bioinformatics secrets

The Bioinformatics Skill System
Role-playing games

What would a bioinformatics skill system look like?
Laying out your skill bar

- **Critical weakness** – below freshman level knowledge
- **Apprentice** ~ 2,000 hours
- **Mastery** ~ 10,000 hours
Laying out your skill bar: SYS

**SYStems**: the ability to identify, understand, run, troubleshoot, chain together the countless bioinformatics tools and techniques that have already been created.
Laying out your skill bar: ALGO

**Expertise level**

- **mastery** – 10,000 hours

**ALGOrithms**: the ability to create a new algorithmic approach or web service, the ability to implement these as a software tool or as a web based bioinformatics resource.
Laying out your skill bar: STAT

**STATistics:** the ability to identify and apply the proper statistical method. The ability to devise a new statistical approach to extract a new type of knowledge from the data.
Laying out your skill bar: BIO

**BIOlogy:** the ability to interpret bioinformatics data/results in the proper biological context, the ability to devise/imagine a new computational approach/technique to measure novel biological attributes
Laying out your skill bar: VERB

**VERBal:** the ability to understand the goals and needs of individuals from diverse backgrounds. The ability to communicate with these same individuals.
Laying out your skill bar: LUCK

LUCK: the ability to be in the right place at the right time – and when the opportunity presents itself have the skill to work on unexpected tasks.
My skill bar

Expertise level

SYS  ALGO  STAT  BIO  VERB  LUCK
A collaborator of mine
Averages are not all that great!

Expertise level

mastery ~ 10,000 hours

apprentice ~ 2,000 hours

SYS  ALGO  STAT  BIO  VERB  LUCK
First: fix critical weaknesses!
First step: core competency

- There is no need to take a graduate level courses – those may even be counterproductive!

- What you need is freshman level knowledge

- BUT the goal is not to know enough to PASS such a course with a good grade!

- Master and internalize the knowledge

- You don't need to even enroll – plenty of self study materials
No weaknesses? Now what?

Where should you invest next? Strengthen your stronger skills or improve on your weaker skills?
Improve your strengths

- Strengthen your stronger skills

Expertise level

- SYS
- ALGO
- STAT
- BIO
- VERB
- LUCK
Strengthen your strong skills!

- Invest into what you are already good at!
- We need experts in various domains
- People with complementary skill-sets are more valuable
- Differentiate yourself
Make your own luck!

- Luck favors the prepared (Luis Pasteur)
- Expand your knowledge:
  - Do work that does not directly relate to your research!
  - Explore on your own – how do people do a certain task?
Unique opportunities

- There is no other field of science where redoing another study would be easier – all you need is a computer and the data!

- Pick a paper that interests you and redo it!

- Compute the same quantities for a different genome/annotations
Bioinformatics is relatively simple

- The complexity lies in having to make a very large number of simple decisions.

- The majority of these need to be correct!

- Methods sections in papers are misleading, they show a straight process:

  Step A ➔ Step B ➔ Step C ➔ RESULT

In reality this is not what happened AT ALL!
The path to knowledge

We need to try a large number of approaches …

… some of which will go better than others …

… each biological problem is a little different from the other…

… has its own peculiarities and quirks …

… when we redo a study we truly learn the decision making that needs to happen at each step…