

How to Do Research and Survive the Research Woes

Prof. Nikos Papanikolopoulos

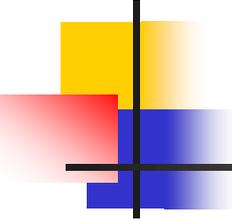
Email: npapas@cs.umn.edu



Research

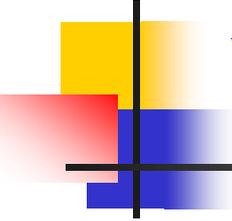
“How many times I have wished that I could look out onto the world through the eyes, with the mind, of a chimpanzee. One such minute would be worth a lifetime of research.” Jane Goodall





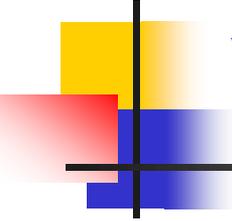
What is Research?

- Research is the art of doing a piece of work that moves knowledge **forward** and helps us understand ourselves and the world around us better.
- Research is a **struggle** with ourselves.
- Research is a way to keep your brain young.
- Research is part of our life and does not start at 9am and finish at 5pm.



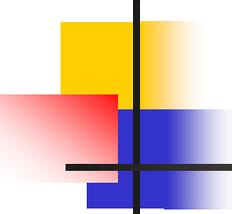
“Good Research”

- Research needs a problem.
- Research sometimes raises new issues.
- Solutions are not as important as the path to them.
- Problem formulation needs exposure to a variety of topics.
- Take many classes and open yourself to new and erratic ideas.
- Question everything.
- Step back and evaluate your work often.
- Understand previous related work.



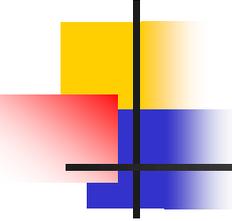
“Questionable” Research

- Work that is not focused.
- Work that misses the big picture.
- Work that answers too few questions.
- Work that cannot summarize its contributions in a few sentences.
- Work that is not grounded in the literature.
- Work that is only done to enjoy the comforts of the student life.



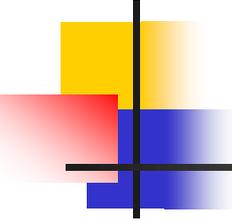
Advisor

- The advisor-student relationship is crucial and lasts a lifetime.
- The right chemistry is important.
- Be clear about your goals and state them to the advisor.
- Do a small project with him/her before you commit.
- Be clear about future financial support.
- Have regular meetings, especially at the beginning.



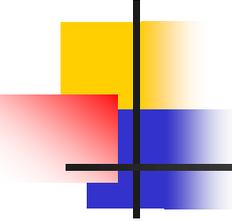
Problem Formulation

- Tough part.
- Advisor is essential at this phase.
- Literature survey.
- Depression often dominates this step.
- Start small and do not expect to solve the “Computer Vision” problem.
- Look at earlier theses.
- Back out early from problems that seem unrealistic.
- Do a TA’ship in order to explore other research opportunities.



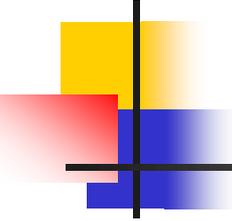
Literature

- Read a lot, especially at the beginning.
- Use resources such as CiteSeer, INSPEC, IEEE Xplore, and the ACM Digital Library.
- Attend conferences and workshops and ask a lot of questions.
- Talk and exchange emails with people who have done or are doing similar work.
- Ask your peers.
- Organize the references with comments.
Three years down the line when you need the information, you will not recall the details.



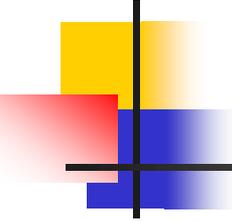
WPE

- Breadth and depth of knowledge are important.
- Look for research topics and issues.
- Projects help a lot.
- Stress for the WPE is natural. Do not overdo it however.
- Work in groups helps.



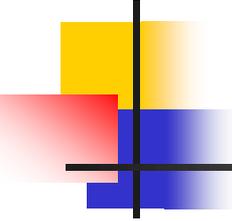
Papers

- Papers help you set doable goals.
- Papers are important for future employment.
- Create a structure before you start (**abstract, introduction, problem statement, related work, solution, results and analysis, conclusions, and future work**).
- All the words and sentences should be your own.
- Minimum overlap between your papers.
- Use of spell checker is essential.
- Give plenty of credit.
- Order of authors.



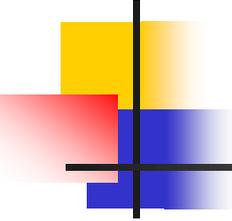
Proposal

- Clear ideas about problem and previous work.
- Helping advisor writing grant proposals is a good experience.
- The main theme should be summarized in a paragraph.
- There always differences between the final thesis' topics and the proposal's topics.
- Timeline and priority ordering are essential.



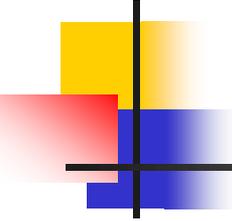
Conferences

- Networking is important part of the research enterprise.
- Group presentations help before conference presentations.
- Think of the audience in front of you as a bunch of your friends.
- Think before you answer questions.
- Tough questions can be deferred after the talk.
- Practice, practice, and practice your talk.



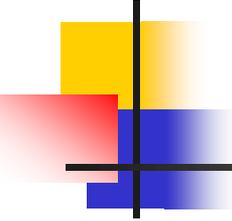
Thesis

- The last mile of the marathon runner.
- It might be painfully boring.
- It is your legacy. People thirty years down the road will still look at it.
- Start the writing early.
- Combine the writing with some research work.
- Push your advisor to give you feedback early.



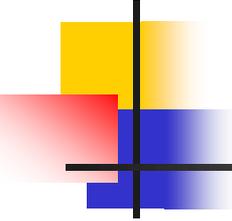
Life Afterwards

- Academia vs. Industry.
- Start the networking and the search early.
- Create a plan. Do not apply simultaneously for all types of jobs.
- Create a couple of different interview talks.
- Practice the talks.
- Recommendation letters are important.
- Student memberships (e.g., IEEE) help.
- Invite yourself to give talks at places you are traveling.



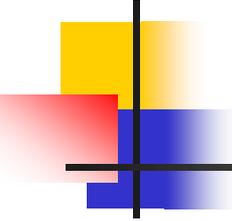
Time Management

- Time flies.
- Organize your days around small and doable tasks.
- Do not stress over the final result.
- Social life is important.
- Paper deadlines help.



Conclusions

**It is a tough and demanding job but
you never get bored**



Acknowledgement

To the more than 60 research assistants of mine, I owe a lot. I learnt something from each one of them.