ALL A CITY NEEDS IS TO BE THE KIND OF PLACE THE NEXT TRAITOROUS EIGHT LOOK AT AND SAY "I WANT TO STAY HERE," AND THAT WOULD BE ENOUGH TO GET THE CHAIN REACTION STARTED.

— PAUL GRAHAM [HOW TO BE SILICON VALLEY, 2006]

October 23, 2016

BUD MISHRA

TWENTY QUESTIONS FOR YOUNG SOCIAL-MEDIA-ENTHUSIASTS

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Dedicated to my family — .

Preface

This book is about

Courant Institute & Silicon
Alley
Greenwich Village
2016

bxm

The subject matter of this book overlaps with many other excellent books on all or some of the topics that the preface alludes to.

EK 9780521195331 EASLEY, NETWORKS CROWDS AND MAR-
KETS

Is 9781476708690 ISAACSON, THE INNOVATORS

Ch 9781107024946 CHIANG NETWORKED LIFE: 20 QUESTIONS
AND ANSWERS

Proeme

We will examine twenty questions related to the Internet and So-
cial Networks, but also have few review chapters going over somme
mathematics and computer science: e.g., probability, linear algebra,
graph theory, game theory, algorithms, computational complexity
and logic. All very important topics: necessary for someone wish-
ing to excel in creating the technologies of the future or to exercise
control over the future of the technologies.

An undergraduate course has been structured around these topics:

1. Projects – 50% (Based on a Refutable Hypothesis and MVP, Mini-
   mum Viable Product)

2. Quizzes (one per week) – 15%

3. Home Works (total of 5) – 35%

Interlude 0: Mathematics and Computer Science Preliminaries

See Notes #?

Qo: What are Investors looking for?

A lecture presented by Foy Savas:

Possible Answer(s)

Short Answer(s)　Value of a company is based on future cash flow, which depends on "sustainable competitive advantage."
Strategies:

1. Trade Secret (knowhow)

2. Intellectual Property (Patent, copyright, software-rights, mask-rights, etc.)

3. Scalability

4. Tipping Points and Stable Equilibria

Longer Answer(s)

Q1: Why is Silicon Valley in Silicon Valley?

Possible Answer(s)

1. California: Good weather, progressive politics, open mindedness, etc.

2. Steve Jobs: An iCON in charge of the Reality Distortion Field

3. Stanford: Proximity to Silicon Valley

4. Traitorous Eight: Shockley and Robert Noyce

Short Answer(s)   Traitorous eight (Noyce, Moore, Grove et al., from Fairchilds and Intel) played an important role.

Longer Answer(s)   See Notes #1

Q2: Can your Best Friend help you to get a Job?

Possible Answer(s)

1. Yes. Because best friends have something to gain (utility) if you get a job and they are rational (utility optimizing).

2. Yes. Best friends are likely to be honest and give a correct portrayal of your strength and weakness.

3. No. Acquaintance are unlikely to know your flaws and hence give you a good recommendation

4. No.The empirical social studies experiments has demonstrated that acquaintances play a more important role than best friends.

Short Answer(s) The answer is "No," and is supported by the empirical studies that demonstrates "strength of weak links" in a social network. The explanation comes via a signaling game with recommenders (candidate's friends) and verifiers (candidate's potential employer).

Longer Answer(s) See Notes #2 & #3.

Interlude 1: Linear Algebra

See Notes #?

Q3: How does PageRank work?

Possible Answer(s)   We first pondered over the question whether Rank matters: Which one is better: a Rankless society or a society that creates Ranks. No one supported a Rankless society, and argued for a ranked society which identifies individuals with highly-prized skills or who can guide the society to a better future (aspirational). The other argument was that the society is implicitly ranked, and being able to know the ranks of an individual will help us in being strategic in social circumstances: e.g., we ask a high-ranked acquaintance to recommend for a job (or drop names of a high-ranked acquaintances, thus implicitly suggesting that one may be recommended highly).

   We examined four ways to rank web-pages:

- Expert-assisted (Yahoo!): Hire people to go over the web pages and categorize and rank them (base upon expertise). Problem: Too sparse in connecting the right webpage to the right expert.

- Crowd-sourcing (Wiki-rank?): Let non-expert users rank every page; combine ranks from many users. Problem how to incentivize the users.

- Recommenders (Google): Every page recommends other pages via hyperlinks. The page recommended by many high-ranked pages should have high ranks. Hub: recommends many good pages; Authority: recommended by many good pages. Problem: The logic seems circular. Computational complexity; convergence, representation, etc.

- Behavior (Bing, Mobile Rank): Watch user's behavior as they go to a page, etc. Problem: Invasive, violates users' privacy.

- Semantics/Knowledge Graphs:

   The consensus was that Google's approach is the best and will remain unbeatable (because they have huge amount of resources and a first-mover's advantage).

Short Answer(s)   Google page ranks are highly specific and sensitive. It controls complexity and representational problems by MAP-REDUCE and iteratively doing many rank-1 modification.

The best way to understand the algorithm is to think of it in terms of a "Random-Surfer with teleportation" model.

Longer Answer(s)   See Notes #4 and 4(a)

Q4: How does Netflix Recommend Movies?

Possible Answer(s) Netflix started as a DVD rental company in 1997, morphing into a streaming media company around 2009 and finally into a content creation company.

In 2008 it had 9 million users growing to 23 million in 2009.

Netflix problems: User satisfaction (scalability); User loyalty (stickiness); Inventory Control.

Solutions: First through Recommenders, but finally through content creation.

Collaborative Filtering: By clustering users and movies by their implicit features, to be computed from a user × movie database, each entry giving: user rating and date of rating.

These can then be used for creating content: E.g., "House of Cards," based on a) Director: Dave Fincher, Dir. Social Network (usually watched from beginning to end without pause) b) Actor: Kevin Spacey c) Genre: Political Action, following a BBC series about a Prime Minister (Francis Urquhart (FU)) and political intrigues surrounding his Machiavellian schemes.

Short Answer(s) To be written.

Longer Answer(s) See Notes #5 and 5(a)

Interlude 2: Probability

See Notes #6

Q5: Is Obama my friend's-friend's-friend's-friend's-friend's-friend? Six Degrees of Separation?

Possible Answer(s)   To be written.

Short Answer(s)   To be written.

Longer Answer(s)   See Notes #?

Q6: How do Things go Viral?

Possible Answer(s)   To be written.

Short Answer(s)   To be written.

Longer Answer(s)   See Notes #?

Q7: How do Ads get Auctioned?

Possible Answer(s)   To be written.

Short Answer(s)   To be written.

Longer Answer(s)   See Notes #?

Q8: Who is Satoshi Nakamoto? And how did he invent Bit-Coins?

Possible Answer(s)   To be written.

Short Answer(s)   To be written.

Longer Answer(s)   See Notes #?

Q9: Who am I? On the Internet, what is my identity? Reputation?

Possible Answer(s) To be written.

Short Answer(s) To be written.

Longer Answer(s) See Notes #?

Q10: Can I Stop a Nuclear Holocaust with a Computer? How can I make my own Stuxnet?

Possible Answer(s)   To be written.

Short Answer(s)   To be written.

Longer Answer(s)   See Notes #?

Q11: What is a Silk Road? How did Dread Pirate Roberts control it?

Possible Answer(s)   To be written.

Short Answer(s)   To be written.

Longer Answer(s)   See Notes #?

Q12: Why do Unicorn Tech Companies need my Private Data? Should I just give it away?

Possible Answer(s)   To be written.

Short Answer(s)   To be written.

Longer Answer(s)   See Notes #?

Q13: Do our Social Lives Matter? Does Internet discriminate?

Possible Answer(s)   To be written.

Short Answer(s)   To be written.

Longer Answer(s)   See Notes #?

Q14: What is a Gig Economy?

Possible Answer(s)   To be written.

Short Answer(s)   To be written.

Longer Answer(s)   See Notes #?

Q15: How to Match and Mate?

Possible Answer(s)   To be written.

Short Answer(s)   To be written.

Longer Answer(s)   See Notes #?

Q16: How to do Greater Good? Civil Society, wiki-leaks and anonymous

Possible Answer(s)   To be written.

Short Answer(s)   To be written.

Longer Answer(s)   See Notes #?

Q17: Can AI make a Philosopher King? Government from China to US/NSA?

Possible Answer(s)   To be written.

Short Answer(s)   To be written.

Longer Answer(s)   See Notes #?

Q18: Can they Experiment with their Users? A/B Testing, Multi-Armed Bandits and Boosting.

Possible Answer(s)   To be written.

Short Answer(s)   To be written.

Longer Answer(s)   See Notes #?

Q19: How to Separate an Investor and his Money? Kickstarter, Incubators, Grants and BURPA.

Possible Answer(s)   To be written.

Short Answer(s)   To be written.

Longer Answer(s)   See Notes #?

Q20: How to Invent the Internet of the Future? Before Albert Arnold Gore, Jr. does it again.

Possible Answer(s)   To be written.

Short Answer(s)   To be written.

Longer Answer(s)   See Notes #?

Author's Bio

Bud Mishra is a professor of computer science and mathematics at NYU's Courant Institute of Mathematical Sciences, professor of human genetics Mt Sinai School of Medicine, and a professor of cell biology at NYU School of Medicine. Bud has a degree in Sciences from Utkal University, in Electronics and Communication Engineering from Indian Institute of Technology (IIT), Kharagpur, and MS and PhD degrees in Computer Science from Carnegie-Mellon University. Bud is also a visiting scholar at CSHL's Center for Quantitative Biology.From 2001-04, he was a professor at the Watson School of Biological Sciences, Cold Spring Harbor Lab (CSHL).

Bud is an IIT, Kgp Distinguished Alumnus (2011), NYSTAR Distinguished Professor (2001), AAAS Fellow (engineering: robotics, hardware verification and computational biology), IEEE fellow (robotics and automation) and a fellow of the ACM (computational biology and symbolic computation).

He has industrial experience in Computer Science (ATTAP, Genesis-Media and Tartan Laboratories, Inc), Finance (Instadat, PRF, LLC, and Tudor Investment), Robotics and Biotechnology (Abraxis, Bioarrays/Immucor, InSilico, OpGen, and Seqster). He is/was editor of Molecular Cancer Therapeutics, AMRX (Applied Mathematics Research Exchange) and Transactions on Systems Biology, and author of a textbook on algorithmic algebra and more than two hundred archived publications spanning hardware verification, graph theory, algorithms, complexity theory, robotics, real-time systems, mathematical finance, genomics, systems biology, bioinformatics, genetics of cancer, bio- and nano-technology, cyber security and the Internet.

Bud's current research is aimed at developing an Internet technology supporting virtualization for privacy and security; genomic technology to accurately analyze haplotypic data for large-scale human population studies; cyber security technology based on game theory and crypto-coins. He has been working also on the evolution of multicellularity and its role in cancer.
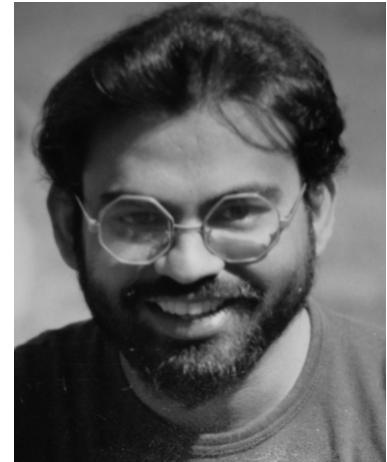

Figure 1: Bud Mishra: (http://en.wikipedia.org/wiki/Bud_Mishra).