



Creating Infinite
Possibilities.

Optimizing Wi-Fi Channel Selection in a Dense Neighborhood

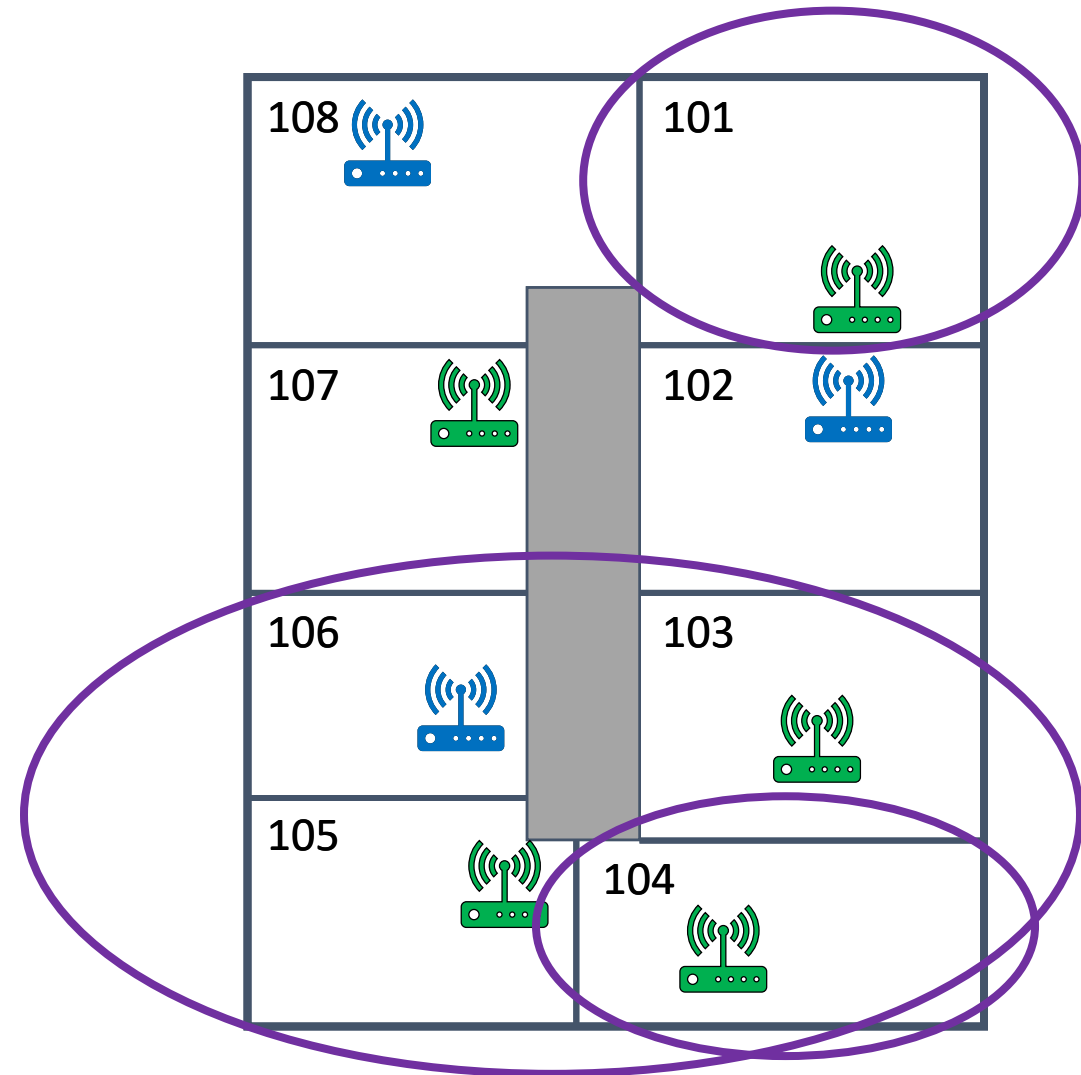
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Wi-Fi in a Dense Neighborhood

	101	102	103	104	105	106	107	108
101		■		□		■		■
102	■		■	□	■	■		
103		■	■	■	■	■		
104	□		■	■	■	■		
105			■	■	■	■		
106	■	■	■	■	■	■		■
107	■	■				■	■	
108	■						■	



Wi-Fi Pain Formula

$$C^* = \underset{C \in \{0,1\}^{n \times n_c}}{\operatorname{argmin}} \operatorname{Tr}(C^T P C)$$

s. t. $\forall i \in \{1 \dots n\}: \sum_{c=1}^{n_c} C_{i,c} = 1$

C^T

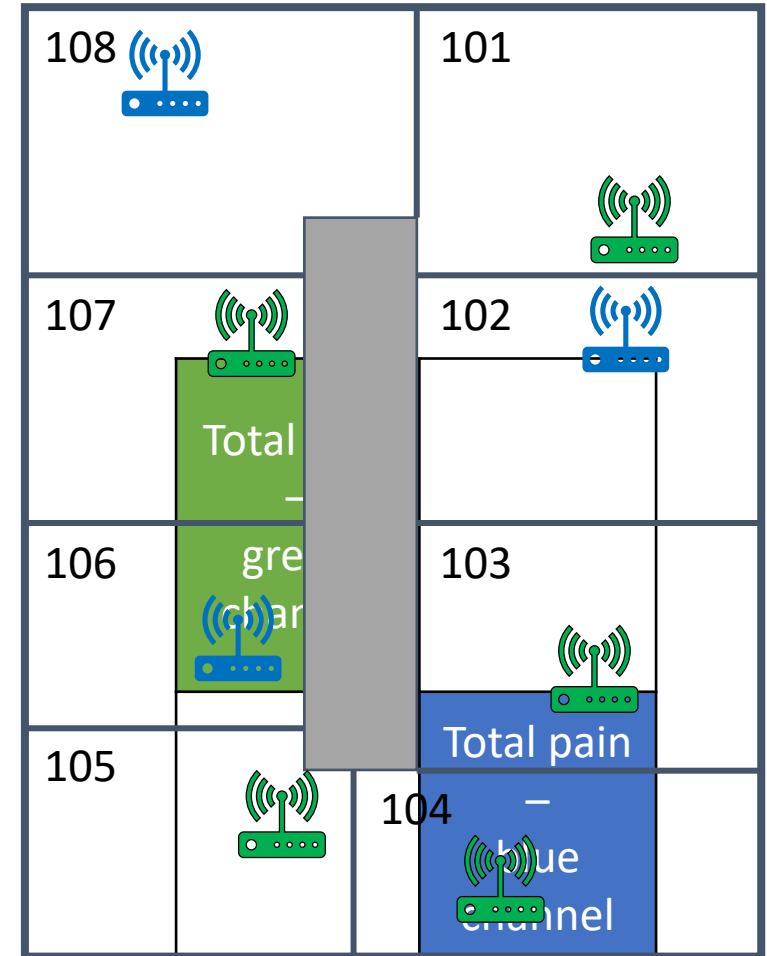
	101	102	103	104	105	106	107	108
green	█	█	█	█	█	█	█	█
blue	█	█	█	█	█	█	█	█

$P \in \mathbb{R}_+^{n \times n}$

	101	102	103	104	105	106	107	108
101	█	█	█	█	█	█	█	█
102	█	█	█	█	█	█	█	█
103	█	█	█	█	█	█	█	█
104	█	█	█	█	█	█	█	█
105	█	█	█	█	█	█	█	█
106	█	█	█	█	█	█	█	█
107	█	█	█	█	█	█	█	█
108	█	█	█	█	█	█	█	█

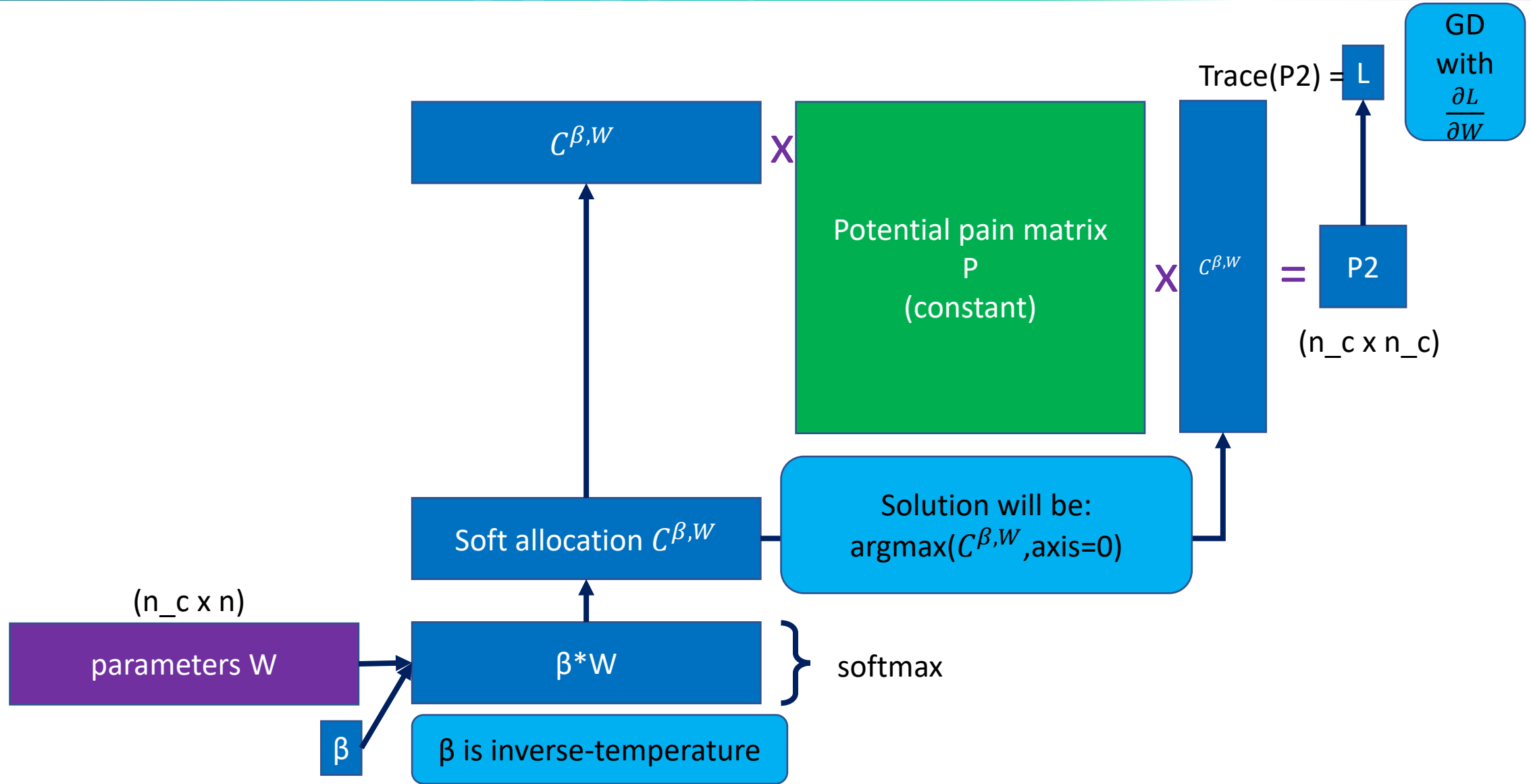
$C \in \{0, 1\}^{n \times n_c}$

	green	blue
101	█	█
102	█	█
103	█	█
104	█	█
105	█	█
106	█	█
107	█	█
108	█	█

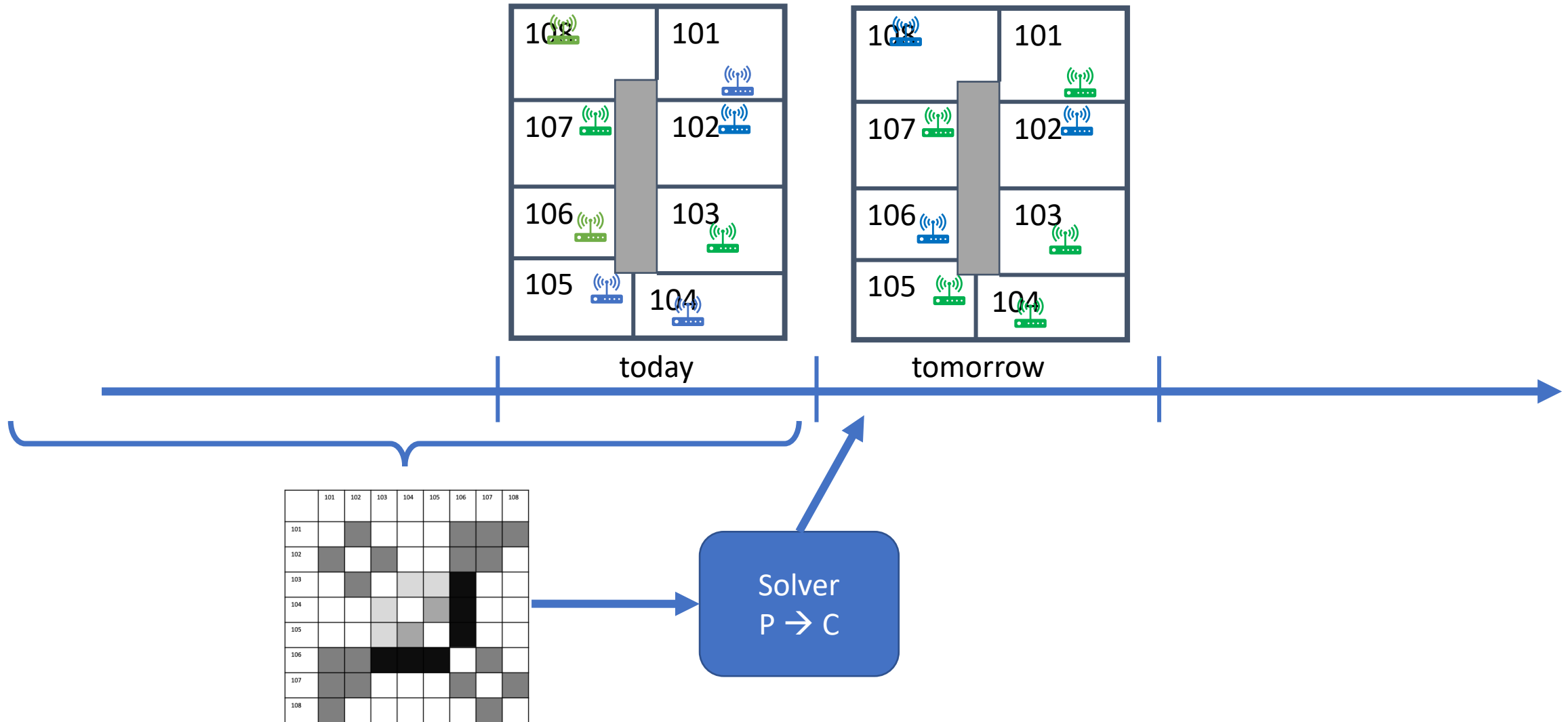


$$\begin{aligned} C^* = \operatorname{argmin}_{C \in \{0,1\}^{n \times n_c}} & \operatorname{Tr}(C^T P C) \\ \text{s.t. } \forall i \in \{1 \dots n\}: & \sum_{c=1}^{n_c} C_{i,c} = 1 \end{aligned}$$

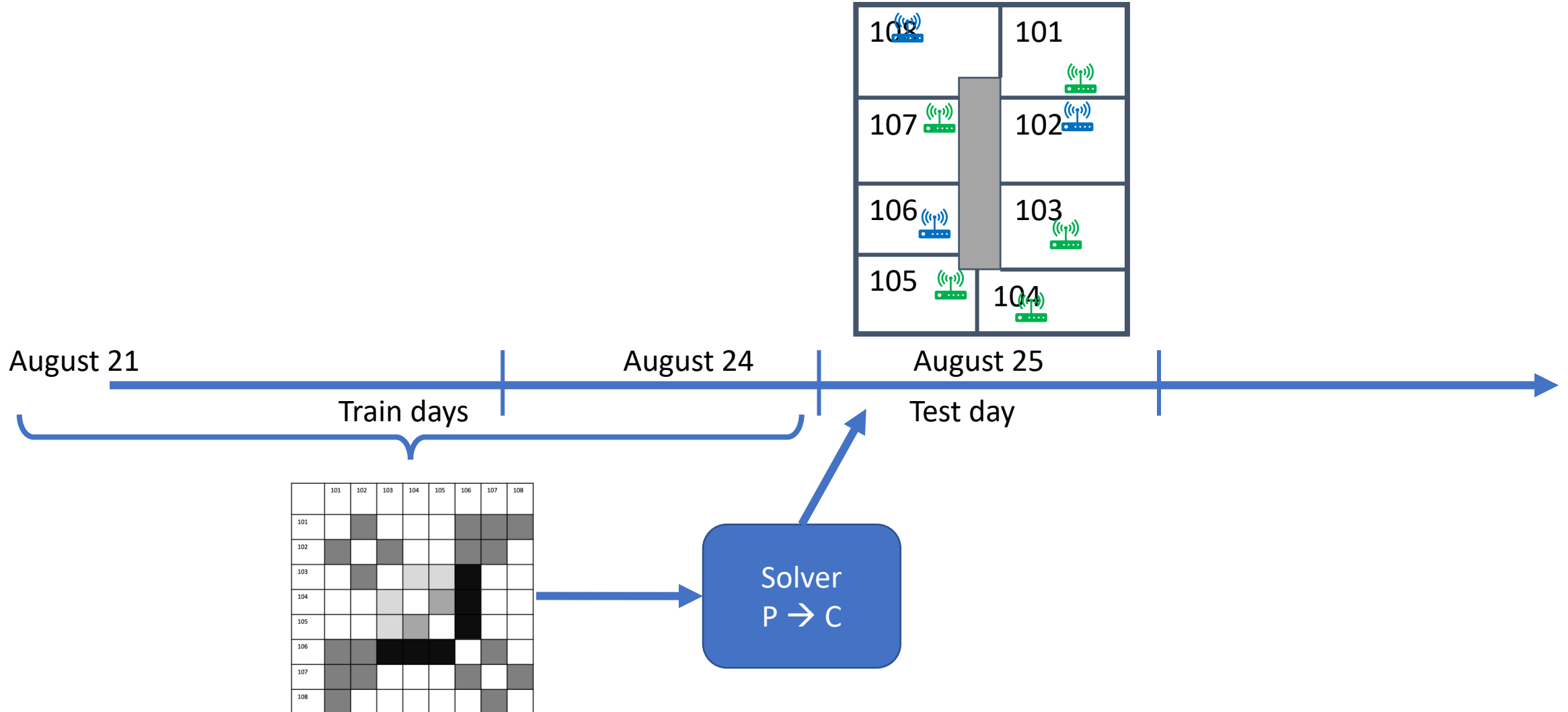
- Non-convex problem
- Off-the-shelf solver, Gurobi
- Neural Network solver



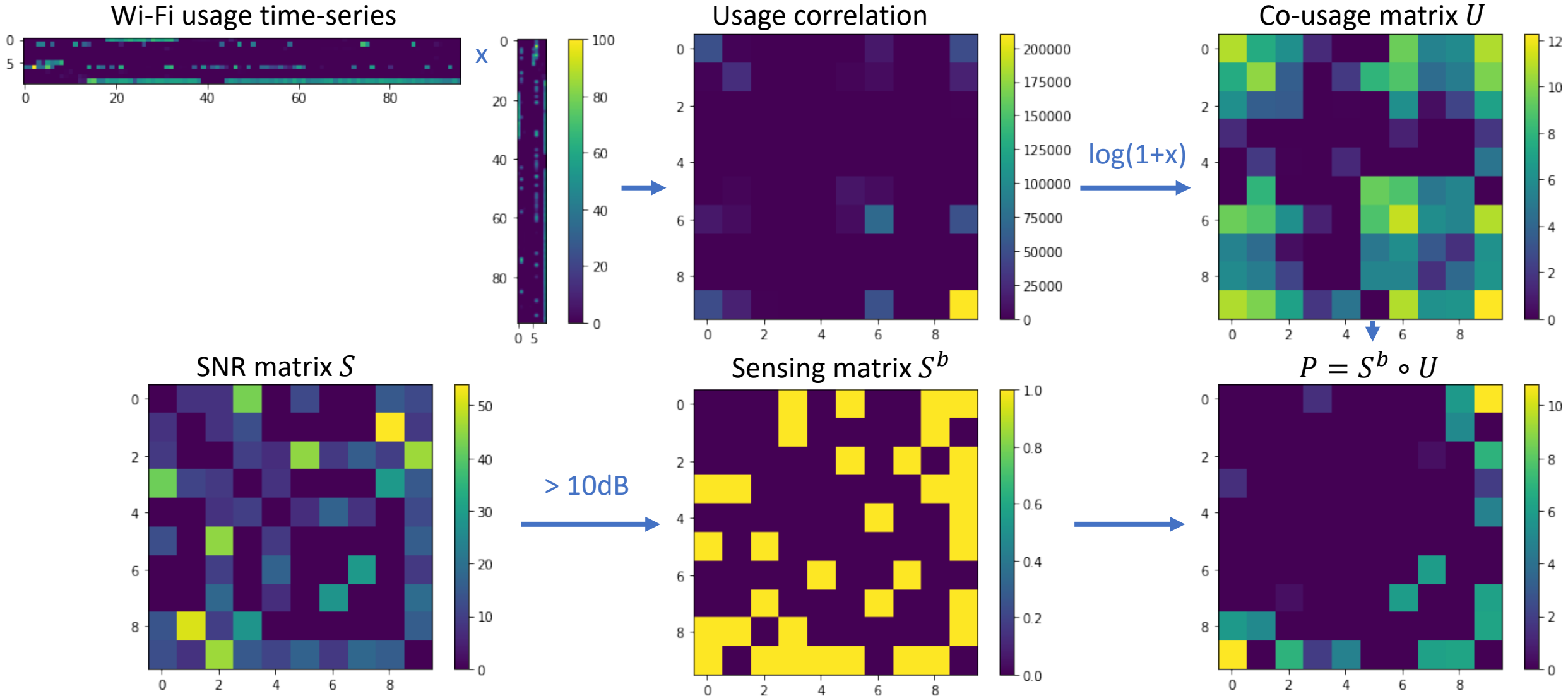
Typical Scenario



Preliminary Experiment



Potential Pain Matrix P



We collect, store, and use all data in accordance with our privacy disclosures to users and applicable laws

Train days	Solver	Total pain per train day	Total pain – test day
1 (Aug 24)	Gurobi	58.2	194.0
1 (Aug 24)	Neural Network	58.2	184.9
4 (Aug 21-24)	Gurobi	64.5	166.3
4 (Aug 21-24)	Neural Network	69.9	143.8

- Wi-Fi in a dense neighborhood
- Centralized channel selection
- Wi-Fi pain, potential-pain matrix, optimization problem
- Neural network solver
- Preliminary experiments



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Thank You!

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