# The Huge Potential of AI in CAR-T Cell Therapies


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# Artificial Intelligence-driven, Decentralized Production for Advanced Therapies in the Hospital


The AIDPATH project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no 101016909.

# Improving CAR-T Cell Therapies

- CAR-T Cell Therapy: a transformative treatment in hematology for acute leukaemia and lymphoma
- Living drug paradigm: the patients' own immune cells are redirected to eliminate the cancerous cells
- Now: manual processes leading to high costs, long production times and moderate chances of success

How could AI approaches improve this?

- Lower treatment costs and shorten production times
- Highly potent & optimally adapted CAR-T cell products
- Smart 'bedside' provision of personalized treatments directly at the 'point-of-care'

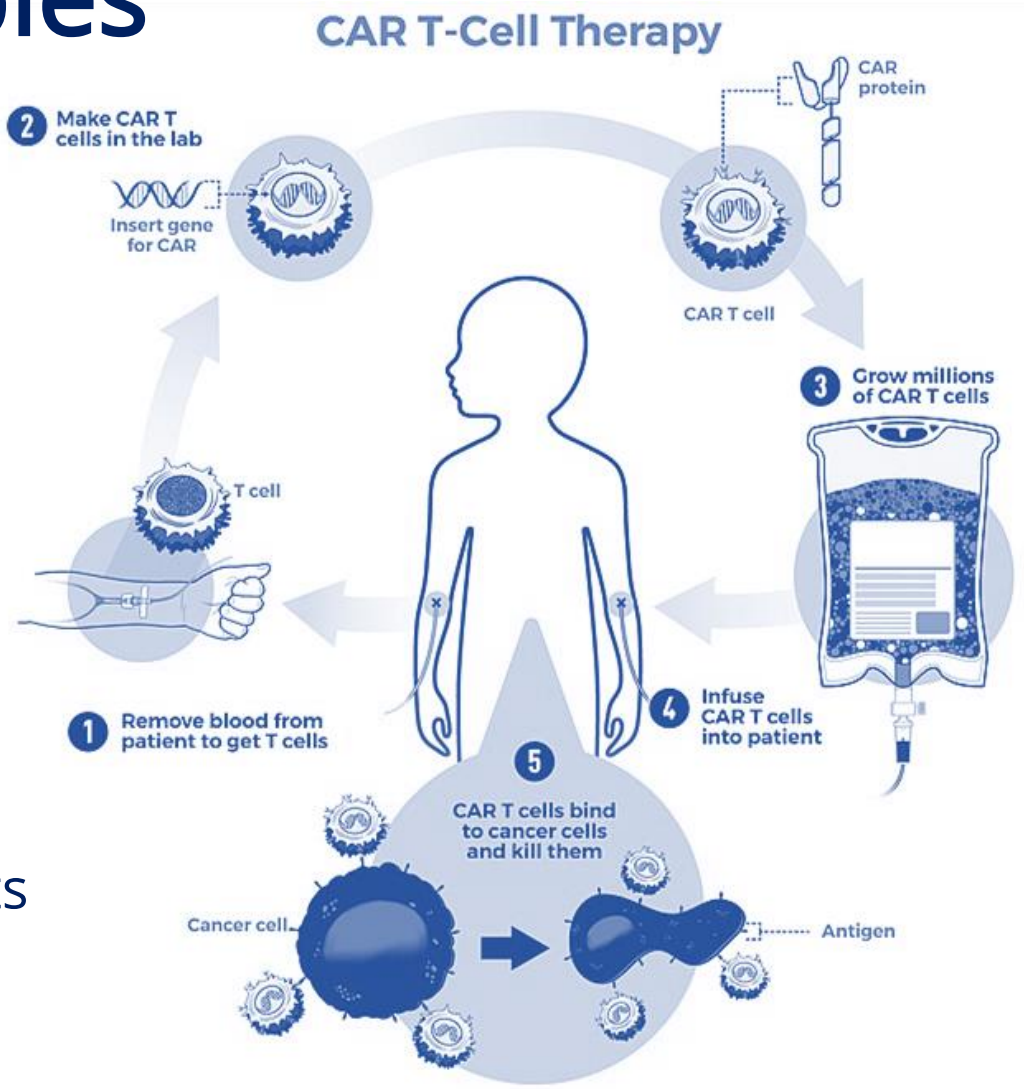



image source: cancer.org via Wikimedia commons

# AIDPATH: Main Objectives

- Automated robotic, modular manufacturing platform for CAR-T cell treatments
- Artificial Intelligence solutions supporting the end-to-end manufacturing process
- IoT and Data Architecture enabling a continual AI learning and CAR-T process optimization
- Business Model and Innovation Ecosystem

# AIDPATH: Roles of AI

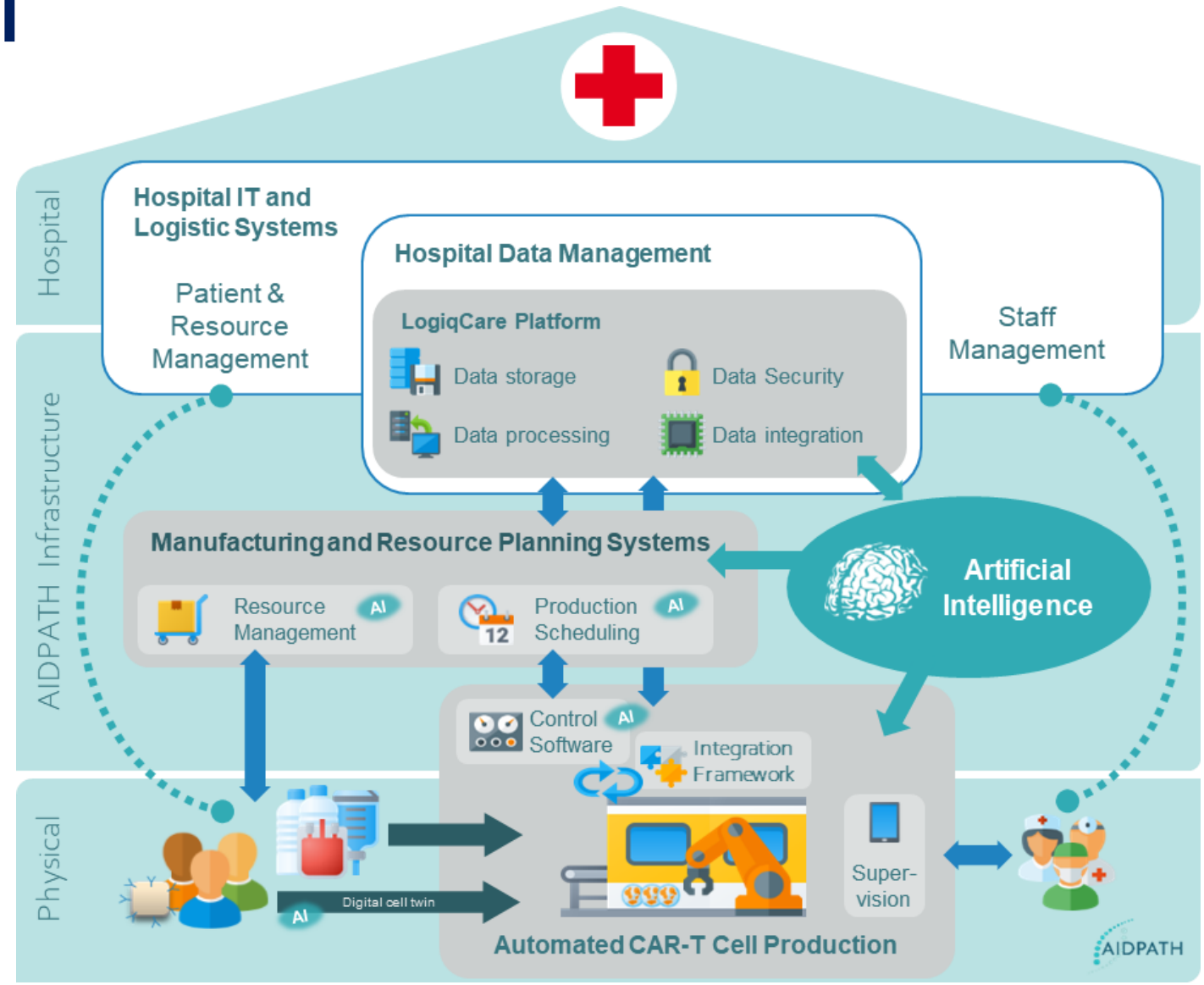
**AI1:** Modelling and Predicting CAR-T Cell Expansion Process

**AI2:** Adaptive Online Process Control of the Bioreactor

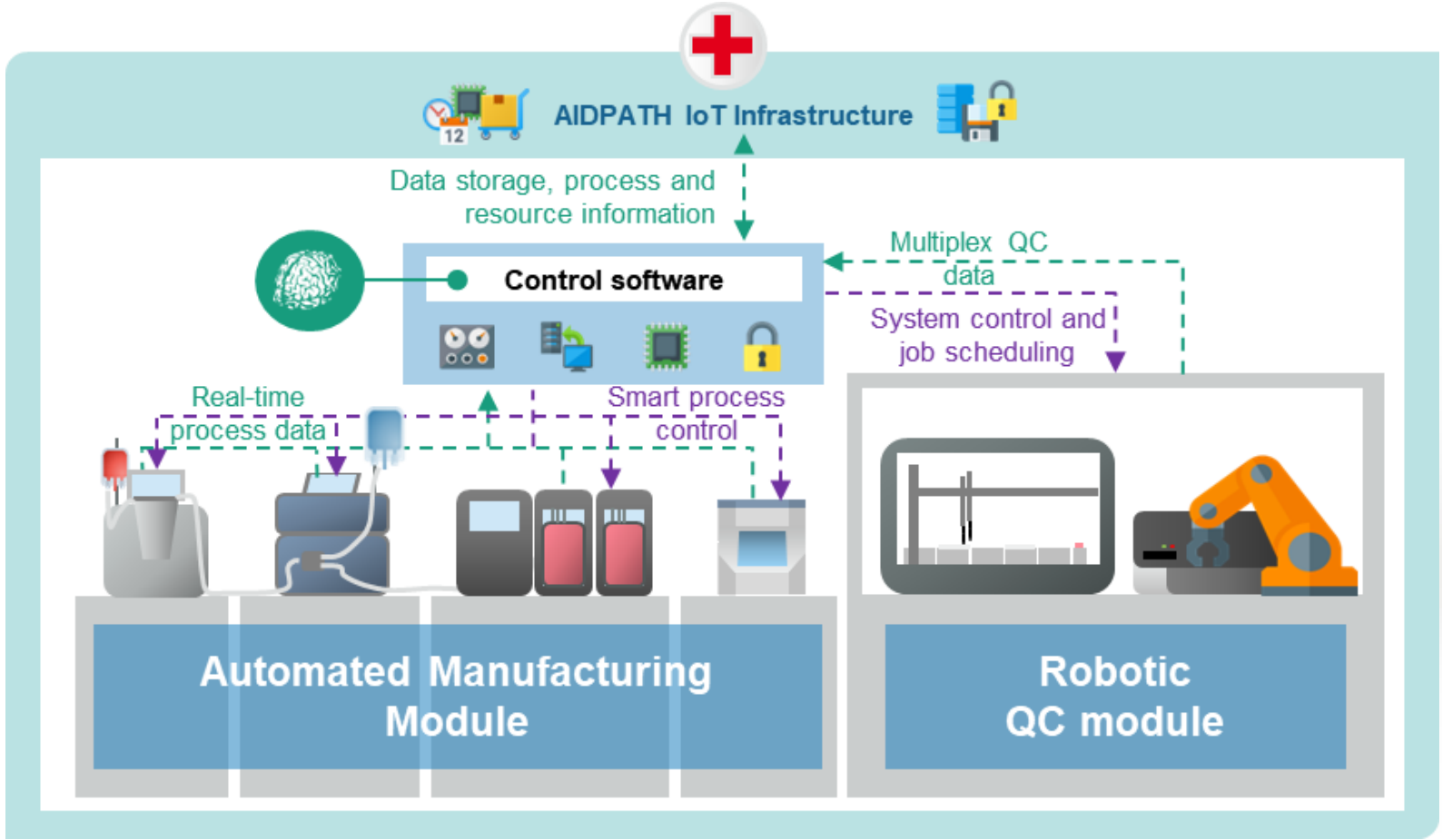
**AI3:** Robust Production Scheduling of the Platform

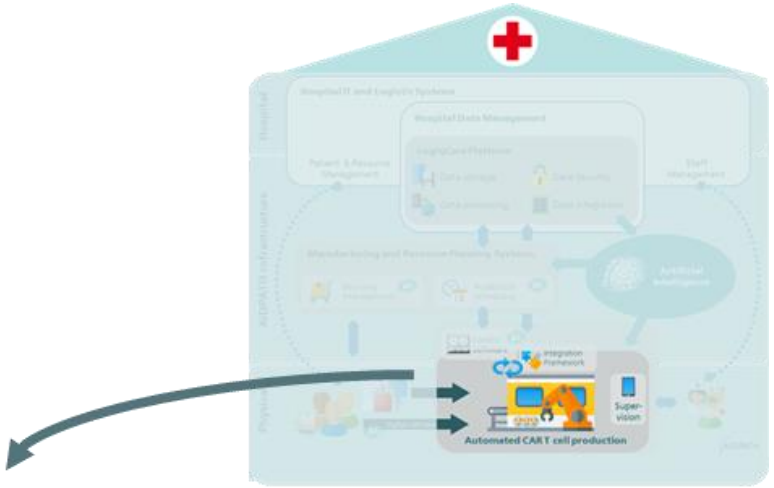
**AI4:** Resource Management of the Hospital Environment

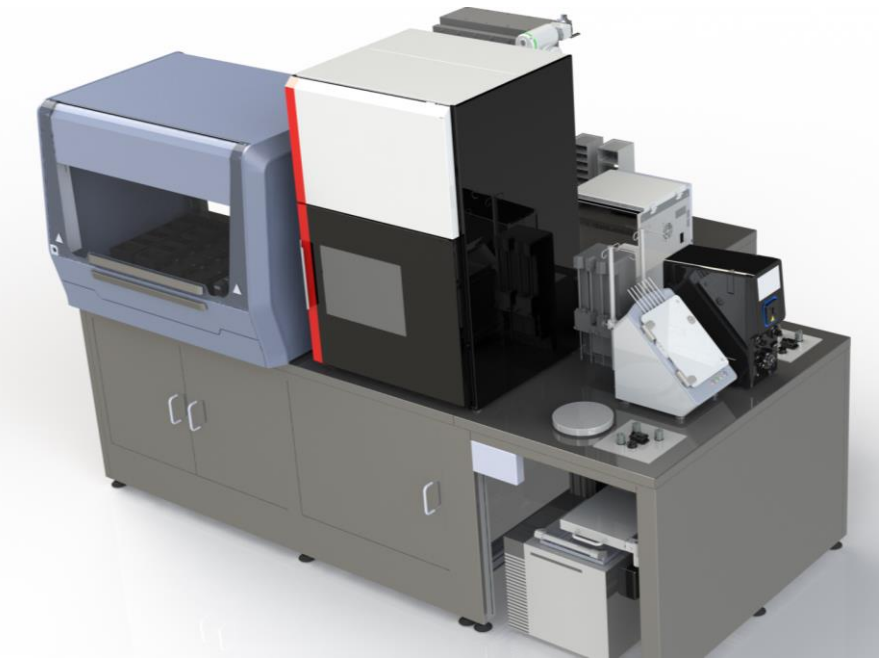
**AI5:** Clinical Decision Support to Optimize the Treatments



# Automated, AI-Driven CAR-T Cell Manufacturing Platform



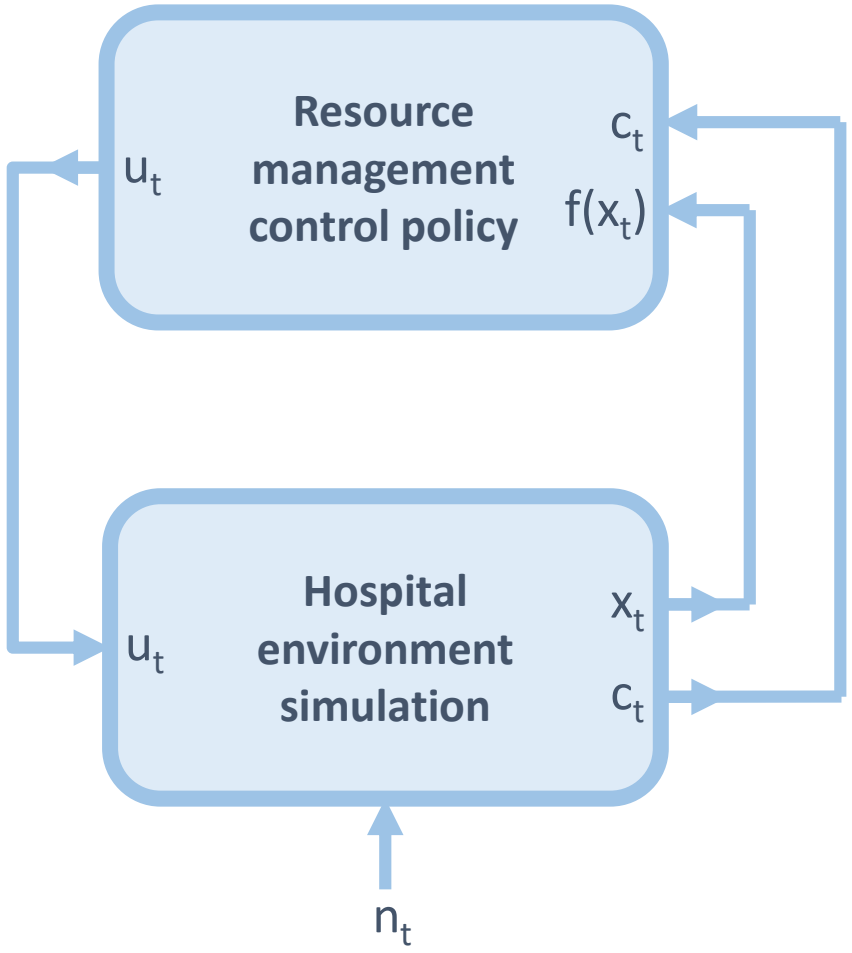



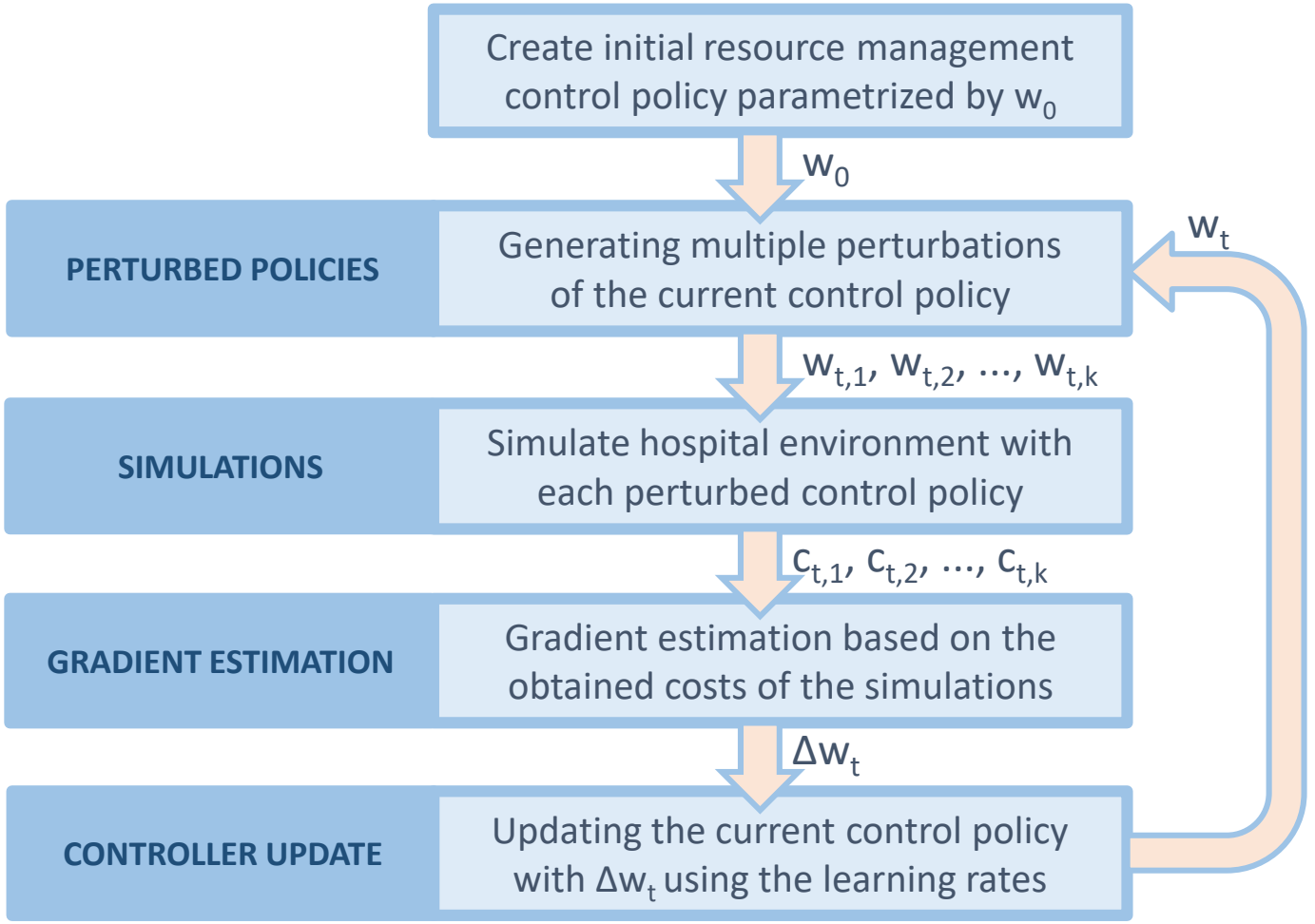


# Resource Management

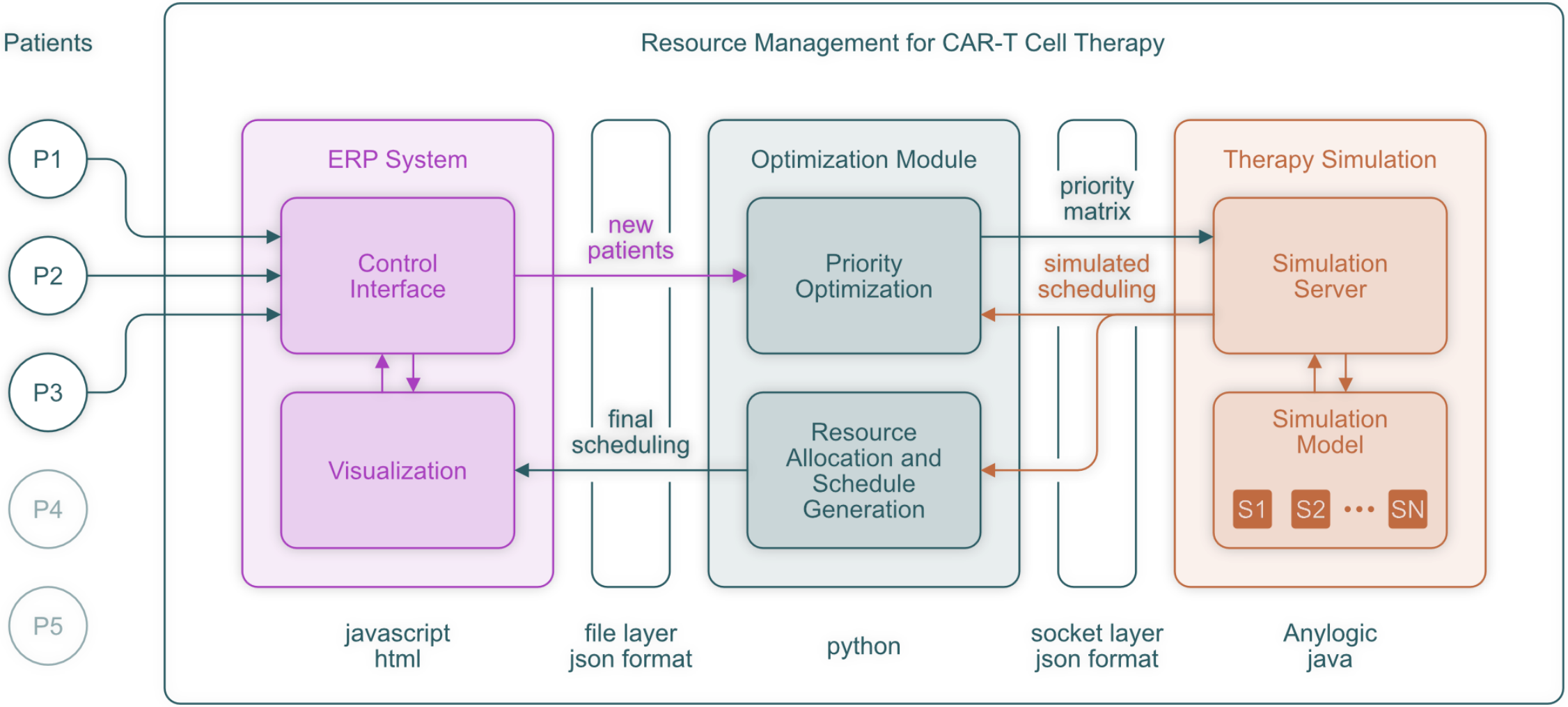
- Goal of AI4 module: efficiently managing the resources in the hospital environment
- Aim: minimize protocol violations, and various other secondary objectives during therapies
- The staff (physicians, nurses) and the medical devices are treated as scarce, reusable resources
- Tasks of a treatment are considered as non-preemptive, time-dependent and interconnected, e.g., precedence constraints
- The hospital environment is modelled and simulated in the cross-platform AnyLogic
- Finally, resource management strategies are optimized by using reinforcement learning

# Reinforcement Learning for Resource Control

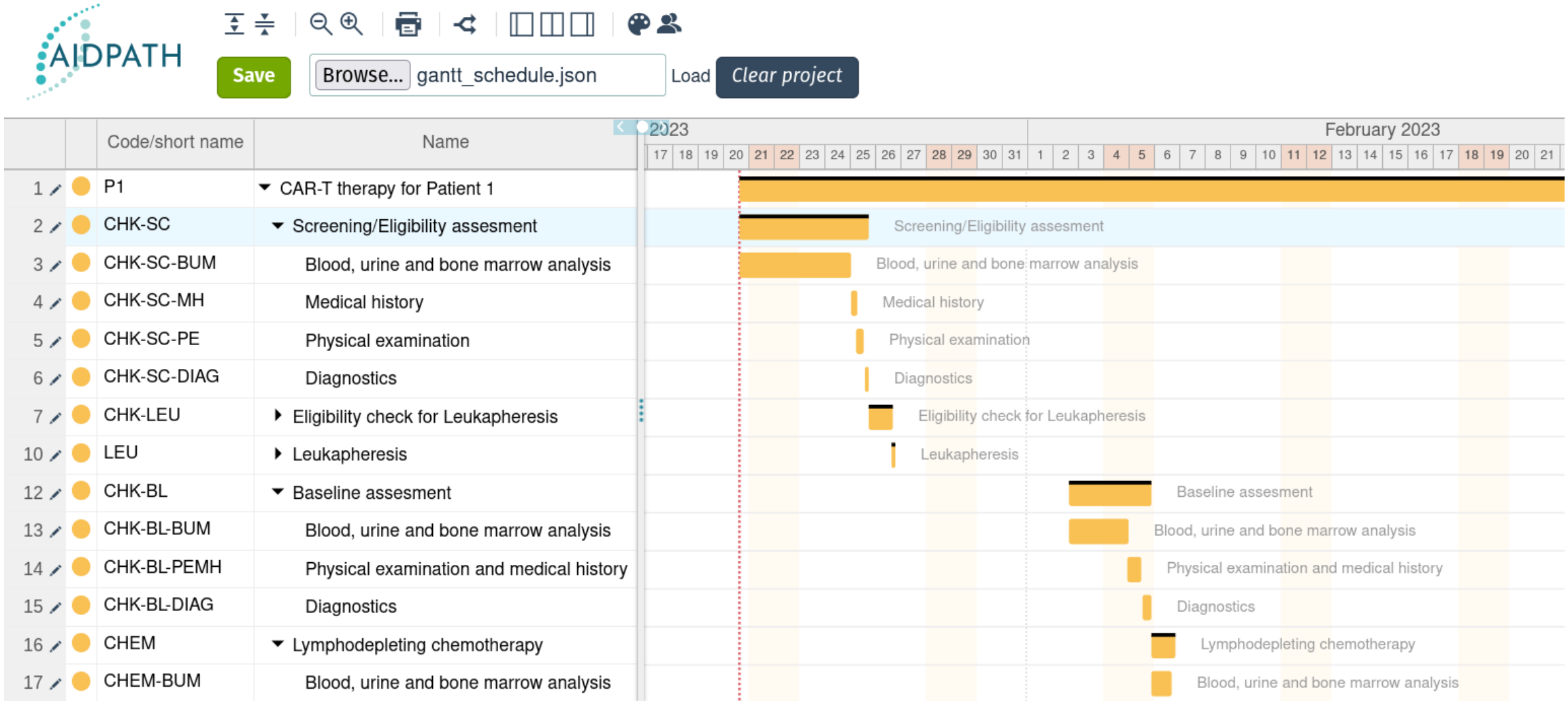


# Resource Management Architecture



# Visualization: Gantt Charts



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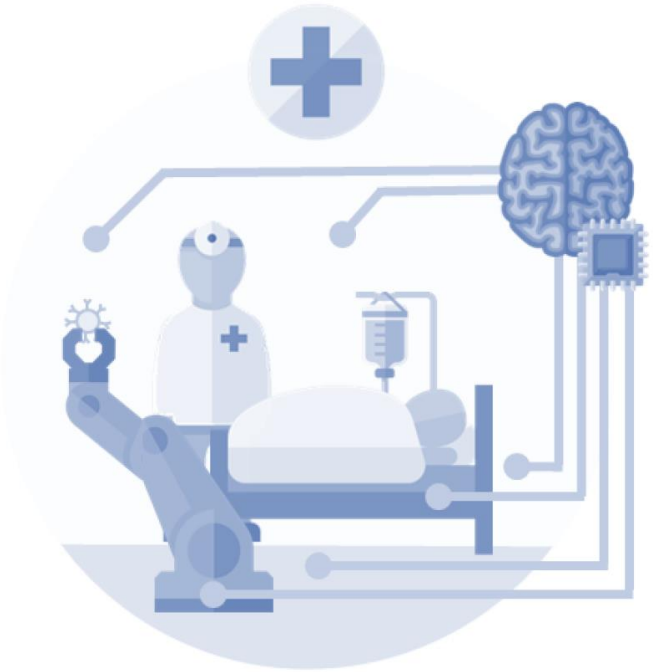

# Thank you for your attention!

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