Research Statement

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1 Learning-Augmented Online Optimization

- Learning-augmented multi-option ski rental.
  우리 성과
  identifying the best possibility of the randomized learning-augmented algorithms
  another application of the button problems

- Parsimonious learning-augmented online metric matching.
  임성진 교수님 논문 for learning-augmented caching, open question
  metric matching/MTS로 확장 가능함

- New error metric for online metric matching.
  기존 online metric matching의 error metric
  Azar et al.의 error metric
  Combine these two

2 Online Optimization

- Online correlated selection.
  Fahrbach et al., 우리 성과, Gao et al., Blanc & Charikar 언급
  Improve? any idea?
  Another applications?

- Online bipartite matching with worst-case reassignments.
  Bernstein et al.에서 inspired?
  Deterministic algorithm
  Does randomization help?

- Multi-stage bipartite matching.
  Feng et al. two-stage, Feng & N.. multi-stage fractional
  Multi-stage integral?
  For unweighted case, 이의웅 교수님 논문 + matching skeleton implies multi-stage integral algorithm; but only 3-stage gives a better-than-0.632.
  Dependent rounding technique may help

- Online weighted geometric set cover and hitting set.
  SoCG 2023 논문 & subsequent papers
  weighted case, doubling scheme
  laminar family, intervals, logarithmic-competitive for both problems
  extend to a general problem? e.g., 2d-axis-parallel boxes, VC-dimension
  cell complexity and divide-and-conquer-like approach may help?

3 Approximation Algorithms

- Edge-colored clustering with outliers.
  Veldt's work
  r outliers for each hyperedge? LP-rounding algorithm, integrality gap of $O(r)$

- Bottleneck asymmetric traveling salesman problem.
  Thin tree for laminar families, and then?

- Facility location for matched clients.
  Parity-constrained facility location
  what if clients should be matched in order to get assigned to a facility?
  Other settings, e.g., dynamic or online?

4 Others

- Bandit learning for stable matching.
  Kong and Li's player-optimal stable matching learning needs observations on the arms' decisions
  remove these observations? using properties of Gale-Shapley's?

- Bilateral trade with partial information.
  Bilateral trade. When only the average of one distribution is known, 2/3 is achievable and the best possible.
  What if stdev (and beyond) is also known?