

Advice for Students starting into research work

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Don't get hung up trying to understand everything at the onset

- ◆ **Biggest Challenge** : Huge amount of stuff you need to know, to tackle problem properly !
- ◆ **Important skill for good research**: Learning to cope with this challenge
- ◆ **Road to Failure**: Blocking your action/progress, waiting for complete knowledge

Coping Mechanisms

- **Prioritizing** : What do I need to know most ?
- **Read** : seek out more, but don't wait months before starting things
- **Multithreading**: When blocked on one path , is there another I can productively pursue ?



Coping Mechanisms

1. Wishful thinking : If I solve this, will this allow me to solve other problems ?
2. Pester other people with the right stuff
 - a. show respect for their time
3. Propose working models
 - a. Gives you smth. Concrete in mind to work, discuss, compare with others

Losers vs winners

- ◆ Always Blame someone/ something for their lack of progress
- ◆ Know all the reasons it cannot be done



- ◆ Find ways to make progress despite complications
- ◆ Find a way to do it



Decompose

- ◆ Whole problem seems overwhelming!
- ◆ Methodology : Divide and Conquer
 - Decompose into manageable pieces
 - Each piece = Stable Intermediate
 - Tackle one at a time
- ◆ As you understand more, new problems and tasks arise

Target Stable intermediates

1. Points where some clear piece of problem has been solved
 - Have a nice interface to the problem
 - Produces results at this stage
2. Things you can build upon
3. Things you can spin-out (as deliverables)
4. Things you can share
5. Points of accomplishment

Deliver

- ◆ **Common Fallacy:** have to deliver the final solution to everything at once
- ◆ **Losers :** promise but never deliver
- ◆ **Winners**
 - Show workable/usable results along the way to final solution
 - Pieces include:
 - ◆ Solutions to simplified models
 - ◆ Intermediate output/data
 - ◆ Stable intermediates



Demonstrate Progress

- ◆ Allows adviser feedback
- ◆ Requirements and understanding invariably evolve
- ◆ Change and redirection is normal and healthy



Incremental Model vs Monolithic

- ◆ Monolithic (all-at-once) is brittle
- ◆ Incrementally grow your solutions
- ◆ Best new technique:
incremental development and
progressive refinement towards the
goal



Be organized

- Work continually to structure the problem and your understanding of it
- Keep careful track of what you have done and what you need to do



Write everything down

Prioritize

- ◆ Make priorities in your efforts
- ◆ Check your priorities with your adviser



Meeting with Adviser

- ◆ He expects: you are self moving and motivating
- ◆ Ideal Scenario :
 - You supervisor gives you the seed and some directions.
 - You put in concentrated time on your problem, come back with more knowledge and insight than your supervisor
- ◆ Do not expect him to solve all problems

Don't reinvent unnecessarily

- ◆ Keep focused on the overall goals and come up with “adequate” solutions to sub-problems
- ◆ Try the obvious or simple approach
- ◆ Make notes and come back later, if needed



Strive for Independence

- ◆ Learn techniques and gain confidence in your own ability to solve problems now
- ◆ Don't depend on your adviser but learn from them



Communicate and synchronize

- ◆ Do others have different models from yours?
- ◆ What can be learnt from each others' models and assumptions
- ◆ Let others know what you are doing, solving ...

