



Legend:

t = current day

$N_j(\cdot)$ = Real distribution function for advertising

$n_j(\cdot)$ = Learned (from GP) distribution function for advertising

$Y_{j,t}$ = Real best budget allocation

$y_{j,t}$ = Learned best budget allocation for the budget allocator

$R_{j,t}$ = Best daily reward

$r_{j,t}$ = Learned daily reward

v_j = Value per click

Same for the other subcampaigns

New Knapsack problem to solve:

$$\max_{y_{j,t}} \sum_{j=1}^N v_j n_j(y_{j,t})$$

$$\text{s.t. } \sum_{j=1}^N y_{j,t} \leq \bar{y}_t$$