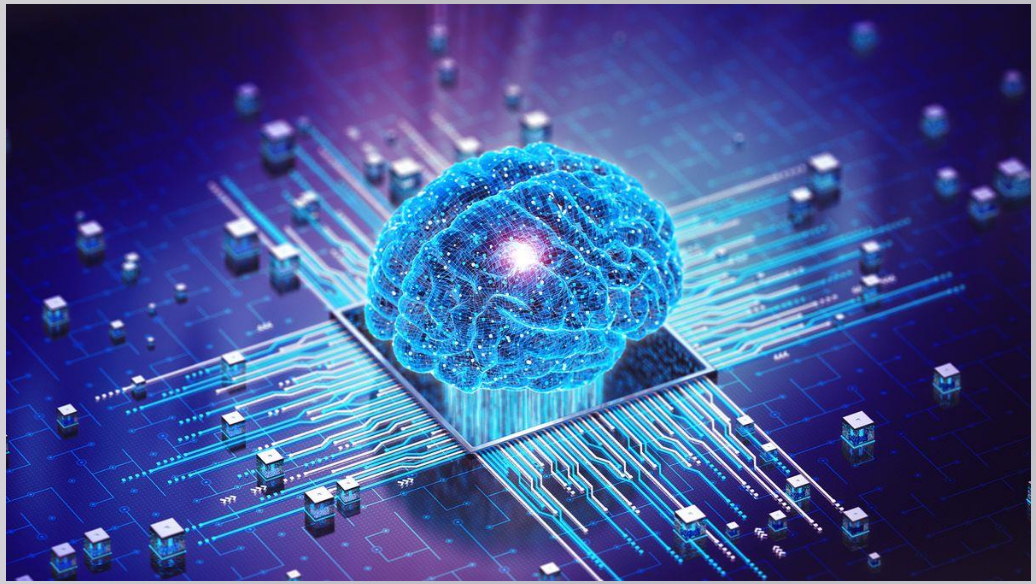
Artificial Intelligence in Bariatric Surgery



Artificial intelligence is revolutionizing healthcare, with promising applications in bariatric surgery. This review explores the current status and future potential of machine learning in predicting surgical outcomes and supporting clinical decision-making.

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Disclosure

Ethicon Endosurgery	*Consultant/ Speaker*
Medtronic	*Speaker/ Advisor*
SAGER	*Consultant*
Olympus	*Consultant/ Speaker*
Boston Scientific	*Advisor*
GI Windows	*Consultant*

POSSIBLE APPLICATIONS IN BMS

RISK STRATIFICATION

CLINICAL RECOMMENDATIONS RECOMMENDATIONS

SURGICAL PLANNING

REAL TIME DECISION-MAKING

OVERCOMING LEGAL AND

AND ETHICAL HURDLES

POSTOP- FOLLOW UP

PREDICTIVE MODELS

ENHANCING ALGORITHM ACCURACY

OPTIMIZING OR PLANNING

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REVIEW

Artificial Intelligence in Bariatric Surgery: Current Status and Future Perspectives

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Review

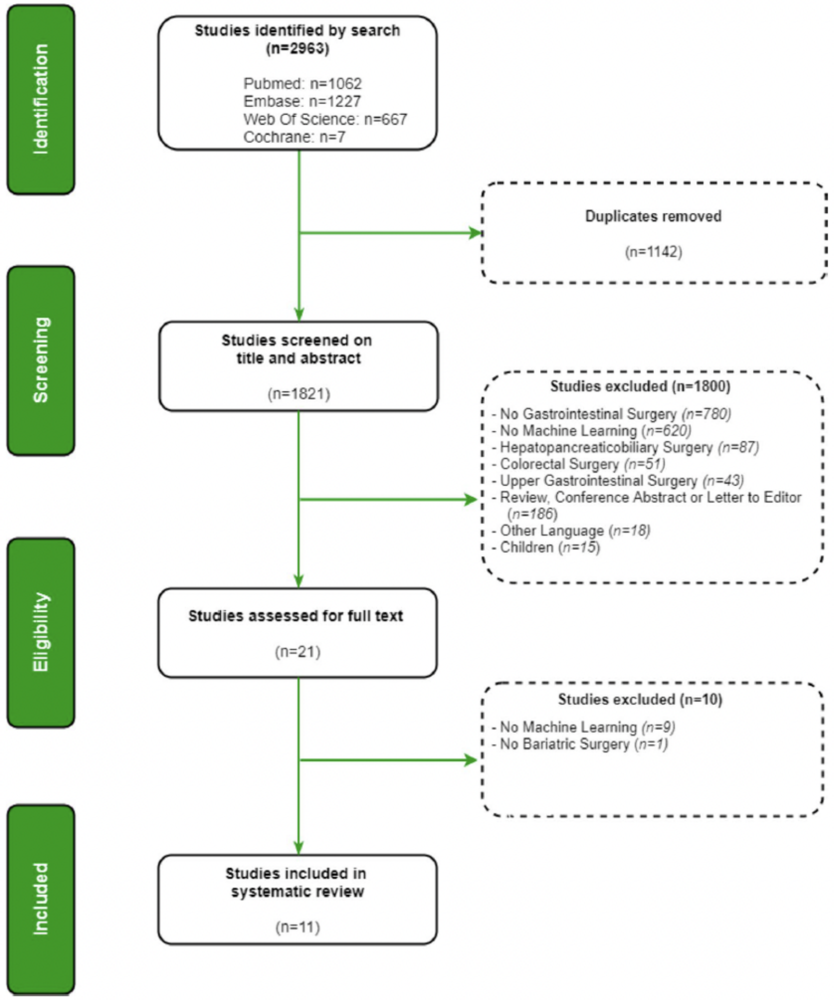
2022

Table 2 General characteristics of included studies

Authors	Year	Country	Patients s	Age (mean)	Female (%)	Study design	Follow-up	Surgical procedures	Type of machine learning	External validation	ML Purpose	Study outcomes	Prediction performance (ACC/AUC)
Sheikhtaheri et al	2019	Iran	1509	39	NS	Retrospective Cohort	30 days	OAGB	Neural network	Yes	Predict post-operative complications	Accuracy; AUC	0.98/0.97
Cao et al	2019	Sweden	37,811	41	75,9	Retrospective Cohort	30 days	NS	Multiple machine learning	No	Predict post-operative complications	AUC	NA
Cao et al	2020	Sweden	44,061	42	NS	Retrospective Cohort	30 days	NS	Neural network	No	Predict post-operative complications	Accuracy; AUC	0.95/0.57
Nudel et al	2021	USA	436,807	45	79,3	Retrospective Cohort	30 days	Lap gastric bypass; LSG	Multiple machine learning	No	Predict post-operative complications	AUC	-/0.69
Wise et al	2020	USA	101,721	44	79,4	Retrospective Cohort	30 days	LSG	Neural network	No	Predict post-operative complications	AUC	-/0.59
Piaggi et al	2010	Italy	235	42	100	Retrospective Cohort	2 years	Gastric Banding	Neural network	No	Predict weight loss	AUC	-/0.80
Wise et al	2016	USA	647	47	79,6	Retrospective Cohort	1 year	Lap gastric bypass	Neural network	No	Predict weight loss	AUC	-/0.83
Lee et al	2007	Taiwan	249	33	71,1	Prospective Cohort	2 years	OAGB; Gastric Banding	Neural network	No	Predict weight loss	Accuracy	0.94/-
Aminian et al	2020	USA	13,722	54	65	Retrospective Cohort	4 years	Lap gastric bypass; LSG; Gastric Banding; Duodenal Switch	Random forest	No	Assist in decision-making	AUC	-/0,71
Assaf et al	2021	Israel	2482	43	62,7	Retrospective Cohort	-	LSG	Decision tree	No	Predict diagnosis of hiatal hernia	Accuracy	0.88/-
Cao et al	2019	Sweden	6687	43	77	Retrospective Cohort	5 years	Lap gastric bypass	Neural network	No	Predict postoperative Quality of Life	Mean squared error	NA

Abbreviations: LSG, laparoscopic sleeve gastrectomy; *Lap gastric bypass*, laparoscopic gastric bypass; *OAGB*, one-anastomosis gastric bypass; *NS*, not specified; *ACC*, accuracy; *AUC*, area under the curve; *NA*, not applicable

Fig. 1 PRISMA flow diagram of the search



Postoperative complications		Postoperative weight loss	
Protective factors	Risk factors	Helping factors	Inhibiting factors
Low BMI	Non-White race	Female gender	Older age
	Diabetes mellitus*		Diabetes mellitus*
	Older age		High BMI
	Previous bariatric surgery		

BMI, body mass index

* = type not specified

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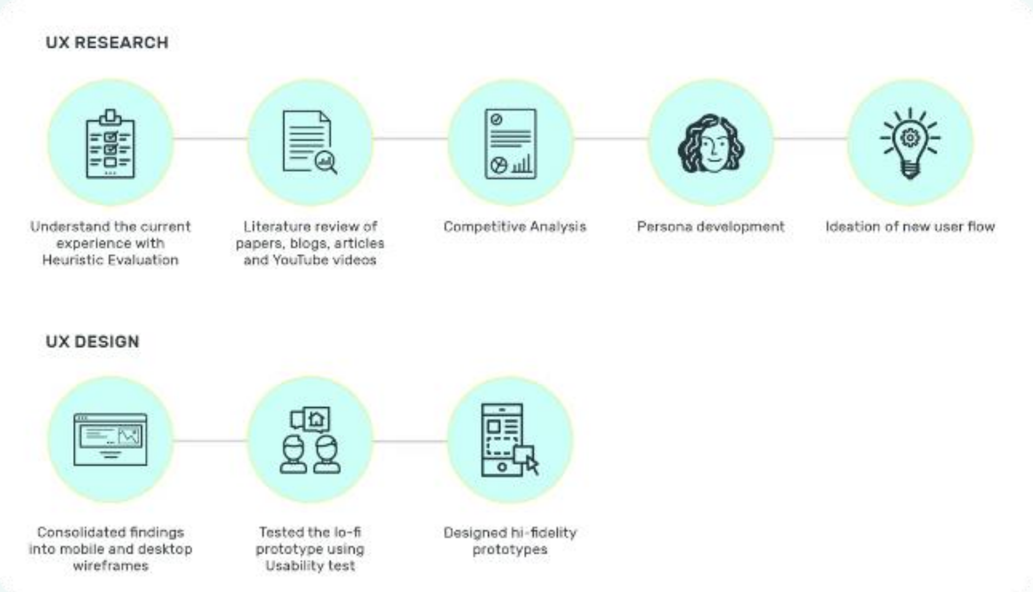
Results Analysis



Assisting Decision-Making

1 Predicting Long-Term Risks

Machine learning can estimate the risk of complications like heart disease and kidney disease in obese patients with diabetes.

2 Informing Surgical Choices

This can help patients and surgeons make more informed decisions about pursuing bariatric surgery.

3 Improving Outcomes

Personalized risk prediction could lead to better patient selection and improved long-term outcomes.

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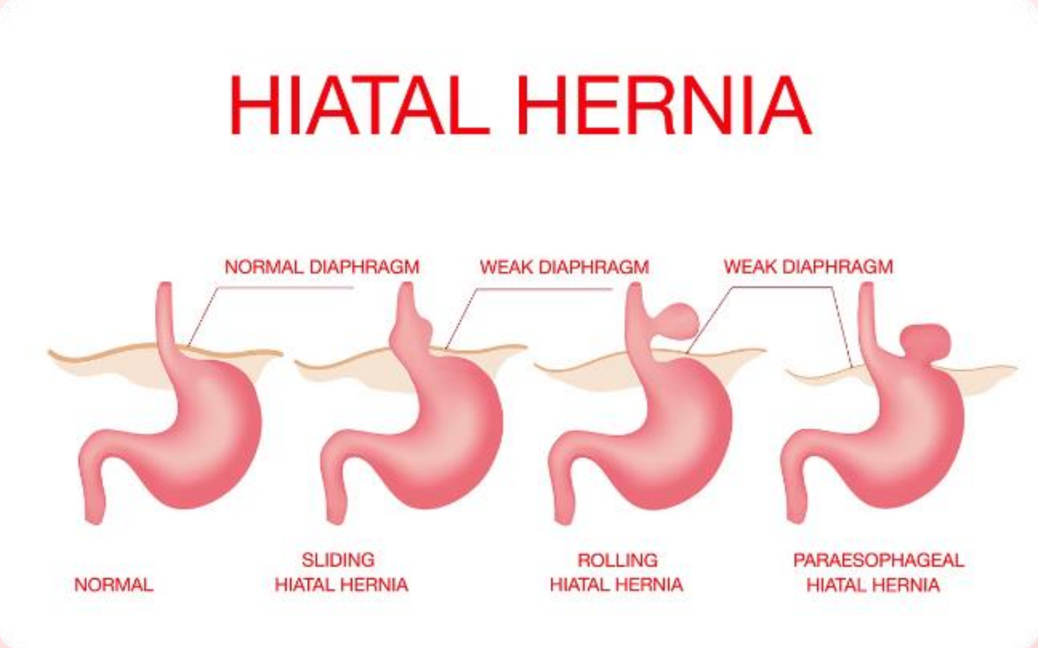

Diagnosing Comorbidities

Predicting Hiatal Hernias

Machine learning models can identify patients at risk of having a hiatal hernia prior to bariatric surgery.

Improving Surgical Planning

Better preoperative planning for the procedure.

Accuracy up to 88%

While promising, further refinement of these models is needed to enhance their clinical utility.

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Predicting Complications

1

Accuracy up to 98%

Machine learning models can predict postoperative complications with high accuracy, helping to identify high-risk patients.

2

Key Risk Factors

Factors like age, BMI, and diabetes are important predictors of complications after bariatric surgery.

3

External Validation Needed

Further research is required to validate these models and enable their clinical implementation.

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Forecasting Weight Loss

Accuracy up to 94%

Machine learning can accurately predict postoperative weight loss, a key outcome for bariatric patients.

Identifying Risk Factors

Factors like gender, race, and diabetes influence weight loss after bariatric surgery.

Validation Challenges

Lack of external validation limits the clinical application of these predictive models.

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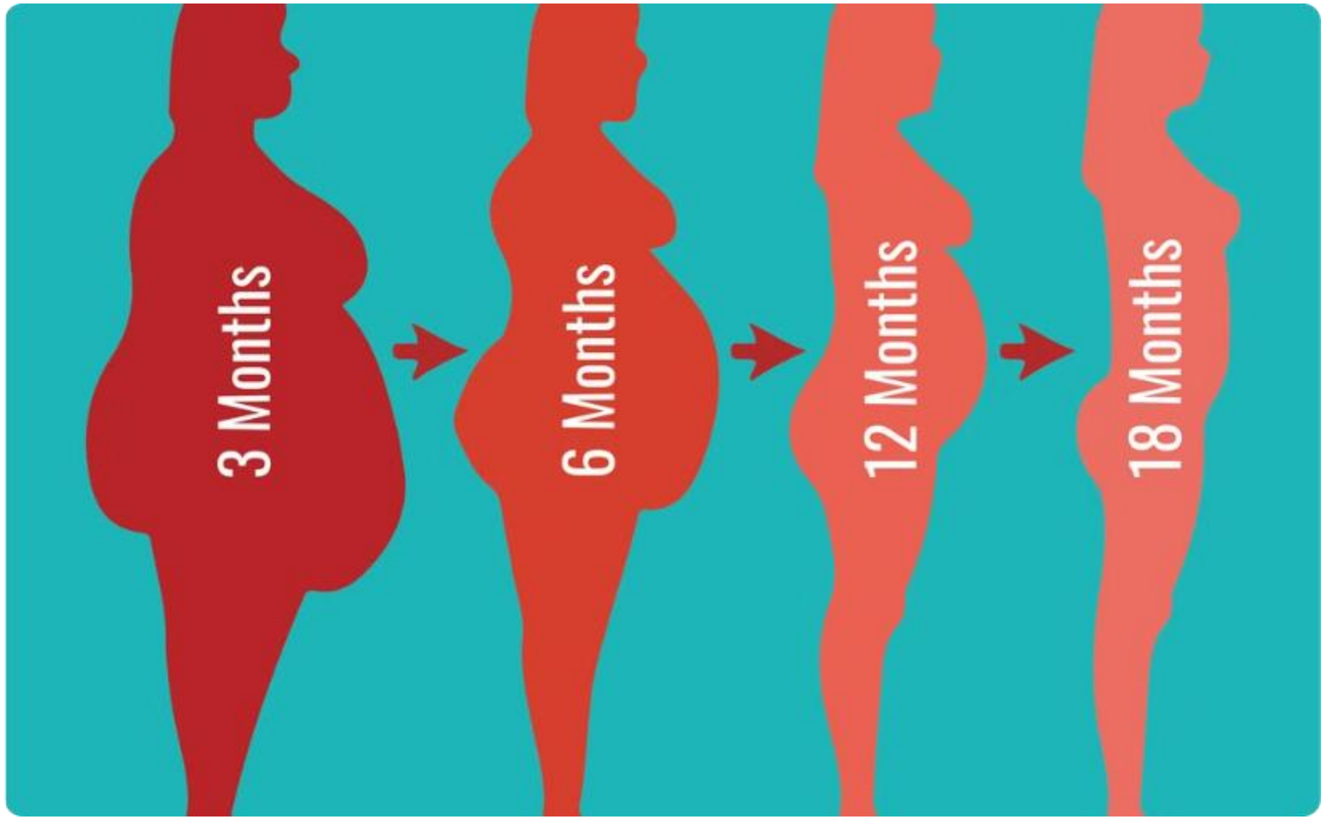
Forecasting Quality of Life



Predicting Outcomes

Machine learning can estimate improvements in patients' quality of life after bariatric surgery.

Personalized Expectations

This can help set realistic expectations and guide postoperative care and rehabilitation.

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Overcoming Limitations

Data Availability

Lack of large, diverse datasets limits the development and validation of machine learning models.

External Validation

Most studies lack external validation, hindering the generalizability of the predictive models.

Clinical Implementation

Integrating machine learning into clinical practice requires further research and regulatory approval.

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The Path Forward

1

Data Collection

Expanding data sources, including from laparoscopic and robotic surgery, will enhance model development.

2

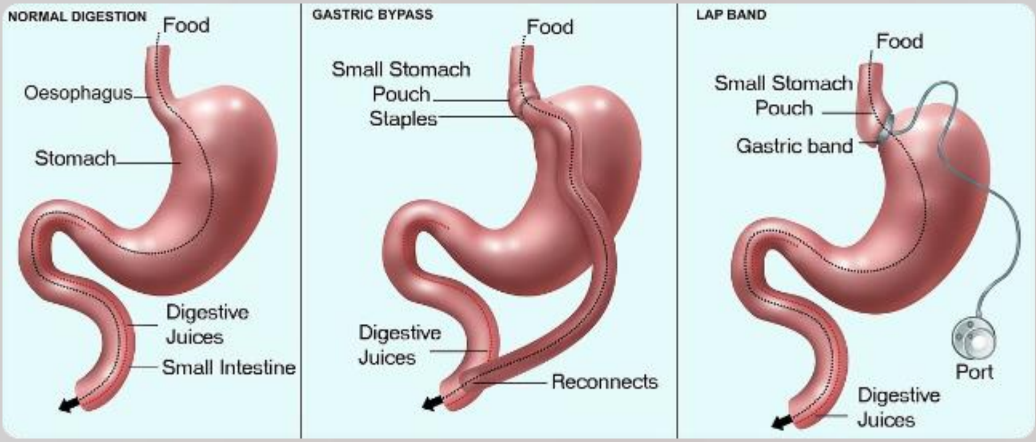
External Validation

Rigorous validation in diverse patient populations is crucial for clinical implementation.

3

Clinical Trials

Conducting clinical trials will demonstrate the real-world impact of machine learning in bariatric surgery.



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Transforming Bariatric Care

Predicting Complications	Forecasting Weight Loss	Assisting Decision-Making
Accuracy up to 98%	Accuracy up to 94%	AUC up to 0.81
Identify high-risk patients	Personalize expectations	Estimate long-term risks

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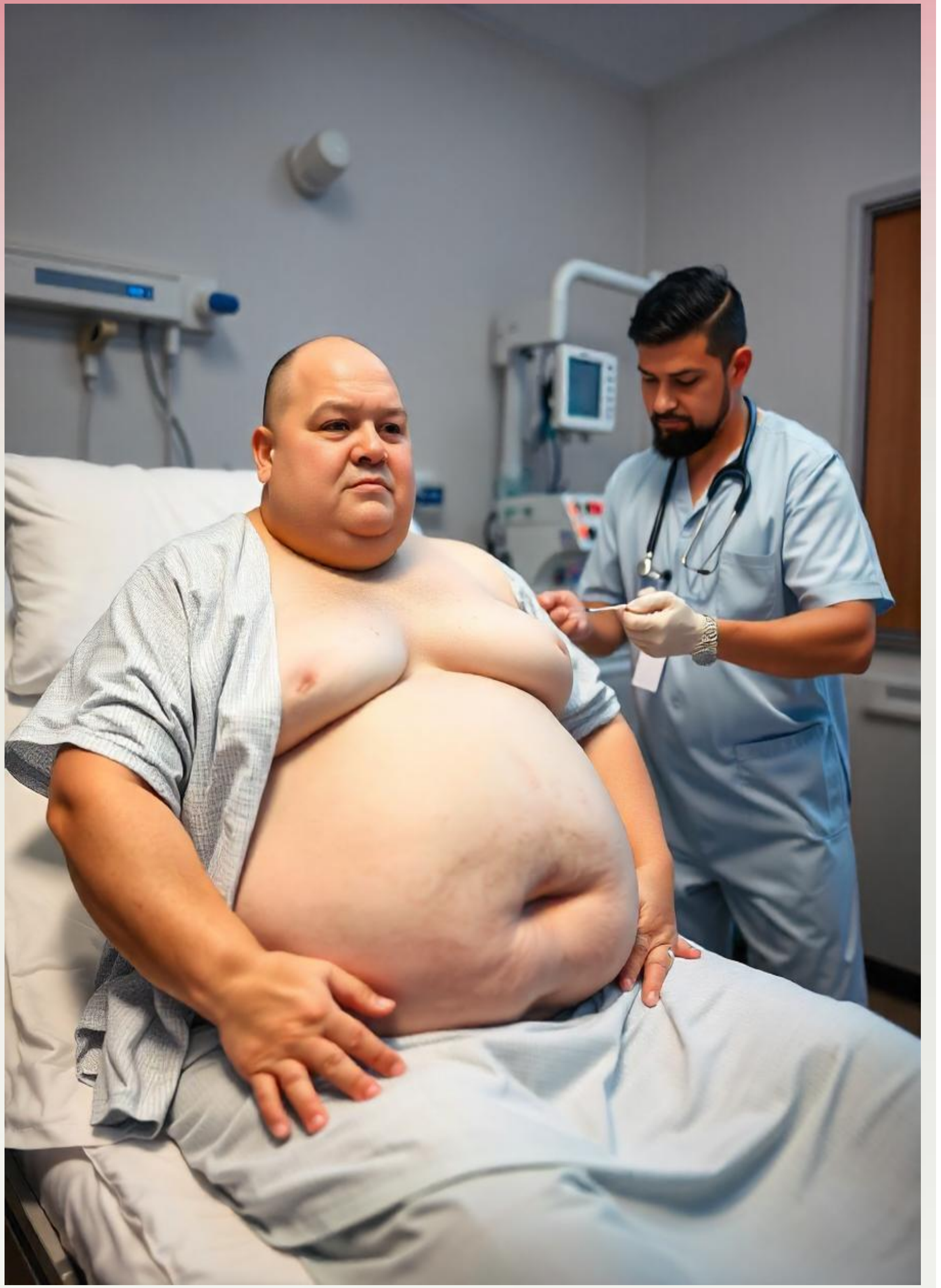

Overcoming Limitations / Challenges

ETHICS

VALUES

The Future is Intelligent

Revolutionizing Bariatric Care

Machine learning has the potential to transform decision-making, improve outcomes, and enhance the patient experience in bariatric surgery.

Overcoming Challenges

Addressing data availability, validation, and clinical integration will be key to realizing the full potential of AI in this field.

Towards Personalized Medicine

As machine learning models mature, they can enable truly personalized, data-driven approaches to bariatric surgery.

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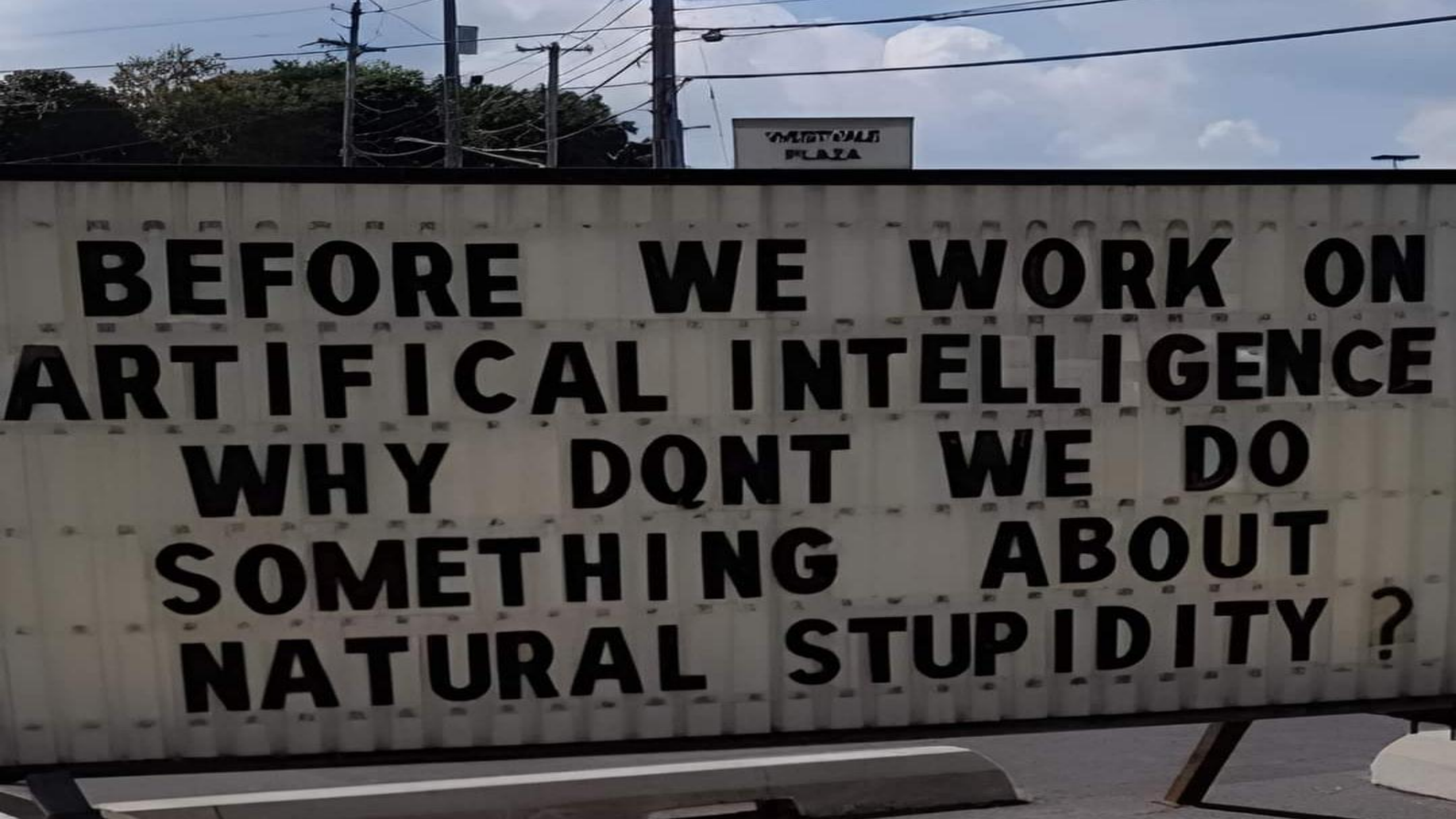
BEFORE WE WORK ON
ARTIFICAL INTELLIGENCE
WHY DQNT WE DO
SOMETHING ABOUT
NATURAL STUPIDITY ?