

【ICDE 2014勉強会】

## Session 4: Pareto Optimization

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Some figures are copied from ICDE 2014 proceedings.

# Stochastic Skyline Route Planning Under Time-Varying Uncertainty

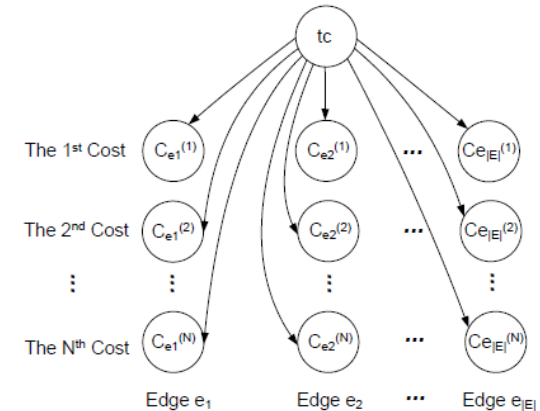
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- ▶ Bin Yang, Chenjuan Guo, Christian S. Jensen, Manohar Kaul, Shuo Shang (U. Aarhus, Denmark/CUP-Beijing, China)
- ▶ 対象: route planning
- ▶ 問題点: Travel costs
  - ▶ 時間, 距離, Green house gas(GHG) 排出量
- ▶ チャレンジ
  - ▶ 複数のコスト (Multiple costs)
    - ▶ 緩い相関性: 時間・距離が短いほど, GHG排出量が少ないわけではない
  - ▶ 時間依存 (Time dependence)
    - ▶ 例: peak hoursにおいて, 同じ道路でもより長く移動時間がかかる
  - ▶ 不確実性 (Uncertainty)
    - ▶ 例: 車の運転の仕方によって, GHG排出量も変わる
- ▶ 提案手法: MTUG model, Stochastic skyline route planning

# MTUG model (Multi-cost, Time-dependent, Uncertain Graph)

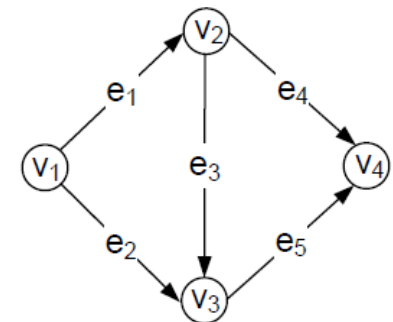
## ▶ Time-Dependent Uncertainty

- ▶ 時間によって不確実性も異なっている,
  - ▶ 例: peak hoursにおいて, 不確実性が低い
- ▶ ランダム変数
  - ▶  $C_{e_i}^{(n)}$ : 第n項のtravel cost of edge  $e_i$
  - ▶ tc(temporal context): 可能な開始時間ポイントの分布



## ▶ Multi-cost, Time-dependent, Uncertain Graphs(MTUG)

- ▶  $G=(V,E,MM,W)$ : a directed, weighted graph
- ▶  $MM=\langle MM^{(1)}, MM^{(2)} \dots, MM^{(N)} \rangle$ 
  - ▶ a vector of functions
    - $MM^{(n)}$ : 第n項のコストタイプの最大や最小な値
- ▶  $W = \langle W^{(1)}, W^{(2)} \dots, W^{(N)} \rangle$ 
  - ▶ a vector of weight functions
    - $W^{(n)}$ : 第n項のコストタイプの時間に依存した分布



# Stochastic skyline route planning

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- ▶ Stochastic skyline routes:  $SKR(v_s, v_d, t)$ 
  - ▶ Given a source, a destination, and a travel start time
    - ▶ Sourceからdestinationまで, ほかのroutesに支配されないroutes
  - ▶ Stochastic dominance
    - ▶ ランダム変数 $X, Y$ , 累積分布関数 $F_X(z) = P(X \leq z)$ ,  $F_Y(z) = P(Y \leq z)$ ,
      - If  $F_X(z) \geq F_Y(z)$  for all  $z$ ,  $X$  stochastically dominates  $Y$ , denoted by  $X \succ Y$
- ▶ Stochastic skyline route query
  - ▶ Stochastic skyline routes セット $SKR(v_s, v_d, t)$ を返す
- ▶ 効率的なStochastic skyline route planning
  - ▶ Pruning Strategy
  - ▶ Efficient Dominance Checking method