Scribe: Adam Kravitz

Draco (Scribe Notes)
Admin (website made easier, on the sides is a permanent review submit button)
Grading of AI coming out tomorrow.

Feedbacks on Assignment 2 (Draco and Voyager Assignment):

"Draco has no documentation or explanation"
Prof. Wu used Draco lp on github to get definitions to see how Draco works
• "Observable is complicated"
For the Draco assignment, everyone got different results but all valid results.
• Project Proposal pushed back and due by next week

Draco (Wu Presents)

High level motivation:
3 motivations to create Draco
       1. Rendering datasets well, is hard to do
       2. What "good" is, is constantly changing
       3. Want to leverage evolving visualizations.

Perceptual studies:
There are many ways to visualize same dataset.

How do you pick design choices and how do people perceive the design choices

Effectiveness varies for different tasks

We can perceive and measure the range of errors graphs causes to a user.

APT
People want Automatic visualization

There are 2 criteria to make Automatic Visualizations
       1. Expressiveness: Design is expressive for all you need and leaves no artifacts (e.g. using bar graphs to indicate country as the dependent variable, doesn't make)
       2. Effectiveness: Design can find best expressive graph from the set of graphs we have

Implements Logic programing with hard constraints

ex.

Rel = x $\rightarrow$ y $\wedge$ $\neg$ Numeric (x) …

Rule based heuristics:
(e.g. Tableau, Show Me, Voyager)

Different Quantitative - Quantitative graphs for example can have different heuristics compared to other graphs

Voyager has hard coded heuristics

Order of visual milestones:
APT $\rightarrow$ Polaris $\rightarrow$ Show Me $\rightarrow$ Compass/Voyager

Contributions*:*

Draco uses constraint programming

Draco's encoding design studies hard and soft constraints
      - Using partial ranking as part of the encoding design

• Learning weights automatically (Most useful Prof. Wu's opinion)

Q:
Is Draco the first instance of Machine Learning in Visualization design?
A:
No, people have tried all types of things

Machine Learning works around Central System (Not flexible)
Draco is flexible, it allows user to change what they want for constraint rules

Constraint Language:
Search Space – Vega-Lite specs (expressive)
Hard constraints - Incorrect specs (specs that cannot happen) (expressive)
soft constraint - Ranking (effective)

Head   Body
Atom :- L_1, … , L_n Atom is true L_1, … , L_n if are true

Atom :- not L

Fact $\rightarrow$ Atom

A, B, C Tables

Rule: A(x) :- B(x) C(x)

B(1) – Populate table B
A(x) – At this point is still nothing since table C still has nothing in it
C(1) – Populate table C
A(1) – Once B and C are populated we can derive A(1) from A(x) :- B(x) C(x)

We can also do the reverse:

Rule: A(x) :- B(x) C(x)
A(1) - We want A(1) to Exist
B(1) - So the program populates table B
C(1) - And also populates table B

∅ :- not L

Objective Function (soft constraints) (penalized if we go against the rules):

 :- not L

Marktype is populate with values (point, bar, line...)

Ex. Marktype (point, bar, line)

Mark (m) :- Marktype (m)   ← m from Mark must be the same m from Marktype, and m has to be in Marktype. (Example of how to define rules/ constraints)

Encoding
        Ob_id (1,2,3,4,5)

0 {encoding(E) : Ob_id(E)} 1   ← 0 or 1 output where encoding E is also 1 of the 5 encodings in Ob_id.

{Channel(E,C): Channel(C)}   = 1 :- encoding(E)   ← This binds E, which comes from encoding, and C which is a channel in Channel, together. The binding output should only be of size 1, this E and C should only bind 1 time.

Q: How does Draco become vega?
A: Output of Draco is actually special tables

Data properties

:- Log(E), Zero (E)   ← Log scale better not be 0

0 {Zero(E)} 1 :- encoding   ← soft constraint that will output 0 or 1 items and will be penalized
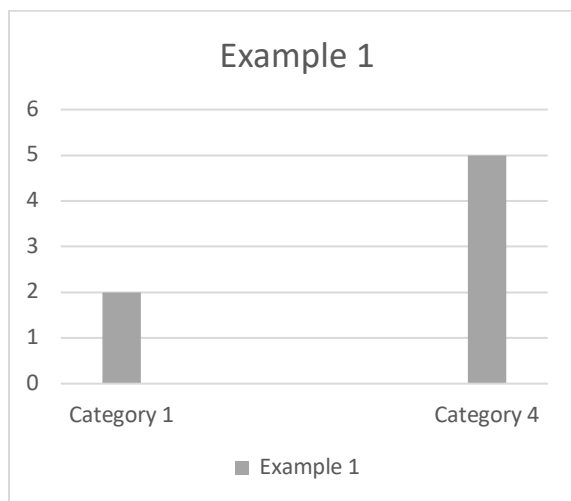

Learning soft weights
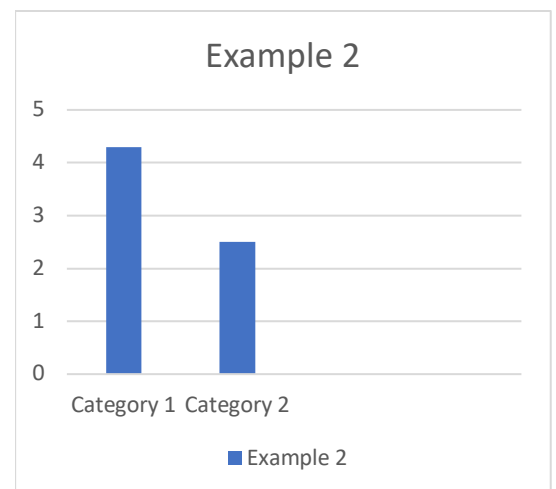
How do they do it?
- Training?
- Regression?

Weights for what?
How generate features and compare(X, Y)?

Overall: Described encodings use Vega-Lite specs, which we can convert to Draco specs. With the Draco Specs we can get Draco features. Draco gets the features by counting errors of soft constraints)

Ex. Getting Draco features

Rules   Number of violations per visualization
R_1:   <10, …, 30>
R_2:   <0, …, 0>
R_3:   <5, …, 0>

So we can get the feature:

$\langle R_1, R_2 \rangle \rightarrow O()$ $\leftarrow$ This means where R_1 has less visualization violations than R_2

Draco proved weight learning works !

<u>Discussion:</u>
• Is something missing going into read this?

• Won best paper

• How would we write the paper?
      Maybe open up with "Described encodings use Vega-Lite specs, which we can convert to Draco specs. With the Draco Specs we can get Draco features. Draco gets the features by counting errors of soft constraints)" from above.

• Paper are supposed to be reproducible this is not reproducible

• This paper won best paper because it had good idea and it was achievable

• The Draco paper itself is not-self contained, there are other resources to get a more full understanding of it.

• Maybe this is best for expert users ?

• This paper has the opposite problem from Vega-Lite. Draco has a lot of
of detail in the paper, but it is hard to use. (Vega-Lite's paper wasn't very detailed and was really easy to use).

COMS W6998
Voyager Discussion

-Presenter Adam Kravitz
-Scribe Carmine Elvezio

Discussion Notes

Note- It was compared to PoleStar

Q- Are they capable of doing layered graphs?
A- Adam- It seems like it is possible based on playing around with it for Assignment 2.

Q- So was Voyager more expressive?
A- Voyager is like a breadth search, it allowed for 2x more exploring
  -Underneath Voyager, there are many related graphs
  -Data you picked + other data you might want to pick
  -When you select a graph it will then give you more encodings
  -Breadth of voyager better than the depth of Tableau (PoleStar)

Q- Is there any future work that you have seen that builds on this in the past 5 years?
A- Draco is the follow up to this work (same team).
Note- Preference weights hard coded which wasn't the case in Draco.
Personalizing weights would turn out to be very important.

Hypothetically, you can use Draco instead for the engine for recommendation

Q- What did we think of the difference between Voyager and Draco?
Celia - Used Voyager before paper, it was easy to use, and then paper showed that that was what the authors were going for.
Deka - Can't use Vega for the type of exploration that Voyager excels at.

Q-Felt like I was reading documentation for an application vs research paper. What were the research questions?
A- Different communities prioritize different things - for tools/artifacts, "why did they design it this way"
  -They spent a lot of time justifying why the heuristic doesn't matter as much
  -The Viz community tends to talk about the tool and justifying why they built it
  -The Design section justifies why they built what they built

Q - Was there a hypothesis in the paper?
A- Is there an easy way to do BFS
A- What's the best way to do exploration. Then that's the question - difference between breadth and depth.

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Q- If that's the question, did they do a good job in the evaluation?
A- (Adam) In using it, I found Voyager to be effective

Q- Celia - Did they successfully answer that question? User count seems low.
A- Often happens in some communities.
A- The users were familiar with the system vs. a novice at creating graphs. If you know what you're doing, is it really exploration?
A- Prof - How did they get their metrics?
A- Celia - Page 8 - 6.2.3 - Bookmarks show increased data variable coverage
        -Number of variable sets a user interacts with
        -Makes sense, with tableau it is difficult to enumerate all combination of the variables
        -Prof. Interesting Metric - Any tool that shows you different variables should aim higher for a metric
                Alternatives:
                        -How about How many insights
                        -How many conclusions
                        -The time take to arrive at the conclusion
                        -You ask them a day later and do they remember more

Q-Is user feedback a powerful metric? The important part of the evaluation is the users? Is it powerful?
A- Prof. They usually have a balance of both. It might be biased towards their system, but it is a way to quantitatively evaluate it. There are different ways of getting at that. The authors pick the quotes so who knows what other feedback they've gotten. Some users said they risk letting the recommendations drive what they see. If the recs are biased, you might be biasing people

Q- Adam- As found in another class, if you pick random data sets, you might find something, but is that a good thing?
A- Celia There are different approaches to data analysis.
        How might this be useful to what I'm doing in my own research?
                Using ggplot is too verbose to do quick snapshots.
A- Is it the Automated Design or recommendation better
A- Celia, I don't push the recommendations away, but probably the automated design is more important
A- Adam, it might be good at hypothesis forming.
A- Prof. If you're doing sequential analysis, you can't make an infinite number of decisions due to false positives.

Q- Is it reasonable to assume this tool can turn a training set into a testing path?
A- Prof. Definitely avoid training and testing on the same set - test somewhere else.

Q- Adam - Does Voyager cross the line of influencing the users?
A- Deka - The different tools can be used for different tasks
A- Prof - It's a long a spectrum

Q- Is depth vs. Breadth a real thing?
A- Most say yes. Lots of tradeoffs, good questions to ask.

Q- Are there other ways of doing breadth oriented analysis (different than just adding variables)?
A- Deka - Different Visual Encodings
A- Related to our project, but another way is to generate an interface for the data sets for the users to use themselves. (Basically, can you generate a Voyager). Let the user control the whole procedure.
A- Depth - You know what you want. Breadth, you're not sure.

Q- Is combination of variables breadth?

A- There might be something in the middle. "Heres the general thing I want to do, can I get recommendations?"

Q- Are visualizations the best way of doing human-data interaction?
A- Text is a type of visualization. For example, Polaris can show a spreadsheet. Text is a very common way to visualize data.

Q- How is auditory data treated?
A- Music/sound is an example of data encoded that way. But other things would be difficult to encode and understand at visualizations

Q- Perhaps a good system would automatically organize the text data.
A- Kinda magic but the invited speaker Eric, his paper is a version of that.
A- Text can be used for text summaries or the raw data.

Q- What are other characteristics that should be important that we haven't really seen?
A- Came across paper with modality where user specifies what it should like and then fill in the blanks
A- Looking for statistical relationships
A- Configurable weights
       - Don't want us to get overwhelmed.
A- Prof Recommendations are a tradeoff- since if they're not very good, you will waste time looking at it.
A- Prof. Might depend on the task or goal. Difficult to encode or express what your task or goal is.
       -Great example are the assignments. Some of these don't make sense, even if it is expressive.

Presentation Notes

-Uses Vega-Lite too (compared to Draco)
-Background: APT (hardcoded effectiveness ratings)
       -Also Tableau, Excel as alternatives
              -Tableau DFS for making graphs
-Uses Compass (the recommendation system - which they seemingly created)
-2x expressiveness
-Looked at 3x the amount of data sets