AI SPACE PLANNER

Intelligent Layout Generation
Using Genetic Algorithm

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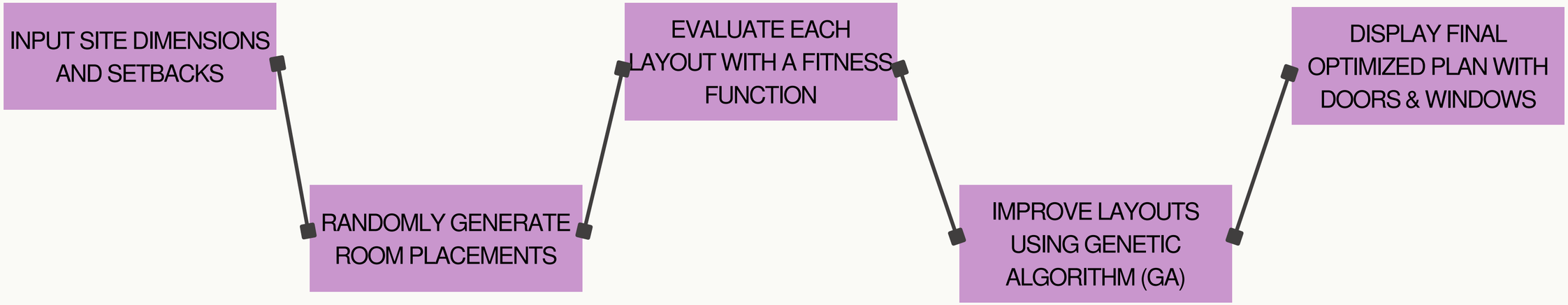
INTRODUCTION

- Manual space planning is time-consuming and often non-optimal.
- The goal of this project is to automate architectural layout generation using AI.
- This tool generates room layouts considering area constraints, adjacency, setbacks, and openings (doors/windows).

OBJECTIVE

- Generate the best possible floor plan layout for a given site.
- Ensure functional adjacency between rooms (e.g., Living–Dining, Bedroom–Toilet).
- Respect site setbacks and avoid overlaps.
- Automatically add doors and windows for realistic plans.

METHODOLOGY OVERVIEW



ROOM AND NEIGHBOR DEFINITIONS

Room	Area Range (m²)	Preferred Neighbors
Living	12–20	Dining, Kitchen, Balcony
Bedroom	10–16	Toilet
Kitchen	6–10	Living, Dining
Toilet	3–5	Bedroom
Dining	8–12	Living, Kitchen
Balcony	4–6	Living

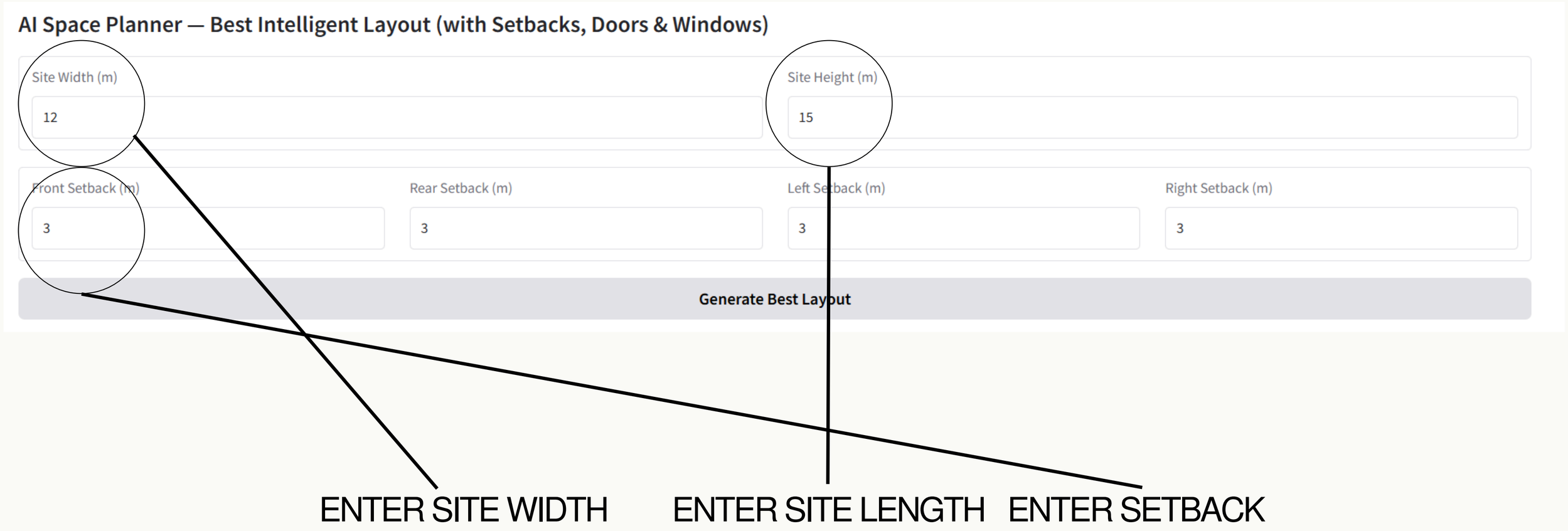
ALGORITHM AND FITNESS FUNCTION

Fitness Function

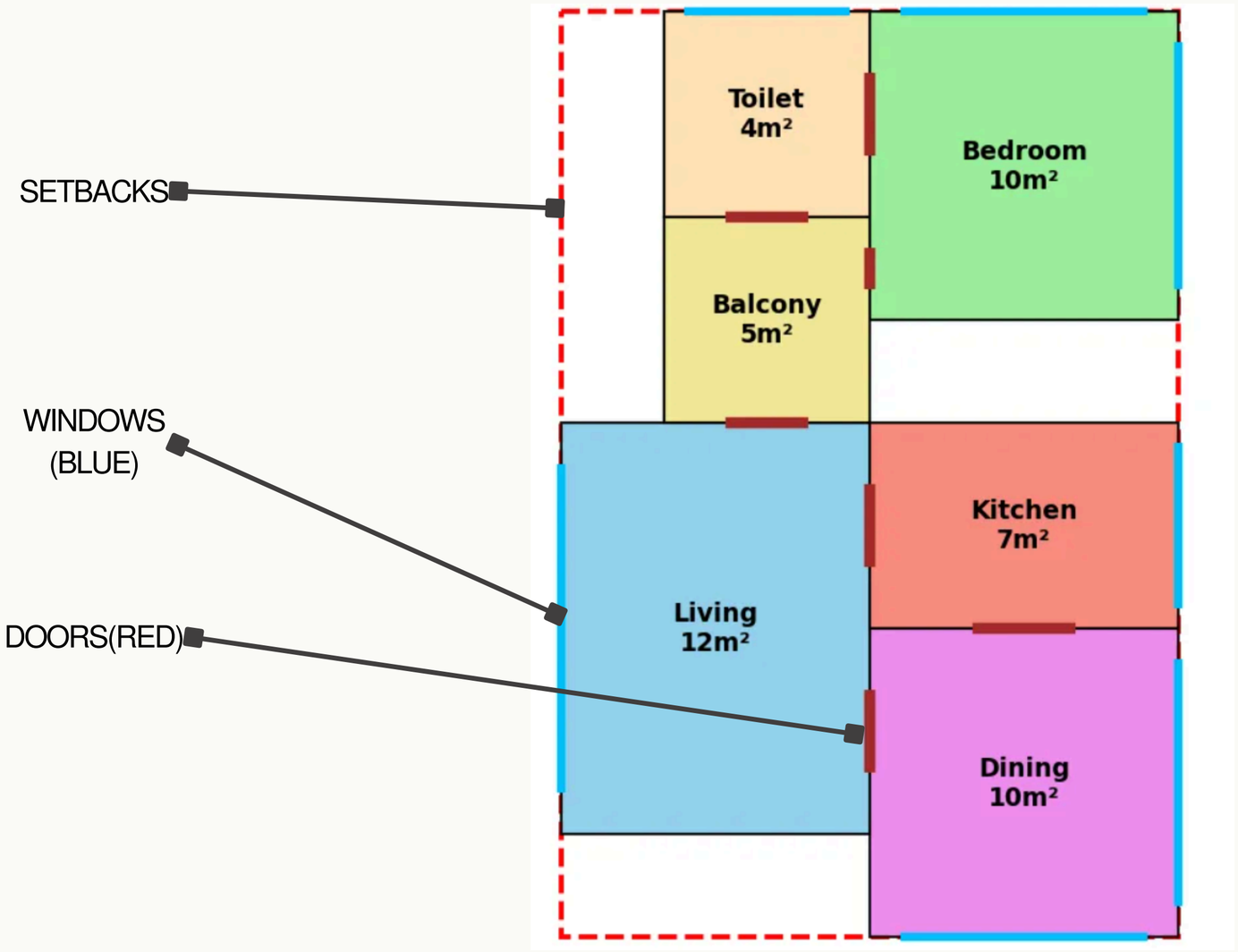
- Evaluates how good a layout is based on
- Room area compliance
- Adjacency score
- Overlap penalty
- Compactness penalty

Genetic Algorithm

- Population of random layouts
- Mutation to generate variations
- Fitness ranking to select best layouts over generations


AI Space Planner — Best Intelligent Layout (with Setbacks, Doors & Windows)
Site Width (m)
12
Site Height (m)
15
Front Setback (m)
3
Rear Setback (m)
3
Left Setback (m)
3
Right Setback (m)
3
Generate Best Layout
ENTER SITE WIDTH
ENTER SITE LENGTH
ENTER SETBACK

GENERATED PLAN



OBSERVATIONS AND LIMITATIONS

Observations

- Adjacencies are generally correct (Living–Dining–Kitchen).
- Rooms are within realistic areas.
- The algorithm maintains setbacks and avoids overlaps.

Limitations

- Layout may not always be architecturally aesthetic.
- No corridor/path optimization.
- Only rectangular rooms (for now).

FUTURE IMPROVEMENTS

- Multi-storey layout planning
- Integration of furniture and circulation paths
- ML-based fitness tuning
- Export to CAD formats (DXF or DWG)

CONCLUSION

- Demonstrated an AI-driven approach to space planning.
- The GA-based system evolves layouts efficiently.
- Combines architecture + AI for practical design automation.