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Stanford | Graduate Admissions

Application for Coterminal Study

Applicant Name	Stanford ID
Aaron Reed	

Degree Program	Entry Term
Computer Science (MS)	**Winter 2022-2023**

This application preview is for your records only.
Do not send this document by mail as your application.

Coterm Biographical Data Notice

You may notice missing biographical details in this PDF — this is normal.

The following information will be imported from your Stanford student record *after* you submit your application:

- **Stanford ID number**
- **Birthdate**
- **Birthplace**
- **Citizenship & visa status**
- **Address**
- **Phone number**

To check what information is on your record and to make updates, see the Personal Information Updates page on the Student Services website. Make any necessary updates in Axess *before* you submit your application.

Allow 48 hours after application submission for the missing biographical details to be filled in on this PDF.

Personal Background

Name

Full Name	Chosen FIrst Name	Pronouns
Aaron Zachary Reed	Aaron	He/him

Contact Information

Email Address	Primary Phone	Mobile Phone
aaron73@stanford.edu		

Mailing Address	Permanent Address

Biographical Information

Birthdate	Birthplace	First Spoken Language
		English

Sex	Gender Identity
Male	Man

Primary Citizenship	Secondary Citizenship	
		☐ U.S. Permanent Resident

Race/Ethnicity

☐ Hispanic ☐ American Indian/ Alaska Native ☐ Asian ☐ Black/African American ☐ Native Hawaiian/ Pacific Islander ☑ White

Military Status

Additional Languages	Reading Fluency	Writing Fluency	Speaking Fluency
French	Intermediate	Intermediate	Beginner
Latin	Intermediate	Intermediate	Not Applicable
Chinese	Beginner	Beginner	Beginner

Please indicate the highest level of education completed by any of your parent(s)/guardian(s) while you were growing up.

Bachelor's degree or equivalent

Additional Background

Were or currently are eligible for Federal Pell grants.

My mother has a B.S. in dental hygiene and my father has a B.S. in accounting, both from Louisiana State University.

Academic History

Primary Undergraduate Institution

1

Institution	Location
Stanford University	Stanford, CA

Level of Study	Dates Attended	Degree	Degree Date
Undergraduate	09/2015 - 12/2023	Bachelor of Science	12/2023

Major	GPA	GPA Scale
Engineering Physics	3.723	4.3

Additional Post-Secondary Institutions

2

Institution	Location

Level of Study	Dates Attended	Degree	Degree Date

Major	GPA	GPA Scale

3

Institution	Location

Level of Study	Dates Attended	Degree	Degree Date

Major	GPA	GPA Scale

4

Institution	Location

Level of Study	Dates Attended	Degree	Degree Date

Major	GPA	GPA Scale

5

Institution	Location

Level of Study	Dates Attended	Degree	Degree Date

Major	GPA	GPA Scale

Academic History Questions

Explanations, if any, will be displayed on the following page.

Have you ever been suspended, dismissed, or placed on enforced leave from any college, university, or post-secondary institution or been the subject of disciplinary action by such an institution? ☐ Yes ☑ No

Have you ever been placed on academic probation by any college or university? ☑ Yes ☐ No

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Academic History

Academic History Questions

Have you ever been suspended, dismissed, or placed on enforced leave from any college, university, or post-secondary institution or been the subject of disciplinary action by such an institution?

Have you ever been placed on academic probation by any college or university?

I incurred an academic probation status following Autumn 2017 and a provisional registration status following Autumn 2019. In Autumn 2017 I was beginning to be affected by mental issues that turned into major depression. I took Spring 2018 off, began treatment, and came back in Autumn 2018. Later, in Autumn 2019, I completed 10 units, but was placed on provisional registration because I neglected to renew my Reduced Course Load accommodation through the OAE (I wasn't aware that it had to be renewed annually).

If applicable, please provide an explanation of any gaps on your transcript indicating time away from your post-secondary institution(s) or program(s).

I took leaves of absence in Spring 2018, Winter 2019, and Spring 2019 because I was still dealing with the effects of major depression and a cardiac disability. I also took a leave of absence in Winter 2020 in anticipation of heart surgery (see also "Diversity Statement"), which was ultimately postponed due to the onset of the COVID-19 pandemic.

You may use the space below if you would like to provide further contextual information about any aspect of your transcript, e.g., the impact of the COVID-19 pandemic or other personal experiences on your educational opportunities or achievements.

I have been on a reduced course load due to my heart condition (see also "Diversity Statement") since Winter 2017, and have consistently been taking less than 12 units per quarter since then. I also changed majors during my junior year. For both of these reasons, it has taken additional quarters to complete my undergraduate degree. Finally, I have been attending school completely remotely (from Louisiana) every quarter since Spring 2020 via a special OAE accommodation because I have a heightened risk of complications if I contract COVID-19.

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Leland Stanford Jr. University
Stanford, CA 94305
USA

Undergraduate Unofficial Transcript - Detailed

Name : Reed,Aaron Zachary
Student ID : 05954880

Print Date: 09/26/2022

* Worksheet - For office use by authorized Stanford personnel *

Academic Advisor: Burchat,Patricia Rose

--------- Academic Program ---------

Program : Undergraduate Matriculated
08/28/2020 : Engineering (BS)
Engineering Physics (Subplan)
Active in Program

--------- Advanced Placement Test Credit ---------

Applied Toward Undergraduate Matriculated Program

2015-2016 Autumn

Advanced Placement	Latin: Vergil	10.00
Advanced Placement	Mathematics: Calculus BC	10.00
Advanced Placement	Physics C - Electricity & Magt	5.00
Advanced Placement	Physics C - Mechanics	5.00
Total Quarter Units Posted:		30.00

Allowable Test Credit subject to restrictions.

--------- Beginning of Academic Record ---------

2015-2016 Autumn

Course		Cmpt	Title	Attempted	Earned	Grade
CHEM	31A	LEC	CHEMICAL PRINCIPLES I Jennifer Schwartz Poehlmann Robert Waymouth	5.00	5.00	A
CME	100	LEC	VECTOR CALCULUS FOR ENGINEERS Vadim Khayms	5.00	5.00	A-
PHYSICS	18N	ISF	FRONTIERS IN THEORETICAL PHYSICS AND COSMOLOGY Savas Dimopoulos	3.00	3.00	A

UG Term GPA	3.884	Term Totals	13.00	13.00
UG Cum GPA	3.884	Cum Totals	13.00	13.00

2015-2016 Winter

Course		Cmpt	Title	Attempted	Earned	Grade
CHEM	31B	LEC	CHEMICAL PRINCIPLES II Hemamala Karunadasa Jennifer Schwartz Poehlmann	5.00	5.00	A
CME	102	LEC	ORDINARY DIFFERENTIAL EQUATIONS FOR ENGINEERS Hung Le	5.00	5.00	A-
EE	22N	ISF	MEDICAL IMAGING SYSTEMS Dwight Nishimura	3.00	3.00	A
MUSIC	184B	WKS	TOPICS IN OPERA STAGECRAFT Marie-Louise Catsalis	2.00	2.00	A
PWR	1JJ	SEM	WRITING & RHETORIC 1: THE RHETORIC OF LANGUAGE AND THOUGHT Jennifer Johnson	4.00	4.00	A-

UG Term GPA	3.857	Term Totals	19.00	19.00
UG Cum GPA	3.868	Cum Totals	32.00	32.00

2015-2016 Spring

Course		Cmpt	Title	Attempted	Earned	Grade
CHEM	33	LEC	STRUCTURE AND REACTIVITY Daniel Stack; Megan Brennan	5.00	5.00	A
CME	104	LEC	LINEAR ALGEBRA AND PARTIAL DIFFERENTIAL EQUATIONS FOR ENGINEERS Vadim Khayms	5.00	5.00	A
THINK	48	DIS	READING THE BODY: HOW MEDICINE AND CULTURE DEFINE THE SELF Nicole Martinez	4.00	4.00	A

UG Term GPA	4.000	Term Totals	14.00	14.00
UG Cum GPA	3.908	Cum Totals	46.00	46.00

Information must be kept confidential and must not be disclosed to other parties without the written consent of the student.

Transcript (Copy)

Reed, Aaron; DOB: 01/01/0001; ID: 399326483

Leland Stanford Jr. University
Stanford, CA 94305
USA

Undergraduate Unofficial Transcript - Detailed

Name : Reed,Aaron Zachary
Student ID : 05954880

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2016-2017 Autumn

Course		Cmpt	Title	Attempted	Earned	Grade
BIO	41	LEC	GENETICS, BIOCHEMISTRY, AND MOLECULAR BIOLOGY Dominique Bergmann; Mary Beth Mudgett Stephanie May; Waheeda Khalfan	5.00	5.00	B
CS	103	LEC	MATHEMATICAL FOUNDATIONS OF COMPUTING Keith Schwarz	5.00	5.00	A-
CS	103A	LEC	MATHEMATICAL PROBLEM-SOLVING STRATEGIES Keith Schwarz	1.00	0.00	NC
CS	106A	LEC	PROGRAMMING METHODOLOGY Mehran Sahami	5.00	5.00	A
PHYSICS	45	LEC	LIGHT AND HEAT Previous Grade(s): I Giorgio Gratta	4.00	4.00	A-
PHYSICS	46	LAB	LIGHT AND HEAT LABORATORY Giorgio Gratta	1.00	1.00	S

UG Term GPA	3.594	Term Totals	21.00	20.00
UG Cum GPA	3.816	Cum Totals	67.00	66.00

2016-2017 Winter

Course		Cmpt	Title	Attempted	Earned	Grade
CS	106B	LEC	PROGRAMMING ABSTRACTIONS Keith Schwarz	5.00	5.00	A
EE	101A	LEC	CIRCUITS I Previous Grade(s): I,NP Thomas Lee	4.00	0.00	RP
PWR	2JJ	SEM	WRITING & RHETORIC 2: THE RHETORIC OF LANGUAGE, IDENTITY AND POWER Jennifer Johnson	4.00	4.00	A

UG Term GPA	4.000	Term Totals	13.00	9.00
UG Cum GPA	3.839	Cum Totals	80.00	75.00

2016-2017 Spring

Good Standing Exemption Medical

Course		Cmpt	Title	Attempted	Earned	Grade	
CME	193	WKS	INTRODUCTION TO SCIENTIFIC PYTHON Blake Jennings; Jacob Perricone	1.00	1.00	S	
CS	107	LEC	COMPUTER ORGANIZATION AND SYSTEMS Previous Grade(s): I Cynthia Lee	5.00	5.00	B-	
PHIL	1	LEC	INTRODUCTION TO PHILOSOPHY Nadeem Hussain	5.00	5.00	A-	
PHYSICS	65	LEC	QUANTUM AND THERMAL PHYSICS Hari Manoharan	4.00	0.00	W	05/17/2017
PHYSICS	67	LEC	INTRODUCTION TO LABORATORY PHYSICS Previous Grade(s): I Rick Pam; Tim Wiser	2.00	2.00	S	

UG Term GPA	3.200	Term Totals	17.00	13.00
UG Cum GPA	3.763	Cum Totals	97.00	88.00

2017-2018 Autumn

P0 Probation Begins Next Quarter

Course		Cmpt	Title	Attempted	Earned	Grade
BIOE	101	LEC	SYSTEMS BIOLOGY Previous Grade(s): I,D Markus Covert	3.00	0.00	RP
CS	109	LEC	INTRODUCTION TO PROBABILITY FOR COMPUTER SCIENTISTS Previous Grade(s): I Chris Piech	5.00	5.00	A-
CS	279	LEC	COMPUTATIONAL BIOLOGY: STRUCTURE AND ORGANIZATION OF BIOMOLECULES AND CELLS Ron Dror	3.00	3.00	B+

UG Term GPA	3.550	Term Totals	11.00	8.00
UG Cum GPA	3.744	Cum Totals	108.00	96.00

2017-2018 Winter

Good Standing Exemption Medical

Course		Cmpt	Title	Attempted	Earned	Grade
EE	102A	LEC	SIGNAL PROCESSING AND LINEAR SYSTEMS I Previous Grade(s): GNR Joseph Kahn	4.00	4.00	A
PHYSICS	112	LEC	MATHEMATICAL METHODS FOR PHYSICS Srinivas Raghu	4.00	4.00	A

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UG Term GPA	4.000	Term Totals	8.00	8.00
UG Cum GPA	3.765	Cum Totals	116.00	104.00

2018-2019 Autumn

Good Standing Exemption Medical

Course		Cmpt	Title	Attempted	Earned	Grade	
ME	104B	SEM	DESIGNING YOUR LIFE Gabrielle Santa-Donato John Armstrong	2.00	2.00	S	
MUSIC	23	LEC	ELEMENTS OF MUSIC III Talya Berger	3.00	3.00	A+	
PHYSICS	70	LEC	FOUNDATIONS OF MODERN PHYSICS Previous Grade(s): I Shamit Kachru	4.00	4.00	A	
PHYSICS	111	LEC	PARTIAL DIFFERENTIAL EQUATIONS OF MATHEMATICAL PHYSICS Srinivas Raghu	4.00	0.00	W	11/04/2018

UG Term GPA	4.128	Term Totals	13.00	9.00
UG Cum GPA	3.788	Cum Totals	129.00	113.00

2019-2020 Autumn

R0 Provisional Registration Begins Next Quarter

Course		Cmpt	Title	Attempted	Earned	Grade	
CS	229	LEC	MACHINE LEARNING Andrew Ng; Chris Re; Moses Charikar	4.00	0.00	W	11/05/2019
MUSIC	113	SEM	INTRODUCTION TO INSTRUMENTAL COMPOSITION Francois Rose	2.00	2.00	A	
MUSIC	123A	SEM	UNDERGRADUATE SEMINAR IN COMPOSITION: RHYTHMIC DESIGN Francois Rose	1.00	0.00	W	10/29/2019
PHYSICS	105	LEC	INTERMEDIATE PHYSICS LABORATORY I: ANALOG ELECTRONICS Previous Grade(s): L Rick Pam	4.00	4.00	A-	
PHYSICS	110	LEC	ADVANCED MECHANICS Patrick Hayden	4.00	0.00	GNR	
PHYSICS	111	LEC	PARTIAL DIFFERENTIAL EQUATIONS OF MATHEMATICAL PHYSICS Steven Kivelson	4.00	4.00	B-	

UG Term GPA	3.360	Term Totals	19.00	10.00
UG Cum GPA	3.752	Cum Totals	148.00	123.00

2019-2020 Spring

Provisional Registration 1st Quarter Complete

Course		Cmpt	Title	Attempted	Earned	Grade
CS	229	LEC	MACHINE LEARNING Chris Re; Moses Charikar; Tengyu Ma	4.00	4.00	S
PHIL	2	LEC	INTRODUCTION TO MORAL PHILOSOPHY Barry Maguire	5.00	5.00	S
PHYSICS	113	LEC	COMPUTATIONAL PHYSICS Blas Cabrera	4.00	4.00	S

UG Term GPA	0.000	Term Totals	13.00	13.00
UG Cum GPA	3.752	Cum Totals	161.00	136.00

2019-2020 Summer

Course		Cmpt	Title	Attempted	Earned	Grade
ENGR	145	LEC	TECHNOLOGY ENTREPRENEURSHIP Rebeca Hwang	4.00	4.00	A+

UG Term GPA	4.300	Term Totals	4.00	4.00
UG Cum GPA	3.770	Cum Totals	165.00	140.00

2020-2021 Autumn

Provisional Registration 2nd Quarter Complete

Course		Cmpt	Title	Attempted	Earned	Grade
BIOE	101	LEC	SYSTEMS BIOLOGY Markus Covert	3.00	3.00	A
CS	110	LEC	PRINCIPLES OF COMPUTER SYSTEMS Previous Grade(s): I Jerry Cain	5.00	5.00	A+
CS	110A	LAB	PROBLEM SOLVING LAB FOR CS110 Jerry Cain	1.00	1.00	S
CS	230	LEC	DEEP LEARNING Andrew Ng; Kian Katanforoosh	4.00	4.00	A-
EE	134	LAB	INTRODUCTION TO PHOTONICS Dan Congreve	4.00	4.00	A

UG Term GPA	4.018	Term Totals	17.00	17.00
UG Cum GPA	3.799	Cum Totals	182.00	157.00

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2020-2021 Winter

Provisional Registration 3rd Quarter Complete

Course		Cmpt	Title	Attempted	Earned	Grade
CS	161	LEC	DESIGN AND ANALYSIS OF ALGORITHMS Moses Charikar; Nima Ahmadipouranari	5.00	5.00	A-
PHYSICS	120	LEC	INTERMEDIATE ELECTRICITY AND MAGNETISM I Srinivas Raghu	4.00	4.00	A
PHYSICS	130	LEC	QUANTUM MECHANICS I Previous Grade(s): GNR Hari Manoharan	4.00	4.00	A-

UG Term GPA	3.792	Term Totals	13.00	13.00	
UG Cum GPA	3.798	Cum Totals	195.00	170.00	

2020-2021 Spring

Course		Cmpt	Title	Attempted	Earned	Grade
ECON	43	LEC	INTRODUCTION TO FINANCIAL DECISION-MAKING John Shoven; Michael Boskin	5.00	5.00	A
PHYSICS	121	LEC	INTERMEDIATE ELECTRICITY AND MAGNETISM II Renata Kallosh	4.00	4.00	A
PHYSICS	131	LEC	QUANTUM MECHANICS II Xiaoliang Qi	4.00	4.00	B+

UG Term GPA	3.784	Term Totals	13.00	13.00	
UG Cum GPA	3.797	Cum Totals	208.00	183.00	

2020-2021 Summer

Academic Status Waived: FLEX Term

Course		Cmpt	Title	Attempted	Earned	Grade
EE	101A	LEC	CIRCUITS I Joanna Sands	4.00	4.00	A+

UG Term GPA	4.300	Term Totals	4.00	4.00	
UG Cum GPA	3.809	Cum Totals	212.00	187.00	

2021-2022 Autumn

Course		Cmpt	Title	Attempted	Earned	Grade
PHYSICS	110	LEC	ADVANCED MECHANICS Previous Grade(s): GNR Patrick Hayden	4.00	4.00	A
PHYSICS	134	LEC	ADVANCED TOPICS IN QUANTUM MECHANICS Douglas Stanford	4.00	4.00	B+
PHYSICS	170	LEC	THERMODYNAMICS, KINETIC THEORY, AND STATISTICAL MECHANICS I Ben Feldman	4.00	4.00	B

UG Term GPA	3.433	Term Totals	12.00	12.00	
UG Cum GPA	3.784	Cum Totals	224.00	199.00	

2021-2022 Winter

Course		Cmpt	Title	Attempted	Earned	Grade
APPPHYS	228	LEC	QUANTUM HARDWARE Previous Grade(s): I Amir Safavi-Naeini	4.00	4.00	B-
CS	210A	LEC	SOFTWARE PROJECT EXPERIENCE WITH CORPORATE PARTNERS Jay Borenstein	3.00	3.00	A
PHYSICS	171	LEC	THERMODYNAMICS, KINETIC THEORY, AND STATISTICAL MECHANICS II	4.00	4.00	B-

UG Term GPA	3.054	Term Totals	11.00	11.00	
UG Cum GPA	3.742	Cum Totals	235.00	210.00	

2021-2022 Spring

Course		Cmpt	Title	Attempted	Earned	Grade
CS	210B	LEC	SOFTWARE PROJECT EXPERIENCE WITH CORPORATE PARTNERS Jay Borenstein	3.00	3.00	A
CS	221	LEC	ARTIFICIAL INTELLIGENCE: PRINCIPLES AND TECHNIQUES Previous Grade(s): C Tatsunori Hashimoto	3.00	3.00	A
PHYSICS	172	LEC	SOLID STATE PHYSICS Aharon Kapitulnik	3.00	3.00	C

UG Term GPA	3.333	Term Totals	9.00	9.00	
UG Cum GPA	3.723	Cum Totals	244.00	219.00	

2022-2023 Autumn

Course		Cmpt	Title	Attempted	Earned	Grade
CS	154	LEC	INTRODUCTION TO THE THEORY OF COMPUTATION Omer Reingold	4.00	0.00	
CS	242	LEC	PROGRAMMING LANGUAGES Alex Aiken	4.00	0.00	

UG Term GPA	0.000	Term Totals	8.00	0.00	
UG Cum GPA	3.723	Cum Totals	252.00	219.00	

Undergraduate Career Totals

Cum GPA	3.723	Cum Totals	252.00	219.00

UNITS COMPLETED TOWARDS UNDERGRADUATE DEGREE: 249.00
STANFORD TOTAL UNDERGRADUATE UNITS: 219.00

	Max Allowed	Attempted	Earned

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UG Activity Units	8	0.00	0.00
UG Pass/Fail Units (Satisfactory & Credit)	36*	7.00	6.00

* Transfer Students are allowed a Maximum of 27 Pass/Fail Units

Pass/Fail units do not include terms that are offered Satisfactory/No Credit

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* Worksheet - For office use by authorized Stanford personnel *
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END OF TRANSCRIPT

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Research Experience

1

Organization Name	Location	Dates of Experience
Stanford University	Stanford, CA	06/2019 - 08/2019

Position/Title	Principal Investigator	Hours/Week
Electrical Engineering Summer REU Scholar	Gordon Wetzstein	20

Description

Designed, modeled, 3D-printed, and tested a medical device to to treat strabismus using Risley prisms; presented at a poster session. Skills learned: CAD modeling in Solidworks, electronics, rapid prototyping, technical presentation.

2

Organization Name	Location	Dates of Experience
Stanford University	Stanford, CA	06/2018 - 08/2018

Position/Title	Principal Investigator	Hours/Week
Bio-X Undergraduate Fellow	Euan Ashley	20

Description

Assisted in literature review and implementation of multiomics pipelines and data analysis. Skills learned: reading technical papers, R programming language.

I was dealing with major depression during this research experience, and as a result I was not able to work to my full capacity during my time in Dr. Ashley's lab. I appreciated Dr. Ashley and my research mentor David for being so supportive and understanding.

3

Organization Name	Location	Dates of Experience

Position/Title	Principal Investigator	Hours/Week

Description

Publications / Presentations / Posters

1

Type	Title	Date
Poster	Foveators: Strabismus correction with Risley prisms	08/2019

Authors: (see attached poster)

Peer-reviewed	Journal/Conference/Event Title	Status	PMID
First-author	Electrical Engineering REU Poster Day 2019		

2

Type	Title	Date
Poster	Utilizing differential network methods for analysis of multiomics data	08/2018

Authors: (see attached poster)

Peer-reviewed	Journal/Conference/Event Title	Status	PMID
First-author	Stanford Bio-X Undergraduate Poster Day 2018		

3

Type	Title	Date

Authors:

Peer-reviewed	Journal/Conference/Event Title	Status	PMID
First-author			

4

Type	Title	Date

Authors:

Peer-reviewed	Journal/Conference/Event Title	Status	PMID
First-author			

5

Type	Title	Date

Authors:

Peer-reviewed	Journal/Conference/Event Title	Status	PMID
First-author			

Work Experience

1

Organization Name: Lab64, Electrical Engr. Dept., Stanford University

Location: Stanford, CA

Dates of Experience: 01/2018 - 03/2018

Position/Title: Maker-in-Residence

Industry: Healthcare

Hours/Week: 10

Description: Researched, designed, pitched, obtained materials for, and began building "autofocals" (auto-focusing reading glasses) using Alvarez lenses. Skills learned: soldering, 3D printing, Raspberry Pi, OpenCV, Pupil Labs platform (open source eye tracking software).

Reason for Leaving: The length of the program was one quarter.

2

Organization Name: St. Tammany Parish Public Schools

Location: Mandeville, LA

Dates of Experience: 08/2014 - 09/2015

Position/Title: Substitute teacher

Industry: Education

Hours/Week: 10

Description: Worked as a substitute teacher in elementary, middle, and high schools (including my alma mater) during gap year before starting college. Skills learned: classroom leadership, organizing and implementing lesson plans.

Reason for Leaving: Starting college at Stanford. (I took a gap year after high school.)

3

Organization Name: Self-employed/freelance

Location: Mandeville, LA

Dates of Experience: 08/2014 - 09/2015

Position/Title: Private Tutor

Industry: Education

Hours/Week: 10

Description: Started private tutoring business and tutored junior high, high school, and college students in mathematics, science, English, and ACT prep. Skills learned: teaching, communication, motivating others, adaptability to diverse learning styles.

Reason for Leaving: Starting college at Stanford. (I took a gap year after high school.)

AARON Z REED

aaron73@stanford.edu | +1 (985)-237-5717 | 708 River Oaks Dr., Covington, LA 70433

EDUCATION:

9/2015 - present **Stanford University,** Stanford, CA

- Pursuing B.S. in Engineering Physics; planned M.S. in Computer Science
- Coursework in physics, CS, machine learning, electrical engineering, chemistry, biology
- Academic interests: Physics simulation, biomedical engineering, adaptive optics, AI

8/2010 - 5/2014 **Mandeville High School,** Mandeville LA

- AP coursework in Physics C (Mech and E&M), Calculus, Biology, Macroeconomics, U.S. History, English Literature, Latin, and Computer Science. Scored 5 on all 9 AP tests taken
- Valedictorian ACT: 36 SAT: 2360

8/2012 - 1/2014 **New Orleans Center for Creative Arts,** New Orleans, LA

- Louisiana's high school arts conservatory, attended for jazz piano half days during grades 11 and 12; admitted by audition

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HONORS AND AWARDS:

- 2014 Presidential Scholar Nominee and Semi-Finalist
- National Merit Scholarship Winner
- National AP Scholar Award

EXPERIENCE AND LEADERSHIP:

1/2022 – present **GPU Leasing for Artificial Intelligence**

- Using vast.ai to lease GPUs to AI researchers. Created custom Docker image to idle-mine cryptocurrency and shell scripts for monitoring and conditional overclocking.
- Skills learned: Docker, shell scripting, Nvidia CLI, Ubuntu Server installation and administration

1/2022 – 6/2022 **CS 210: Software Project with Industry Partners,** Stanford University

- In a 4-student team: consulted with Chia blockchain representatives, created a marketplace for NFTs based on Chia tokens, pitched our solution to VC investors (a16z) and Bram Cohen
- Implemented a Chia node and frontend web server on AWS instance; managed system administration and networking tasks
- Skills learned: need-finding, opportunity analysis, business presentation; cryptocurrency technology, NFT design, Chialisp, AWS, Flask, Unix sysadmin skills, IPFS

6/2020 – 8/2020 **ENGR 145: Technology Entrepreneurship,** Stanford University

- In a 4-person team: identified a market need for accessible psychotherapy, interviewed patients, brainstormed/evaluated solutions, and finally pitched an NLP-based therapy app to VC investors
- Built a simple chatbot with voice recognition using OpenAI GPT-3 and Google Cloud
- Skills learned: need-finding, opportunity analysis, business presentation, working with diverse backgrounds and skill sets, Python APIs

6/2019 – 8/2019 **Electrical Engineering REU, Wetzstein Lab,** Stanford University

- Designed, modeled, 3D-printed, and tested a medical device to treat strabismus using Risley prisms; presented at a poster session
- Skills learned: CAD modeling (Solidworks), electronics, rapid prototyping, technical presentation

9/2018 – 9/2019 **Stanford Students in Biodesign, Project Team,** Stanford University
- Designed an NLP pipeline for patient-friendly interpretation of free-text radiology reports
- Skills learned: project management, networking, collaboration in a small (4-person) group

6/2018 – 8/2018 **Bio-X Undergraduate Fellow, Ashley Lab,** Stanford University
- Assisted in literature review and implementation of multi-omics pipelines and data analysis
- Skills learned: reading technical papers, R programming language

1/2018 – 3/2018 **Maker-in-Residence, Lab64,** Stanford University
- Researched, designed, pitched, obtained materials for, and began construction of autofocals (auto-focusing reading glasses) using Alvarez lens-based design
- Skills learned: soldering, 3D printing, Raspberry Pi, OpenCV, Pupil Labs (open source eye tracking software)

2/2017 – 4/2017 "**FroSoCo 500" Derby,** Freshman-Sophomore College, Stanford University
- Worked on a team of 3 students who built an electronic vehicle and participated in a race against other Stanford teams
- Skills learned: RC vehicle basics, technical collaboration

9/2016 – 6/2017 **Sophomore Fellow,** Freshman-Sophomore College, Stanford University
- Organized and coordinated dorm events for freshman and sophomore students on my floor
- Skills learned: social leadership, event planning

8/2014 – 9/2015 **St. Tammany Parish Public School Substitute Teacher,** Mandeville, LA
- Worked as a substitute teacher in elementary, middle, and high schools during gap-year before starting college
- Skills learned: classroom leadership, organizing and implementing lesson plans

8/2014 – 9/2015 **Entrepreneur: Private Tutoring Services,** Mandeville, LA
- Started private tutoring business and tutored Maths, Sciences, English, and ACT prep to junior high, high school, and college students
- Skills learned: teaching, communication, motivating others, adaptability to diverse learning styles

2010 – present **Freelance Musician/Composer**
- Pianist and percussionist in diverse ensembles: church (incl. Catholic Mass at Stanford Memorial Church), stage band, jazz combo, theater pit orchestra, marching and concert band, orchestra
- Most recent project (2019 – present): composed and orchestrated an original musical theater album. Worked with a globally-distributed team of actors, musicians, and production crew.

SKILLS AND INTERESTS:
- **Computer/Technical:** Windows/Mac/Linux OS, Python (incl. NumPy, SciPy, PANDAS, Matplotlib), C/C++, UNIX shell scripting, Java, MATLAB
- **Languages:** English (native), French (3 yrs), Latin (4 yrs), some Mandarin (one summer)
- **Interests:** Music (classical and jazz piano, and percussion); science exploration and research; languages and linguistics

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I am interested in Stanford's CS coterm program because the curriculum furthers the academic interests I developed as an undergraduate. As I was completing my degree in Engineering Physics, I found myself most interested in the computational aspects of physics, such as simulation, quantum computing, and physical modeling in an engineering context. I have extensive coursework in both quantum computing (my EPhys track was Quantum Science and Engineering) and classical computing (the entire CS major core, plus some AI classes). I began an optics project in Wetzstein Lab that evolved into an independent project involving physical modeling of liquid crystals for optics applications -- if possible, I'd like to continue pursuing this project in the context of a Master's thesis. In both my coursework and my research, I realized that fluency in computational methods is essential to progress in a natural science like physics.

To me, the most compelling fields of CS are AI and Systems -- AI because it has yielded great leaps in previously intractable problems in science, such as protein folding and data mining; and Systems because it deals with the architecture and networks that underlie all other software. For this reason, I will be taking both Systems and AI classes in my Master's program.

Reed, Aaron; DOB: 01/01/0001; ID: 399326483

Diversity Statement

Since the age of 14, I've had an invisible disability. I've been physically limited due to heart problems: an enlarged aortic root and a severely leaking aortic valve. A corrective heart surgery is in my near future, made more complicated (and dangerous) because my cardiac anatomy is already abnormal: I was born with a congenital heart defect (Transposition of the Great Arteries) and underwent surgery at 5 days old.

While having a disability has presented me with academic and personal challenges (see "Academic History"), it has also given me a unique perspective and opportunities that I never would have had otherwise. For a long time, I struggled with how to make sense of my medical condition and contextualize it in my own life -- to "make it mean something." That opportunity came when a friend at Stanford confided in me that she too had an invisible disability: accommodative spasm, an eye condition that made basic tasks like reading a whiteboard and taking notes (switching between near and far vision) a struggle, and also kept her in constant pain. She said she usually didn't talk about it because "no one can do anything about it." Knowing what it is to cope with a rare, all-pervasive medical problem without an easy solution, I could not sit idle. Empathy compelled me to try to "do something" anyway.

I investigated the state-of-the-art in eye tracking, adaptive optics, and wearable technology, and came up with a design for a medical device: a pair of glasses that do the work of the eye's lens, automatically changing focal power. I found out about a "Maker-In-Residence" opportunity at Lab64 in the Packard building, pitched my idea, and was funded to work on it for a quarter (Winter 2018). While I was working in Lab64, someone told me about a grad student who had been working on a similar optics project. I contacted that grad student and his PI, Gordon Wetzstein, which led me to do research in Gordon's lab in Summer 2019.

My experience in an engineering lab convinced me that no "off-the-shelf" adaptive optics systems had all the characteristics my application required. I went back to the drawing board and discovered liquid crystals (LCs), a state of matter with unique optical properties and promising engineering applications. Wanting to understand LCs is part of why I changed majors to Engineering Physics. In my physics coursework, I became interested in computational physics simulation, especially simulating the optical properties of LCs to make it easier to design with them. I had to shelve my project due to the pandemic, but I've been looking for an opportunity to pick it up again — a CS Master's thesis could be just such an opportunity.

When I came to Stanford, I never could have predicted how my disability would shape my time here. Sometimes I think my Stanford journey has taken every possible detour, but when I reflect on where it has brought me, I wouldn't change a thing about it.

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Program Supplemental

Form Title	Program Supplemental
Academic Interest 1	Systems
Academic Interest 2	Artificial Intelligence
Academic Interest 3	Computer and Network Security
Please list your home page URL (if any).	https://github.com/aaronzr

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Foveators: Strabismus correction with Risley prisms

Aaron Reed[1], Robert Konrad[1], Gordon Wetzstein[1], Anthony Norcia[2]
[1]Stanford Computational Imaging Lab, [2]Stanford Vision and Neuro-Development Lab

Motivation

- Strabismus (misaligned eyes) affects 5% of people[1]. It can be present in infancy or acquired later. It causes vision loss and destroys stereoacuity (depth perception).
- Current treatment options are[1]:
  1. Surgery: risky and usually not 100% effective
  2. Corrective lenses: fixed, work well only near center of vision
  3. Vision therapy: effective, but difficult, time-consuming, and expensive
- Goal: improve treatment with optical and computational techniques: Risley prisms (**Fig. 1**) and eye tracking (**Fig. 3**)

Methods

1. Create computer-controlled, mechanically actuated Risley prisms
2. Use existing eye-tracking system[2] to find gaze positions, control prisms
3. Use Maxwell's spot (see below) and eye tracker to localize fovea (**Fig. 2**)
4. Run user trials in strabismus patients to test for improved vision and stereoacuity

- Maxwell's spot is a dark splotch that appears in the visual field at the position of the fovea when a particular light stimulus is presented to the subject[3]. The subject can move a cursor to the perceived position of the spot to record its coordinates.

Figures

Figure 1 (above). Risley prisms are two wedge prisms coupled back-to-back. They can deflect light in any direction by angles up to ~20°. *Source: [4]*

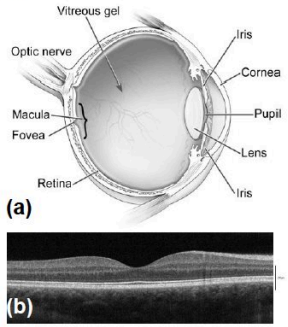

Figure 2 (right). ***(a)*** The fovea has the highest density of photoreceptors of any place on the retina, and provides the sharpest detail to the center of the visual field. ***(b)*** The foveal pit in cross-section. *Source: NIH*

Figure 3. The eye-tracker used to calibrate Risley prisms and localize Maxwell's spot. *Source: own work, [2]*

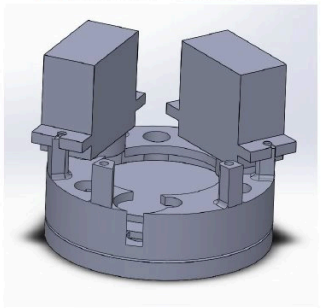

Figure 4. A SolidWorks model of the Risley prism assembly with servos attached. *Source: own work*

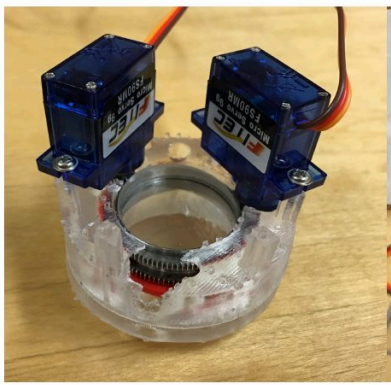

Figure 5. The printed Risley prism assembly. The outer casing (clear plastic) was printed using clear resin on a Formlabs Form 1+ printer. The lens holder (inner red ring) was printed using red PLA filament on an Ultimaker 3 printer. *Source: own work*

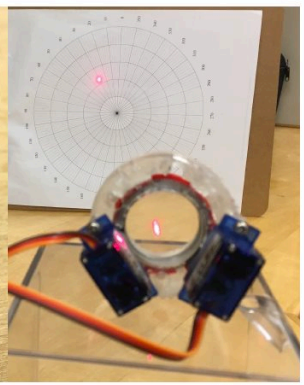

Figure 6. Steering a red laser beam using the device. The image of the laser is deflected from the center of the polar coordinate system although the beam passes through the center of the Risley prisms. *Source: own work*

Results

Commercially available Risley prisms (Thorlabs) were disassembled and paired with two continuous- rotation servo motors (Feetech). A housing for the prisms and servos was designed (**Fig. 4**) in SolidWorks (Dassault Systèmes) and printed (**Fig. 5**) using FDM and SLA 3D printers (Ultimaker; Formlabs). The servos were controlled through the GPIO interface of a Raspberry Pi 4 (Raspberry Pi Foundation) and laser beam steering was demonstrated (**Fig. 6**).

Future work

- Implement eye-tracking hardware and software on the Pi to automate servos
- Migrate low-level servo control to Arduino to improve accuracy
- Preliminary user studies to refine gaze tracking and detection of Maxwell's spot
- Switch to low-profile stepper motors to remove obstruction of peripheral vision by servos
- Miniaturize prism assembly and integrate into a wearable platform for strabismus trials
- Long-term clinical trials in strabismus patients to compare with current treatment options

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Utilizing differential network methods for analysis of multiomics data

Aaron Reed[1], David Amar[2], Euan Ashley[2]
Departments of Computer Science[1] and Cardiovascular Medicine[2], Stanford University

Introduction

Multiomics is the analysis and interpretation of data across different types of "omics," including genomics, proteomics, transcriptomics, metabolomics, and microbiomics. Data can vary across samples, subjects, and time points. Analysis of this data is complicated by its heterogeneity: data points vary across omics types, subjects, and time. Various methods have been implemented to address different challenges of interpreting this data.

Many approaches use the paradigm of biological networks to organize data. In this representation, analytes (e.g., genes, proteins, clinical markers) are represented as nodes in a network and the relationships among them (e.g. coexpression, protein-protein interactions) are represented as edges. In **differential network analysis,** two networks are compared and the differences between them are highlighted. For example, subtracting the coexpression network of a set of genes in healthy patients from one in diseased patients would yield a representation of how gene interactions change with the onset of disease. Our project focuses on comparing differential analysis algorithms in the analysis of multiomics data.

Methods

We analyzed data from the **iPOP (Integrative Personalized Omics Profiling; Chen et al. 2012)** study performed in the Snyder Lab at Stanford. The study tracked 108 individuals, many of whom were pre-diabetic, in order to measure how various omics measurements change with the onset of disease. We isolated the RNA data from the study and ran differential analyses using two published methods:

1. ModMap (Amar and Shamir 2014)

Given two networks representing different types of gene interactions, the ModMap algorithm finds strongly connected modules in the first network and inter-module connections in the second. For example, the first set of gene interactions could represent the frequency of gene co-expression, and the second could represent interactions between the proteins encoded by the genes.

Mathematically, the algorithm takes as input two graphs G and H with the same vertices but different edge weights: $G = (V, E_G, W_G)$, $F = (V, E_G, W_G)$. It outputs a graph $F = (M, L)$, where M contains disjoint subsets of V that are highly connected in G ("modules"), and L is a set of links between modules based on their connectivity in H.

2. DINGO (Ha et al. 2015)

DINGO creates differential gene expression networks by performing a procedure akin to subtracting one network from another. For example, it is possible to isolate the differences in gene expression between long-term and short-term survivors of glioblastoma by comparing the networks in each case.

DINGO takes genomic data such as mRNA, methylation, DNA copy number, and microRNA from each group in the form of a matrix $\mathbf{Y}$ (n patients x p genes) and $\mathbf{X}$ (n x 2, indicating to which of two groups each patient belongs). It then estimates a GGM (Gaussian graphical model) with two components: G, representing the "global" component of the network (the part that is conserved between both groups) and $L(x)$, the "local" component representing the differences between the group networks.

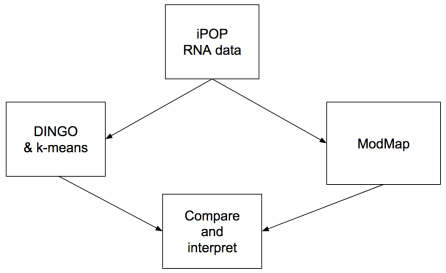

Figure 1: Analysis pipeline

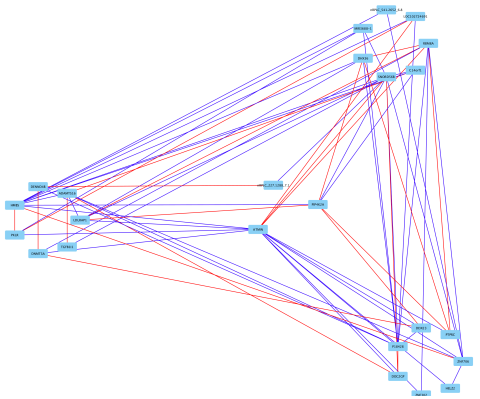

Figure 2: Clusters with differential edge scores found by DINGO

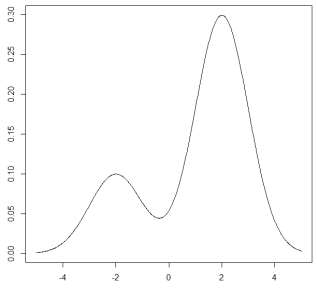

Figure 3: Mixture of Gaussians produced by ModMap

Results

We ran DINGO on a randomly sampled, 50-gene subset of the iPOP RNA data from healthy and diseased patients. This produced 1225 edges between gene pairs, representing the differences in the correlation networks in the healthy and infected groups. We selected for significant p values, leaving 44 edges. Finally, we used k-means clustering to group these genes into three clusters, representing genes that were highly correlated in the original networks. As a result, their expression levels change as a unit, preserving the genes' correlation with each other between healthy and diseased groups. Thus, a preponderance of the edges are found between the clusters rather than within them. These results are displayed in **Figure 2**.

We also ran the ModMap algorithm on all ~7000 genes from the iPOP dataset. Community identification yielded several modules (analogous to clusters), one of which contained genes with low correlations. This cluster was removed from the rest and analyzed separately as "non-mated" genes, i.e., those that do not have strong correlations with another gene. Plotting the correlations yielded a mixture of Gaussians, schematized in **Figure 3,** with a clear delineation between the mated and non-mated groups. However, the non-mated genes had an average correlation > 0, indicating either a technical error in processing or the need to change the input parameters to the algorithm to produce more statistically sound results.

Future directions for this research involve repeating DINGO on a 500-gene set to find more robust differential networks and diagnosing the statistical inconsistencies in the ModMap results.

References

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4. Chen, R. et al. Personal omics profiling reveals dynamic molecular and medical phenotypes.

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