Introduction to Reinforcement Learning and Contextual Bandits

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Agenda

Adapting to the changing world

Introduction to reinforcement learning and contextual bandits

Personalizer overview

Apprentice mode

Making contextual bandits work in practice

Q&A

Supervised Learning

- Labeled examples
- Supervised Learning Algorithm
  - Classification
    - DNN
    - Logistic Regression
    - Boosted Trees
    - Support Vector Machines
  - Regression
- Trained Model
- Deploy Model & Inference

Supervised Learning

Problems:

- No labeled data
- No right answer
- Non-stationary world

Reinforcement Learning

- World provides a context
- Interact with the world (explore/exploit)
- Get feedback (reward)
- Learn from it (context, action, reward, …)
- Repeat

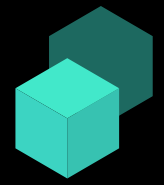
Reinforcement learning with Contextual Bandits

- Contextual Bandit
  - Choose among n actions
  - Cannot know the reward for all actions. Only the chosen action

  vw -d train.dat --cb <k actions>

  (demo)

Reinforcement learning with Contextual Bandits



- Contextual Bandit w/ Exploration
- Simple exploration strategy – epsilon greedy
- Others
  - bag
  - cover
  - softmax

  vw -d train.dat --cb_explore <k actions> --epsilon 0.2
  (demo)

Reinforcement learning with Contextual Bandits

- Contextual Bandit w/ Exploration, Context and variable actions
  - Present context about the world
  - No need to specify number of actions
  - Still must specify exploration strategy

  vw -d train.dat --cb_explore_adf --epsilon 0.2

  (demo)

Evaluating different RL methods

- Supervised learning – ROC
- Reinforcement Learning - CFE

Questions?

- https://github.com/VowpalWabbit/vowpal_wabbit
- https://vowpalwabbit.org/tutorials/contextual_bandits.html