Dr. Sagar Samtani's NSF Grants "Template": My View (Tailored for IS/Business School; AI/Cybersecurity; Applied Research; CISE Research)

Disclaimer 1: I do not claim to know everything about the NSF process. I am still learning.
Disclaimer 2: This document is less so of a template, but more so of the ingredients needed to craft a proposal. The organization presented here is not necessarily how a proposal should be organized. However, all the sections (i.e., ingredients) should appear in the proposal at some stage and in some capacity.

1. **Introduction: Background and Motivation**
    a. Background and motivation
    b. Clear, crisp problem specification
    c. Summarize approach, collaborators; briefly summarize **BI and IM**.
2. **Review of the field**
    a. Who is doing what. What is their approach? – what are the limitations. Link tightly with next point
    b. Show unique characteristics of the datasets – helps guide proposed research
    c. Need to show you know the field. Common limitations include, but are not limited to:
        i. Do not account for all data types (limits comprehensiveness; lowers performance)
        ii. Do not account for unique data characteristics (lowers performance)
        iii. Do not allow scientific reproducibility
    d. Include yours – diagram is great here showing the timeline and activities
3. **Relevance to ___ program**
    a. What does that program aim to achieve?
    b. What has been funded in the past? Need to show that you know the field.
    c. Highlight the gap(s)
    d. Summarize why this proposal hits on that gap and aligns with the core vision of the program.
4. **Proposed research (get to this by page 4, latest)**
    a. 1 paragraph summarizing overall diagram and research approach
    b. One nice, beautiful diagram linking all components together (use logos for everything)
        i. Data sources, algorithms, evaluations, technologies, collaborators, advisory board
    c. Systematically explain each component
        i. Data collection – summarize approach, highlight how it is iterative, adaptive, ongoing; illustrate selected examples, how past work has leveraged these data, and what they have not done (and their importance)
        ii. Algorithm overview – use selected math.
            1. Need to summarize and emphasize novelty. What are the key differences between what is being proposed and existing approaches? Why won't existing approaches/infrastructure/methods/data work?
        iii. Evaluations (need to show combination of technical and non-technical; lack of convincing and through evaluation is often a reason why the proposal is declined)
            1. Intrinsic (A/P/R/F1/ROC/AUC/t-tests; H/C/V1/NMI/Rand; NDCG/MRR/MAP; Kappa/t-tests; computational complexity/speed)
            2. Extrinsic (expert validation; introduce collaborators; highlight their excellence and contributions; summarize their broader reach)
            3. SBE evaluations (surveys, qual, mixed methods; TAM/UTAUT; usability testing)
            4. Metrics to evaluate successful impact (need to think carefully about what end users value)
        iv. (Selected) Preliminary Results
            1. Illustrate value with case studies (pull from MISQ/ISR papers) → "the proposed work will further examine/evaluate… "
            2. System screenshots to show system → "the proposed work will… evaluate system design (SBE)… we have included funds for a dedicated research programmer to develop a commercial grade system"

3. Technical evaluations → "while the preliminary experiments yield promising results, the proposed research will evaluate the ___ algorithm on multiple datasets/contexts. Etc. to identify its… value/limits, etc."

5. **Dissemination of Research**
    a. Conferences (academic for outreach, include how PIs have key role; industry; panels)
    b. Journals (pull references from recent journals related to the topic)
    c. Dedicated workshops (**local:** department/college/university; **regional:** community colleges, local universities; **NSF/National:** link with larger PI meetings, collaborative efforts; emphasize URMs)
    d. Include in publicly available data repositories for scientific reproducibility (GitHub, Kaggle)
6. **Integration into education (Show metrics for each. Use tables. Highlight URMs)**
    a. Ph.D./DBA (cybersecurity concentration, exec education)
    b. MS in Cybersecurity (Concentration director; capstone research)
    c. Undergraduates (REU; show statistics)
    d. SFS integration (for collaboration with SFS granting organization)
    e. Integration into MOOC courses (large-scale; increase diversity, range)
    f. Cybersecurity center education forum/industry workshops
7. **Sustainability and Maintenance**
    a. Highlight resources to keep project going (facilities, staff, etc.)
    b. Relevant
    c. Summarize how past projects have been successful
8. **Timeline**
    a. One table – year by year breakdown. Show clear and measurable metrics. Summarize how each activity builds on the previous.
9. **Intellectual Merit (Make sure they have subsection headers; this helps proposal stand out)**
    a. Method (technical) novelty – how can it be used in other contexts? (abstraction; usable in other contexts; think MISQ); flexibility across multiple datasets with similar data characteristics
    b. Scientific reproducibility
10. **Broader Impacts (Make sure they have subsection headers; this helps proposal stand out)**
    a. How will this help society?
    b. Inclusion of URM (with metrics); point to relevant university resources
    c. Ranking choice amongst veterans
    d. Higher education in additional disciplines
    e. Outreach, high school, middle schools, etc.
11. **Prior NSF Works**
    a. Summary of each project, followed by two references; IM and BI
    b. Show timeline of events with diagram – how does this project help fit that larger vision?
12. **References**
    a. More recent is better. Show references for evaluations, and for the broader field.

Other key notes (and lessons learned):

- When getting a solicitation – always:
    - Read it multiple times
    - Summarize who collaborators are
    - Create an outline – be detailed with this.
    - Create a checklist of items to get done
    - Start early!
- Propose work that has already been (mostly) done. Then use funding to create new novelty to pursue the next round of funding.
- More than just pure methodological depth; need complete package (partners, plans for education/dissemination/evaluations/BI/IM)
- BI and IM are the most important! Must make sure that each proposal has them.
- Use diagrams, figures, and tables very carefully; they can communicate so much!

- Leave spacing between paragraphs; bold, italicize, and use bullets/numbering/ABCD list formatting where necessary – increases readability and flow. Think about 40th proposal in a stack!
- Keywords to use: research thrusts, investigate, design, evaluate
- Words to avoid: infrastructure development (not research), numerous, various, assorted, multiple (all too vague; need to tell them exactly what they need to know). Be precise first, then concise.
- Preliminary results illustrate PI has capability of executing the proposed research.
- OAC is more applied and less competitive (nearly 35% funding rate in 2019). IIS is most competitive and difficult – competitive proposals may get lost in the stack and go unfunded.
- Must contact program managers to make sure proposal fits current interests and how to tailor specific components.
- Supplementary documents:
    - Biosketches – do not just list MISQ/ISR or other B-school journals. Need to list IEEE/ACM and other more recognized outlets by NSF. Include sufficient 1st and 2nd author references over a sustained period of time (e.g., 5 – 7 years).
        - Display synergistic activities that show community activity and building. Great examples include PC, reviewing, guest editing/editor roles, innovative course development, URM development.
    - Always get letters of collaboration! It is better to ask and not use, rather than not get one at all.
    - DMP can be largely recycled from previous proposals
    - Some solicitations require a project plan – be careful of this (I forgot to upload this once and the proposal was returned without review! My biggest regret from my Ph.D. program.)
    - Budget – work with administrators (they do a great job – stay out of their way, and do what they ask for right away!)
        - Do not use money for infrastructure or data collection (extensively) – NSF wants money to be spent on grad students, personnel, summer support, and possible outreach. Equipment should go into supplies category.
        - Negotiate with the college and/or to have portions of the indirect cost rates returned to the PI/Co-PI as discretionary funds. This will help to support during rainy days.
- Attitude – positive, persistent, professional, personable.