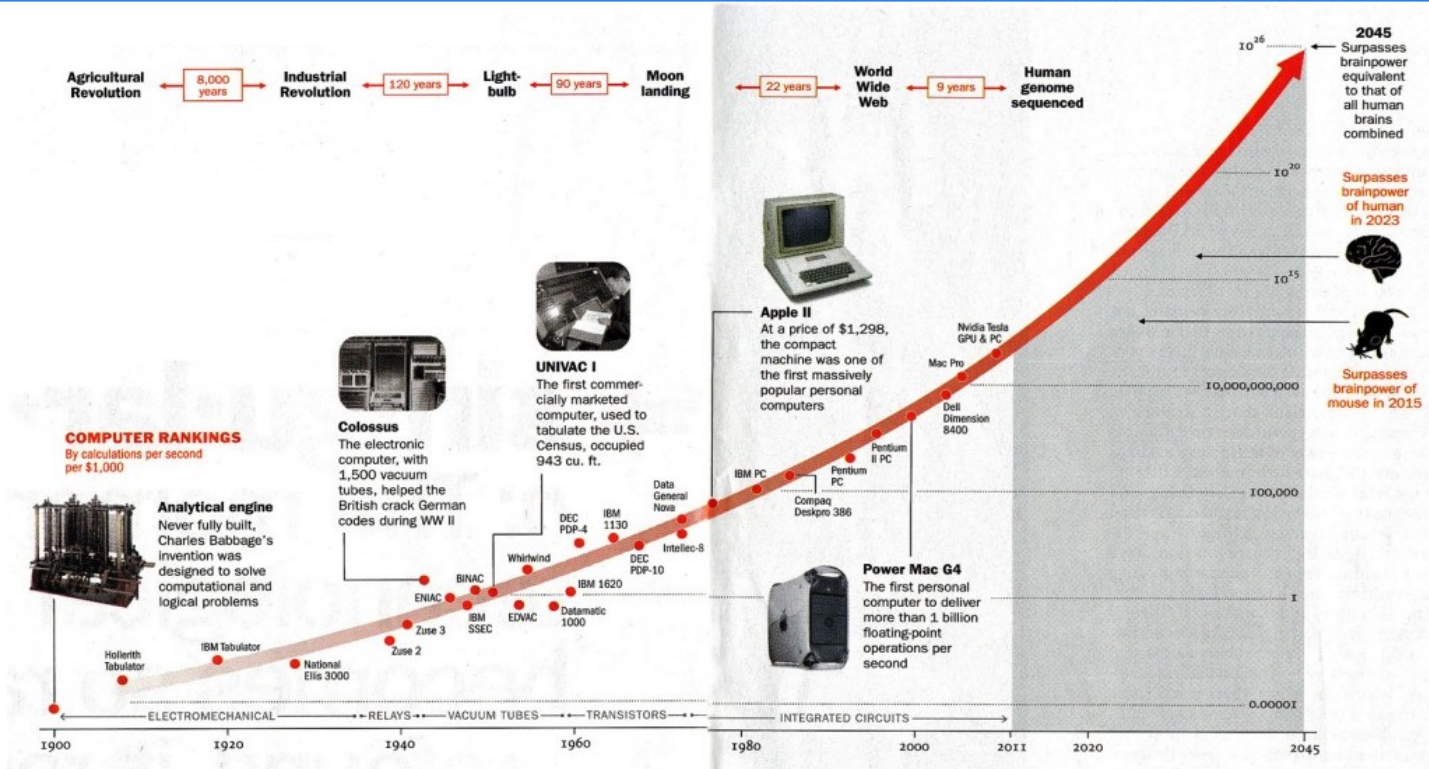
Neural network with 2 or more hidden layers.

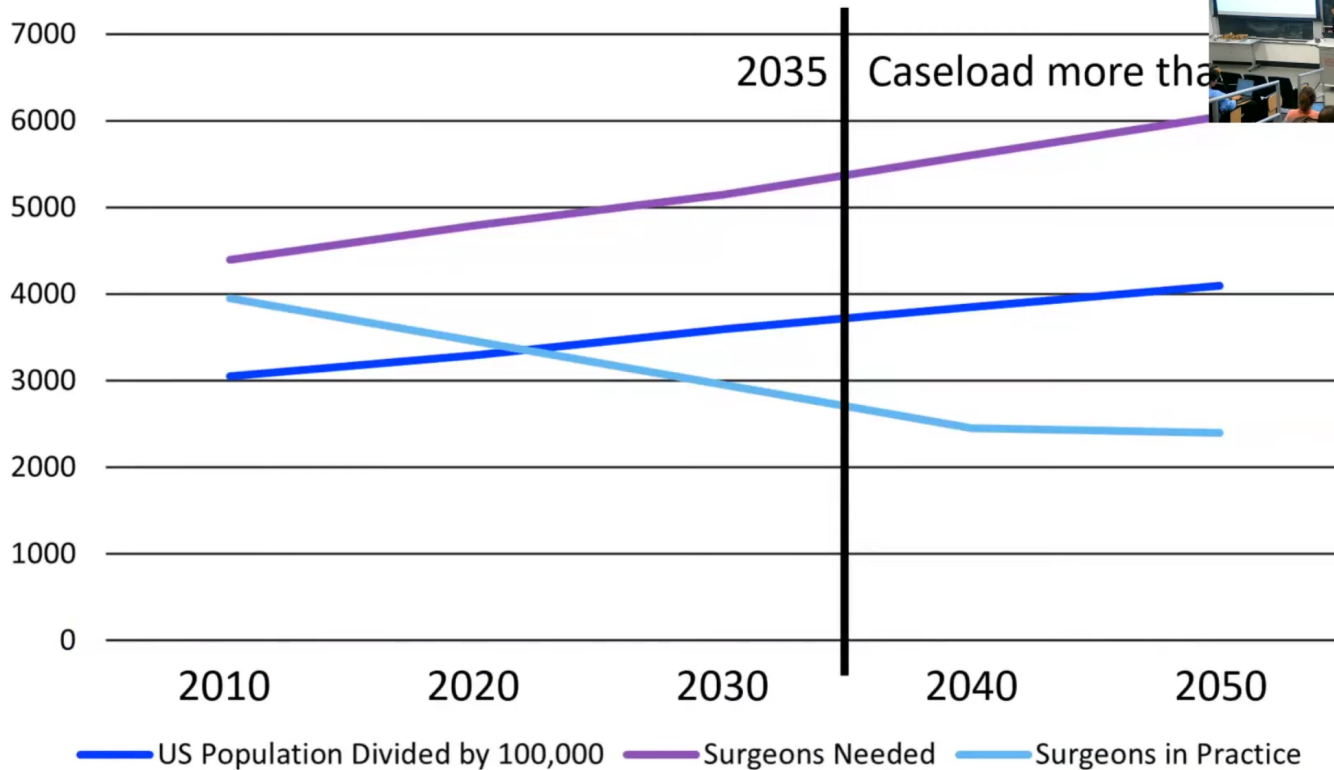
Convolutional Neural Network (CNN)

Deep learning architecture used for image recognition and uses 3-layer groups:

- Convolutional layer: to extract information using preconfigured filters
- Pooling layer to organize data
- Fully connected layer connects all input nodes to output nodes







Susan Moffatt-Bruce, Juan Crestanello, David P Way, and Thomas E Williams Jr. Providing cardiothoracic services in 2035: Signs of trouble ahead. *The Journal of thoracic and cardiovascular surgery*, 155(2):824–829, 2018.

Slide Credit Alan Kuntz



Autonomous gallbladder removal (cholecystectomy)



- 3-yr ARPA-H project
- Ultimate goal: autonomous gallbladder removal on a **live pig**

1) Detach gallbladder



Dr. Daniel A. Popowich

2) Clip/cut ducts

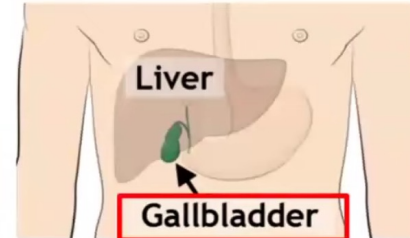


Dr. Daniel A. Popowich

3) Remove



Mount Sinai



Fall general surgery



Intuitive Surgical

*"La IA no es el futuro de la medicina.
Es el presente -- y la cirugía bariátrica está en el centro."*

68

expertos internacionales

35 países, consenso Delphi
(Kermansaravi, Sci Rep 2025)

28

declaraciones evaluadas

25/28 con consenso $\geq 70\%$
en primera ronda

100%

consenso final

Acuerdo unánime: la IA
transformará la cirugía bariátrica

La Diferencia que Importa -- Reglas vs. Patrones Aprendidos

Software Tradicional

- Reglas escritas por programadores
- Comportamiento 100% predecible
- No mejora con la experiencia
- Falla ante casos no previstos

-> Como un protocolo quirúrgico rígido

Machine Learning / IA

- Aprende patrones desde datos
- Mejora con más experiencia
- Maneja casos no previstos
- Generaliza a nuevos contextos

-> Como un cirujano senior con 10K casos

Selección de Pacientes

- Algoritmos ML analizan datos demográficos, metabólicos y fenotípicos
- Identificación de candidatos en atención primaria
- Consenso: 82% expertos respalda esta aplicación

Kermansaravi, Sci Rep 2025

Estratificación de Riesgo

- 29 algoritmos ML comparados en >44.000 pacientes
- AdaBoost y Random Forest: >90% sens/esp para complicaciones graves
- Superan significativamente la regresión logística clásica

Cao et al., J Clin Med 2019

Predicción de Trayectoria de Peso

- Modelo SOPHIA: validado en 10.231 pacientes, 12 centros, 10 países
- Predice BMI a 5 años post-MBS: diferencia media -0.3 kg/m²
- Disponible para uso clínico hoy

Saux et al., Lancet Digital Health 2023

El Consenso Internacional lo Dice -- 68 Expertos, 35 Países

98.5%

IA mejora evaluación
objetiva de habilidades
quirúrgicas

92.5%

Riesgo de over-reliance:
threat real al juicio
clínico

88.2%

IA reducirá costos
de MBS optimizando
procesos quirúrgicos

97%

El uso de IA debe
cumplir normas éticas
y de consentimiento

3 áreas que requirieron segunda ronda de votación (debate aún abierto):

- Matching de técnica quirúrgica por IA: el cirujano siempre toma la decisión final, especialmente basado en hallazgos intraoperatorios (consenso 91% en 2ª ronda)
- Diagnóstico de hernia interna con IA: útil para identificar candidatos a laparoscopia diagnóstica, pero no toma la decisión final (consenso 85.1% en 2ª ronda)
- Robótica IA-guiada: sistemas capaces de realizar procedimientos complejos bajo guía de cirujano experto (consenso 91% en 2ª ronda)

Barreras Reales -- Lo que Frena la Implementación

Regulación y accountability

¿Quién responde cuando el algoritmo se equivoca? La responsabilidad legal en IA médica no está definida. 81% de expertos lo reconoce como problema crítico.

Sesgo en los datos

Los modelos entrenados en poblaciones específicas fallan en grupos subrepresentados. El riesgo de profundizar inequidades en salud es real.

Over-reliance

92.5% de expertos: el riesgo más importante. La dependencia excesiva erosiona el juicio clínico y el pensamiento crítico del cirujano.

Caja negra (XAI)

Los modelos de DL no explican su razonamiento. "Explainable AI" (XAI) es el campo que intenta resolverlo -- aún incipiente en cirugía.

Datos de calidad

Variabilidad en técnica quirúrgica, registro clínico y demografía dificultan la construcción de datasets robustos y comparables entre centros.

Ética y consentimiento

97% de expertos: el uso de IA debe incluirse en el proceso de consentimiento. El paciente tiene derecho a saber que un algoritmo participa en su cuidado.

3 Mensajes que te Llevas Hoy

01

La IA ya está transformando la cirugía bariátrica -- no es hype

Tenemos evidencia validada en selección, predicción de peso, complicaciones y monitoreo. El consenso de 68 expertos en 35 países es inequívoco.

02

El cirujano que usa IA superará al que no la usa

No se trata de reemplazo -- se trata de amplificación. La IA extiende nuestra capacidad de procesar datos, anticipar problemas y personalizar el cuidado.

03

La educación en IA debe entrar al currículum quirúrgico hoy

70.6% de expertos en consenso: mandatory en el futuro. Si no formamos a los residentes en IA ahora, los dejamos atrás de una transformación ya en curso.