Utilitarian Algorithm Configuration for Infinite Parameter Spaces

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Previous Work - UP [1]

- Optimizes generic **utility function**
- **Anytime** guarantees are refined over time
- SuccessiveElimination [2] + captime exploration

This Work - COUP

- Optimizes generic **utility function**
- **Anytime** guarantees are refined over time
- Searches **infinite parameter** space
- UCB [3] + captime exploration + configuration set expansion

```
COUP:
  while True
    select configuration with largest UCB
    run it on next instance for up to k seconds
    update bounds
    double k if too many runs timeout
    add new configurations periodically
  return configuration with smallest sub-optimality
```

[1] Devon R Graham, Kevin Leyton-Brown, and Tim Roughgarden. *Utilitarian algorithm configuration*. In Neural Information Processing Systems, 2023.
[2] Eyal Even-Dar, Shie Mannor, and Yishay Mansour. *PAC bounds for multi-armed bandit and markov decision processes*. In Conference on Computational Learning Theory, 2002.
[3] Tze Leung Lai. *Adaptive treatment allocation and the multi-armed bandit problem*. The Annals of Statistics, 1987.

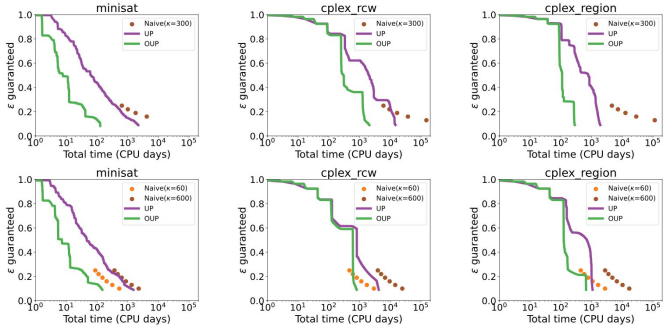
Presenting COUP:
Continuous
Optimistic
Utilitarian
Procrastination

COUP is the first **utilitarian** algorithm configuration procedure that searches **infinite parameter spaces**.

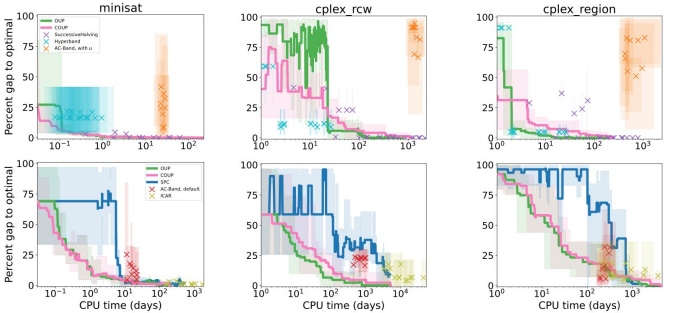
COUP makes **input-dependent** theoretical guarantees that improve with time.

Download the full paper:

COUP proves better optimality guarantees:



COUP finds better configurations:



COUP spends less time running bad configurations: