MENTORING WORKSHOP FOR UNDERREPRESENTED MINORITY UNDERGRADUATE ENGINEERING STUDENTS AND FACULTY/STAFF ADVISORS

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Maximizing Undergraduate Research & Scholarly Productivity

Scholarly Productivity – Conducting Research
- Identifying STEM-focused Research Opportunities
- Conducting Literature Searches
- Reading and Preparing Scholarly Articles
- Professional Team-Building Exercises

Friday 1:30pm
Opportunities for STEM-focused Undergraduate Research

Apply your algorithmic training into research this year
- Engage in a research project during the school year
- Full-time research experience during sophomore-end summer

Funded Research Opportunities
- UROP/SROP (Undergraduate/Student Research Opportunities)
- REU/REU Site funding
- NSF SGER projects
- CRA-CREU Fellowships
- University-Internal research grant

Conducting a Literature Survey

1. **GoogleScholar, CiteSeer, Web of Science, or even a general Google search**
   - These applications will get you started by locating papers with titles similar to your search area

2. **Follow the leads...**
   - Look for papers that reference this paper
   - Look for papers that this paper references
   - Some websites will recommend similar papers
   - Email authors for help, give them sample papers and ask if the can suggest other papers or other research projects

3. **Iterate!!!**
   - When you find a relevant paper/researcher repeat (2)
Research Opportunities: A 4-Year Plan

**Freshman Year**

**Student Guidance:**
- There is very little research in your first-year courses
- DO WELL IN YOUR FIRST SCIENCE COURSES!!!
- Go to the department’s colloquium talks that interest you
- Introduce yourself to the professor that hosted the talk that interests you
- Solicit part-time funded (or non-funded) opportunities in your 2nd semester
- Split your time between home and short research opportunities or conference volunteer assignment during first summer

**1st Year Developmental Milestone:**
- Explain existing research problems and detail how to run existing studies
- Have general background knowledge of a research problem
- Have requisite skills to develop user interfaces, surveys, test protocols, documentation

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Research Opportunities: A 4-Year Plan

**Sophomore Year**

- **Apply your algorithmic training into research this year**
  - Engage in a research project during the school year
  - Full-time research experience this summer

- **Funded Research Opportunities**
  - UROP/SROP (Undergraduate/Student Research Opportunities)
  - REU/REU Site funding
  - NSF SGER projects
  - CRA-CREU Fellowships
  - University-Internal research grant

- **2nd Year Developmental Milestone:**
  - Run directed complex experiments
  - Write the motivation for a research project and also provide a preliminary technical explanation of the experimental process and results
Research Opportunities: *A 4-Year Plan*

**Junior/Senior Year**

- **Start forming a research opinion**
  - Either craft your electives to build a specialization or take junior year to investigate a different area at dept
  - Internship at a corporation during summer after junior year
  - Do a senior thesis or capstone project in your senior year

- **3rd Year Developmental Milestone:**
  - Suggest variations in complex experiments
  - Write a technical explanation of the experimental process/results and co-author a paper or three...

- **4th Year Developmental Milestone:**
  - Suggest new studies (*independent thoughts... ahhh yes!!*)
  - Lead the authorship of a workshop/conference paper and co-author a journal article

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Graduate School Planning and Other Topics

- Mentoring Younger Students (no slides)
- Networking
- Graduate School Planning
  - Processes and Timelines
  - Creating Materials for Letter Writers
  - Writing a Strong Research Statement
  - Portfolio and Personal Profile Development

(Friday 11am – Seniors)
Networking (potential letter writers)

- Do well in your courses related to your discipline
  - Ask questions, ask questions, ask questions...
  - Suggest projects that extend course requirements
- Schedule a meeting with multiple faculty within the target department
- Volunteer at research conferences
  - Develop your "academic stalking" technique
- Visit faculty at schools in your hometown who are close to your area (easy way to increase your network)
- Attend mentoring workshops (...like this one) and speak to everyone

Process and Deadlines

- Start early....
  - Choose your target schools in the summer before senior year, at the latest
  - Speak to professors about your target schools
- Work on applications in the late Summer or early Fall
  - Then visit if you can, some programs will invite
- Financial Support (drop-dead) Deadline is typically mid-February
- Notifications are typically Mid-March
Creating Materials for Letter-Writers

- Meet with your letter writers
- If you like a course, go over and above the call of duty, so the faculty member will get to know you
- Participate in undergraduate research
- Do a senior thesis

**After the letter-writer agrees, be courteous and..**

- Provide a career plan for your letter to put your work in context
- Give PLENTY of time, letter writers can target specific departments

Writing a Strong Research Statement

- Avoid writing a resume in text form
  - Your application already includes a resume
  - Faculty members ultimately have to read a lot already
- Write a persuasive essay
  - What don’t you like about world? How can you fix?
  - What do you think is unexpectedly interesting about the world?
  - When did you come to your epiphany?
- Now, cheat!!
  - Sneak in your autobiographical bullets to substantiate your findings
Profile of a Competitive Graduate Candidate

– Competitive GPA and GRE
  • Unfortunately, most schools rely heavily (perhaps too much) on these two measures as an predictor for success
– Research or Industry experience (perhaps both)
  • Undergraduate research, internships, or externships
– Course that support ambitions
– Extracurriculars that support leadership AND teaming ability
– Good rapport with faculty who can write the most compelling letters
– Clear communication skills, confident, and energetic
– A resume and statement that is clear and free of errors

Profile and Personal Profile

Management and Other Topics

• Portfolio and Personal Profile Development (no slides)
• Global Research Opportunities (no slides)
  • e.g., NSF’s Developing Global Scientists and Engineers (International Research Experiences for Students - IRES)
• Writing a Research Abstract
  
  (Friday 4:15pm – Seniors)

• Test-taking Strategies (no slides)
• Writing a Research Plan (previous slide)
• Making Effective Presentations at Meetings/Conferences (no slides)
• Developing a Career Portfolio

  (Saturday 10:45am – Seniors)
Writing a research abstract

– **Consider 5 aspects of the abstract...**
  - High-level challenge in society or motivation for the research
  - Description of a problem that anyone can understand
  - Identify your specific problem
  - Quick description of your approach to solve the problem
  - Description of what you will show that suggests that your approach is better than other existing approaches.

*Your research abstract is meant to attract readers to the paper, so keep it engaging!*