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The Operating Table as an Intelligent Hub for Data-Logging to Promote Physical Patient Comfort During Surgery

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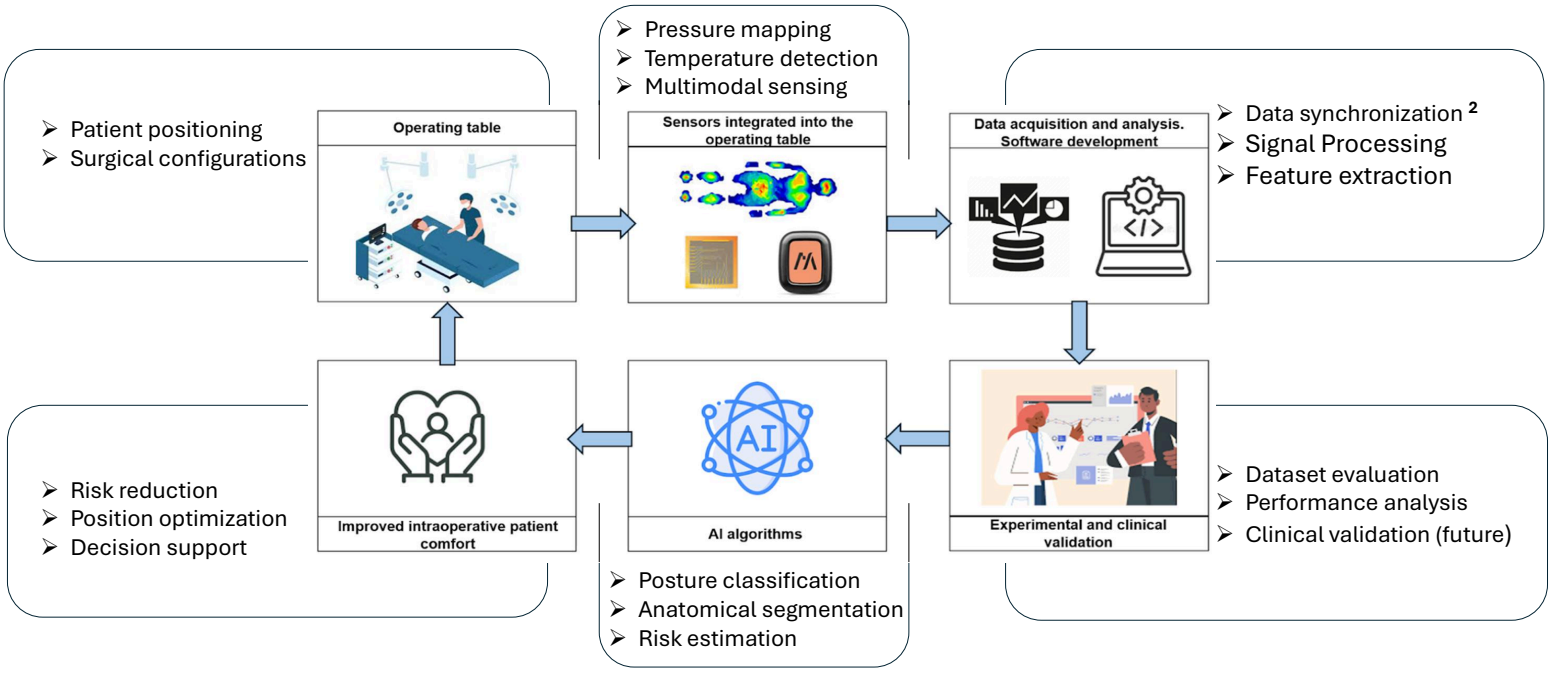
INTRODUCTION

During surgery, patients remain immobilized for long periods, exposing them to a high risk of pressure injuries and improper positioning.
Pressure sensing technologies are widely used to assess body–surface interaction[1].
However, these approaches are typically limited to controlled environments and fail to provide reliable, real-time assessment in intraoperative conditions.

OBJECTIVE

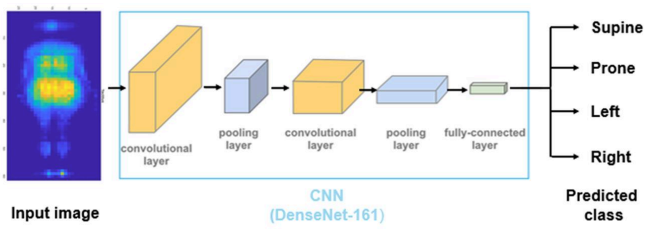
To develop an *Artificial Intelligence of Medical Things* (AIoMT) framework that transforms the operating table into an intelligent sensing hub for integrated assessment of patient positioning and pressure-related risk, enabling multimodal sensing and supporting improved positioning protocols, risk prevention and intraoperative comfort.

AIoMT FRAMEWORK



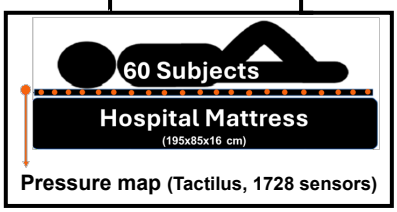
PRELIMINARY RESULTS ON THE PoPu DATASET [3]

AI algorithm for posture classification



Accuracy	Precision	Recall	F1-score
96,43%	96,45%	96,43%	96,42%

(i) Two different analysis were conducted (ii)



Features extraction for each subjects

- Center of Pressure (CoP):

$$x_{CoP} = \frac{\sum_{i=1}^{M}\sum_{j=1}^{N} x_j\, P_{i,j}}{\sum_{i=1}^{M}\sum_{j=1}^{N} P_{i,j}}$$

$$y_{CoP} = \frac{\sum_{i=1}^{M}\sum_{j=1}^{N} y_j\, P_{i,j}}{\sum_{i=1}^{M}\sum_{j=1}^{N} P_{i,j}}$$

- Mean Pressure
- Peak Pressure

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[1] Cimignolo, S.; Fruet, D.; Nollo, G.; Masè, M. Technical Characteristics and Biomedical Applications of Flexible Pressure Sensor Matrices: A Scoping Review. *Sensors* **2026**, *26*, 1971. doi:10.3390/s26061971
[2] Fruet, D.; Cimignolo, S.; Nollo, G. Multimodal Data Synchronization: A High-Level Software Methodology for Heterogeneous Devices, 23 March **2026**, PREPRINT (Version 1) available at Research Square. doi:10.21203/rs.3.rs-9008593/v1
[3] Fonseca, L.; Ribeiro, F.; Metrôlho, J.; Santos, A.; Dionisio, R.; Amini, M.M.; Silva, A.F.; Heravi, A.R.; Sheikholeslami, D.F.; Fidalgo, F.; et al. PoPu-Data: A Multilayered, Simultaneously Collected Lying Position Dataset. *Data* **2023**, *8*, 120. doi:10.3390/data8070120

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