



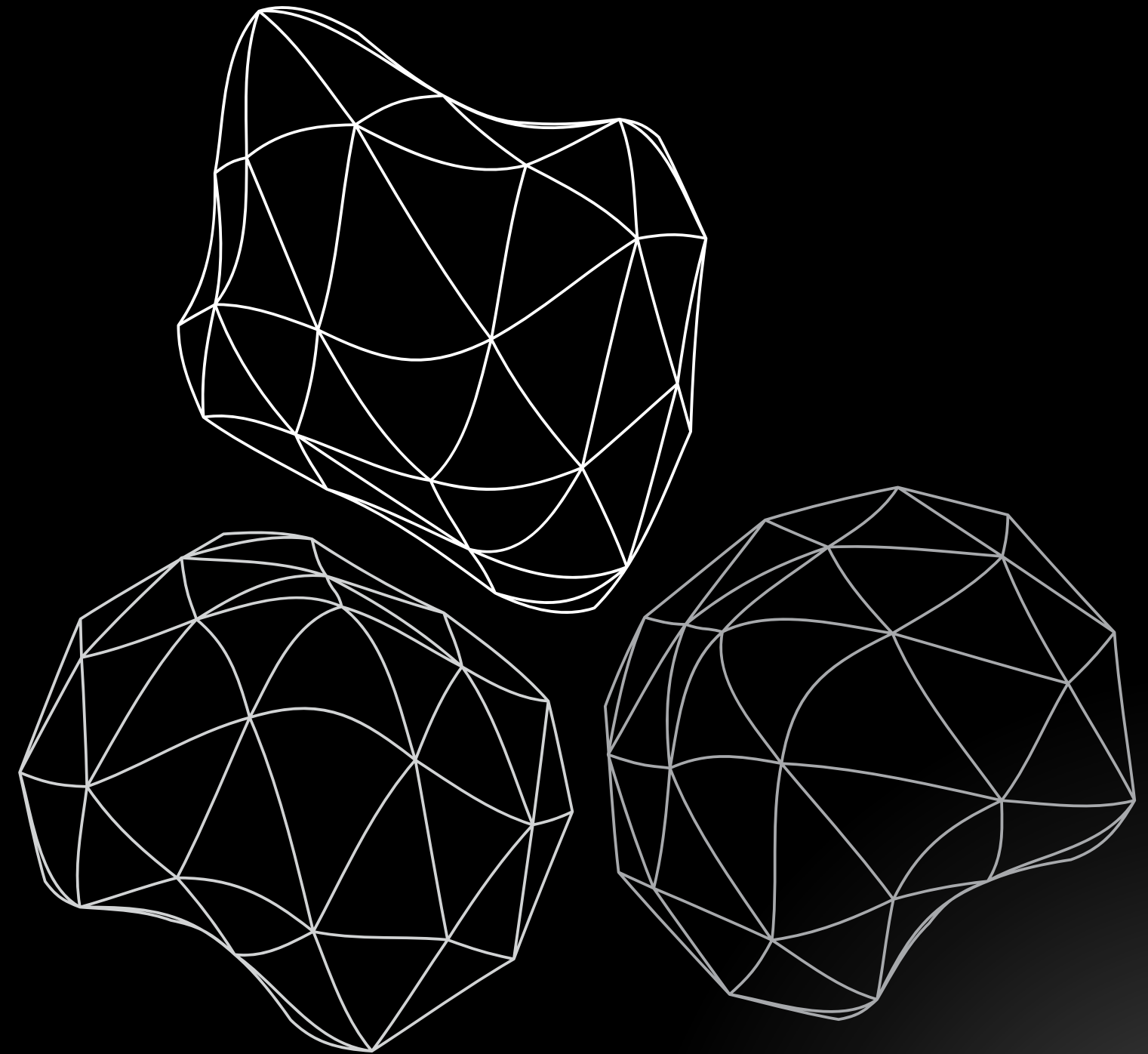
OMNI MED

PROBLEM STATEMENT 5

REALTIME X

OMNI MED

Omni-Med is an intelligent mobility platform that integrates custom robotics with advanced ML to give critical medical devices unprecedented agility and precision.





PROPOSED SOLUTION

A hierarchical navigation stack built on ROS 2 for safe, predictable, and adaptive performance.

Hybrid Path Planning: A reliable Global Planner (Hybrid-A)* maps the optimal, safe route, while an intelligent RL Local Planner handles dynamic obstacles.

Predictive AI Controller: The local planner uses a Recurrent (LSTM) Actor-Critic Model to fuse sensor data, understand motion, and predict the intent of dynamic objects.

Safety-First Design: The entire system is governed by a dedicated Safety Node with executive authority to issue an emergency stop, ensuring safety is never compromised.



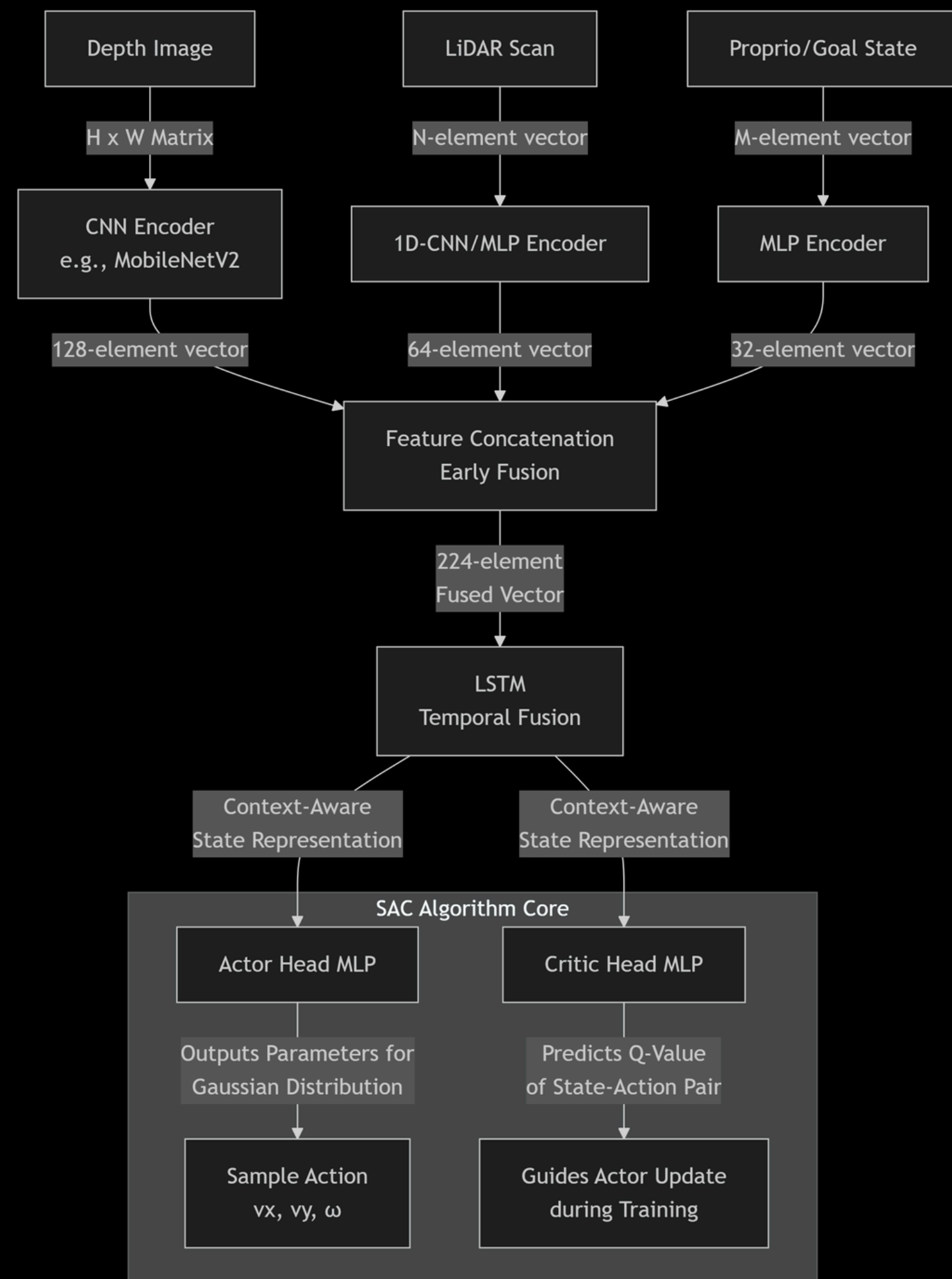
HARDWARE

A purpose-built medical instrument engineered for precision and reliability

Co-Axial Swerve Modules: A compact design with zero-backlash harmonic drives delivers silent, millimeter-perfect omnidirectional motion.

Integrated Electronics: A single, custom all-in-one PCB houses the computer and all motor controllers, radically simplifying the system and increasing reliability.

Chassis: A lightweight yet rigid unibody frame provides a robust, space-efficient foundation for the entire platform.

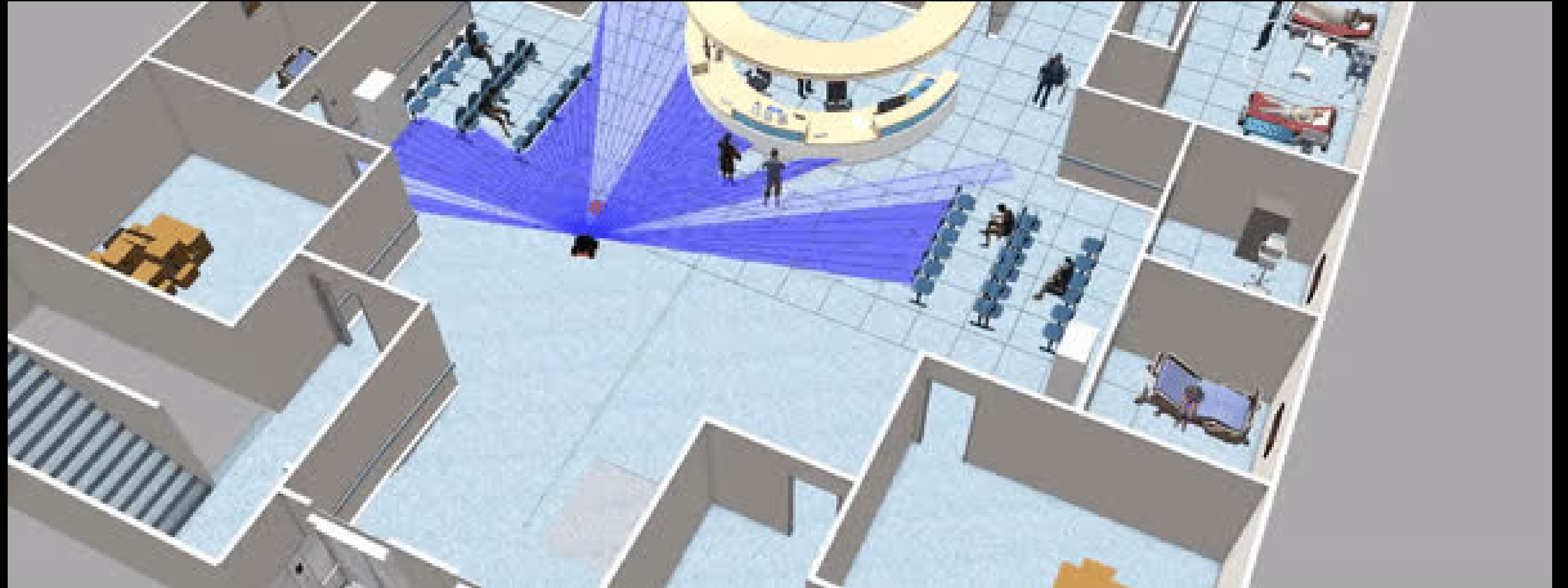


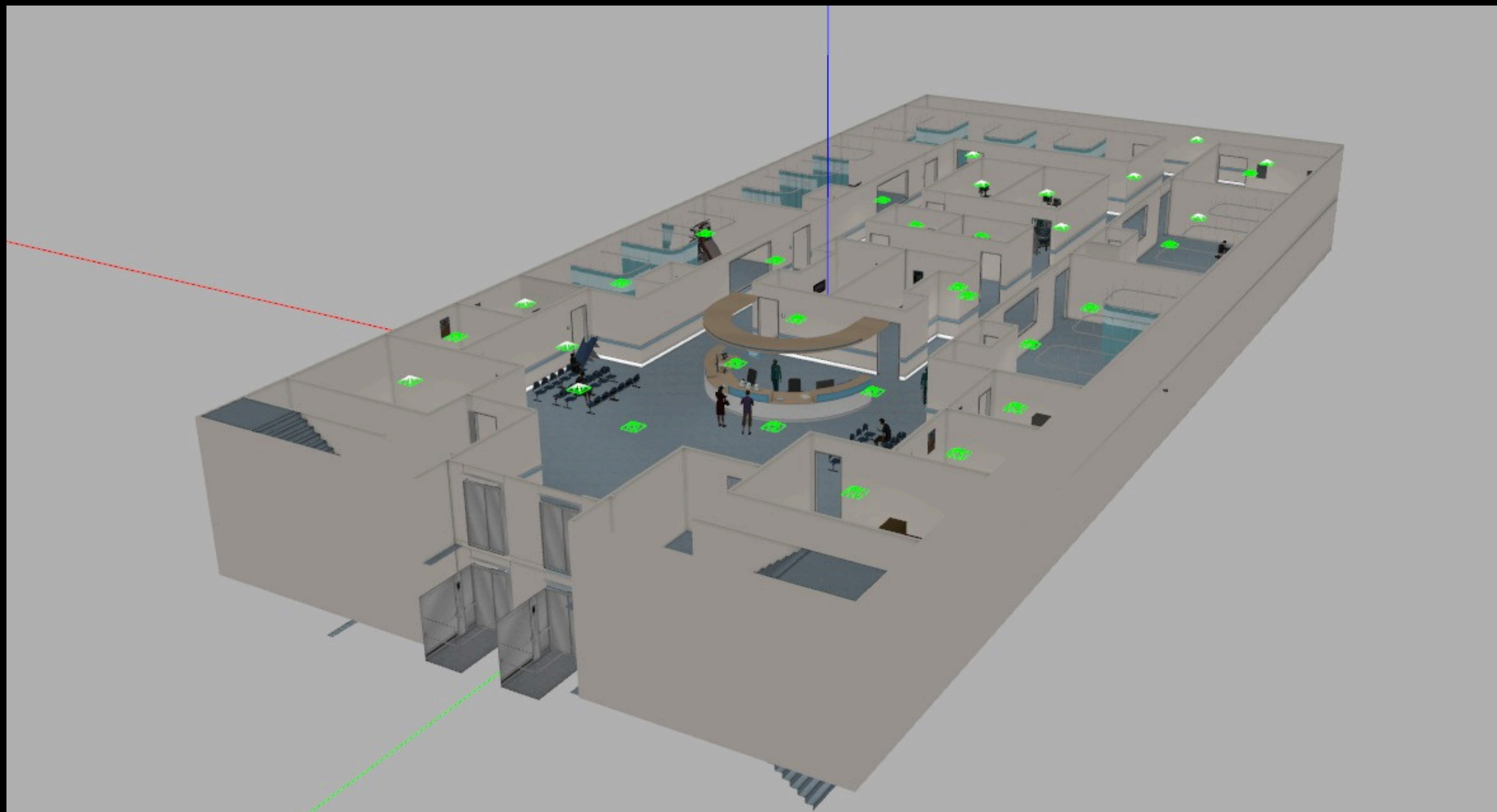
ALGORITHM FOR PROCESSING MODALITIES: CONVOLUTIONAL NEURAL NETWORKS (CNNs) FOR SPATIAL DATA (IMAGES, LIDAR SCANS) AND MULTI-LAYER PERCEPTRONS (MLPS) FOR VECTOR DATA.

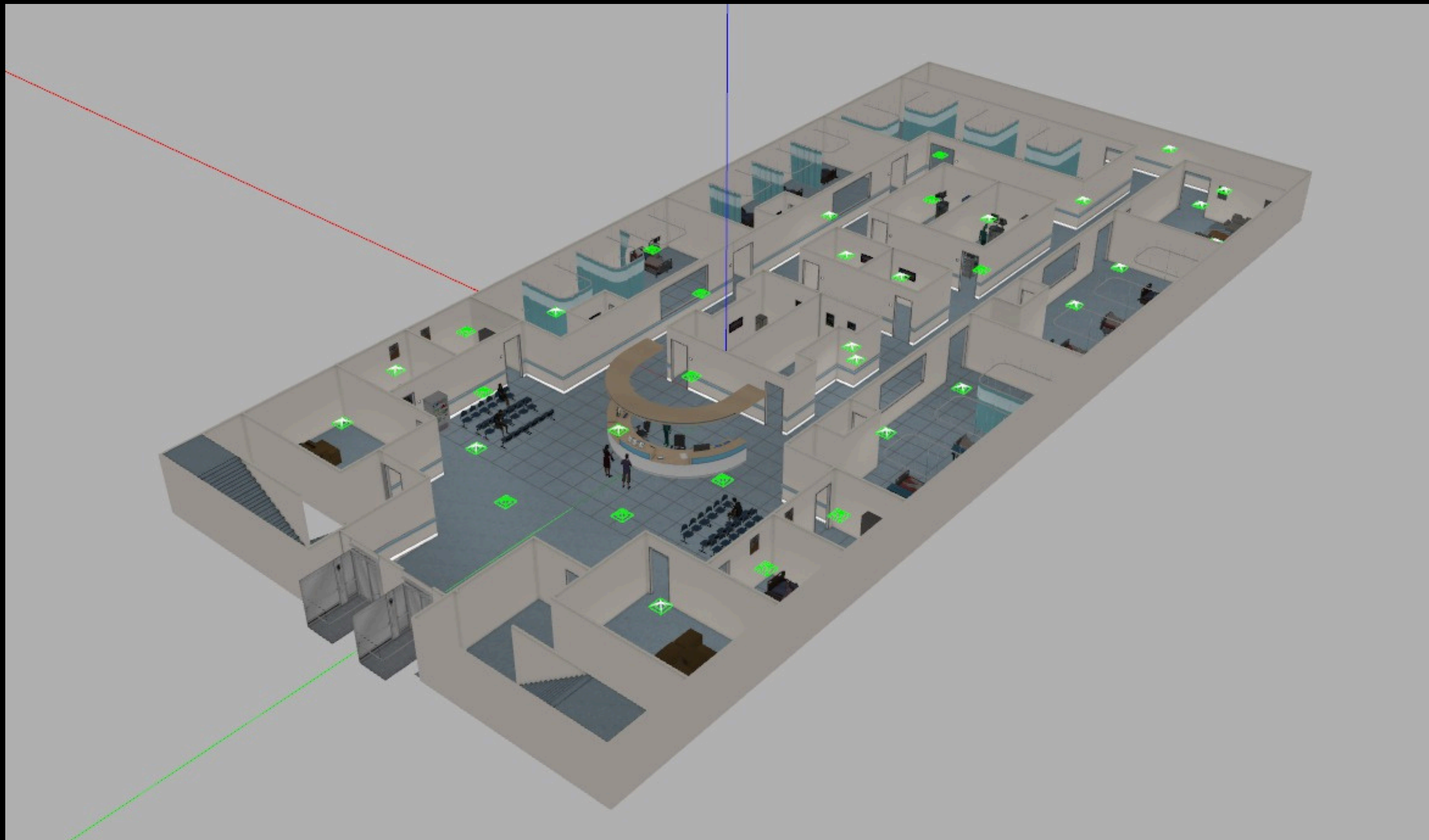
ALGORITHM FOR FUSING MODALITIES: FEATURE-LEVEL FUSION VIA CONCATENATION. THE MODEL LEARNS THE CROSS-MODAL RELATIONSHIPS THROUGH THE WEIGHTS OF THE LAYERS THAT COME AFTER THE CONCATENATION POINT (THE LSTM AND THE ACTOR/CRITIC HEADS).

ALGORITHM FOR FUSING TIME: LONG SHORT-TERM MEMORY (LSTM). THIS ALLOWS THE MODEL TO INTEGRATE INFORMATION OVER TIME, TURNING A SERIES OF SNAPSHOTS INTO A DYNAMIC UNDERSTANDING OF THE ENVIRONMENT.

OVERARCHING LEARNING ALGORITHM: SOFT ACTOR-CRITIC (SAC). THIS IS THE META-ALGORITHM THAT USES ALL THE COMPONENTS ABOVE TO LEARN, VIA TRIAL AND ERROR IN SIMULATION, THE OPTIMAL POLICY FOR NAVIGATION.







The background is a dark gradient with intricate white line art. On the left, a series of concentric, wavy lines form a shape reminiscent of a stylized leaf or a wing, extending from the bottom towards the center. On the right, another set of similar wavy lines curves upwards from the top right corner. The central area is a smooth, dark gradient where the text is placed.

THANK YOU