

Postgraduate Application Form

UNIVERSITY OF CAMBRIDGE
Postgraduate Admissions Office

Kim, Ms Grace Ra

Course	MASt in Astrophysics (MASAS)	Date submitted	05 Dec 2023
Department	Institute of Astronomy	Mode of study	Full Time
Course start date	01 Oct 2024 (MT 2024)	PUF	No

Academic History

Aug 2019 - May 2023	Bachelors of Science in Engineering Sciences (Harvard SEAS) - All or mostly full-time	Cum Laude	Harvard University (<i>United States</i>)
Oct 2023 - Jun 2024 <i>(Not yet obtained)</i>	Masters of Philosphy in Advanced Computer Science (Computer Science) - All or mostly full-time *	A	University of Cambridge (<i>United Kingdom</i>)

Immigration	Language														
<table><tr><td>Nationality</td><td>United States (1st), Korea, Republic of (2nd)</td></tr><tr><td>Country of birth</td><td>United States</td></tr><tr><td>Currently ordinarily resident</td><td>United States</td></tr><tr><td>Country of birth is ordinary residence since birth</td><td>Yes</td></tr><tr><td>Estimated fee status</td><td>Overseas</td></tr><tr><td>Visa</td><td>Required</td></tr><tr><td>Visa type</td><td>I hold a Student visa</td></tr></table>	Nationality	United States (1st), Korea, Republic of (2nd)	Country of birth	United States	Currently ordinarily resident	United States	Country of birth is ordinary residence since birth	Yes	Estimated fee status	Overseas	Visa	Required	Visa type	I hold a Student visa	Not required
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Estimated fee status	Overseas														
Visa	Required														
Visa type	I hold a Student visa														

Scholarships

Apply for funding No

* Document not uploaded at the point of submission
** Other university

Curriculum Vitae

Uploaded

Career Goals

981/1000 chars

Throughout my undergraduate degree, I explored my passion for satellite technology by leading the Harvard Satellite Team, designing flight hardware with SpaceX Starlink satellite constellations, and programming predictive spacecraft collision avoidance algorithms at Kayhan Space. While I ultimately want to return to industry, I realize the research questions I would like to answer lie in the intersection of ML, distributed systems, and aerospace. This year, I built a stronger foundation in ML and federated systems through the University of Cambridge's MPhil in Advanced Computer Science. Having this experience, I aim to continue towards a pursuit of a PhD expanding on my current research interests: distributed autonomous systems and on board ML to improve satellite constellation communication and control. These experiences and knowledge will bring me one step closer to establishing my own startup optimizing satellite constellations and deep space networks through ML.

Additional Information to Support Application

995/1000 chars

I am a First-Generation, Low-Income (FGLI) student, and am immensely grateful to have the ability to pursue higher education. However, this journey wouldn't have been fathomable without my parents' sacrifices immigrating to the US. Due to their poor English, they took on menial jobs to scrape up money for food and rent each month. I live each day hoping to repay them for their endless struggles and affection, and I finally reached a place to start giving back. Reflecting now, I realize I leaped many steps closer to my dreams than I ever thought possible. I've led the Harvard College Engineering Society and the FGLI Student Union as President. I became Chief Engineer of the Harvard Satellite Team, and have a patent under my name. I worked at SpaceX and designed components manufactured in the thousands; they are now flown on every Starlink V2.0 satellite launched this year. Now I'm at Cambridge, taking my first steps in exploring my passions within satellite constellations research.

Course Specific Questions

Core - statement of interest	As an engineer, I always attempted to better understand the intersection and crossover between hardware and software, specifically on the utilization of scientific instrument data for research into deep space. I am particularly interested in the utilization of machine learning for the analysis of infrared imagery taken on the James Webb telescope. After having built my foundations in ML, federated learning, and computer vision through the University of Cambridge's MPhil in Advanced Computer Science, I am excited to take on the opportunity to expand my knowledge and expertise within these topics by applying state of the art ML models for astrophysics research through this MASt program.
Core - reasons for applying	Previously, my expertise has generally been centralized within ML applied on space systems research due to my extensive experience working on developing satellite constellations and cube satellite missions. However, in order to continue progressing within this field, I realize I would benefit immensely from gaining a more in depth understanding of the scientific research directions currently being taken within astrophysics to continue building spacecraft that support them. I've identified several topics of interest ranging from, but not limited to: galaxy identification in sky surveys, searching for transient events like supernovas, and spotting signatures of life on Mars! It is my hope to find many areas where I can apply machine learning principles to the fields of research available in astrophysics through my courses, and pursue a final project that allows me to practice this.
Astronomy - Extra Materials WP	Uploaded

Application Information

Academic Awards

2023 Marshall Scholar, 2023 Rhodes Scholarship Finalist	Marshall Scholarships finance young Americans of high ability to study for a degree in the UK.	31 Dec 2022	£100,000.00
Harvard - Cum Laude, Department High Honors, John Harvard Scholar	GPA in top 20% of Class of '23, one of few selected from Department of Engineering as High Honors	30 Sep 2020	
Currency Sorting Mechanisms and Methods - Patent #10,672,213	Invented a wallet that identifies/sorts US paper currency for visually impaired individuals	30 Jun 2020	
Scholarships (Gates, Jack Kent Cooke, Coca Cola, GE Reagan)	Scholarships awarded to finance four year undergraduate education at Harvard University	30 Sep 2019	£500,000.00
Deans Award for Outstanding Engineering Project: Best Senior Thesis Award	Thesis: Machining/Optimizing a GNC Subsystem for the CalIPER Calibration Satellite of Europa Clipper	31 May 2023	£500.00

Employment History

Sep 2022 - Aug 2023	Vacuum Vessel Engineering Intern	Commonwealth Fusion Systems (Cambridge, MA, United States)
May 2022 - Aug 2022	Starlink Payload Mechanical Engineering Intern	SpaceX (Redmond, WA, United States)
Dec 2019 - Aug 2021	Undergraduate Researcher - Harvard College Research Program (HCRP) Stipend	Harvard Microrobotics Laboratory (Cambridge, MA, United States)
Jun 2021 - Aug 2021	Undergraduate Researcher - Sim2Real Reinforcement Learning	Stanford Intelligent Systems Laboratory (Palo Al, CA, United States)
Jun 2021 - Apr 2022	Space Data Analyst and Modeling Co-Op Intern	MITRE (Bedford, MA, United States)

Other Applications Made

PhD	Computer Science	University of Cambridge (United Kingdom)
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Personal Information

Identifying Information

Full name

Kim, Ms Grace Ra

Date of birth

21 Aug 2001

Previous name

Legal gender

Female

Contact

Email

gracek1459@gmail.com

Phone

+44 7887479266 (1st)
+1 2408057547 (2nd)

Skype address

Home address

Same as contact address

Contact address

19 Polk Ct, Gaithersburg, Maryland,
20878, United States

Valid until

01 Apr 2025

Valid until

Dependants

Partner

WILL NOT bring partner

Child

WILL NOT bring children

Disability

Disability

No

Further information

Adjustment for Interview

Adjustment required

No

Details

College Preferences

College

Gonville and Caius College (1st)
King's College (2nd)

Current Membership

College

Gonville and Caius College

Visa Requirement

Visa type

I hold a Student visa

Study Visas

Applicant previously **STUDIED** in the UK

Visa type

Student Visa (including Tier 4)

Start date

09 Aug 2023

Qualification level

Level 07: Masters Degree, PGCert., PGDip., PGCE

End date

30 Aug 2024

Funding Application

Not wish to apply for any funds

I have secured external funding that covers my course fees and living costs (please give details below)

Mastercard Foundation

Your Funding

Funding Sources

	Details	Date of decision	Tenure years	Amount per year
Scholarship/grant	Marshall Scholarship: Marshall Scholarships finance young Americans of high ability to study for a degree in the United Kingdom. Up to fifty Scholars are selected each year to study at graduate level at an UK institution in any field of study.		1	
Total available				£0.00

Declaration

The information you have provided forms the legal basis of your application to the University of Cambridge. We reserve the right to refuse admission in the event of any misrepresentation by you. Submission of an application does not imply an offer of admission.

- The University of Cambridge, the Cambridge Colleges, the Gates Cambridge Trust and the Cambridge Commonwealth, European and International Trust (and their collaborators) will use your personal information for the purpose of processing your applications for admission and funding and deciding whether to offer you a place for the course you have applied for. For further information on the use of your personal information during the application process, please see [How we use your personal information \(for applicants\)](#).
- I certify that all the information given in this application is complete and accurate. I also understand that if I have given false or misleading information, the University of Cambridge will not admit me as a Postgraduate student and may take legal action against me.
- I certify that I am the original and sole author of all work submitted as part of this application, except where clearly indicated otherwise.
- I understand that if my application is unsuccessful, the papers relating to it will be destroyed and cannot be returned.

I confirm that I have read, understand and agree to the above declarations.

Postgraduate Application Form
(Supplementary)



Kim, Ms Grace Ra

Course

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(Not yet obtained)

Masters of Philosphy in Advanced Computer Science (Computer Science)

A

University of Cambridge (United Kingdom)

CAN'T UPLOAD

Other (please outline below)
Have not graduated yet, no transcript available.

** Other university

Kim, Grace R.
Admitted in 2019
Good Academic Standing

Kirkland House
HUID: 11423515

Degrees Awarded
Degree: Bachelor of Science
Date Conferred: 05/25/2023
College Honors: Cum Laude in Engineering Sciences
Dept Honors: Recommended for High Honors in Engineering Sciences

Academic Program
Concentration: Engineering Sciences

Beginning of Harvard College Record

2019 Fall			
Course	Description	Earned	Grade
ENG-SCI 51	Computer-Aided Machine Design	4.000	A
FRSEMR 51N	The Secrets of Stradivarius or What Makes the Violin Sound Beautiful?	4.000	SAT
GOV 1005	Data	4.000	A
MATH 21A	Multivariable Calculus	4.000	A

2020 Spring
2020 Spring semester significantly disrupted starting 10 March 2020 due to Coronavirus COVID-19 outbreak. Mandatory Satisfactory (SEM)/Unsatisfactory (UEM) grading in effect. Other grades appearing in this semester were submitted prior to 10 March.

Course	Description	Earned	Grade
EXPOS 20	Expository Writing 20	4.000	SEM
Course Topic: GENED 1102	The Psychology of Success and Making Change When Change is Hard: the Law, Politics, and Policy of Social Change	4.000	SEM
MATH 21B	Linear Algebra and Differential Equations	4.000	SEM
PHYSICS 15A	Introductory Mechanics and Relativity	4.000	SEM

Term Honor: John Harvard Scholar

2020 Fall			
Course	Description	Earned	Grade
COMPSCI 50	Introduction to Computer Science	4.000	A
ENG-SCI 125	Mechanical Systems	4.000	A-
GOV 1347	Election Analytics	4.000	A
PHYSICS 15B	Introductory Electromagnetism and Statistical Physics	4.000	A

2021 Spring			
Course	Description	Earned	Grade
ENG-SCI 50	Introduction to Electrical Engineering	4.000	A
ENG-SCI 120	Introduction to the Mechanics of Solids	4.000	B+
ENG-SCI 128	Computational Solid and Structural Mechanics	4.000	A
GENED 1067	Creativity	4.000	A

2021 Fall

Course	Description	Earned	Grade
ENG-SCI 96	Engineering Problem Solving and Design Project	4.000	A
ENG-SCI 159	Introduction to Robotics	4.000	A
ESE 160	Space Science and Engineering: Theory and Applications	4.000	A
GENED 1080	How Music Works: Engineering the Acoustical World	4.000	A

2022 Spring

Course	Description	Earned	Grade
COMPSCI 286	Multi-Robot Systems: Control, Communication, and Security	4.000	A
ENG-SCI 150	Probability with Engineering Applications	4.000	A-
ENG-SCI 177	Microfabrication Laboratory	4.000	A
MUSIC 161R	Advanced Composition	4.000	A

2022 Fall

Course	Description	Earned	Grade
ASTRON 17	Galactic and Extragalactic Astronomy	4.000	A-
ENG-SCI 100HFA	Engineering Design Projects	0.000	A
ENG-SCI 155	Systems and Control	4.000	A
ENG-SCI 192	Materials Selection and Design	4.000	A-

2023 Spring

Course	Description	Earned	Grade
APMTH 201	Physical Mathematics I	4.000	A
ASTRON 100	Methods of Observational Astronomy	4.000	A-
ENG-SCI 24	Flavor Molecules of Food Fermentation: Exploration and Inquiry	4.000	A
ENG-SCI 100HFB	Engineering Design Projects	4.000	A
GENED 1178	Mexico and the Making of Global Cuisine	4.000	PA

Harvard College Career Totals
Cum GPA: 3.911

Cum Totals 128.000 104.000

End of Harvard College Record

Academic reference for Ms Grace Ra Kim

MASt in Astrophysics

Referee Details

Name	Professor Robert Wood	Job title	Charles River Professor of Engineering and Applied Sciences
Email	rjwood@seas.harvard.edu	Department	School of Engineering and Applied Sciences (SEAS)
Phone		Institution	Harvard University
Relationship	research advisor	City	Cambridge
Known for	three years	Country	United States

Reference

Academic ranking	The best performance in their year 50
Student potential	Distinctly original/creative/independent of thought
Course suitability	Exceptionally Suitable

Reference provided as uploaded file. Please see the next page.



Dear Admissions Committee,

I am writing with my most enthusiastic recommendation for Grace Kim for your graduate program. I have known Grace while she was an undergraduate at Harvard. I served as her research advisor for several projects in my lab, including studying the dexterity of soft robotic manipulators and, more recently, modifying drones to study marine mammals. These are a very exciting topics in my lab and Grace has made significant contributions over the short time that she has worked with us.

In her first research project with us, Grace worked with one of our senior graduate students to explore actuated palm mechanisms for soft robot hands. We have been developing soft hands as alternatives to more classical rigid robotic manipulators for nearly a decade. These hands have benefits in terms of their compliance which enables delicate interaction with grasped objects without the need for feedback control on motion or contact forces. As an example of this utility, we have deployed these soft hands throughout the world's oceans as a means to interact with and gently sample marine organisms from the deep ocean without harming them. More recently, through Grace's research topic, we have been attempting to achieve human-level dexterity using these compliant fingers. This had involved an exploration — in both hardware and software — of digit design, implementing additional degrees of freedom in the digits and hand itself, and integration of other components such as a palm. This was very successful and led us to a greater understanding of the role of a palm, both passive and active, for dexterous robotic manipulation. Her results were described in a series of three papers that she and her mentors published in the two most important robotics conferences and a high impact robotics journal — no small feat for an undergraduate project! Grace deigned a mechanism that controls the height of the palm surface relative to the robotic fingers, thus allowing the object being grasped to change its position to better engage with the fingers performing the grasp. This investigation was a combination of simulations and hardware experiments, and Grace excelled in both domains.

More recently, Grace moved on to join Project CETI — the CEtacean Translation Initiative. This is a large and interdisciplinary project that aims to collect a huge amount of vocalization (and other) data on a population of sperm whales that live in proximity to the island of Dominica in the Caribbean. This data will then be provided to machine learning and linguistics experts to decode structure and, we hope, allow us to communicate with this majestic species. My group is heavily involved on the data collection side of the project. Specifically, we are developing hardware that will (non-invasively) attach to whales to perform recordings, as well as hardware to assist with the deployment of those devices and other recording devices such as drones and autonomous underwater vehicles. The use of drones for both deployment and collection of these recording devices, in addition as stand-alone recording devices is poised to dramatically accelerate our data collection throughput relative to more manual deployment means that have been used for the past several decades by cetacean researchers. In addition, the drones are far quieter than boats, thereby reducing the disturbances to the whales while these assets are deployed. However, there are no off-the-shelf drones that can be used for this purpose and so Grace worked with us to redesign components for existing drones to make them programmable for our needs, as well as incorporating features for waterproofing and related aspects of robustness. This has been hugely successful in a short period — shortly after Grace got involved we embarked on an expedition in Dominica where the drones were tested successfully for the first time, proving that their use for this project will be invaluable.

It is rare for undergraduates to produce publishable work in top venues/journals, and I believe this speaks to Grace's collaborative nature and the rigor that she applies to her research. I have been very impressed with the maturity that she has shown over the past several years. Grace is currently a graduate student at the University of Cambridge after receiving a Marshall Scholarship. This extremely competitive program (given to roughly 40 students per year from all across the United States) attests to her skills and recognition as one of the top undergraduates in the country!

In summary, I strongly recommend you consider Grace for your program. I would welcome the opportunity to work with her again in the future — undoubtedly a very bright future for future academic pursuits. Please do not hesitate to contact me if I can be of further assistance with this case.

Sincerely,



Harvard John A. Paulson
School of Engineering
and Applied Sciences

Harvard Science and Engineering Complex
150 Western Avenue, Rm 4.217
Allston, MA 02134
P: 617 496 1341 rjwood@seas.harvard.edu
www.micro.seas.harvard.edu

Robert J. Wood

Harry Lewis and Marlyn McGrath
Professor of Engineering and Applied Sciences
Harvard John A. Paulson School of Engineering and Applied Sciences

Robert Wood

Academic reference for Ms Grace Ra Kim

MASt in Astrophysics

Referee Details

Name	Dr Julia Lee	Job title	Professor, Executive Director for Education and Research
Email	julialeestremple@gmail.com	Department	School of Engineering and Applied Sciences (SEAS)
Phone		Institution	Harvard University
Relationship	Professor in class; mentor	City	Cambridge
Known for	Sept 2021-present	Country	United States

Reference

Academic ranking	The best performance you have known in the last 5 years The class itself was just 15 students since the intent was to keep it small for the project work. However, I have taught at Harvard for 18 years and I would rank Grace most definitely in the top 3% (if not higher) over all across those years.
Student potential	Outstandingly original/creative/independent of thought
Course suitability	Exceptionally Suitable

Reference provided as uploaded file. Please see the next page.



HARVARD

School of Engineering and Applied Sciences

Julia C. Lee, PhD | +1-617-230-1217 | julialeestremple@gmail.com | [LinkedIn](#) | [Research](#)

3 December 2023

Dear Committee,

What a pleasure it is to be able to write on behalf of one of my more exceptional students, Grace Kim, to continue her studies at the Cambridge University IoA where I did my own PhD, a place that has had a profound impact in shaping my own life. Of all the undergraduates, graduate students, and postdocs I have taught over the course of my 17-year career at Harvard, Grace ranks amongst the top few I would recommend with such enthusiasm based on her academic achievements and character. Her resume and academic record will speak for themselves, but it is worth noting that she undertook a challenging concentration/major of her own design (Aerospace and Robotics; degrees not formally offered through the Harvard School of Engineering & Applied Sciences) within already challenging requirements for the ABET accredited Bachelor of Science degree in Engineering Sciences. Beyond her academic achievements and already impressive internship/work history, I see Grace as a confident yet humble young woman with the fortitude to drive her own destiny, a leader who will actively elevate and support those around her, and a selfless individual who will prioritize for the good of the whole. I can support these claims with concrete examples based on my observations of her as a student in my class and through extended one-on-one conversations. I am thrilled that she wants to stay at Cambridge University beyond her Marshall Scholarship year.

I first got to know Grace during Fall 2021 when she was enrolled in my Engineering-Sciences 96 (ES96) class. This course is one in which junior/senior level students are tasked to work in teams to solve a challenge posed by a client. In the interest of brevity, I will give examples of how Grace stood out as the top student in a class of very high achieving and capable students and refer interested readers to the [Harvard SEAS article](#) lauding student undertakings and achievements in that class. There is no question that Grace is technically capable, one of the best, if not the best in the class. What makes her exceptional is her ability to fluidly transition between leadership and supporting roles as necessary for the good of the team without demand for recognition. Two examples illustrate this well.

— As project manager for the ES96 computer vision prototyping team, ***Grace demonstrated her effectiveness as a leader, collaborator, and mentor.*** She took on the challenge of learning and mastering the YOLO object detection algorithm and together with two other technically advanced classmates, set up the necessary electronics and training algorithms. Grace also took time to teach a less technically capable classmate (hereafter Student X) critical engineering skills X needed to contribute to the team. What impressed me most about this is the considerable time Grace spent mentoring Student X during and outside of class even as her own deadlines loomed. The result of these efforts was a noticeable change in Student X's demeanor from one of dejection at the onset to something more purposeful and confident as the course progressed. When I pulled Grace aside to acknowledge her efforts, she was surprised and then simply replied that it was her pleasure to help a fellow teammate. X was a struggling minority student who resisted/avoided asking me or my teaching assistant for help despite our continued encouragement for her to seek us out. As such, it was gratifying and somewhat of a relief to see X flourish under Grace's tutelage.

— As a team-member, ***Grace is a person who will go the extra mile to ensure the highest quality work from the team.*** This is best exemplified by the fact that whilst another student had been assigned the project manager role for organizing and summarizing the results from the three prototyping teams for the final presentation to clients, it was Grace who took the extra time to develop an effective narrative that framed all three teams' efforts in a way that demonstrated the efficacy and deployability of the solution as

a whole, and class efforts to best effect. I can assign credit to Grace because it was she who spent another two hours with me to discuss the framing for the presentation after an already three-hour special (and intensive) session with the entire class. The outcome was a sophisticated and professional presentation and a happy client who repeatedly marveled at how the deliverables exceeded far beyond expectations.

In summary, Grace exemplified true leadership skills by mentoring the struggling, supporting where needed, and taking charge when the situation called for it, all for the good of the team without demand for recognition. This ES96 class cohort was exceptional but Grace, in her unassuming way, played a pivotal role in elevating the quality of work and the experiences of many.

Having spent my own PhD years at Cambridge University, I can say without a doubt that it is exactly the type of environment where Grace can flourish. I hope that you will agree with me that she is the type of individual worthy of your nurture. I have no doubt that she will continue to do Cambridge proud.

Please do not hesitate to contact me if I can be of further assistance.

Sincerely yours,

Julia C. Lee



My brief bio if needed: I recently left Harvard to pursue several startups but have held the following senior academic positions: (1) 2005-2014: Professor of Astrophysics (Harvard Dept. of Astronomy), (2) 2014-2021: Executive Director for Education and Research (Harvard Paulson School of Engineering & Applied Sciences), (3) 2016-2022: Executive Vice Provost ([UTECH](#): new startup engineering and technology university in Peru that I drove the academic vision for) – this was a position that was concurrent with but separate from my Harvard appointment overlapping many of the same years. Cambridge University (1996 Matriculation; St. John's College, PhD).

We thank you for your time spent taking this survey.
Your response has been recorded.

Below is a summary of your responses

[Download PDF](#)

Institute of Astronomy

Important: please read before continuing

In this form, you will be asked a series of questions to help us gather information about your **previous** university study. The questions relate to your previous study, not the course that you are currently applying to. Depending on department procedures, relevant contextual data may have a small impact on some funding opportunities, so if your application is eligible for University funding, we encourage you to fill in this form.

You will be given the opportunity to tell us about any events or circumstances that have had an impact on your education, and limited your ability to perform in your studies. **You do not need to provide personal or detailed information about these circumstances**, we only ask you give details of the **impact** that they have had on your studies.

Please only provide the information that you are asked for in the form, and leave the text box blank if you cannot/ do not wish to respond. You should only provide information in the form if you feel comfortable to do so. Your application will not be disadvantaged if you choose not to respond to the questions, and your academic merit will be assessed based on the information you provide in other parts of the application. Once you have completed this form, you will need to download a PDF copy of your answers to upload to the [applicant portal](#). You will be given the option to download the PDF at end of the form, and you will also receive a copy by email. This

the PDF at end of the form, and you will also receive a copy by email. This will be sent to you as soon as the form is submitted.

Your first name:

Grace

Your surname:

Kim

Your email address:

gracek1459@gmail.com

Confirm your email address:

gracek1459@gmail.com

The following questions relate to your experience of studying at undergraduate/ bachelor's level.

Your undergraduate/ bachelor's institution:

Harvard University

Did you undertake your degree full-time or part-time?

☒ **Full-time**

☐ Part-time (for any part of the degree)

When choosing your university, were there any factors other than grades that you felt limited your choice of institution?

e.g. not being able to live away from home, financial considerations, concerns about fitting in

Financial considerations, mostly needed full financial aid to attend my undergraduate institution.

Characters remaining: 901

Did you have any essential regular commitments that impacted the extent to which you could dedicate yourself to your studies? If so, please explain the impact of this on your studies.

e.g. caring responsibilities, being a single parent or guardian, employment during studies

I took on several jobs over the course of my degree to send money back to my family to pay our apartment rent and utility fees. Although it was difficult to manage my studies with this additional responsibility, I was able to graduate with a 3.911/4 GPA, recognized as Cum Laude in my class.

Characters remaining: 709

Did you experience any serious disruption to your studies that prevented you from studying for at least 3 months over the course of a year? If so, please explain the impact of this on your studies. It is not necessary to provide details about the nature of the disruption.

e.g. illness, bereavement

Characters remaining: 1000

The following questions relate to your previous experience of university study at all levels (undergraduate and/or postgraduate).

Some students get off to a slower start than others in their studies, and later show an upward progression in their marks.

Were there any circumstances that you feel initially inhibited your academic performance? If so, please provide details of the impact on your studies, and the change in circumstances that allowed you to improve your performance.

N/A

Characters remaining: 997

Please use the space below to let us know about anything else that has had an impact on your studies or educational pathway. You might like to explain any incomplete qualifications or course changes.

Characters remaining: 1000

Powered by Qualtrics [↗](#)

GRACE RA KIM

gracekim@college.harvard.edu • 240-805-7547

EDUCATION:

University of Cambridge – Marshall Scholar Cambridge, UK
Masters in Advanced Computer Science – CamMLsys - Federated Learning for Satellite Constellations Class of 2024

Harvard University – Harvard College School of Engineering and Applied Sciences Cambridge, MA
High Honors B.S. in Engineering Sciences – Cum Laude GPA: 3.911/4.0 Class of 2023

HONORS: Rhodes Finalist, Marshall Scholar, John Harvard Scholar Top 5% GPA of Class, Coca Cola Scholar, Gates Scholar, Jack Kent Cooke Scholar, GE Reagan Scholar, President's Volunteer Service Award, Comcast Leaders & Achievers Scholar, Performer at John F. Kennedy Center Centennial Celebration

RESEARCH/TEACHING:

Harvard Microrobotics Laboratory Cambridge, MA
Undergraduate Researcher - Harvard College Research Program (HCRP) Stipend Dec 2019 – May 2022

- Reconfigured internal structure, electronics of a Splashdrone 3 UAV on **AutoCAD Fusion 360** to utilize open-source components for drone's mechanics and control systems, earned **UAV Drone Pilots License**
- Conducted research in mechanical design of dexterous soft robotic hand, redesigned a compliant soft actuated palm within **AutoCAD Fusion 360** and **python pybullet** simulations to enhance capabilities with grasping and in-hand manipulation

Stanford Intelligent Systems Laboratory Remote - Palo Al, CA
Undergraduate Researcher – SURF (Summer Undergraduate Research Fellowship) June 2021 – Aug 2021

- Explored Sim2Real principles through reinforcement learning in **Julia POMDP** and **Crux** libraries, on a personally designed and built hardware setup and simulation model for an *inverted reaction wheel pendulum*

Harvard Mechanical Engineering Department Cambridge, MA
ES 51 Course Assistant - Bok Center Certificate of Distinction in Teaching Aug 2021 – May 2022

- Led two weekly lab sections teaching machining principles on the lathe, CNC, laser cutter, 3D printers, silicone casting, soldering, and other introductory machine shop tools; taught Friday lectures, weekly OH

WORK EXPERIENCE:

Commonwealth Fusion Systems Cambridge, MA
Vacuum Vessel Engineering Intern Sept 2022 – Aug 2023

- Developing shielding layouts and configurations for off plane port plugs utilized on the SPARC tokamak vacuum vessel, need to withstand electromagnetic and structural loads

SpaceX Redmond, WA
Starlink Payload Mechanical Engineering Intern May 2022 – Aug 2022

- Designed **four injection molded flight components** to be utilized on the Starlink V2.0 Satellites, **mitigating satellite brightness** and unwanted light diffraction by accounting for **thermal duty cycle effects** on surface interface between the plastic and reflective adhesion material; full thermal analysis performed on **ANSYS**, designed components, and created GD&T drawings through **NX**

MITRE Bedford, MA
Space Data Analyst and Modeling Co-Op Intern June 2021 – April 2022

- Performed in depth **verification and validation analysis** of MITRE's main space system modeling toolkits **STK** and **AFSIM**, focusing on the J2 and SGP4 orbital satellite propagators; identified key differences in ground station access calculations and precession rates through classical orbital elements

Kayhan Space Remote - Boulder, CO
Aerospace Engineering Intern, 2021 Zed Factor Fellow May 2021 – Aug 2021

- Developed functionality for **Monte Carlo** analysis on Kayhan Space's integrated spaceflight operations tools & conjunction assessments for collision events that cannot be calculated through simplified assumptions with 2D formulations on their Phoenix **Python** libraries

Code for America Remote – Fort Collins, CO
Data Scientist, Community Fellow Oct 2020 – June 2021

- Worked directly with the City of Fort Collins to create a user-friendly **web-based application** increasing accessibility for income-qualified programs to eligible residents, income verification capabilities included

TECHNICAL PROJECTS:

Senior Thesis – *Machining and Optimizing the CaliPER Satellite GNC subsystem, calibrating Europa Clipper (2023)*

- In collaboration with **NASA Jet Propulsion Laboratory**, fully designed, built, and characterized a 6U cube satellite Guidance Navigation and Control (GNC) system with student designed sun sensors and reaction wheels, and integrated hardware 1D test setup, **Deans Award for Outstanding Engineering Project**

Harvard Satellite Team – *Chief Engineer; Project Manager*

- Led interdisciplinary collaboration of 4 subgroups in the design, construction, and operation of a **2U cube satellite**, testing and designing a developmental stable **solar panel array actuator** using **SMAs**
- Designed, analyzed, welded, and machined groundstation antenna mount on **Solidworks FEA**, developed superstructure manufacturing protocols on **Solidworks CAM**, **pick and placed** and programmed open source **PyCubed** on board computers with **Circuit Python**, modeled orbit/access/link budget in **STK**, awarded **NASA CSLI launch initiative for launch in 2025**

SmartWallet/Money Sorter – *Technical/Sustainability Lead - Patent #10,672,213 – Citation Senator Chris Van Hollen (MD)*

- Invented a **patented** wallet that identifies/sorts US paper currency for visually impaired individuals, developed identification mechanism utilizing security features within material, took charge of rapid prototyping process with **AutoCAD Fusion** and **3D printing**, with emphasis on sustainable design
- Supported by **Microsoft #Make WhatsNext** program, won **\$8,000 Lemelson-MIT InvenTeam** initiative, fundraised additional **\$10,000** on GoFundMe

CovidCubicles - *Awarded 3rd overall – Engineers Without Borders USA (EWB-USA) Hackathon*

- Reengineered current designs of physical barriers utilized to **block the primary method of COVID transmission** with an alternative **low-cost, reusable** barrier for setting up field hospitals
- Presented to **EWB-USA Board of Directors** and build manuals **distributed in Dominican Republic and Guatemala**

ES 128 Finite Element Analysis Course - *FEA of Optimal Rocket Structure*

- Wrote **ABAQUS** scripts and **MATLAB** code minimizing Von mises stress and plastic strain of a simplified **SpaceX Falcon Heavy** rocket by optimizing landing leg geometry; analyzed under variable masses/thrusts, velocities, tilts, & wind

LEADERSHIP:

PRIMUS Harvard First Generation Low Income Student Union

Cambridge, MA

President, Chair of External Relations, Greater Exec Board Member

Oct 2019 – May 2022

- Representative for Harvard's undergraduate population of all first-generation students, oversee executive board of **25** members. Connected **10** first-generation low-income university organizations across the US

Harvard College Engineering Society

Cambridge, MA

President, Mentorship Chair, Board Member Freshman Representative

Sept 2019 – Present

- Oversee board of **20** students comprising four different committees, largest engineering student organization on campus serving over **500** Harvard undergraduates
- Published and distributed the most widely used undergraduate engineering guide on campus, created Big E Little E mentorship program serving **70** students to foster sense of community within Harvard SEAS

PUBLICATIONS:

C.B. Teeple, B. Aktas, M.C. Yuen, **G.R. Kim**, R.D. Howe, and R.J. Wood, "**Controlling Palm-Object Interactions via Friction for Enhanced In-Hand Manipulation**," *IEEE Robotics and Automation Letters*, 2022

M.A. Graule, C.B. Teeple, T.P. McCarthy, **G.R Kim**, R.C. St. Louis, and R.J. Wood, "**SoMo: Fast and Accurate Simulations of Continuum Robots in Complex Environments**," *IEEE International Conference on Intelligent Robots and Systems (IROS)*, 2021

C.B. Teeple, **G.R. Kim**, M.A Graule, and R.J. Wood, "**An Active Palm Enhances Dexterity for Soft Robotic In-Hand Manipulation**," *IEEE International Conference on Robotics and Automation (ICRA)*, 2021

SKILLS / HOBBIES:

Software: FEA (**ABAQUS**, **ANSYS**), CAD and CAM (**NX**, **Solidworks**, **Fusion**), **Python**, **MATLAB**, **R**, Space Systems Modeling (**AFSIM**, **STK**), Arduino, RL (**Julia**, **Python Pybullet**), Robotics (**ROS**, **Gazebo**)

Machine Shop: CNC Milling, Lathe, Welding, Silicone Casting, Soldering, 3D Printing, Laser cutting

Languages: Native English, Fluent Korean

Hobbies: Boxing, Baking macarons, Hiking, Playing pop songs on the piano