NSF CAREER Writing Workshop

The "CAREER" Experience

Walid Saad

Electrical and Computer Engineering Department, Network Science, Wireless, and Security (NetSciWiS) Group
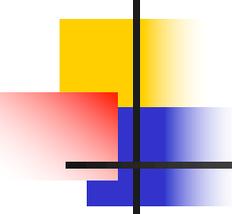
Virginia Tech

walids@vt.edu
Group: http://www.netsciwis.com
Personal: http://resume.walid-saad.com

Profile

- **Walid Saad, Assist. Prof., VT, since August 2014**
  - PhD, University of Oslo, 2010
  - Dissertation: Cooperative Game Theory in Wireless Networks
- **Previous positions**
  - Postdoc (2011): Princeton University
  - Assistant Professor (2011-2014): ECE, University of Miami
- **Research areas**
  - Wireless networks and security
  - Game theory
  - Cyber-physical systems
  - Machine learning
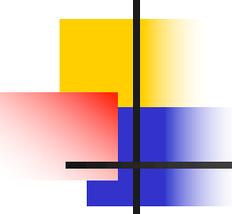
My CAREER Experience

- Joined the University of Miami in August 2011 and had no idea what to do until late June 2012…

- Submitted my proposal in the first year – July 2012
  - Recommended in November 2012 and started in January 2013

- While a first-year, first-attempt success is not typical, this demonstrates that…
  - Coming from a relatively smaller/unknown university does not affect your chances
  - Being a PI with no prior support and no prior CAREER attempts, does not affect your chances
  - **It's all about Intellectual Merit and Broader Impacts!**

3

The CAREER Topic

- August 2011: Want to submit but….
  - I have no idea what to do ☹!
  - Need to find a topic!
- How to choose the topic?
  - **Innovative** in your field but also **credible.**
  - **Ambitious** enough to convince your reviewers that you have enough to do for a 5-year timeline
    - The CAREER is perhaps the **only** NSF program that enables a 5-year plan for a **single** PI. Keep it in mind!
  - *What are the topics that my research community is "flirting" about, but no one has yet tackled?*
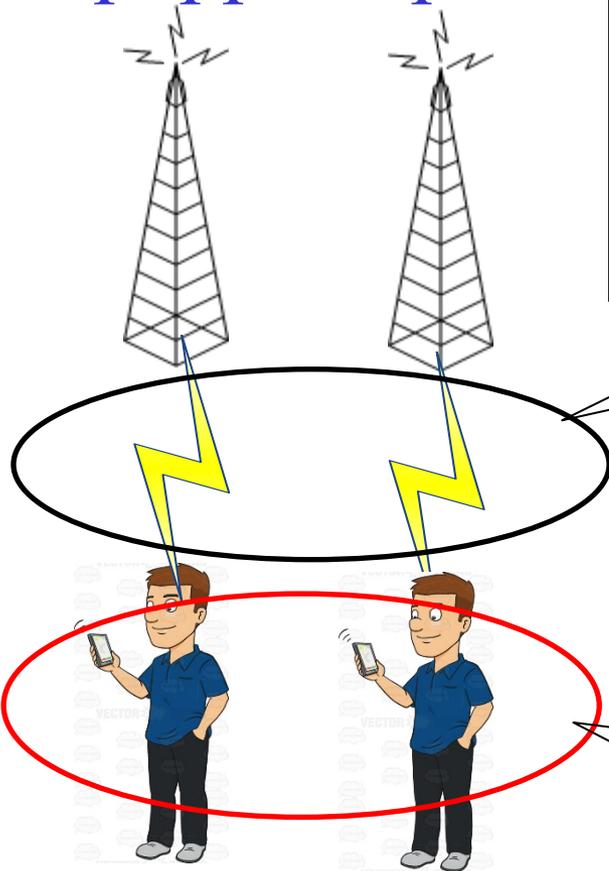
4

The CAREER Topic

- With those three ingredients, an idea popped up!

For decades, as wireless researchers we've been focused on how to combat the impediments of the **wireless channel and its physical environment**
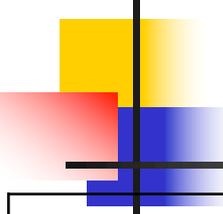
I decided to focus on the **user's context** and its rich environment

The CAREER Topic

- What are the key winning ingredients?
  - **Broad** vision but sufficiently **focused** and **credible**.
    - Potential to open new fields in 5-year timeline
    - As of today, many problems still open (e.g., caching, etc.)
  - Simple to explain to experts AND non-experts!
    - **I just explained it in three sentences!**
  - **Substantial** problems to solve => do not attempt to solve all of them; I focused on **three** coherent ones
  - **Exciting** – at least to me!
  - Representative of my expertise
   - *If I had promised to go to Mars….*

CAREER vs. Regular NSF

	CAREER	Regular NSF
Research	• Innovative and bold • **Big** vision necessary • **Substantial** 5-year plan with **long-term** impact	• Innovative and bold • **Solid** vision with **novel** components can work • Scope varies
PI	• PI is well-equipped • **Centered** around the PI's career ambitions	• PI is well equipped
Broader Impacts	• Broad societal impacts • Opens up new areas • **Holistic plan that integrates research and education**	• Broad societal impacts • May lead to new areas • Curriculum development, student involvement at a more or less flexible level
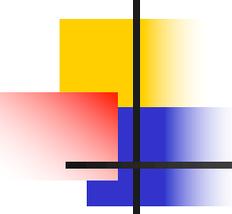
The Educational Plan

- Do not treat education as an **afterthought**
  - While the quality of the educational plan alone may not be **enough to win, it is enough to lose!**

- Research and education must complete each other
  - How can you use your research for education?
  - How can your education plan help in research?

- Educational plan should also be reasonable..
  - Reforming the entire ECE curriculum is not the way to go…
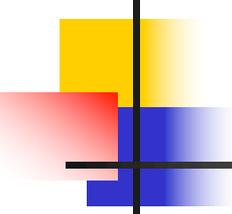
The Educational Plan

- Primary components of education

  - **Curriculum:** how can you help your institution enhance its curriculum? What is missing?

  - **Students:** Beyond the graduate students you intend to hire, how can you involve students at other levels?

  - **Tools:** Can your research provide new tools for education?

  - **Outreach and diversity:** Reach out to schools, work with K-12, articulate a feasible plan for this!

  - **Dissemination:** workshops, website, etc.

  - **Education assessment:** I read a lot about it, did not include due to: a) space and b) lack of expertise in my institution

The "Writing"

- Innovative research + Educational Plan = I will get it!
  - **Wrong!** Need to write it concisely and clearly: *reviewers see what you write not what you think!*
  - Tell it as a story that your grandmother will understand!
  - **Think big, write focused!**
- Write **deep** for your community and **clear** for non-experts/out of area
- Use **figure** to convey key ideas
- Can be skimmed and understood
 - Reviewers have 10 proposals to review in a short period of time!
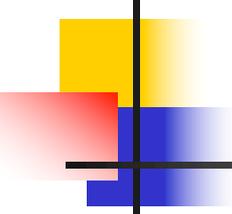
The "Writing"

- My proposal structure (not universal)

  - **Introduction (2 pages):** Why should this research be undertaken? What is the key idea?

  - **State-of-the-art (0.75 pages):** this work vs. literature

  - **Proposed Research (8.75 pages):**

    - **Research goals (1 page):** Technical description of goals

    - **Three research thrusts (7 pages):** the actual research plan, tasks, and technical details

    - **Validation plan (0.75 pages):** how do I intend to validate my research?
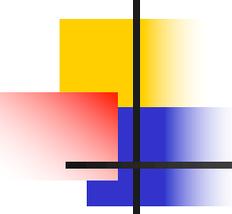
The "Writing"

- My proposal structure (not universal)

  - **Educational plan (2 pages):** all the details in one elaborate section, with subsections

  - **Broader impacts, industry collaborations, and dissemination (0.5 page):** broader impacts beyond the educational plan (NSF GPG now requires a broader impacts section, so you may want to re-order)

  - **Project timeline (0.5 page):** timeline of activities

  - **PI background/prior support (0.5 page):** was mostly background for me, I had no prior support
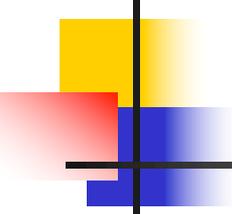
Additional Writing Tips

- Introduction (i.e., first 2-3 pages of the proposal)

  - Arguably the most important part of your proposal

  - Reviewers will make up their opinion after reading the introduction, they use the rest to verify whether you can do it

- Project Summary

  - Very important, it sets the tone for the reviewer

  - Reviewers excited by summary and "wanting more"!

  - Do not copy/paste from your introduction

  - Use the summary to test whether **you** understand your own idea and can summarize it!

    - If you can't, then you need to revisit your idea!

Luxury Items

- Beyond the essentials, you need to also get the **luxury items** that can give you an additional "edge"

- Letters of collaboration with industry
  - Engage industry and try to get letters of collaboration with **specific** actionable items
  - Examples: student internships at industry, access to data
  - I had two letters of collaboration with industry, viewed positively as broader impacts.

- Letters of collaboration with local schools
  - **Do** outreach, engage schools
 - Get letters from local teachers or schools (I had one)
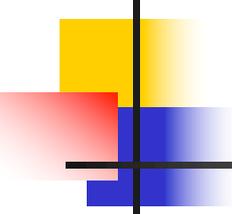
Useful Tips

- Talk to your program director, if possible
  - I did not do that due to two reasons: a) I came up with my idea very late **(shy to contact with no plan)** and b) Knew which program to submit **(NeTs program was obvious)**

- Serve on an NSF panel before your CAREER
  - From my perspective, it was the most **useful** advice as it was an illuminating experience
  - My first panel in May 2012 (not in my program)
  - You see "who" serves on panels, "what" they look for, and "how" decisions are made

Useful Tips

- Start as early as you can
  - I was extremely late (started end of June 2012), and I had to run against the clock => exhaustion!

- Let your peers review your proposal
  - I asked **7 colleagues**
  - I was late, they **had a week to review**!
  - Somewhat simulated a "real" panel ☺
  - Who to ask? "Nice" vs. "adversarial"
    - Past CAREER awardees in your program
    - Senior colleagues
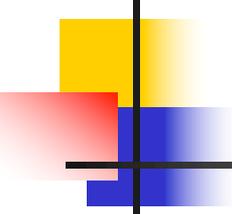   - **Colleagues from outside the US (they catch unique things!)**
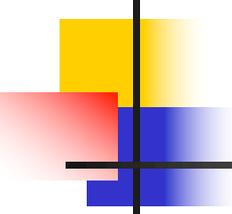
Useful Tips

- Submit proposals before your CAREER
  - I had **three unrelated, declined proposals** (one in NeTs)
  - The reviews were very helpful, I learned the pitfalls from my own experience, I identified my shortcomings/strengths
  - PD of my declined NeTs proposal handled my CAREER, and he had given me feedback on the declined proposal
    - The topics were orthogonal, but the feedback still helped
- Talk to your peers, learn from their expertise
- Read other proposals, if you get access to them
  - I read two other proposals: one downloaded online and one from a colleague
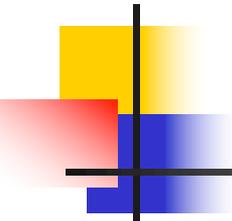
Concluding Remarks

- Think big – but write clear and focused

  - Keep reminding yourself – it is a 5-year proposal!

  - Keep reminding yourself – reviewers have no time!

- There is no "one size fits all" approach

  - Each experience is different

- Being declined is part of the NSF process

  - My own record thus far: I have 12 successful/ongoing proposals, and about **40 declined**

  - *Keep your hope up and learn from your declined proposals! It is a continuous process*

Finally....

Best of Luck! Questions?