CSE 591: Introduction to Graduate Study in CSE

Class 2
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Plan for today

Orientation to CSE Literature
See “Guide to Finding CSE Literature” (website)
Anatomy of a CS conference paper
The Research Process

1. Understand the state of your problem
2. Conceive of an idea
3. Develop a proposal to support the idea
4. Do the work
5. Communicate the results
Orientation to CSE Literature

How do you learn about interesting and important problems?
Investigate the work done by others

Much of your previous experience in learning about other people’s work in CSE has been via textbooks
Good starting point, but rarely current, and usually don’t cover very advanced topics
Remember from last time...

Bachelor’s degree

Master’s degree

Reading research papers
CSE Literature

Conferences
Rapid communication of results (months between submission and presentation)
Important for visibility and to establish priority of research topics

Journals
Slower communication of results
More thorough editorial and review process

Both are peer-reviewed and competitive
Need to read and write both kinds to succeed
Technical Reports and Dissertations

Technical reports
Detailed descriptions of work, not peer-reviewed, that provide information not found in publications

Theses and dissertations
Include results equivalent to one or several papers, submitted by a student seeking a degree. Reviewed by a committee of faculty.
Conferences

CSE has developed a competitive conference model that is unique in science and engineering

Annual conference solicits papers in a particular area (e.g. networking, AI, ML, computer architecture)
A submission deadline is announced many months in advance
Submissions have strict page limits
The conference program committee arranges multiple reviews (3-6) for each submission and selects the best to form the conference program
Typical acceptance rates range from 10-30%
Authors give a 15-30 min presentation at the conference; papers appear in the proceedings
There are some variants, e.g. majority of papers at NIPS and UAI are presented as posters
Some areas and conferences are experimenting with different submission and reviewing models (e.g. VLDB, ICML)
“Top” conferences
Each area of CSE has its own hierarchy
A given area typically has 1-3 top conferences
Reputation for technical excellence
High-quality reviewing and strict acceptance standards
The most significant and technically strongest new results
An audience that includes the well-respected members of the field, which increases the impact of results reported there

Your advisor is your guide to the good conferences in your area
Some online rankings also exist, which attempt to be quantitative

Remember: your reputation in CSE is largely based on your ability to get papers into top conferences!
Workshops

• Typically smaller, less formal, and much less competitive than a conference
• Largely meant to explore new areas or work in progress
• Large conferences often have associated, co-located workshops
• Often a lot more interaction during and after talks, because the work is not a *fait accompli*
In other fields

- Conferences play a very different role
- Submissions are typically 1-2 page abstracts
- No publication associated with the presentation

There are some who call for CS to “grow up” as a discipline, instead of following the model of a conference as a “journal that meets in a hotel.”
CSE “Journal Versions”

- Journal publications in CSE are often based on successful conference publications
- Due to their greater page limits, journal versions can accommodate more material
- Rule of thumb: 1/3 new material
- Again, different areas may have different conventions. In theory, journal versions are often just the conference versions with full proofs...
Journal Review Process

Paper review and selection process governed by Editor-in-Chief and Editorial Board

Decisions can require many months

Reviewers often request one or more rounds of changes to the manuscript

The system has memory – the same reviewers review subsequent rounds of submission
Models of Journal Publication in CSE

- Sometimes all papers in a (typically weaker) conference are invited for publication in a journal.
- Often, journals publish special issues of extended versions of the “best” papers from a conference.
- Authors may expand conference papers and submit to a journal (must disclose!)
- Review/survey articles (typically by experts) provide an overview of a topic area.
Moving on

Guide to finding CSE literature

Now, let’s examine the anatomy of the typical CS conference paper in detail...
Learning the Demand Curve in Posted-Price Digital Goods Auctions

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ABSTRACT

Online digital goods auctions are settings where a seller with an unlimited supply of goods (e.g., music or movie downloads) interacts with a stream of potential buyers. In the posted price setting, the seller makes a take-it-or-leave-it offer to each arriving buyer. We study the seller's revenue maximization problem in posted-price auctions of digital goods. We find that algorithms from the multi-armed bandit literature like UCB, which come with good regret bounds, can be slow to converge. We propose and study two alternatives: (1) a scheme based on using Gittins indices with priors that make appropriate use of domain knowledge; (2) a new learning algorithm, LLVD, that assumes a linear demand curve, and maintains a Beta prior over the free parameter using a moment-matching approximation. LLVD is not only (approximately) optimal for linear demand, but also learns fast and performs well when the linearity assumption is violated, for example in the cases of two natural valuation distributions, exponential and log-normal.

Categories and Subject Descriptors
J.4 [Social and Behavioral Sciences]: Economics

General Terms
Algorithms, Economics

Keywords
Electronic markets, Economically-motivated agents, Single agent learning

the potential population of buyers, reflecting how much each potential buyer values that piece. However, the seller is not aware of this distribution, and can only learn it through interaction with buyers. The seller's goal is to maximize her own revenue. While such problems have typically been dealt with by using a few discrete possible prices and estimating popularity, this has mostly been due to the transaction costs associated with regularly changing prices. Dynamic pricing mechanisms, on the other hand, are increasingly available to sellers, and it is now practical to consider strategies that change prices online [15]. The typical interaction will be that the user searches a music database for the piece, sees a price, and decides whether or not to buy.

In this kind of posted-price mechanism [15, 3], the seller offers a single price, and an arriving buyer has the option to either complete the purchase at that price, or not go through with it. If the seller know the distribution of valuations, the pricing problem for revenue maximization would be simple to solve, yielding a single fixed price to be offered to all the buyers (under the assumption that the seller has no way of discriminating between buyers, or finding out their individual valuations). This distribution can also be thought of as the demand curve, because an arriving buyer will only buy if her valuation exceeds the posted price being offered.

Posted price mechanisms have also received attention in the context of limited supply auctions [4]. There has been work in economics on learning the demand curve in posted price auctions when the seller has a single unit of the item to sell [5], and also on learning the demand curve using buyers' bidding behavior in non-posted price settings [19].

Posted price auctions in which the seller must learn the demand curve are a natural application for the tools of
Introduction

Background
What is the problem?
Why is it important?
To whom is it important?

Related work (may also be later)
Who has worked on this stuff before?
What is novel about the present work?
Does the work have any direct competitors?

Statement of contribution
Novelty
Method
Result summary
Methods/Proposal/Design/“Body”

How they did what they did
Does the paper describe new methods or explore/integrate/compare existing ones?
How much is explained vs elided to save space?
Are there formal claims? Are they proven?
Is there supplementary information online?

E.g., SIGGRAPH papers always have videos, NIPS papers may have proofs, STOC/FOCS papers are technically just “extended abstracts” with proofs in a “full version”
Some examples in selected areas

A multi-agent systems paper: model and algorithms
A machine learning paper: similar
A data mining paper: domain description, algorithm
A theory paper: model and theorems

Important: know the conventions of your area!
Results/Evaluation

May include high-level methods if nowhere prior

Validation

Proof?
Analytical performance estimate/model?
Coded up? Simulated? Put into hardware?
How thorough is the testing?
  On simulated data? How realistic is the data?
  On real data? How much/what kind?
  In interactive systems, is the algorithm “in the loop”?
User studies?
What metrics are reported? Are there error bars or other statistical tests?
Comparison to competitors?
Discussion/Conclusion + Future Work

Why is the world better off for knowing the results of this paper?

New methods?
New explanations or a new model for something?
Comparison of existing things?
New empirical evidence of something?

Are there qualitative statements?

“This method results in fewer dropped packets under realistic loads”
“This method predicts significantly more regulatory motifs than...”
“We have developed a new algorithm to substantially increase the accuracy of branch prediction in out-of-order, superscalar processors”

-- How well are these statements supported? Do you believe them?

What is left to future work? Why?
also do not account for correlation between arms. Existing extensions typically consider multivariate normal priors, though, which are not appropriate for monotonic functions like demand. This is a fruitful area for future work.

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7. REFERENCES

APPENDIX
A. FUNCTIONAL DISTANCE
Let $F(x) = \frac{x}{B}$ represent the c.d.f of Uniform distribution over the interval $[0, B]$ and $G(x)$ be the c.d.f be the actual valuation distribution. L2-Norm for the difference between the two distributions is given by:

$$f_d = \sqrt{\int_0^\infty (F(x) - G(x))^2 \, dx}$$