REU PROGRAMS: Mine and Others

William Gasarch-U of MD

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This talk is about



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▶ REU programs in general and also my REU program.

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My REU program REU-CAAR

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- My REU program REU-CAAR
- Graduate School.

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Some programs may vary this formula. **Example:** Mine has 15-20 students.

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1. Applying Theory to Practice (REU-CAAR at UMCP)

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2. Parallel and Distributed computing

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- 6. Systems: High Performance Computing

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- 6. Systems: High Performance Computing
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- 6. Systems: High Performance Computing
- 7. Medical Informatics
- 8. Machine Learning

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- 2. Parallel and Distributed computing
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- 4. Big Data, Security, and Privacy
- 5. Interdisciplinary Software Enginnering
- 6. Systems: High Performance Computing
- 7. Medical Informatics
- 8. Machine Learning
- 9. Security of Smart Things

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- 11. There are more.

Can find the list of REU programs by Googling

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NSF REU

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- 2. The faculty mentor gives you the problem to work on.
- 3. But then its on you!

Research! What is Research?



Research! What is Research? Work on problems where the answers are *not* already known. This is very different from taking a class.

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3. Build a network with faculty and students. Useful for the future!

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1. Show up every weekday on time and sober.

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- 1. Show up every weekday on time and sober.
- 2. Actively contribute to your research project.

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3. Attend activities. (More on that later.)

- 1. Show up every weekday on time and sober.
- 2. Actively contribute to your research project.
- 3. Attend activities. (More on that later.)
- 4. Give a research presentation the last week.

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- 2. Time: Explain the project, answer questions, etc.

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- 3. Background: Explain how the research fits into other things!

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- 2. **Time:** Explain the project, answer questions, etc.
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4. Connection: Connect you to their colleagues and others.

REU programs and Grad School

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2. In Grad School you are self-motivated.

REU-CAAR

 $\ensuremath{\mathsf{CAAR}}$ stands for



REU-CAAR

CAAR stands for Combinatorics, Algorithms, and AI for Real Problems

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Thats a mouthful.



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If I get funded and run the program in Summer 2025 then they will be different projects, but similar to these.

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Parallelism



Parallelism

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Hilbert Geometry

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Hilbert Geometry

There are geometric algorithms for problems like this: given n points in the plane, find the two that are closest together.

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Parallelism

An algorithm takes T steps on a sequential machine. How fast on a parallel machine with p processors? T/p would be great but it unlikely. How close can we get? **Prereq** Algorithms and systems programming (C, C++)

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Cryptography



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Prereq Math Maturity, linear algebra. Crypto is (oddly enough) not needed as you will pick it up as you go.

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AI to help Farmers In India

Using AI to determine when farmers should plant their crops. Uses Markov chains and ML.

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Prereq Pytorch, Python.

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Classical and Quantum Error Correction

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Classical and Quantum Error Correction

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Quantum Graph Games

There are cooperative games that two players can do much better if they are sharing an entangled quantum bit.

REU-CAAR Projects: Quantum Comp. Projects

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Prereq: Linear Algebra, Quantum Information Theory, Graph Theory.

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Game Night and Pizza The description says it all.

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The Website is

https://www.cs.umd.edu/~gasarch/REU/recruittalk.pdf

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- 3. Two letters of recommendation.
- 4. For my program I also will want a list of the project that you are happy to work on. My program assigns project groups ahead of time. Other programs assign the first week.

Question Now or Later

Any questions now?



Question Now or Later

Any questions now?

If you have questions later you can email me at gasarch@umd.edu

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