Artificial Intelligence

A guide to surviving academia

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  - NO → hopeless case. Stop here.

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      Think Kalman (filter), Markov (chains), Shannon (capacity), Dijkstra (semaphores), etc.
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- **Misguided → Wrong career. Stop here.**
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Buying stock when it's high is too late!
Stop here.

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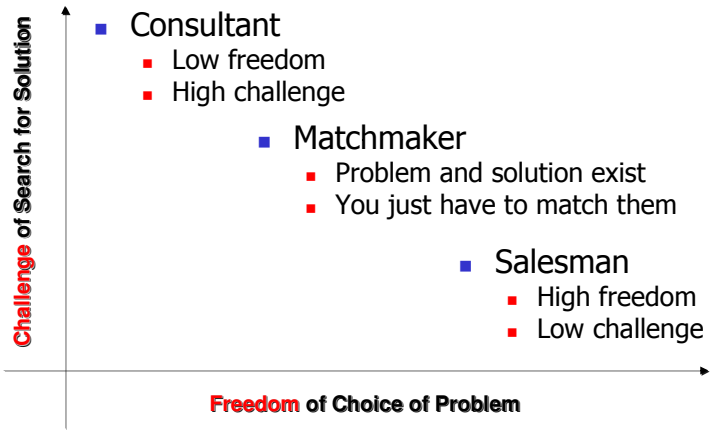

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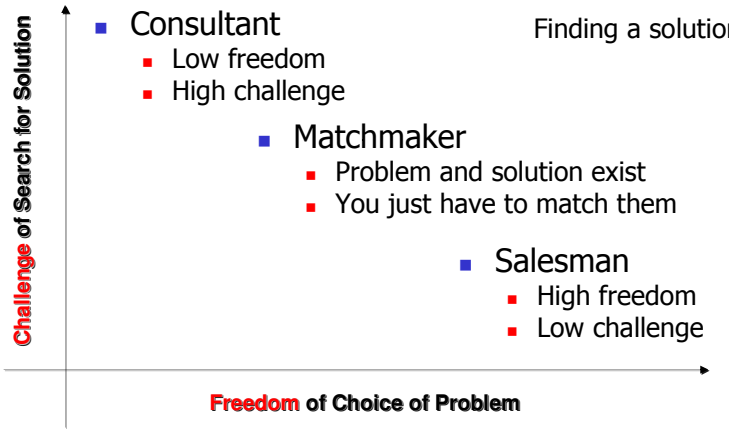

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- Consultant
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  - High challenge
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  - Problem and solution exist
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Freedom / Challenge of Search for Solution

Freedom of Choice of Problem / Challenge

Moral of the Story

Find your personal
"High-Freedom, Low-Challenge"
Point

Channeling Creativity

Too much freedom is killing you???

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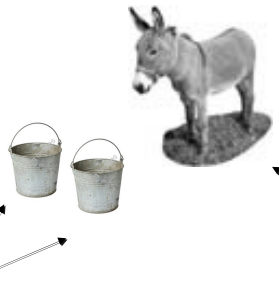

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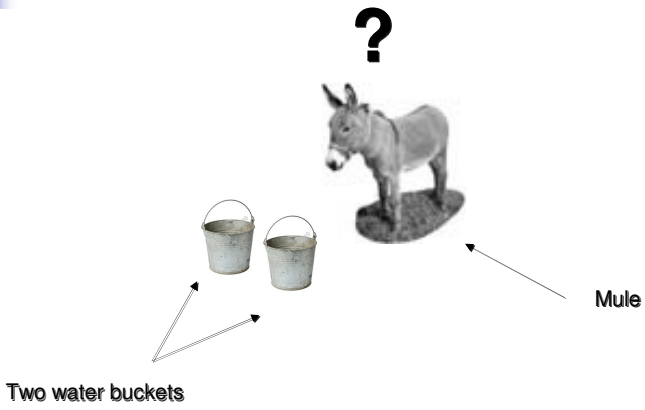

Channeling Creativity

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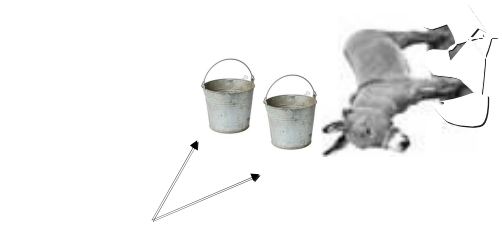
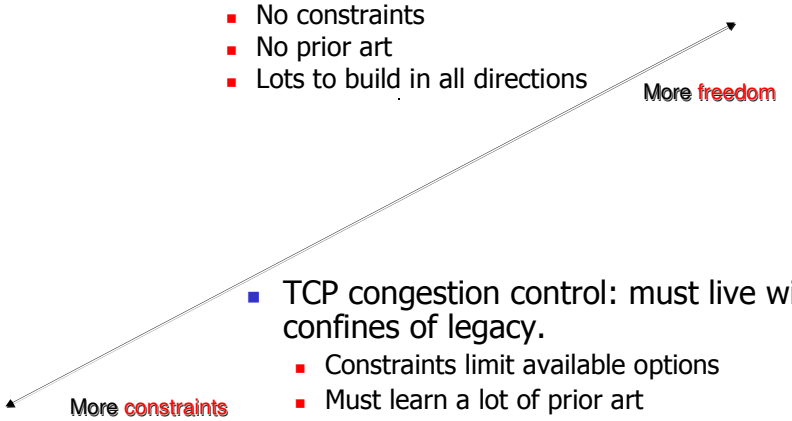
Mule Died of Thirst

(could not decide which bucket to drink from)



Find your Style: How Much Freedom?

- Sensor networks: you define everything from scratch.
  - No constraints
  - No prior art
  - Lots to build in all directions



- TCP congestion control: must live within confines of legacy.
  - Constraints limit available options
  - Must learn a lot of prior art
  - Modifications are minimal

Top 10 Tips to Increase Research Outcomes

There is no substitute for doing good research and being creative.

Besides good research and creativity, here are quantifiable tips to improve "outcome"

Advice #10
Fake clairvoyance

- Q: I do not have a crystal ball. How do I predict the future?
- A: Look at what a major funding agency is going to fund (subscribe to www.fedbizopps.gov)
  - DARPA BAAs
    - BAA → proposals (6 months)
    - Proposals → funding (6 months)
    - Funding → paper submissions (6 months)
    - Submissions to publications (6 months)
    - Prediction: LOTS of papers on subject X in two years

Advice #9
Fake creativity

- Apply A to B
  - Read not very related material
  - Distill common assumptions
  - Find similarities
  - Apply known solutions your read from B to hard problems your read about in A
  - Example:
    - Electrical circuit theory → web servers
    - Stigmergy → Data caching

Advice #8

Fake productivity

- Have collaborations
  - Help N others with their papers, they will reciprocate. Time they saved you is what you spent on them.
    - Same effort → N-times the perceived productivity

Advice #7

Sharpen your tools

- Brush up on your college math
  - The proof of the theory of relativity is college level algebra

Advice #6
Find green pastures

- Break fundamental assumptions
- Example
  - Networking research assumes that network nodes do not have time to do much computation
  - BUT: In a wireless network, bandwidth is so expensive, it might be worthwhile to trade communication for computation
    - Implications? → new research ideas

Advice #5
Get ahead of the curve

- Search for changes that entail "paradigm shifts"
  - Hint 1: Extrapolate long-term trends (or sets of trends)
    - Trends: Moore's law, lower power communication, ...
    - Question: Implications on wearable computing?
  - Hint 2: Be aware of disruptive technology
    - Technologies: WiMax, cognitive radio, …
    - Question: Future ubiquitous computing architecture?
  - Hint 3: Be aware of fundamental theoretical breakthroughs
    - Breakthroughs: network coding, NUM, …
    - Question: New MAC-layer for sensor networks?

Advice #4

Define your own space

- Have a non-collaborative track
  - Your individual contribution

Advice #3

Fit into the big picture

- Get a feel for the community
  - Papers are not enough
  - Must go to conferences and PC meetings
  - Must talk to people about your work and theirs

Advice #2

Lead

- Do not be a follower
  - Do not invest time entering an already hot area

Advice #1

Don't put all the eggs in the same basket

- Diversify your portfolio
  - Start multiple threads and follow through on those that do better

Summary

- Fake clairvoyance
- Fake creativity
- Fake productivity
- Sharpen your tools
- Find green pastures
- Get ahead of the curve
- Define your own space
- Fit into the big picture
- Lead
- Don’t put all the eggs in the same basket