NSF CAREER WORKSHOP

PREPARING AN NSF CAREER PROPOSAL

Ana-Maria Staicu

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Introduction

- Department of Statistics, NCSU (since 2009)

  Research area: functional and longitudinal data analysis, nonparametric statistics, brain imaging

- NSF Career Award (2015). Second attempt

- Served on NSF Career panel

Preparing NSF Career proposal

- NSF is arranged into
  Directorates -> Divisions -> Programs

  Directorate of Biological Sciences
  Directorate of Mathematical and Physical Sciences

  ….

  More info at https://www.nsf.gov/staff/orglist.jsp

- Think carefully where your research proposal fits. Statistics is funded by many divisions/programs

- Carefully read the 2019 PAPPG for guidelines
  https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg

Preparing NSF Career proposal

NSF funds:

- Novel ideas (high risk projects require proven track record)
- "Transformative" research
- High impact (not incremental) research
- Projects that improve STEM education and diversity

Section of the proposal

1. Cover Sheet
2. Project Summary
3. Project Description
4. References Cited
5. Biographical Sketch/es
6. Budget and Budget Justification
7. Current and Pending Support
8. Facilities, Equipment and Other Resources
9. Special Information and Supplementary Documentation:
   Data Management Plan / Postdoctoral Mentoring Plan (if applicable)
10. Single Copy Documents: Collaborators & Other Affiliations Information

Project summary

- Max length = 1 page

- It consists of
  - an overview
  - a statement on the intellectual merit of the proposed activity
  - and a statement on the broader impacts of the proposed activity

Project description
(including results from prior NSF support)

- Max length = 15 pages

- For most part, it describes the proposed scientific research. Must contain as separate sections within the narrative
  - a section labelled "Intellectual Merit"
  - a section labelled "Broader Impact"
  - results from prior NSF support (max 5 pages)

Review Criteria

- Intellectual Merit
- Broader Impact

Intellectual Merit

- Potential of the scientific project to advance knowledge and understanding
- How novel, creative, or potentially transformative are the proposed ideas?
- Is the research plan suitable to be developed for 5 years or beyond?
- How well conceived and organized is the proposed activity?
- Does the research plan incorporate a mechanism to measure its success?
- Does the research activity include alternative options in case proposed ideas do not work ?

Intellectual Merit

- How well qualified is the PI to conduct the proposed research plan?

- Does the PI have sufficient resources (either at the home institution or through collaborators) to carry out the proposed activity?

Broader impact

- How well does the project advance discovery while promoting teaching and training?

- What are the benefits to the society?

- To what extent will it enhance the infrastructure for research and education?

Broader impact (cont'd)

- How well will it broaden the participation of underrepresented groups? More generally, how will it contribute to achieving desired societal outcomes?

- Is there evidence that the proposed activity is feasible?

- Will the results be broadly disseminated? How?

Broader impact (cont'd)

What kind of activities could be listed here

- Applications that have societal benefit
- Development of courses that will include knowledge base covered in the proposal
- Mentoring undergraduate and/or graduate students - what is the PI doing to increase representation of underrepresented groups in their field?
- K-12 STEM outreach
- Public Engagement (collaboration with local museums, libraries, science cafes, etc)

Get creative and think outside the box!

Broader impact (cont'd)

What needs to be included in the Broader Impact section?

- Motivation and rationale
- Activities that you're doing now
  - Development of courses related to the proposed research
  - Mentoring graduate and undergrad students; efforts in recruiting students from underrepresented groups
- Activities that are new
  - K12 STEM outreach
  - Public engagement
- Evaluation and assessment plan
- Budget

Five elements considered in the proposal review

- What is the potential for the proposed research activity to advance knowledge and understanding within its own field or interdisciplinary (IM)? How does it benefit society or advance desired societal outcomes (BI)?

- To what extent the proposed research explores creative, original and transformative concepts?

- Is the proposed plan well reasoned, well-organized, based on a sound rationale? Does the plan incorporate an instrument to measure its success?

- How well qualified is the individual or team to conduct the proposed activity?

- Are there adequate resources available to the PI to carry out the proposed research activity?

First experience with NSF Career

(unsuccessful)

Proposal title: Statistical Methods for Analysis of Emerging Functional Data Structures

- My plan then: "Play safe! Take all the projects I work on, find a common theme and write the proposal"

- Intellectual merit. Emphasize significance of research, novelty of ideas
  Work on this extensively and have it read by many colleagues/friends/even family

- Broader impact: K12 Outreach, undergrads (teaching in developing country), grads (under-representative groups). Summer statistics bootcamp
  Get creative! Demonstrate the proposed ideas are feasible!

Decision: not funded (G/G/VG)

Reviewer1

- "The proposal was <u>well written</u> starting with a <u>specific example</u> of the types of data and the questions of interest … "

Reviewer2

- "The proposal left me unconvinced. It reads like a <u>long list of techniques</u> that have been thrown at functional problems. Perhaps if I worked more directly on FDA (functional data analysis) I <u>might have recognized</u> some more <u>innovative ideas</u>. "
- "The proposal "would have been stronger if it had included <u>more about the actual medical application</u>."

Panel Summary

- "Overall however, the proposal consists <u>of too many different and unfocused ideas</u> … "
- "<u>Educational</u> component is <u>strong</u>"
- "Overall the panel agreed that <u>findings</u> of this proposal are rather <u>incremental</u> in nature. <u>No</u> new broadly applicable <u>theoretical methodology</u> is anticipated."

Successful experience NSF Career

Proposal title: Next Generation Functional Methods for the Analysis of Emerging Repeated Measurements

- NSF returns without review the resubmissions that are identical to their previously submitted versions!

- Read NSF Career solicitation for the current application year !

- NSF values transformative and creative research plan!

Proposal title: Next Generation Functional Methods for the Analysis of Emerging Repeated Measurements

- Research plan (new approach): start with a vision. Start working on it early!

- Outline the main objectives of the research proposal and run them by your mentors as well as more experienced colleagues

- Share the proposed research plan with the Program Officer

- Broader Impact: use the same educational plan as prior submission, because of the the positive feedback it had received

- Decision: proposal was recommended for funding!

Tips from NSF Career experience

- Describe the "significance of the proposed research and research objectives" passionately ! (timely manner, novelty, describe the complexity of the problem)

- Use motivating applications whenever applicable. They allow to better/easier illustrate the proposed methods

- Include theoretical results of your proposed methods (even if studied under stronger assumptions)

Tips from NSF Career experience

- Include specific timeline of the proposed research. Your research plan should be convincingly done in five or a bit over five years!

- Results from prior NSF support: if you have prior NSF support this component is extremely important. Don't be shy; list your contribution on any NSF project that funded you. Be concise (space matters !)
  - NSF returns without review a proposal whose prior NSF support component is missing!

Tips from NSF Career experience

- Broader Impact: The educational component is very serious! It can change the funding decision of your proposal

- Think outside of the box – NSF funds innovative ideas!

- You need to start early (typically this is done in collaboration with other parties, and you need to be mindful of their availability)

Tips from NSF Career experience

- Do your absolute best with this proposal !

- You can submit a shorter version of it as a regular NSF proposal in November (with minimal extra work).
  You would be requested to withdraw it, if your NSF Career is successful.

- If the PO asks you to withdraw your regular NSF submission, trust them and just do it
  It means NSF is recommending your Career proposal for funding!

Thank You!