

Research Methods in computer science

Spring 2024

Lecture 24

Omprakash Gnawali

April 17, 2024

Agenda

Conference updates

Idea generation

HW

Generating Research Ideas

“Standing on the shoulders of giants”

Most ideas may not be new

New may be subjective

Adding a layer to an existing deep learning architecture

When is it new?

When is it not new?

Idea Generator Heuristics

Combination / Hybrid techniques

From the same discipline

(e.g.,)

From a different discipline

(e.g.,)

Address Gap/limitation (Incremental?)

Handle some cases that were not handled

Improve some (partial) aspects of dimension

Apply different datasets / settings / contexts

In-class group activity

Pick a paper

Generate at least two derivative ideas

Present: original and derivative ideas

Graphs

Carte Figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812-1813.

Dessiné par M. Micaud, Inspecteur Général des Ponts et Chaussées en retraite Paris, le 20 Novembre 1869.

Les nombres d'hommes présents sont représentés par les largeurs des zones colorées à raison d'un millimètre pour dix mille hommes; ils sont de plus écrits en lettres des zones. Le rouge désigne les hommes qui ont été en Russie, le noir ceux qui en sont restés. Les renseignements qui ont servi à dresser la carte ont été puisés dans les ouvrages de M. M. Chiers, de Légar, de Fozendac, de Chambray et le journal inédit de Jacob, pharmacien de l'Armée depuis le 28 Octobre. L'on m'eut fait juger à l'œil la diminution de l'armée, j'ai supposé que les corps du Prince Jérôme et du Maréchal Davoust qui avaient été détachés sur Minsk et Mohilow et qui rejoindront Orscha et Witebsk, avaient toujours marché avec l'armée.

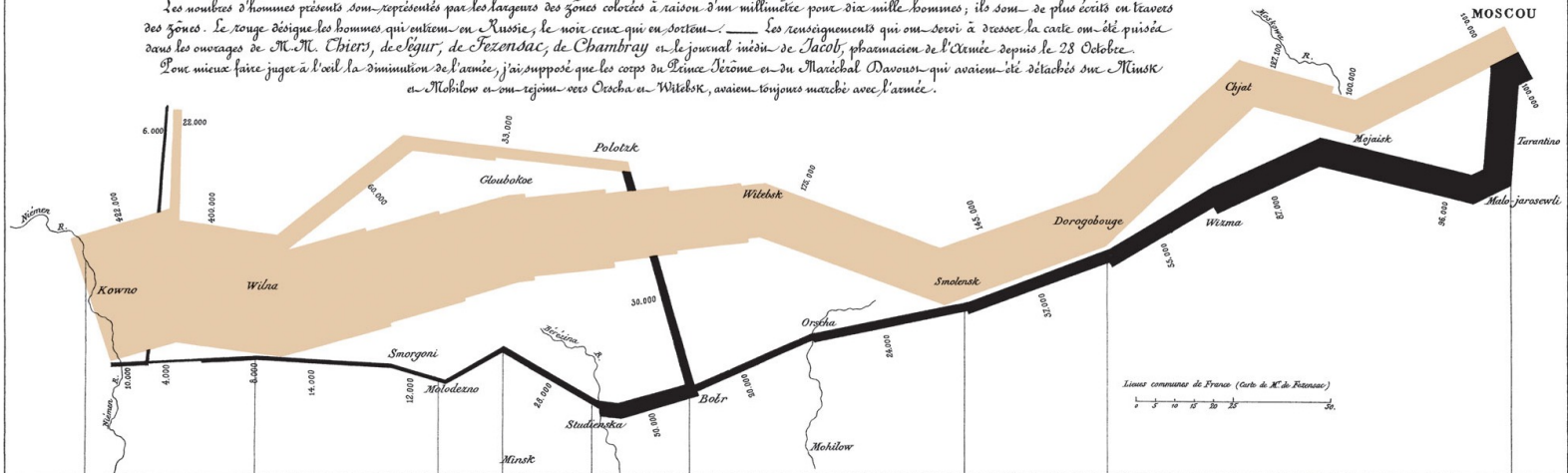
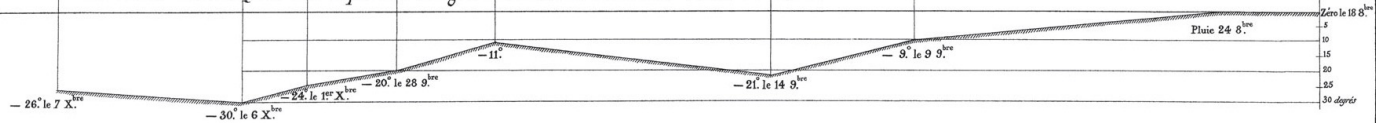
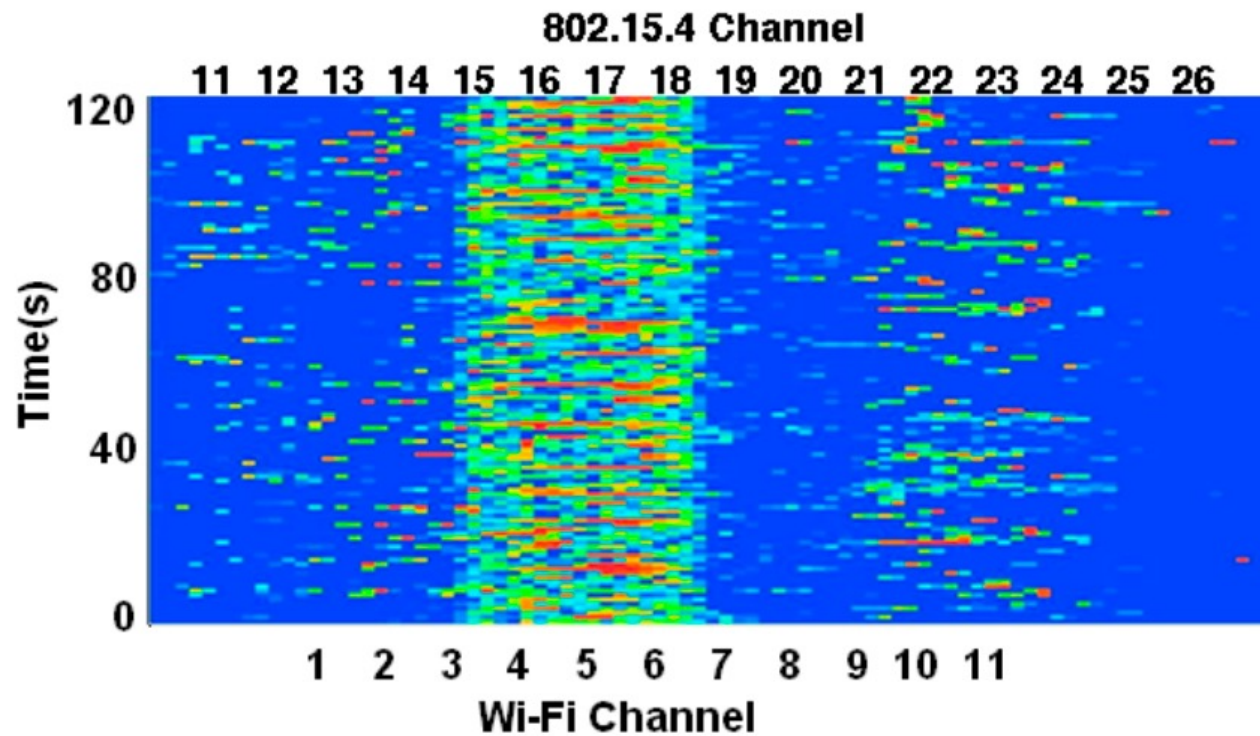


TABLEAU GRAPHIQUE de la température en degrés du thermomètre de Réaumur au dessous de zéro.

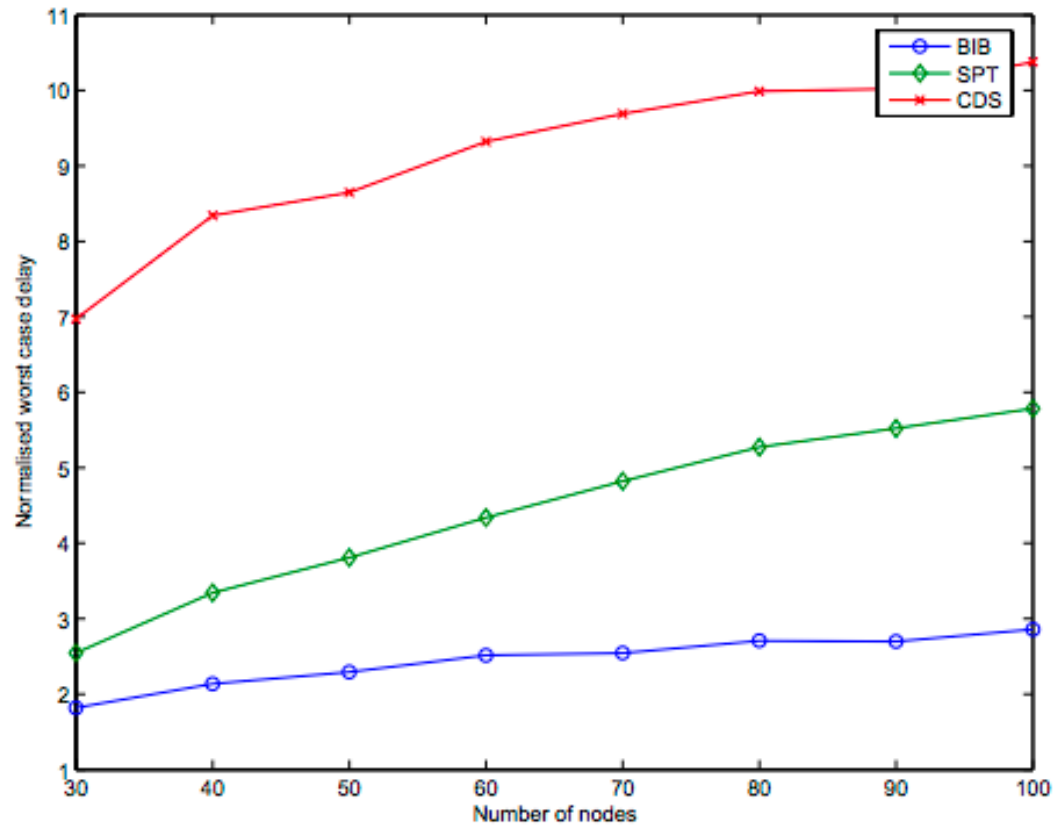
Les Cosaques passent au galop le Niémen gelé.



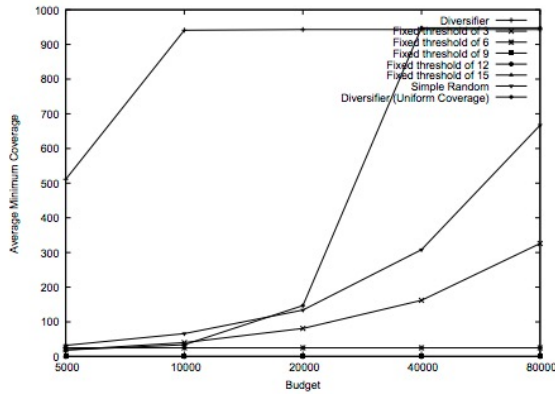


Example of a heatmap (red – high, blue – low)

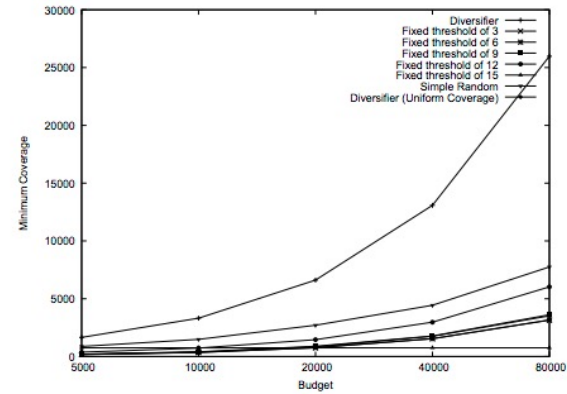
Annotations



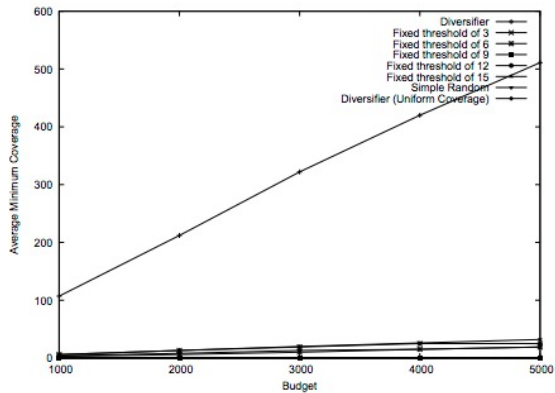
Overlapping legend
Legend order different from line order



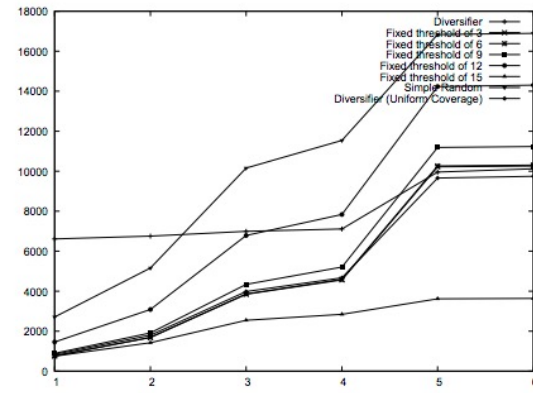
(a) Higher range of budgets between 0.5% and 8%



(a) Minimum coverage with varying budgets



(b) Lower range of budgets between 0.1% and 0.5%

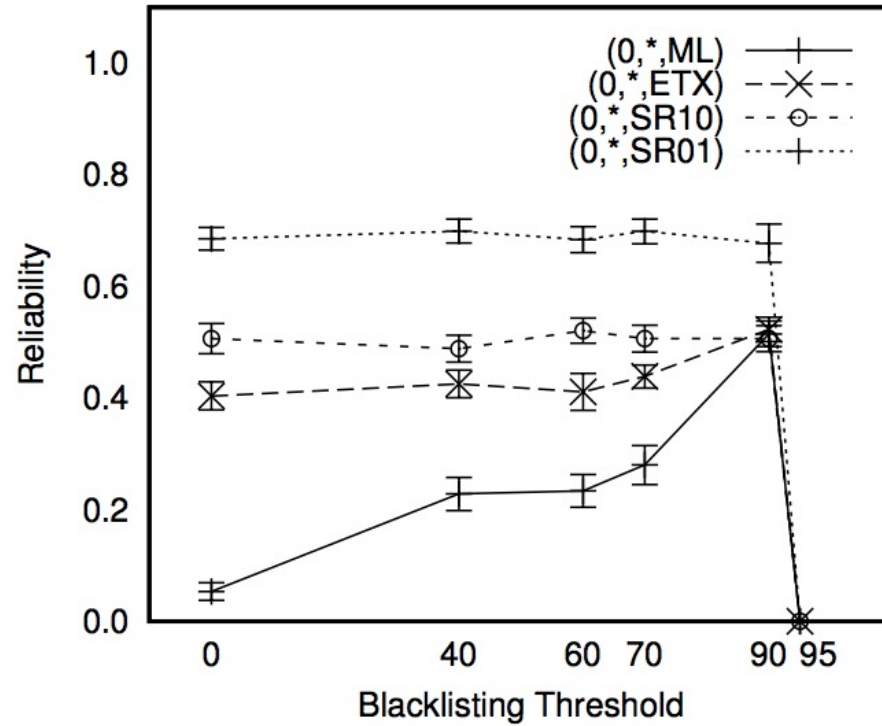


(b) Coverage on the least covered features

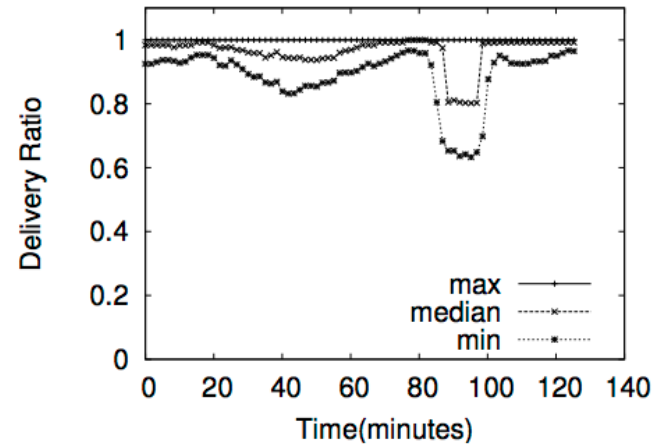
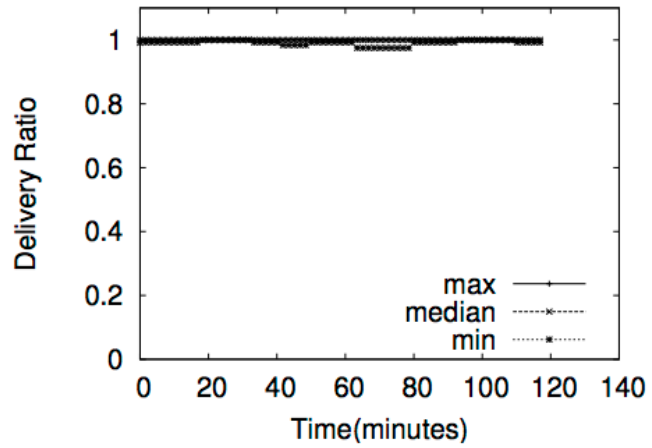
Figure 2: The average minimum coverage achieved by various algorithms over 100 real world data sets of 1M items each.

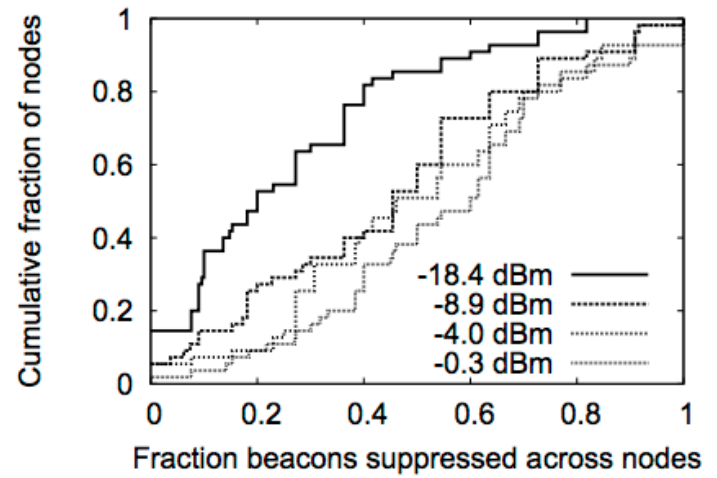
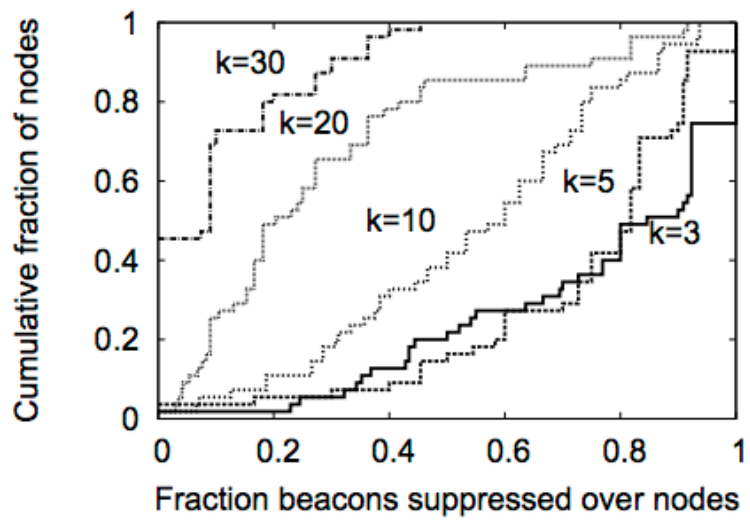
Figure 4: Experimental results for the Independent data set

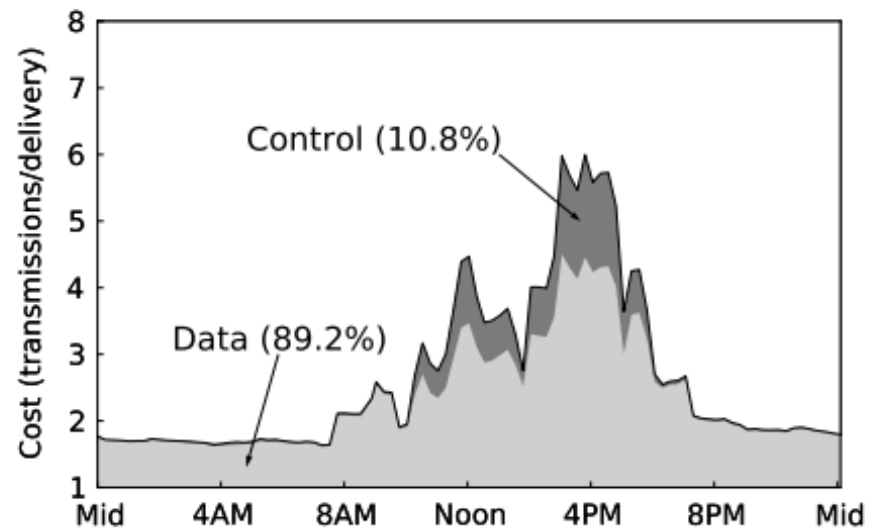
Legend overlapping data



(c) Reliability with different blacklisting thresholds







We saw two common styles

Arrows and text

Legends

Tools

matplotlib

Gnuplot

Excel

Inkspace

Powerpoint

Learn about: Vector format, high resolution graphics

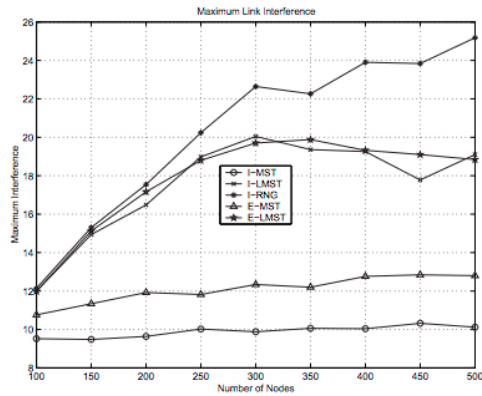
Screen captured images

Zoom in before capture

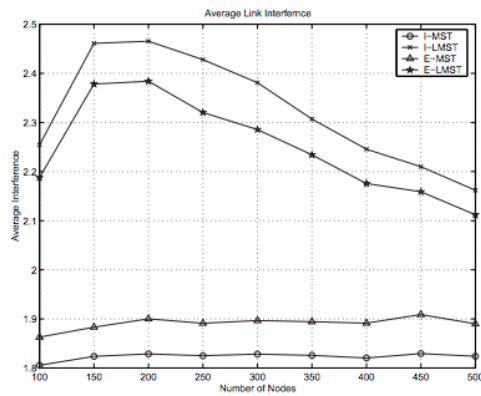
Start with a large image

Ideally start with a vector image

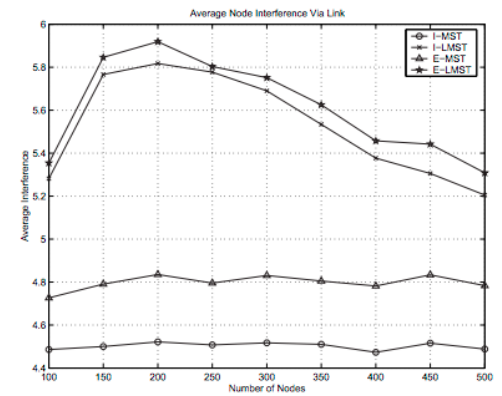
Font size



(a) MMLIP problem

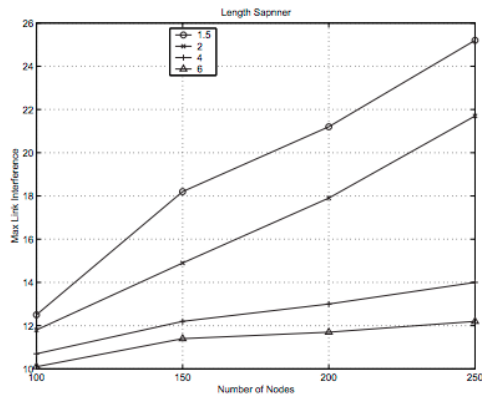


(b) MALIP Problem

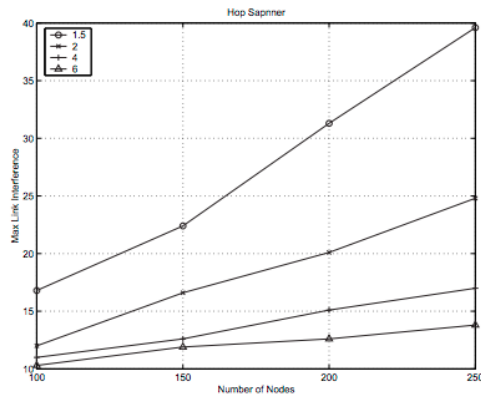


(c) MANILP Problem

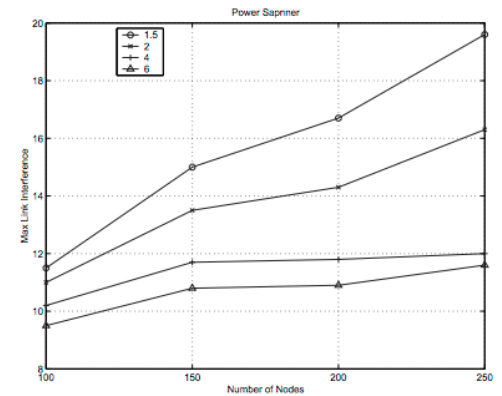
Fig. 4. Performances of various structures for a number of link-interference related problems.



(a) length spanner



(b) hop spanner



(c) power spanner

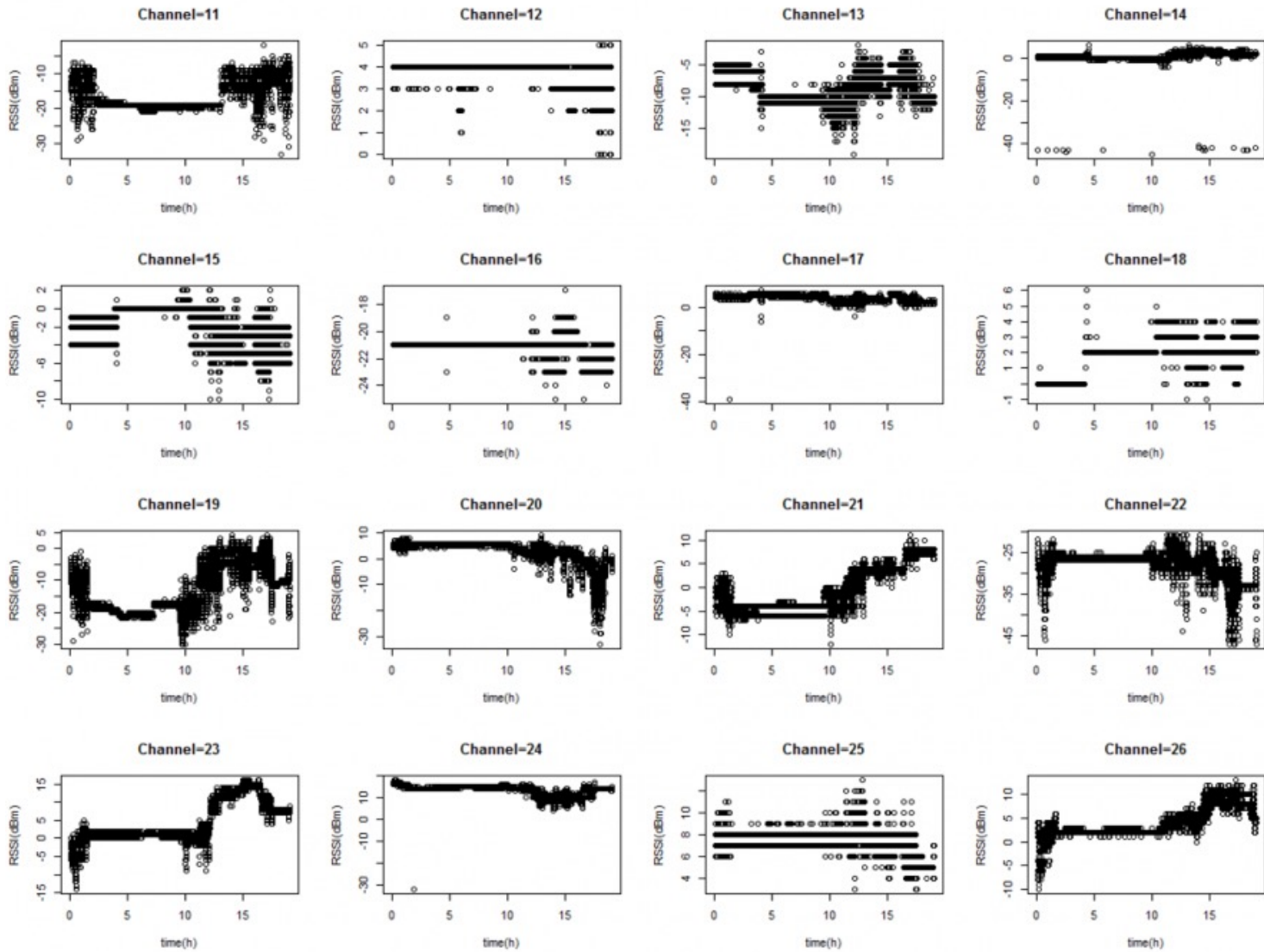
Fig. 5. Minimize the maximum link interference with different spanning ratio requirements.

Unusual placement of legends
 Font size of axis labels too small

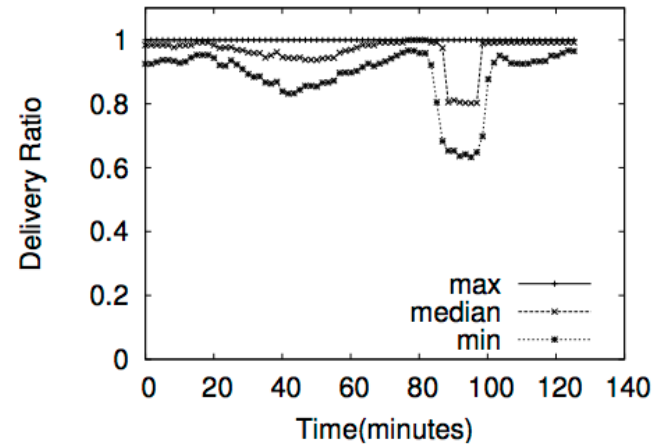
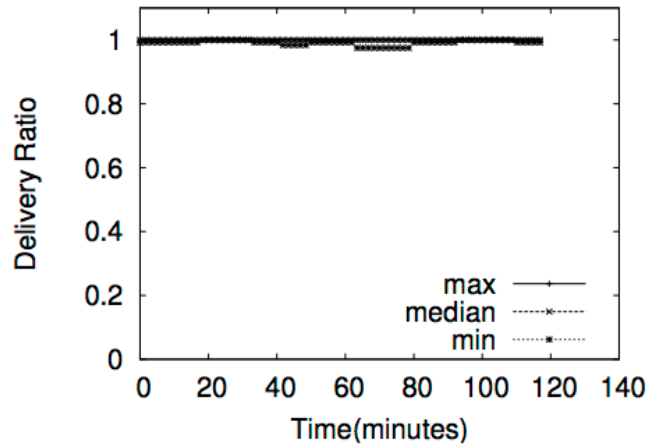
Just one idea to improve all your graphs

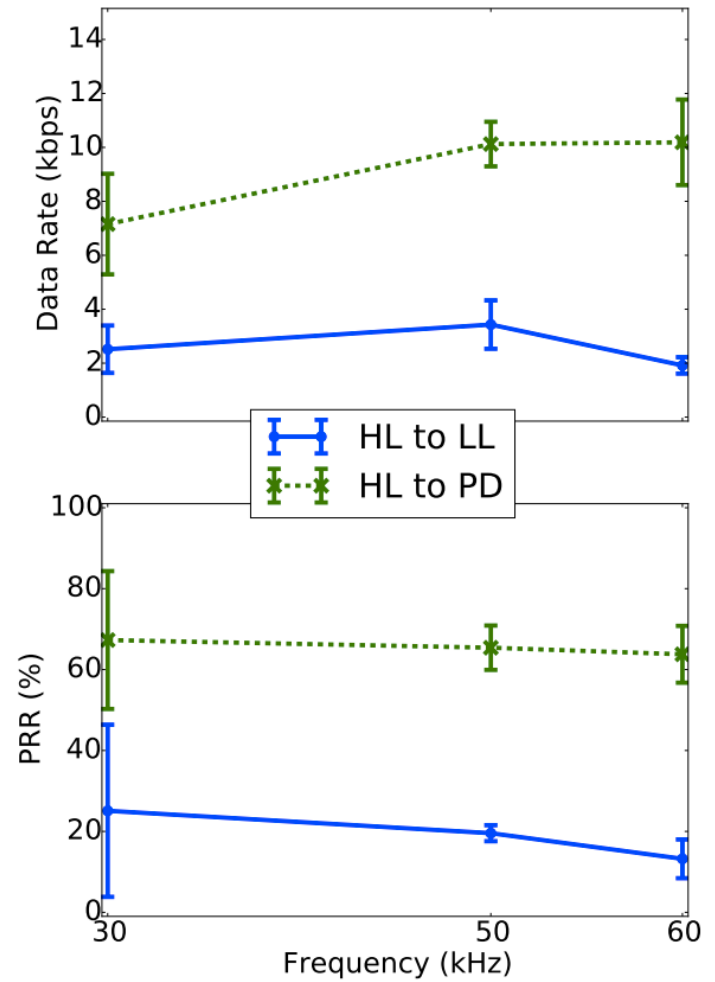
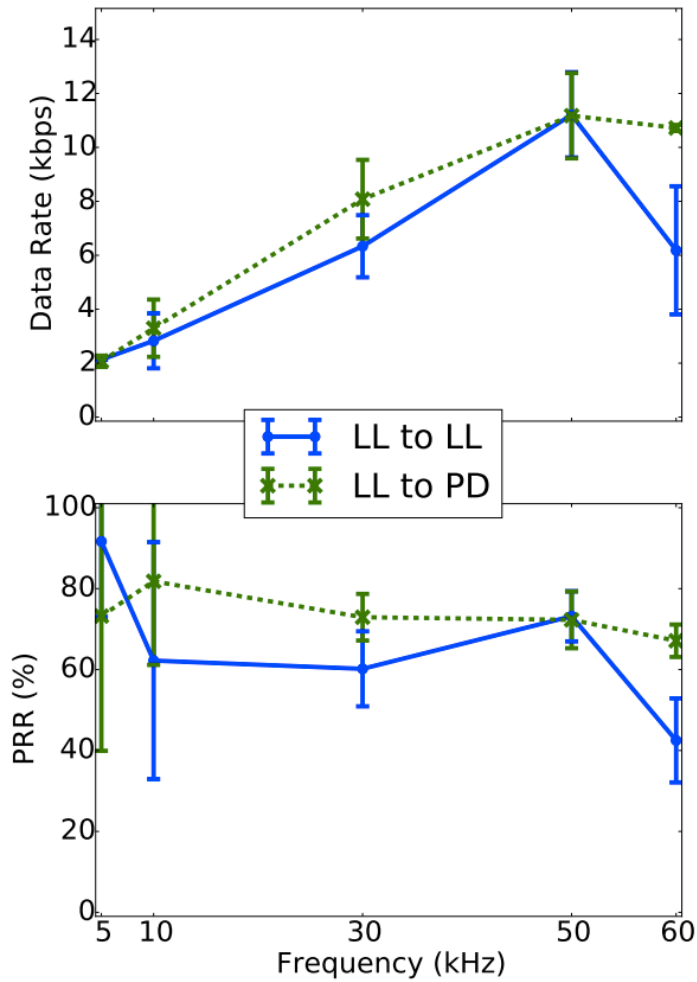
Increase the **font size**

Range



These graphs do not use consistent y-axis range so hard to compare across graphs





Idea #1 Range of the metric
 Idea #2 Range of the observed values

Caption

Should be mostly self-contained

Don't just describe the lines

When, a state change time between activation rate and that rate if the rate suddenly changes; these rate changes how does BigBen handle each activation approach time keeping. To a low-power Microcontroller (RTC) powered by a reliable time source activation. Now daylight change events,

advantage: change global clock. This is events locally rather than to the RTC, BigBen the lights turned on when logs rather than monitor rooms with time (~3 months). The sensors feasible. Monitoring is worth-while configured to trans-

As a proxy for occupancy detection that many rooms have sensitive lights. That are detected in a room no motion is detected BigBen can detect and infer when the activation, but in certain employing an energy-

efficient approach

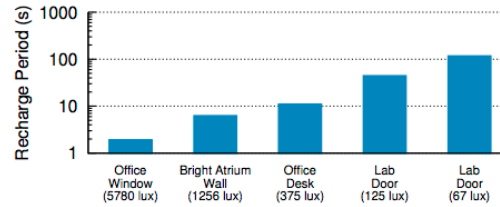


Figure 6: Recharge rate in varying lighting conditions. We measure the time the solar cell based energy-harvester takes to recharge in opportunistic trigger mode under different lighting conditions. As expected, the brighter the room the faster the recharge rate. Rooms with natural light (atrium and office) can support relatively fast recharge rates (in the 10s of seconds). Rooms with only artificial light (lab) cause the sensor to recharge more slowly, but can still support a sample every two minutes.

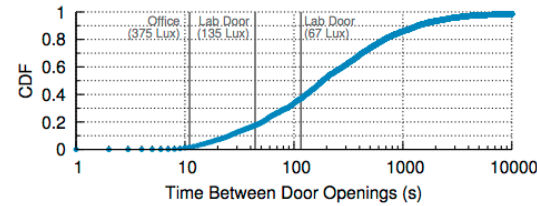


Figure 7: CDF of the interval between door open events. Plotted on a log scale x-axis is the CDF of time intervals between subsequent door opening events of a door over a month period. Also shown are the recharge times for the solar based energy-harvesting power supply in different lighting conditions. Sensors in rooms with natural light would be able to detect most door open events, and even in moderately lit rooms at least 65% of door open events would be detected.

HW

Full paper submission

Reviews