

bioinformatics secrets

The Bioinformatics Skill System

Role-playing games

The image shows a character sheet for a Mage named Khidr. At the top, there are icons for a character portrait, a chest, crossed swords, a winged figure, a book, and a circular arrow. Below these, the character's name 'KHIDR' and class 'MAGE' are displayed, along with 'LVL: 39'. Experience is shown as 'EXP: 1,924 / 3,900' and health/magic as 'HP: 400 MP: 409'. A 'POINTS LEFT' section shows '0'. On the left, four attributes are listed with circular gauges: STRENGTH (27), DEXTERITY (21), ENDURANCE (22), and ENERGY (60). The central 'STATISTICS' section is divided into several categories: 'ATTACK: 362', 'DEFENSE: 333', 'CRITICAL CHANCE: 10%', 'DODGE: 5%', 'BLOCK: 5%', 'RIGHT-HAND DAMAGE: 18-31 / 3-33', and 'LEFT-HAND DAMAGE: 20-34 / 1-47'. A 'RESISTANCES' section shows values for fire (9), lightning (9), ice (49), and poison (9). On the right side of the statistics, there are icons for a lightning bolt, a shield, a sword, a staff, and a cross.

KHIDR
MAGE LVL: 39

EXP: 1,924 / 3,900 HP: 400 MP: 409

POINTS LEFT 0

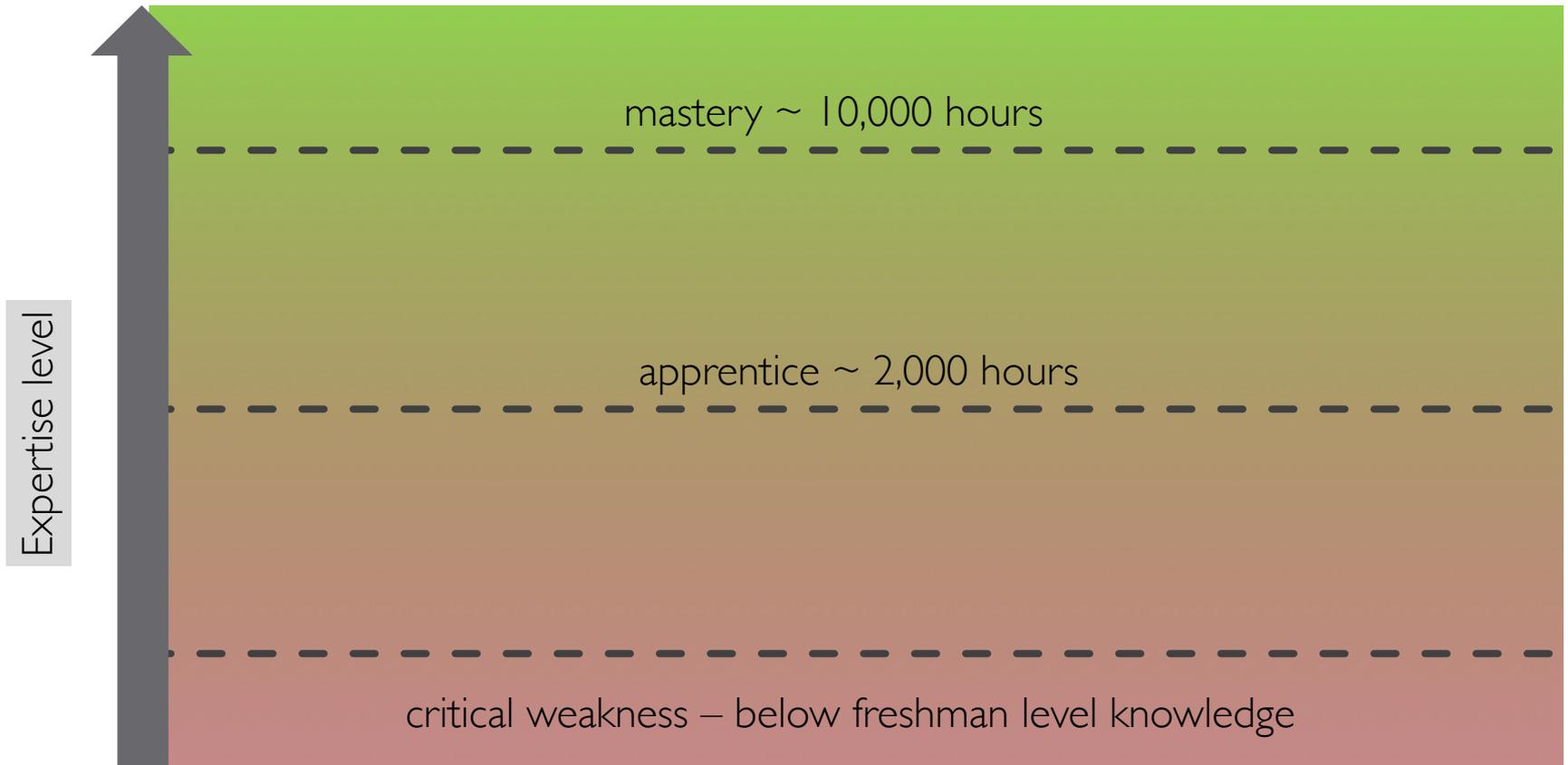
STRENGTH 27
DEXTERITY 21
ENDURANCE 22
ENERGY 60

STATISTICS

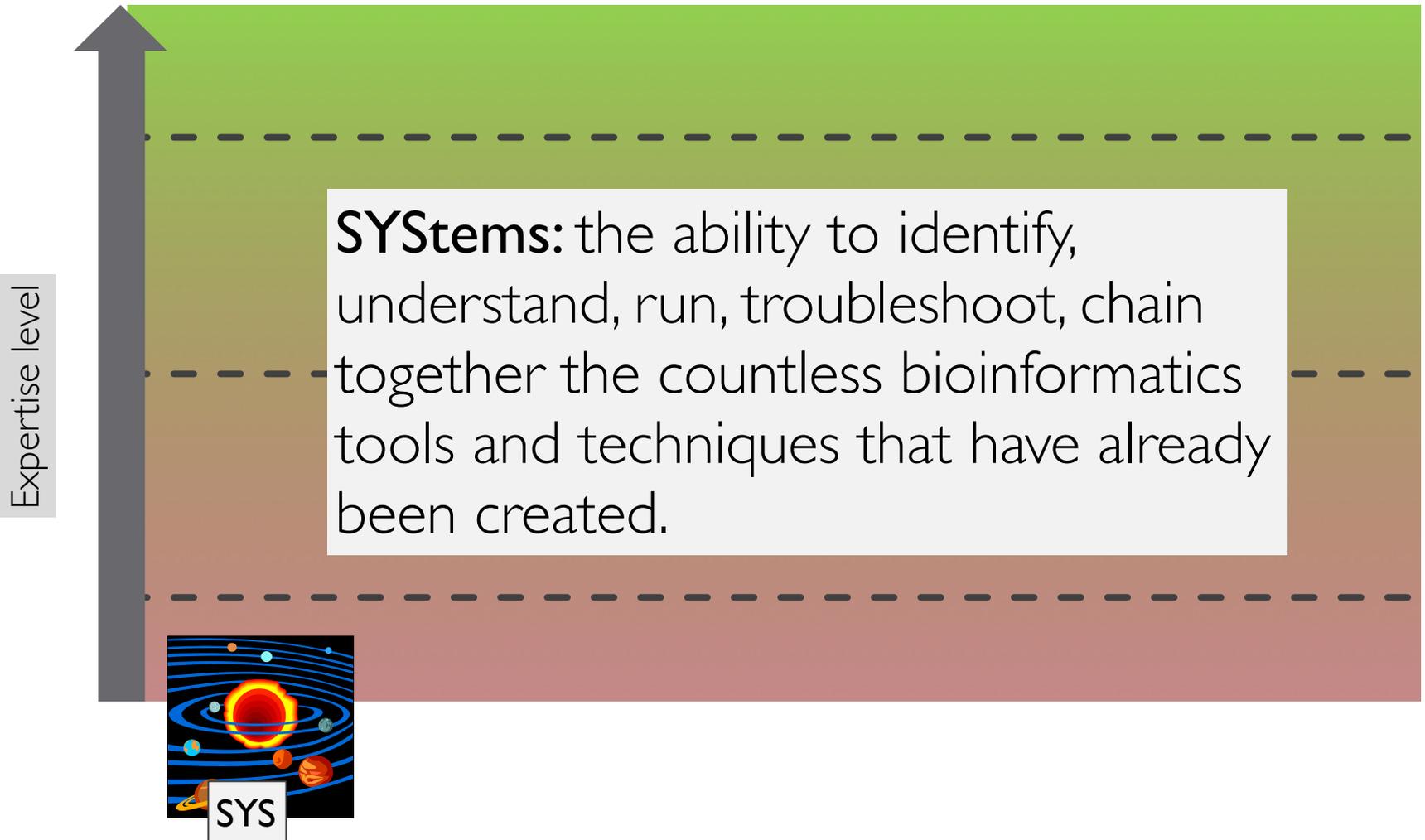
ATTACK: 362 DEFENSE: 333
CRITICAL CHANCE: 10% DODGE: 5%
BLOCK: 5%
RIGHT-HAND DAMAGE: 18 - 31
LEFT-HAND DAMAGE: 20 - 34
RESISTANCES: 9 9 49 9
1 - 47 9

What would a bioinformatics skill system look like?

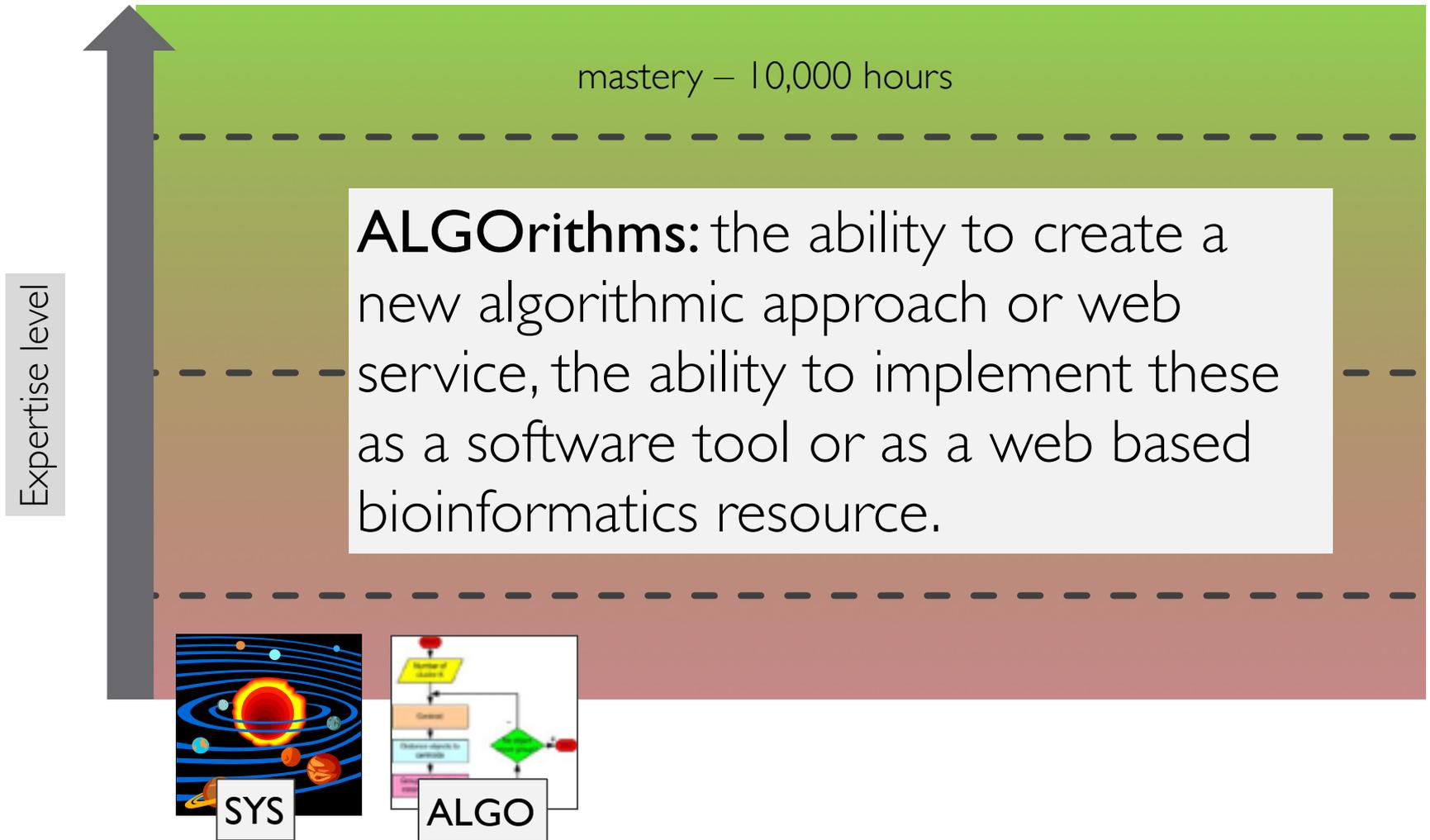
Laying out your skill bar



Laying out your skill bar: SYS



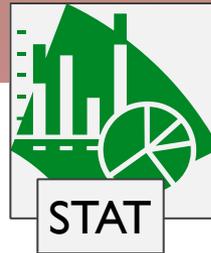
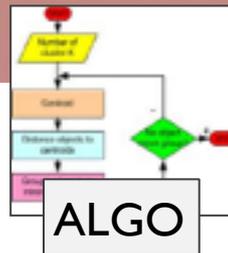
Laying out your skill bar:ALGO



Laying out your skill bar: STAT

Expertise level

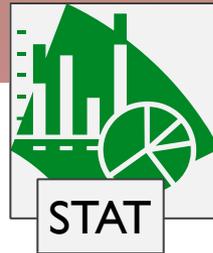
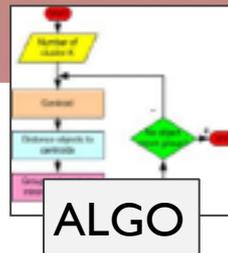
STATistics: the ability identify and apply the proper statistical method. The ability to devise a new statistical approach to extract a new type of knowledge from the data



Laying out your skill bar: BIO

Expertise level

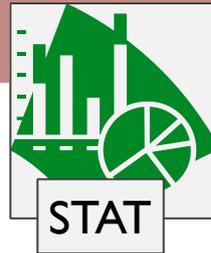
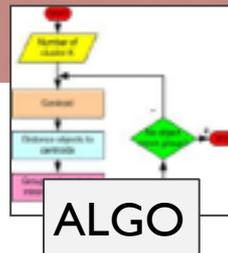
BIOlogy: the ability to interpret bioinformatics data/results in the proper biological context, the ability to devise/ imagine a new computational approach/ technique to measure novel biological attributes



Laying out your skill bar: VERB

Expertise level

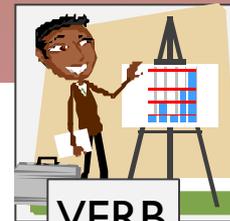
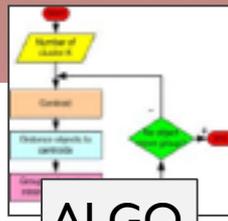
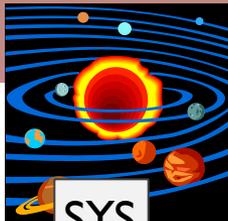
VERBal: the ability to understand the goals and needs of individuals from diverse backgrounds. The ability to communicate with these same individuals.



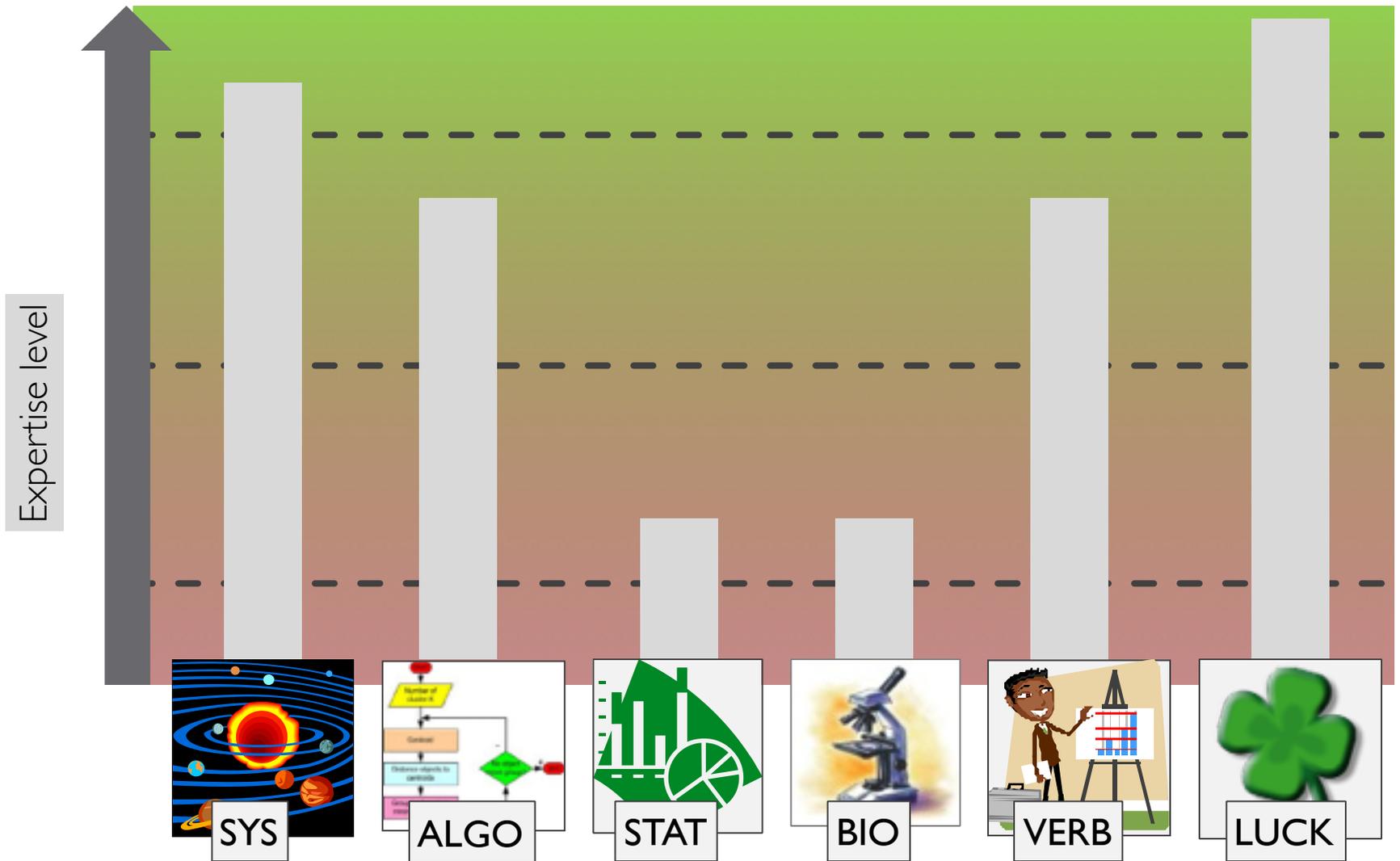
Laying out your skill bar: LUCK

Expertise level

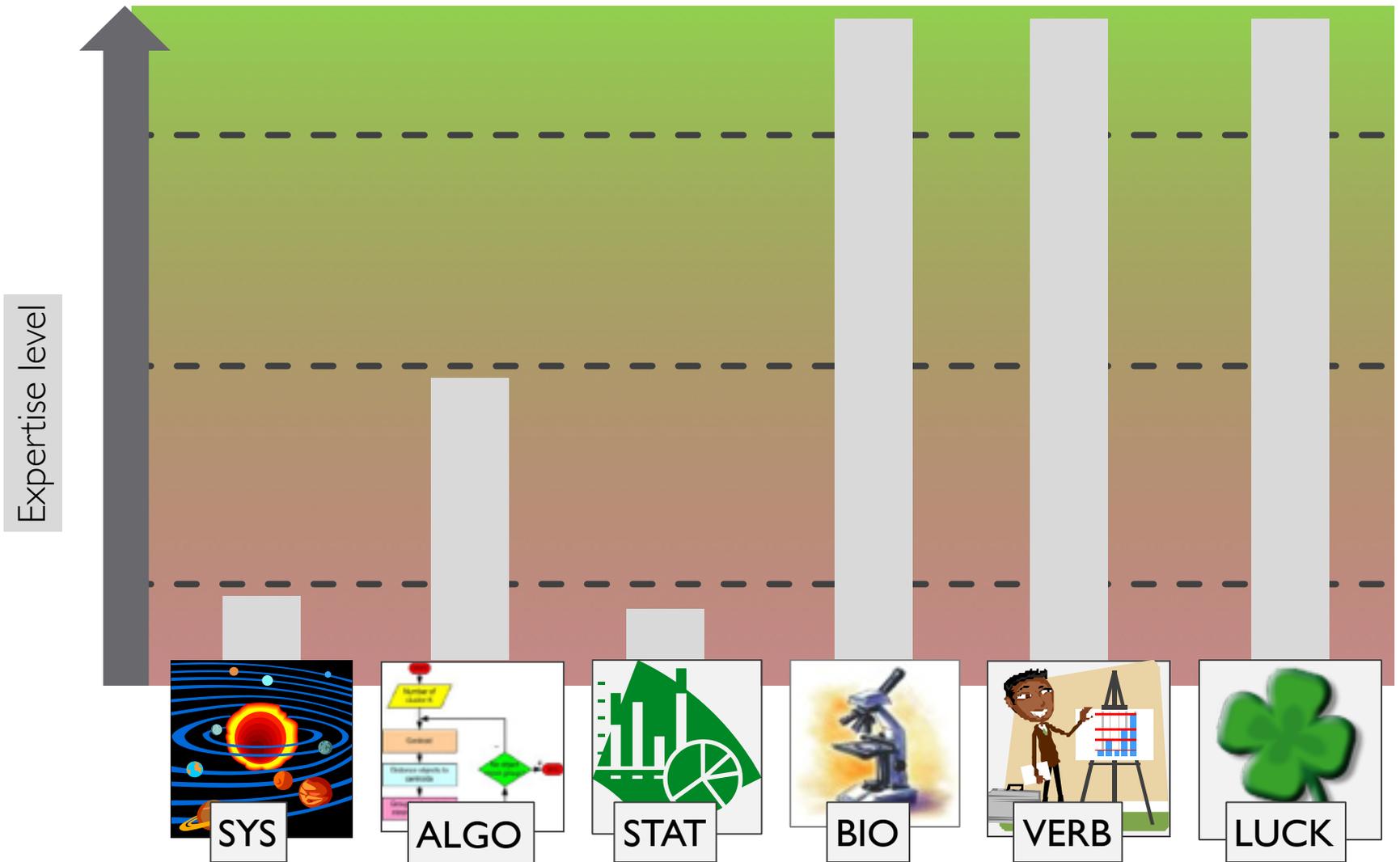
LUCK: the ability to be in the right place at the right time – and when the opportunity presents itself have the skill to work on unexpected tasks



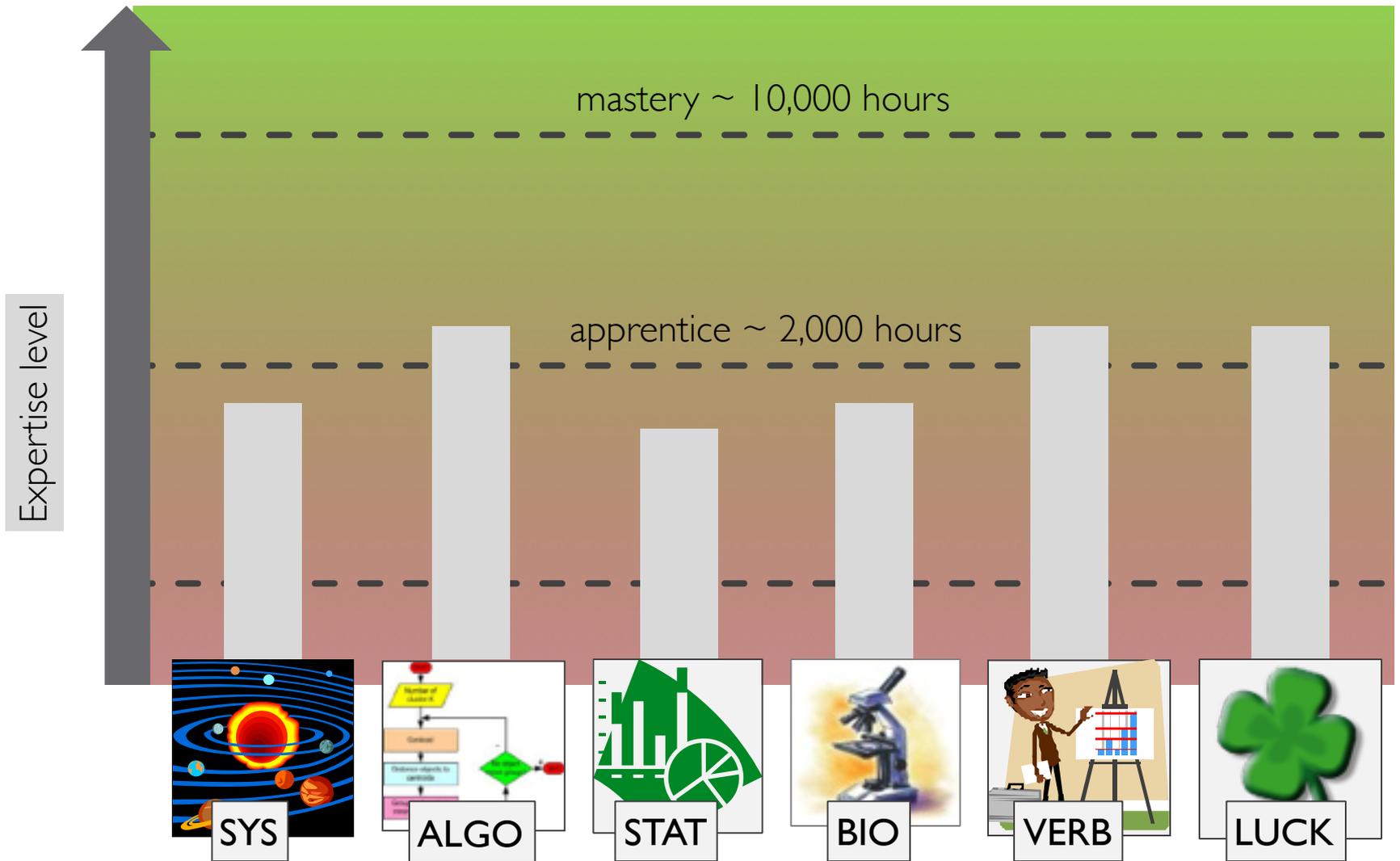
My skill bar



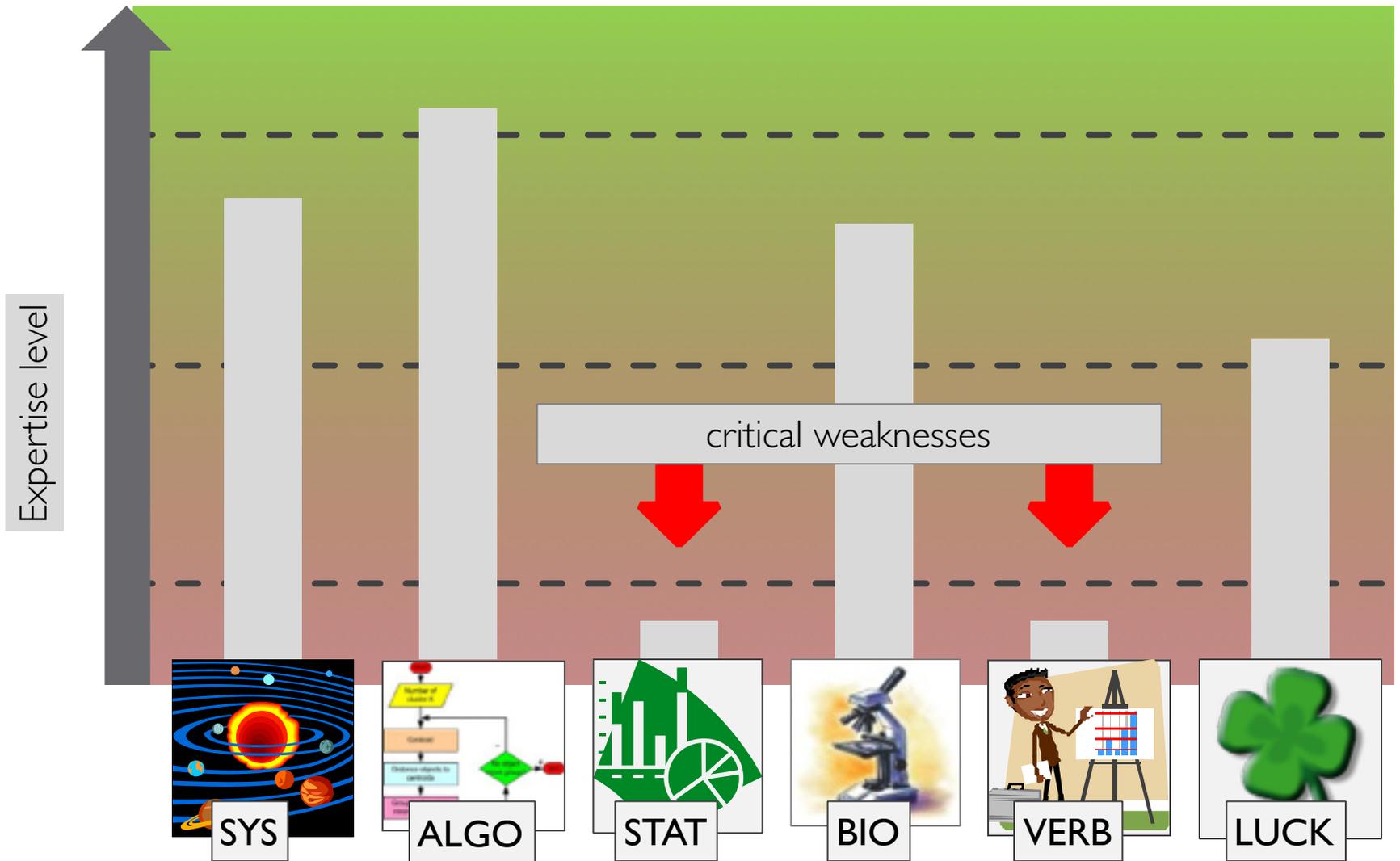
A collaborator of mine



Averages are not all that great!



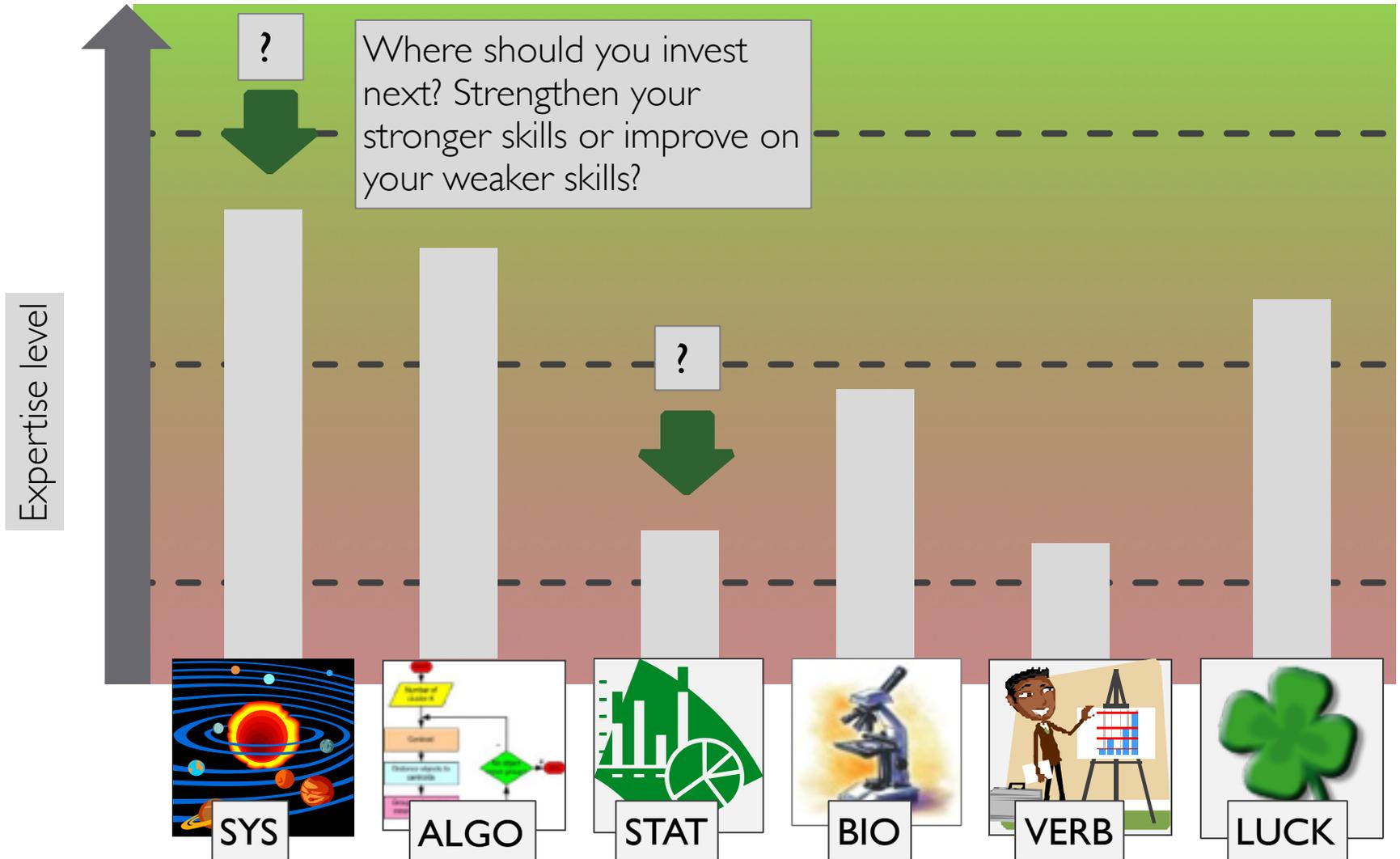
First: fix critical weaknesses!



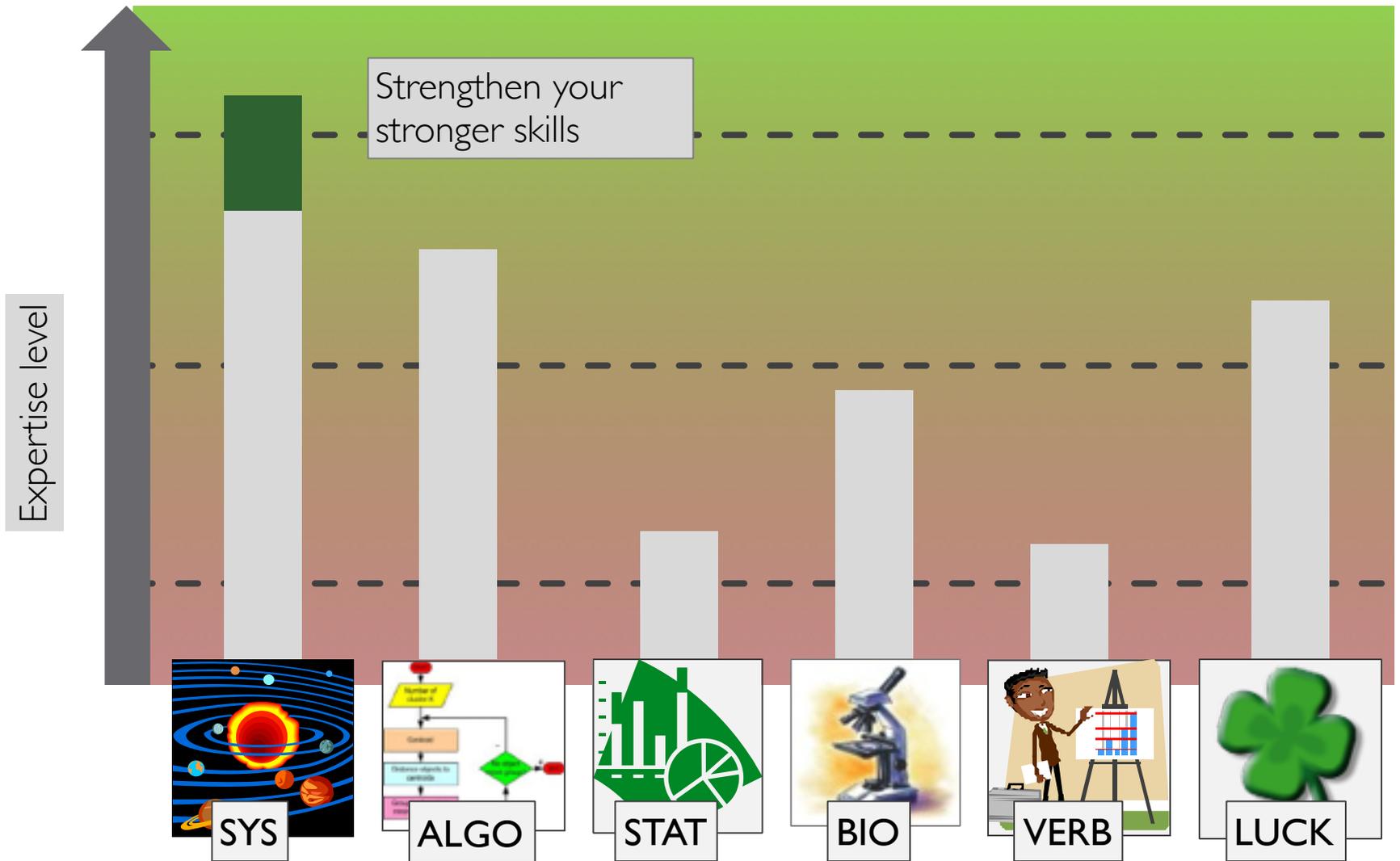
First step: core competency

- 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?



Improve your strenghts



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

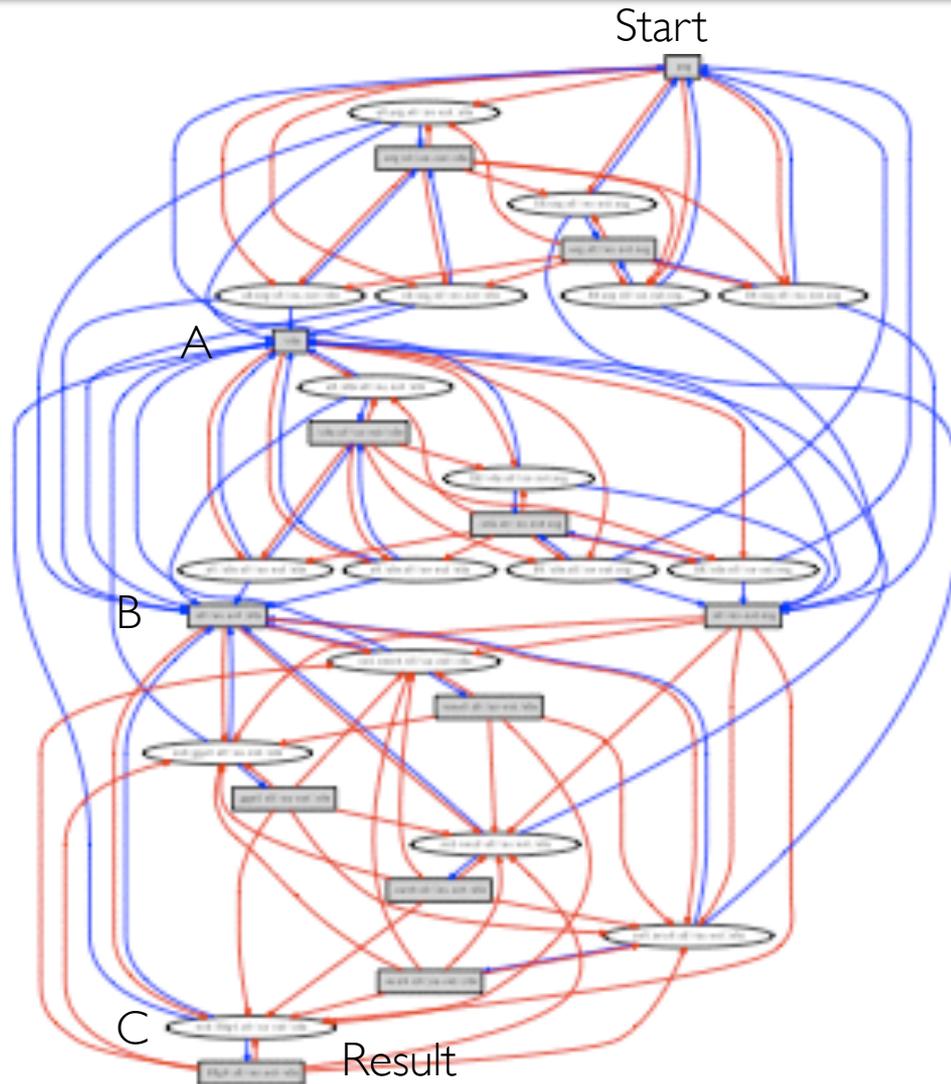
Bioinformatics is relatively simple

- 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:



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...