Drowning in data, Starving for knowledge

“Machine Learning” and “A Personal Journey for Engineering”

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About Me

• Education:
  – PhD from School of Computer Science, Carnegie Mellon University (@ Pittsburgh, PA)
  – BS in Department of Computer Science, Tsinghua Univ. (@ Beijing, China)

• Research interests:
  – Machine Learning, Bioinformatics, Data Mining, Biomedical Informatics

• Five Years’ of Industry Research Lab in the past :
  – 2008 summer – 2013 summer, Researcher in Machine Learning Department, NEC Labs America (@ Princeton, NJ)
  – 2013 Fall – Present, Assistant Professor, Computer Science, UVA
ROADMAP

• Machine Learning & Applications

• My Experience: A Personal Journey of Engineering Study
OUR DATA-RICH WORLD

• Biomedicine
  – Patient records, brain imaging, MRI & CT scans, ...
  – Genomic sequences, bio-structure, drug effect info, ...

• Science
  – Historical documents, scanned books, databases from astronomy, environmental data, climate records, ...

• Social media
  – Social interactions data, twitter, facebook records, online reviews, ...

• Business
  – Stock market transactions, corporate sales, airline traffic, ...

• Entertainment
  – Internet images, Hollywood movies, music audio files, ...
BIG DATA CHALLENGES

• Data capturing (sensor, smart devices, medical instruments, et al.)
• Data transmission
• Data storage
• Data management
• High performance data processing
• Data visualization
• Data security & privacy (e.g. multiple individuals)
• .......

• Data analytics
  ○ How can we analyze this big data wealth?
  ○ E.g. Machine learning
Drowning in data, Starving for knowledge
BASICS OF MACHINE LEARNING

• “The goal of machine learning is to build computer systems that can learn and adapt from their experience.” – Tom Dietterich

• “Experience” in the form of available data examples (also called as instances, samples)
BIG DATA CHALLENGES FOR MACHINE LEARNING

LARGE-SCALE

HIGH-COMPLEXITY

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Large-Scale Machine Learning: SIZE MATTERS

- One thousand data instances
- One million data instances
- One billion data instances
- One trillion data instances

Those are not different numbers, those are different mindsets !!!
Machine Learning is changing the WORLD

Mining Databases

Text analysis

Object recognition

Many more!
RELATED DISCIPLINES

- Artificial Intelligence
- Data Mining
- Probability and Statistics
- Information theory
- Numerical optimization
- Computational complexity theory
- Control theory (adaptive)
- Psychology (developmental, cognitive)
- Neurobiology
- Linguistics
- Philosophy
ROADMAP

• Machine Learning & Applications

• My Experience: A Personal Journey of Engineering Study
To Share Some Lessons learned / Choices made
during my personal journey for studying engineering
1. Before College:

- Suggestion: Do not listen to certain comments, e.g., Girls are not good at math / Engineering / Science!

- Focusing on academic study

IGNORE WRONG COMMENTS !!!
2. During College

- Just like the Olympics: “the thrill of victory and the agony of defeat!”

- I have learned that failure is a good thing for your growth!

Improve Yourself! (Professionally & Personally)
3. During Graduate Study

- Suggestion: Push the limit of yourself as much as you can

- Time management is KEY!
4. After PhD:

- Love to continue research
- Industry Research vs. Academic Research?
- ➔ So I did both!!!

Aim to Use Technology to change the world
5. During PhD and after

- Work / Life Balance
- Working mommy moments

Improve Yourself! (Personally)
Summary: Tailor Goals w.r.t. Experiences

- Why are you here?
- What do you want out of this job/education?
- How can you get it?
Take-Home Message / Question?

- **Question to Ask Yourself?**
  - What makes you feel very excited?
  - What makes you feel “wow… my work has impact!”
  - What makes you feel “I am so proud of myself!”

- How do you picture yourself in 5 years, 10 years, 20 years, … ??
Feel the fear and do it anyway!

“Confidence does not require perfection”

Great advice from CRA-W:

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Career Planning Process

Your Strengths (e.g., creativity, leadership, writing)

Your Interests (e.g., people, math, science)

Your Needs (e.g., income, growth, personal fulfillment)

Identify Career Possibilities

- Occupational Outlook Summaries
- Networking, Internships, Job Shadowing, Volunteering
- CareerOneStop Job Summaries & Videos

Evaluate/Select a Career

From “College, Career and Life Planning”
Great advice from CRA-W:

- do what you love and love what you do!
- Maintain a positive attitude
  - learn from your mistakes (there will be many!)
  - don’t lose heart (or face) if denied
  - all efforts you make at your own institution increases your marketability
- Maintain perspective
  - make sure you enjoy your job/study!
Questions