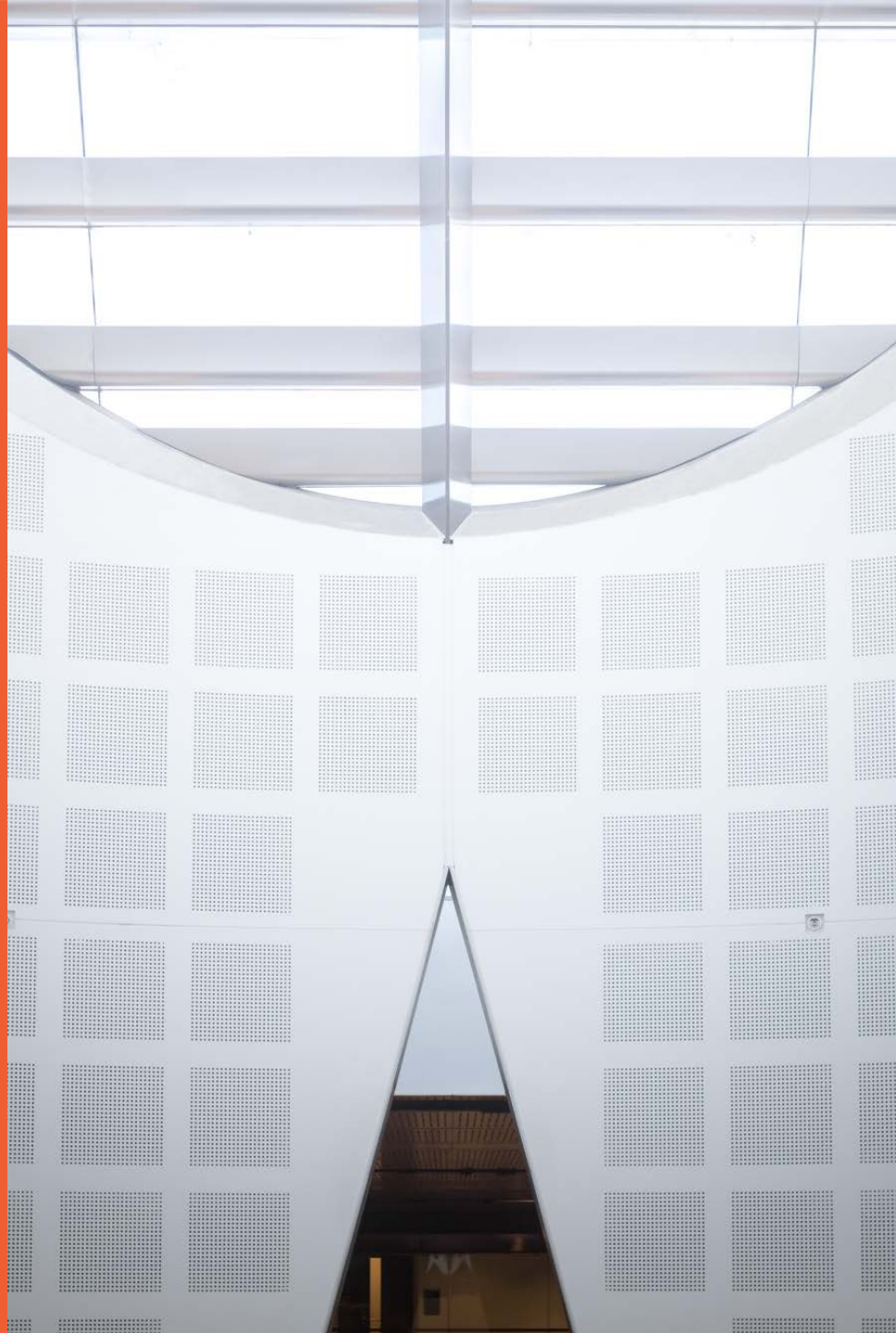
COMP5048
Visual Analytics

Week 13: Review

Professor Seokhee Hong
School of Information Technologies



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Content:

1. Visual Analytics: Review

2. Exam

3. Reminder

Feedback on Presentation

Avoid

- small font size (20-24)
- unnecessary (too many) Pictures/colors/animations
- text: necessary & sufficient

Delivery

- Look at the audience
- Be aware about time

COMP5048 Visual Analytics (CUSP)

- *Visual Analytics aims to facilitate the data analytics process using Information Visualisation.*
- Information Visualisation aims to make good pictures of abstract information, such as stock prices, health data, social networks, and software diagrams.

- The challenge for Visual Analytics is to design and implement effective Visualisation methods that produce geometric representation of complex data so that data analysts can carry out critical decision making.

- ***This unit will provide Visualisaiton techniques and fundamental algorithms to achieve good visualisation of abstract information.***
- It will also provide opportunities for academic research and developing new methods for Visual Analytic methods.

Learning Outcomes (CUSP)

- ***knowledge of basic concepts, techniques and algorithms to produce good visualization of abstract data*** effectively and efficiently
- *understanding* of geometric algorithms and visualization methods
- *use* of geometric algorithms and visualisation methods to solve new problems
- be able to *apply and modify* visualisation methods for application area such as social networks and biological networks
- experience *academic research* in Visual Analytics and Information Visualisation

Assumed Knowledge (CUSP)

- Basic Knowledge in Data Structures and Algorithms
- Programming skills

Assessment

- Assignment 1 (20 marks) : individual work
  - Average: 7.1
- Assignment 2 (40 marks): Group work
  - Initial Report (10): Average 7.3
  - System Demo/Presentation (10)
  - Final report (20): Week 13
- Exam (40 marks)
  - Nov 20 Monday 6-8pm
  - student must achieve at least 40% in the written examination

Week 2: Visualisation of Hierarchical Data

1. Layered (Tidier/RT) Tree Drawing
2. Radial Tree Drawing
3. HV Tree Drawing

Week 3: Visualisation of Network Data

Spring Algorithm

- Spring & Eelectrical force
- Barycenter method
- Force simulating graph theoretic distance
- Magnetic field
- General energy function
- Constraints

Fast spring algorithm

Week 4: Visualisation of Directed Graphs

Sugiyama Method:

- step1. *Cycle removal*: make acyclic digraph
- step2. *Layer assignment*: assign y-coordinates
- step3. *Crossing reduction*: determine the order of vertices in each layer
- step4. *Horizontal coordinate assignment*: assign x-coordinates (Straighten the long edges)

Week 5: Visualisation of Big Data

1. Cluster the data
2. Multi-level approach
3. Use 3 dimensions
4. Reduce Visual Complexity
5. Integration with Analysis
6. Integration with Interaction

Week 6: Visualisation of Complex Data

1. Multi-dimensional/Multi-variate Data
2. Spatial Data
3. Temporal/Dynamic Data
4. Multi-relational Data
5. Data with Constraints

Week 7: Design VA system

1. Overview first, then Details on demand
2. If the data is big/complex, reduce the data set
3. Integrate a number of analysis and visualisation methods
4. Overlay analysis using visual variables (data-ink ratio)
5. Storytelling with the data: narrative visualisation

Week 8: Gestalt principles/Color

Gestalt Principles

- Figure/ground relationships
- Grouping
  - Proximity
  - Similarity
  - Continuity
  - Closure
- Goodness of figures

Color

- Categorical vs ordered color
- Luminance, saturation, hue
- Color deficiency
- Colormaps

Week 9: Evaluation Methods

- Survey:
  - Interview
  - Questionnaire
  - Focused group
- Analytic inspection:
  - Heuristic Evaluation
  - Cognitive walkthroughs
- Empirical evaluation:
  - Observational experiment
  - Controlled Experiment

Exam

- Closed book, written exam
- Scope: lectures notes (week 2-9: excluding week 8)

- Two hours writing plus 10 minutes reading at the start
- Write answers on the question booklet in spaces
- no calculators
- Do 5 questions worth in total 80 marks

Exam Questions: Scope

- (10 marks) Week 2: Visualisation of Hierarchical Data
- (15 marks) Week 3: Visualisation of Network Data
- (15 marks) Week 4: Visualisation of Directed Graphs

- (10 marks) Week 5: Visualisation of Big Data
- (10 marks) Week 6: Visualisation of Complex Data
- (10 marks) Week 8: Gestalt principles/Color
- (10 marks) Week 9: Evaluation Methods

Sample Exam Question

Describe basic concepts/algorithms/methods

1. Describe methods to visualize XXXX data.

2. Explain XXXX algorithm and analyse the time complexity.

3. Explain XXXX (concepts).

Exam technique

- Plan how you will allocate time (wisely)
  - Use “reading time” to check your understanding
- Answer everything (get the “easy marks”)
  - show that you have some relevant knowledge
- Write clearly and efficiently
  - Start with outline/bullet points, then expand
  - Handwriting needs to be easy to read!
- If you need more space, use blank pages but leave a forwarding pointer in the provided space

Pragmatic Advice

- Find the room location before the exam day itself!
- Come in plenty of time

- Have your student id and put it on the desk
- Bring spare pens
- Switch off mobile phone and put it under the desk

- Illness and misadventure: Special consideration

Good Luck

Questions?

Reminder

- Fill out online Unit of Study Survey
  - Answer a few questions online at https://student-surveys.sydney.edu.au/students/
  - Constructive feedback: how to improve this unit

Visual Analytics Research Group

Research opportunities:

- Honours/Masters/PhD/Capstone project
- http://sydney.edu.au/engineering/it/~visual/index.html

Visualisation Challenge

1. Scalability (Computational complexity)

Efficiency

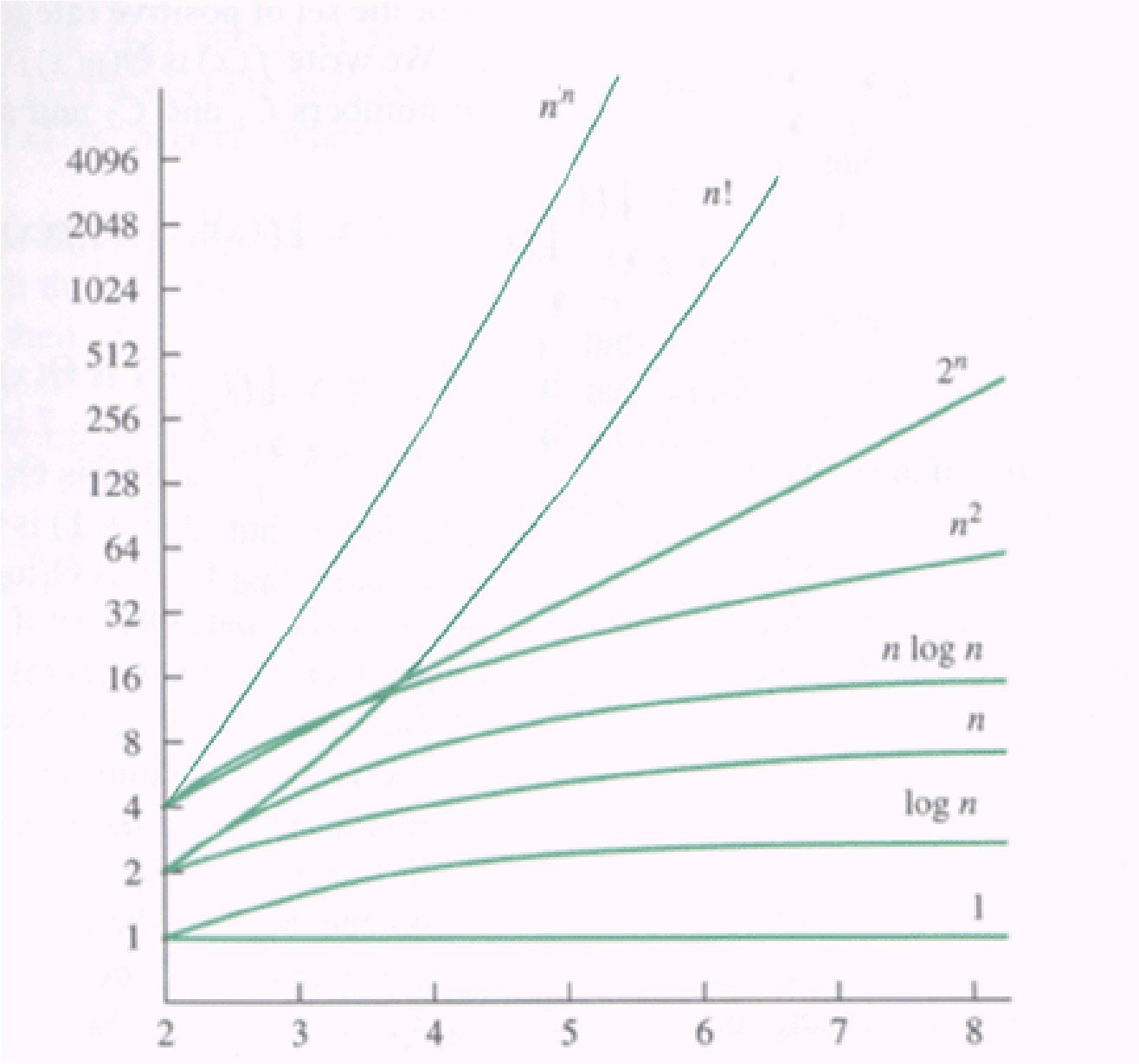
Runtime

2. Visual complexity

Effectiveness

Readability

Challenges


n^n
$n!$
2^n
n^2
$n \log n$
n
$\log n$
1
4096
2048
1024
512
256
128
64
32
16
8
4
2
1
2
3
4
5
6
7
8