REU-CAAR: You’re Here!
Credit where Credit is Due

Origin of this talk
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- Bill G modified this
  
  *boring* handbook into a *fascinating* ~ 230-slide talk!
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John: Why are you telling them all that?
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  Cybersecurity Scholars Handbook.
- Bill G modified this boring handbook into a fascinating ~ 230-slide talk!

John: Why are you telling them all that? 
Bill: In academia its very important to credit past work!
Purpose of This Talk
1. Who are the mentors?
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1. Who are the mentors?
2. What are the projects?
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1. Who are the mentors?
2. What are the projects?
3. What is expected of you?
4. What should you expect of us?
5. Nuts and bolts of how the program works.
6. Advice on how to get the most out of this summer!
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REU: Research Experience for Undergraduates.
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CAAR: Combinatorics, Algorithms, and AI for Real Problems.
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Discuss Find a topic within CS that this title does not cover?
REU: Research Experience for Undergraduates.
CAAR: Combinatorics, Algorithms, and AI for Real Problems.

Discuss Find a topic within CS that this title does not cover?

Systems, HCI, Software Engineering, anything else?
REU-CAAR: TEAM!
Mentors

1. Verification of Quantum Simulation: Andrew C, Dhurv D, Alexy G.
2. Security Estimation for Post-Quantum Crypto: Dana DS.
3. Differential Economics: John D and Ian M.
4. Comparing AI to Human Int. with Regard to Bias: Tom G.
5. Ramsey Theory on Ordered Sets: Bill G.
6. Fair Decision, Resource Allocation, Bias: Furong H.
7. Exploring the Hilbert Geometry: Auguste G. and Dave M.
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REU-CAAR Director: William Gasarch.
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Housing: Jennifer Arseneault
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- **Housing:** Jennifer Arseneault

- **Your Salary:** Jodie Grey
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Housing: Jennifer Arseneault
Your Salary: Jodie Grey
Lots of Stuff: Sharron McElroy
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Housing: Jennifer Arseneault
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Monday Lunches:
Program Goals and Expectations
Program Goals

1. **Research!** What is Research? Discuss!
Program Goals

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   Work on problems where the answers are **not** already known.
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2. **Expose you to a variety of career paths.** Discuss!
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2. **Expose you to a variety of career paths.** Discuss!
   Grad School,
Program Goals

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2. **Expose you to a variety of career paths.** Discuss!
   Grad School, Industry, Government, Writer for the Simpsons, Hobo,
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Program Goals

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3. **Build skills**
Program Goals

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2. **Expose you to a variety of career paths.** Discuss!

3. **Build skills**
   Team Work,
Program Goals

1. **Research!** What is Research? Discuss!
   Work on problems where the answers are **not** already known.

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3. **Build skills**
   Team Work, Communication,
Program Goals

1. **Research!** What is Research? Discuss!
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3. **Build skills**
   Team Work, Communication, Project Management.
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3. **Build skills**
   Team Work, Communication, Project Management.

4. **Build a network** with faculty and students.
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   Team Work, Communication, Project Management.

4. **Build a network** with faculty and students.
   Useful for the future!
What the Program Expects of You

1. Show up every weekday.
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This is the Wrong Way To Look at the program

I invite you to talk about jobs you’ve had. I’ll go first.

Upshot

1. This program should not be seen as a job where you put in your 8 hours a day and then you’re free to do what you want.
2. You are here because you care about Quantum or AI or ML or Bias or Ramsey Theory or Geometry or Security.
3. So you should want to keep working on your projects, perhaps on a lower level, after you go back to the dorms.
4. Talk to each other in the dorms about your projects!
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What the Program Expects of You: Restart

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Acronym SPACE AGE
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1. **Show up every weekday.** On time and sober. 10A-4P.
   You should want to work longer, but prob back in the dorms.

2. Participate in assessments such as surveys.

3. Actively contribute to your research project and your team.

4. Check e-mail. Reminders, notices, requests will be emailed.

5. **Enthusiasm!**

6. Attend lunches, talks, and other activities.

7. Great talks: Attend them and at the end of the semester you will give them.

8. Enjoy yourselves!

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Your Mentor’s Role

1. **Role modeling**: Their experiences offer clues for your own professional success story.

2. **Communication**: Explain the project, answer questions, listen to your concerns and ideas, etc.

3. **Background**: Explain why the research is important! How it fits into other things!

4. **Connection**: Help connect you to their colleagues, graduate assistants, others. You will learn as much from them (or more!) as you do from your research tasks!
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What Faculty Mentors Expect from You

1. **Communication**: Be clear in verbal & written comm. Seek clarification, ask questions, provide suggestions.

2. **Assertiveness**: Think for yourself and support your own ideas.

3. **Maturity**: Be reliable for what your mentor asks you to do.

4. **Enthusiasm**: Be interested in the project, field, and topic.

5. **Responsible**: Tell team changes that affect your participation.

6. **Adaptability**: Be flexible and open minded.

Acronym: **CAMERA**

Credit: Auguste thought of making the words into an acronym.
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Doing Your Part
Sexual Harassment and Discrimination

1. Speak directly to the individual in a respectful manner. This will let you immediately know if the different treatment is a misunderstanding or a major problem.

2. If you feel uncomfortable, seek advice and guidance from others. Bill Gasarch or Jacquelyn Michaelis (REU-BRIDGE director) can offer assistance and direct you to campus resources for help. Note that in the United States there is Mandatory Reporting: if a mentor or director hears about a case of sexual harassment, they must report it.

3. While this slide is about Sexual Harassment and Discrimination, feel free to talk to Bill Gasarch or Jacquelyn Michaelis about any issue, even if it is uncomfortable.
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What is you Slack Off?

Good News That You Know:
1. You get a stipend.
2. You get free room and some meal money.

If you do not do your part you could be asked to leave, which will mean you get less of your stipend. This is RARE! (once in 2014 and once in 2016).

What is 'your part':
SPACE AGE and CAMERA
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**Good News That You Know:**

1. You get a stipend.
2. You get free room and some meal money.

**If you do not do your part**

you could be asked to leave, which will mean you get less of your stipend. This is RARE! (once in 2014 and once in 2016).
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**What is ‘your part’:**
**SPACE AGE** and **CAMERA**
Complaints In the Past

Over the last year there was only THREE complaints:
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   Being Virtual is a Real Downer
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**Not enough meat pizza on Game Nights**

I’ll do what I can.
Complain SOONER Rather than Later

Better to get a problem resolved EARLY, whatever they are.
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Better to get a problem resolved EARLY, whatever they are.

Key to a good relationship:
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In any problem or dispute that arises the important thing is
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NOT fixing it and making things work out
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Key to a good relationship:

In any problem or dispute that arises the important thing is NOT fixing it and making things work out

its finding whose to Blame :-}
Schedule and Activities
First Week++ Talks

You should all know about each others projects:
You should all know about each others projects:

For all projects $p$
First Week++ Talks

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For all projects $p$

there exists a mentor $m$ for project $p$ and a day $d$ such that
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there exists a mentor $m$ for project $p$ and a day $d$ such that

mentor $m$ gives a talk on project $p$ on day $d$. 
First Week++ Talks

You should all know about each others projects:

For all projects $p$

there exists a mentor $m$ for project $p$ and a day $d$ such that mentor $m$ gives a talk on project $p$ on day $d$.

In symbols

$$(\forall p)(\exists m, d)[\text{MENTOR}(p, m) \land \text{TALK}(p, m, d)].$$
First Week - Lunch

1. Monday 12:00-1:00 lunch in IRB.
2. This lunch you will play telepictionary!
3. Tu, We, Th, Fr- Lunch in the union or IRB from your meal card.
4. Bill will join you for lunch some of the first week.
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First Week

1. Red Tape stuff (hopefully ends Wed).
2. Research-Every afternoon.
First Week

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Most Weeks

1. Get here by 10:00AM goto your projects room.
2. Research 10:00-12:00 (approx)
3. Lunch 12:00-1:00 (approx). MONDAY lunch IRB
4. Research 1:30-4:00.
5. Talks on Wednesday afternoons at 4:00.
6. Every other Friday you get your paycheck! Don't blow it all on supercomputer time!
7. At night talk about Quantum ML for Security and Ramseyian Geometry
8. On your own on weekends—Explore Washington DC!
9. Some of these items may change (e.g., a talk on a Tuesday).
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Jill Biden may help you on your project since her is PhD is in Quantum Ramsey Theory.

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Other Things We Will Do

1. Field Trip at Spy Museum (Prob a Monday in July).
2. Lunch where we discuss How to do Bad Science.
3. Lunch where we discuss graduate school (with guests).
4. Game Nights with Pizza!
5. Final presentation the last week.
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Summary of Projects and People
Auguste-Dave Geometry Project

1. Exploring Hilbert Geometry
2. Elevator Pitch

Computational Geometry asks questions like: Given a set of lines find all of the points of intersection. It is assumed they mean lines in the plane or perhaps $\mathbb{R}^n$. What if you are in another space? A curved space? What can you do? You can do this project!

3. Students

Madeline Bumpus, Caesar Dai, Samuel Monoz, Renita Santhoshkumar, Songyu Ye.
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1. Verification of Quantum Simulation

When we have quantum computers we will need to verify that their output is correct. One way to do this is to simulate a quantum computer on a classical device. This project will be about how to do that.

4. Misc

There may be grad students and one postdoc Zooming in from China.
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Andrew-Dhurv-Alexy Quantum Project

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3. Student Ruozchen Gong
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Dana’s Security Project

1. Concrete Security Estimation for Post-Quantum Cryptosystems with Side Information

2. Elevator Pitch

Today’s crypto systems rely on factoring being a hard problem. Quantum computers can, theoretically, factor very quickly. Hence people are already building post-quantum cryptosystems which means those not based on factoring being hard.

What about non-math attacks like side-channel? Are the new systems secure against those? Let’s find out!

3. Students

Michael Gonzalez, Harikesh Kailad, Alexander Lindenbaum.
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3. **Students** Michael Gonzalez, Harikesh Kailad, Alexander Lindenbaum.
1. Differentiable Economics

2. Elevator Pitch

How do we divide up goods (e.g., children to schools, organs to patients, muffins) in a fair way? What does fair mean? This project will apply AI/ML to these problems.

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3. **Students** Davidson Cheng, Yang Hong, Reem Al Marzoa, Abdulaziz Memesh.
1. Comparing AI to Human Intelligence with Regard to Bias

2. Elevator Pitch

Humans are biased. AI systems are biased. Of course, we want to combat this for AI systems (for humans also, but that would be a Psychology REU).

In what ways are human bias and AI similar? Different? Can we identify the source of AI bias? Correct it?

We can try!

3. Students

Maya Murry, Anneke Wernerfelt, Dalal Ahmidouch.
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3. **Students** Maya Murry, Anneke Wernerfelt, Dalal Ahmidouch.
1. Ramsey Theory on Ordered Sets
2. Elevator Pitch
   If you color \( \mathbb{N} \) (the natural numbers) RED and BLUE there will be an infinite \( A \subseteq \mathbb{N} \) that is all the same color. As an ordered set \( A \) looks just like \( \mathbb{N} \).
3. What happens if you color \( \mathbb{Z} \) (integers)? \( \mathbb{Q} \) (rationals)? \( \mathbb{R} \) (reals)? \( \mathbb{N} \times \mathbb{N} \)? Other sets?
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2. Elevator Pitch

Students Joanne Boyland, Nathan Hurtig, Robert Rust.
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3. **Students** Joanne Boyland, Nathan Hurtig, Robert Rust.
Furong’s Fair Div and Bias

1. Fair Division, Resource Allocation, and Bias

2. Elevator Pitch

At one point it was hoped that automating decisions would decrease human bias. But instead there are times when it inherits human bias. Darn! This project looks at how to deal with that (and reduce bias) in the context of ML/AI for resource allocation.

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3. **Students** Suhani Agrawal, Justin Huang, Ben Kreiswirth.
Funding
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Irwin Winkler

Bill Gasarch’s Mother is Pearl (Nee Winkler) Gasarch
Irwin Winkler

Bill Gasarch’s Mother is Pearl (Nee Winkler) Gasarch

Pearl Gasarch’s Brother is Irwin Winkler
Bill Gasarch’s Mother is Pearl (Nee Winkler) Gasarch

Pearl Gasarch’s Brother is Irwin Winkler

Irwin Winkler is a producer in Hollywood.

Irwin Winkler

Produced over 50 movies
Directed 7 movies
David Selznick Lifetime achievement award for producing

Rocky 1, 2, 3, 4, 5, 6
Goodfellas
Creed 1, 2, 3

For more about him: https://www.imdb.com/name/nm0005563/?ref_=fn_al_nm_1

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Why am I telling you this?
Irwin Winkler has established a Charitable foundation that gives money to

Where Does the Winkler Money Go?

- Money for housing for non-citizens.
- The Monday Lunches.

Adam Winkler is Irwin's son who administers the foundation. He's a law professor so he gets academia. (The other two sons are in the biz: a director and a writer.)

His most recent book: *We the Corporations: How American Businesses won their civil rights* got this review: It is deeply shocking that *We the Corporations* is not boring.
Irwin Winkler has established a Charitable foundation that gives money to (a) many worth causes and
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Questions from You?

I welcome questions now and anytime!