Experiment Planning and Design

Lecture 3-a: Homework Analysis

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April 28, 2015

Outline

Make a description of your research topics, taking into account the concepts we discussed about “Science” and “Experiment Design”

- It is a good way to try to weed out some common mistakes;
- Will not be able to comment on everyone’s work. Ask me questions after the class, or extrapolate to your own work.
- Remember that I am not an expert in every field – these are generic scientific questions, more specific questions may apply in your field.

Optics based quantum device

What did I get from the description?

- Description of a 2D simulator of quantum bit behavior
- Desire of the implementation of a 3D quantum bit behavior

My comments

- How to we evaluate that the simulation is operating correctly?
- Exact behavior, or Statistical behavior?
- Minimum/Maximum treshold of behavior?
- What are the observable quantities in the simulation?
- a testing condition is necessary

Image Analysis using Eigensolver clustering

What did I get from the description?

- Image segmentation - clustering of images in order to find features
- Use of the “spectral Clustering” measure
- Difficulty point - connecting theory and practice. I understand j00!

My comments

- Clustering is very easy to setup as an experiment!
- Cluster testing: NMI, Rand Index, other indexes
- Comparison with other clustering methods! (SVM, kmeans?)
- Do you want to focus on the method, or the application?

Database Management Systems

What did I get from the description?

- Concerned about the confidentiality of data (when storing? when transmitting? when processing?)
- Improve performance of storage of encrypted data, but the database becomes “complicated”
- Experiment: execute SQL query and measure the time; Compare with execution time of existing (non encripted?) method;

My comments

- “Big Data has been the basis of attractive research fields” – why is this attractive?
- Tradeoff is good, but what does “complicated” and “performance” mean?
- We could say that the goal is “to perform encrypted operations at no additional performance burden”
- Need to be careful to define many experiment conditions (message size, message complexity, computer load, etc).

Virtual Machine research

What did I get from the description?

- Research about improvement of VM to use kernel instructions
- Topic involves some deep hacking of computer's memory
- System Benchmarks as experiments

My comments

- The student identified different expectations from different results of his experiments.
- Experiments parameters and goals were well described
- This is a hard topic to perform experimentation, but the analysis of system performance is a good topic. Comparison with non-virtual systems is an obvious target.

Natural Language Processing

What did I get from the description?

- Statistical Machine translation;
- Different word alignment models;
- Analysis of “data training” perfomance.

My comments

- Experiment is not well defined: “data training”, “performance” are undefined terms.
- Do you mean correct translation rate?
- Or do you mean time?
- How do you measure both things?
- What other variations and uncertainties do you have to take into account?

Camera Controlled Robot

What did I get from the description?

- Automatic “coating” from camera data
- Decisions: How many cameras are needed? What kind of camera? What models?
- Testing: How to recover data from the camera? How to calibrate the camera?
- Conditions: Setup, light, error, etc/

My comments

- Important distinction: tests for defining what are the best parts for a research model; tests for comparing the model with other research works;
- Model Validation vs Model development;

Secure Wireless Network

What did I get from the description?

- Detection of attackers/wiretapping in a wireless network
- Limited performance (power/communication/memory)
- Evaluation of data confidentiality
- Experiment with varied number of attacks

My comments

- How about experiment without attacks?
- The utility of controls;
- Problem: result is “method is feasible”, which does not say much.
- “High perfomance”, “low performance” as expected results can be quantified (we will do this in this course)

Stream Data Processing Engine

What did I get from the description?

- Many people use “Performance” with many different meanings;
- It is important to be specific in your word use to avoid misunderstandings;

Decentralized SNS development

What did I get from the description?

- Focus on data storage, data syncronization, data replication
- Difficulty to stablish P2P connection among peers with interfering situations
- Evaluation of application “performance”
- Experiment: Time cost and data loss of communication over internet and LAN;
- Compare data loss and time cost against “user tolerance”
- Stress test against multiple concurrent users;

High Performance Computation

What did I get from the description?

- Very Cool Title;
- High performance computing using GPU and MIC
- Application of TCA architecture to MIC
- Test of optimization implementations
- Is your research hard enough?

Intelligent Mobile Robot

What did I get from the description?

- Autonomous robot that can squeeze past crowds
- Algorithm is the critical part - how to control each wheel?
- Experiment: Test if robot can pass or not through crowd;
- Analysis of Noise

My comments

- “Experiment: pass through the crowd” does not need to be a “Yes/No” experiment.
- How many times did you hit a person? (incremental improvement)
- What was the robot’s time while evading people?