Kopparapu, Neeyanth 81213561642

Center for Excellence in Education

2019 Research Science Institute (RSI) Application Deadline: 01/15/2019

Neeyanth Kopparapu
3123 Oxford Forest Dr
Herndon, VA 20171, United States
5712636832
neeyanthkvk@gmail.com

Submitted: January 14, 2019

Paid: $65.00 on January 14, 2019

Forms

Ia. Applicant Information - 2019 Applications

(* = required)

To be completed by applicant. Please provide complete and accurate details on yourself. If you did not enter your complete address and contact details upon account setup with Slideroom, please go back and do so now.

1. Name*

Last Name (Sur)	First Name	Middle Name	Preferred Name
Kopparapu	Neeyanth		Neeyanth

2. Date of Birth*

Please enter in this format mm/dd/yyyy

02/02/2002

3. Gender*

Male

4. Country of Residence*

United States

5. Country of Citizenship*

United States

6. Immigration Status (if not a US Citizen)

7. Current Secondary School Grade Level:*

Select the applicant's secondary grade school level at the time of application:

11

8. College Start Date*

Please indicate the Month and Year you intend to begin college.

September, 2020

9. Home Phone Number {Example: (703) 555-1220; (011) 34 91 555-1220}*

(703) 904-0024

10. Alternate Email Address*

2020nkoppara@tjhsst.edu

Ib. Family Information - 2019 Applications

(* = required)

Please complete this information for all parents/guardians and siblings. To be completed by the applicant or the applicant's parent or legal guardian, if the applicant is less than 18 years of age at the time of application, or by the applicant or an emergency contact otherwise. If the applicant does attend RSI, parent or guardian will also serve as an emergency contact.

1. Parent/Guardian 1 - Name, Gender and Relationship*

Please enter the full name, including title (Ms., Mrs., Mr., Dr., etc.), for parent/guardian 1. Please also include their gender (female, male,other) and relationship (mother, father, guardian, etc.).

Title/Prefix	Given/First Name	Family/Last/Sur Name	Gender	Relationship
Mr	Madhu	Kopparapu	Male	Father

2. Parent/Guardian 1 - Contact Details*

Please indicate the preferred contact email and phone number for parent/guardian 1. If the student attends RSI, these will be used as emergency contact details.

Preferred Email	Preferred Phone
mkopparapu@gmail.com	7037325281

3. Parent/Guardian 1 - Address*

For parent/guardian 1 listed above, please indicate address. If the parent/guardian is at the same address as the applicant please write "Same" in the address section.

Street Address	City	State/Province	Post Code & Country
Same			

4. Parent/Guardian 1 - Occupation and Education*

Please indicate parent/guardian 1's occupation and education level. (Example: Teacher - College Degree)

Current Occupation	Employer	Education Level

Software Engineering Manager	Fannie Mae	Masters Degree

5. Parent/Guardian 2 - Name, Gender and Relationship*

Please enter the full name, including title (Ms., Mrs., Mr., Dr., etc.), for your second parent/guardian. Please also include their gender (female, male,other) and relationship (mother, father, guardian, etc.).

Title/Prefix	Given/First Name	Family/Last/Sur Name	Gender	Relationship
Mrs.	Rajani	Kopparapu	Female	Mother

6. Parent/Guardian 2 - Contact Details*

Please indicate the preferred contact email and phone number for parent/guardian 2. If the student attends RSI, these will be used as emergency contact details.

Preferred Email	Preferred Phone
rajanikm@hotmail.com	7034008066

7. Parent/Guardian 2 - Address*

For parent/guardian 2 listed above, please indicate address. If the parent/guardian is at the same address as the applicant please write "Same" in the address section.

Street Address	City	State/Province	Post Code & Country
Same			

8. Parent/Guardian 2 - Occupation and Education*

Please indicate parent/guardian 2's occupation and education level. (Example: Teacher - College Degree)

Current Occupation	Employer	Education Level
Enterprise Program Manager	Unisys	Masters Degree

9. Siblings

Please include the full name (First and Last), age and gender of your sibling(s). (Example: John Doe - 12 - Male)

Sibling Name	Age	Gender
Kavya Kopparapu	18	Female

10. Has anyone in your family previously attended a CEE program? If so, which program?

CEE programs include RSI, USABioOlympiad and the Teacher Enrichment Program (TEP).

No

Ic. Secondary School Information

(* = required)

To be completed by the applicant or the applicant's guardian. If not known, this information should be publicly available from the applicant's secondary school:

1. Please enter your schools CEEB code:*

Please enter or search for your secondary schools CEEB code. If your school does not have a CEEB code, please select "School not found" and enter your secondary school details.

470054 - Thomas Jefferson Hs Sci/Tec - Alexandria, VA, US

2. School Mailing Address:*

Enter the street number, PO Box, or other mailing address of the applicant's secondary school.

6560 Braddock Road, Alexandria, VA, 22312

3. School Postal Code:*

Enter the postal code (ZIP code in the US) of the secondary school.

22312

4. School Telephone Number:*

Please prepend all numerical digits needed to call this number from within the USA. {Example: (703) 555-1220; (011) 34 91 555-1220}

(703) 750-8300

5. School Email:

Please enter the secondary school's email address, if available.

6. School Website:

Please enter the secondary school's website URL, if the school has its own website.

https://tjhsst.fcps.edu/

7. Principal/Headmaster's Prefix/Title:*

Select the appropriate title for the school's Principal/Headmaster/Director.

Dr.

8. Principal/Headmaster's Given Name:*

Please enter the given name (personal name) of the school's Principal, Headmaster, or Director.

Ann

9. Principal/Headmaster's Middle Initial (optional):

Please enter a middle initial, if desired and/or applicable

10. Principal's/Headmaster's Family Name:*

Please enter the family name (last name) of the school's Principal, Headmaster, or Director.

Bonitatibus

11. Principal's/Headmaster's Administrative Postion:*

Please choose one of the following options:

Principal

12. Principal's/Headmaster's Professional Email Address:*

anbonitatibu@fcps.edu

13. Comments (optional):

(The applicant may optionally add brief clarifying remarks here, for example if he or she has attended multiple secondary schools):

IIa. Applicant Research Field Choice

(* = required)

The applicant should indicate first and second choices for research fields: these should be TWO DISTINCT fields. For each of the two research field choices, select one sub-field within the chosen discipline. (Examples might be the sub-field of genetics within the field of biology; the sub-field of condensed matter physics within the field of physics, or the sub-field of number theory within the field of mathematics):

1. Research Field Choice 1*

Please indicate your first choice field of research. The RSI selection committee will look favorably on applications where the declared fields and sub-fields of interest align with the applicant's previous academic coursework and extracurricular activities as highlighted in your Personal Statements. Please note, selection of a specific discipline does not guarantee a project in that discipline. CEE works with research mentors to assign appropriate projects for each student selected to be an RSI participant:

Computer Science

1.1. Research Field Choice 1 - Subfield*

Please indicate the subfield within Research Field Choice 1 which interests you:

Bioinformatics

2. Research Field Choice 2*

Please indicate your second choice field of research. Remember to select a different, distinct field from that chosen above:

Mathematics

2.1. Research Field Choice 2 - Subfield*

Please indicate the subfield within Research Field Choice 2 which interests you:

Linear Algebra

IIb. Applicant Personal Statements

(* = required)

To each question below, please provide a considered response including specific details that give evidence of performance, passion, and promise in the sciences or mathematics. Should an applicant be accepted, CEE does not promise specific research projects, but the information provided here will offer valuable insight into how a student thinks about science or mathematics and what sorts of problems he or she might enjoy. Please DO NOT request specific mentorships or projects in your statement:

1.
Articulate why the research fields chosen on the previous page are intriguing and exciting to you. For each sub-field, state what you perceive as the one or two most interesting questions or problems in this area. Explain why these sorts of questions interest you. Your responses are shared with mentors. Please respond with clarity.
***

From the first time I learned to program in Java, the abundance of applications for computer science astounded me. I began to see Java used in so many places -- playing video games, baking bread in our Java-controlled oven, watching TV, working on my computer, and so much more. Knowing that over 3 billion devices worldwide use Java still shocks me today. As I grew up, I began to learn more about computer science at school and home. I realized that advances in computer science have impacted every aspect of our lives, including communication, health, and productivity. Seeing the power of computer science, from IBM's Watson to the power of a Quadcopter captured my interest. Specifically, I'm interested in how advances in bioinformatics, the intersection of biology and computational measures, could bring unparalleled changes to the way we diagnose and treat patients, balance our diet, discover vaccines, and study genetics.

The many unsolved problems in the field of bioinformatics truly excites me. The complexity of the human brain is unparalleled, and there are still many problems that computational models cannot

solve. However, I believe there are two important problems, that once solved, will make the field of bioinformatics better able to solve more challenging problems. As we have begun to tackle larger and larger problems, researchers have thrown multiple Graphical Processing Units (GPUs) at the same task in an attempt to combine the power of many GPUs. However, because information doesn't pass through GPUs instantly, one additional GPU only provides a boost of approximately 40% to computation speed. This inefficiency piles up, and the computational power merely doubles when using five GPUs. In my research, I faced the problem of GPU parallelism. With hundreds of gigabytes of data to transfer, training classifiers using multiple GPUs took hours longer than on a single GPU. Other scientists have recognized this problem and are in favor of using one strong GPU instead of multiple smaller GPUs. However, as GPU technology can't keep up with society's thirst for scientific advancement, problems have begun to take days, weeks, and even years to solve. Many important advances in the field of artificial intelligence, including explainability, require massive amounts of processing power to examine. To achieve these advances, we must understand and solve GPU parallelism.

I'm also fascinated by the problem of low-shot learning. Because of the high cost of acquiring medical data and large time investment by patients and researchers, data analysts usually don't have access to the sufficient amount of data. Additionally, complex models required to solve complicated problems that have minute differences in classes require hundreds of thousands of samples. These problems coupled together give rise to the importance of low-shot learning, solving problems with small amounts of initial data. Mastering low-shot learning would give scientists the ability to bypass the creation of massive datasets, saving themselves and patients time. I believe it would be the door to understanding more about how artificial intelligence models work internally and how we can utilize them to solve increasingly difficult problems.

In addition to computer science, mathematics intrigues me because it forms the basis of every other scientific field. Taking advanced math courses including multivariable calculus, linear algebra, and complex analysis have shown me the applications of math in physics, computer science, chemistry, and more. The beauty of the properties of holomorphic functions and other mathematical constructs amazes me. Additionally, the applicability of fields such as linear algebra to computer science has shown me the raw power of mathematics and how it can influence advances in other fields. Although linear algebra is a power field, its applicability in computer science is limited due to the computational complexity of common linear algebra tasks, including matrix multiplication. Currently, the Coppersmith-Winograd algorithm gave us the smallest time for matrix multiplication, but a tenfold increase in a matrix's size makes multiplying matrices 237 times slower. Because matrices are used in computer graphics, economics, Markov chains, and chemistry, speeding up computation for essential operations of matrices would help increase the speed of discovery in these fields.

2. What are your long-range goals?*

I hope to pursue a career with a direct impact on society. With my interest in computer science and its applications, I plan to pursue a PhD in artificial intelligence and put my knowledge into creating products that solve problems in healthcare. In college, I want to be associated with a

research or innovation-based laboratory or hospital such as MIT's Media Lab, Stanford's AI Lab, or the Memorial Sloan Kettering Cancer Center in New York. I am currently working with Dr. Dalca of MIT's CSAIL and hope to recreate that working environment when I go to college and study computer science.

After college, I plan to conduct research with established organizations. As an intern in the Emerging Technologies group at MITRE last summer, I organized research protocol, applied for corporate IRB approval, ran a successful experiment in the MITRE compound, and analyzed the data and extracted results to evaluate the possibility of constructing a Brain Computer Interface (BCI) that is able to extract speech from the thoughts of mute or physically disabled patients. In 2016, I collaborated with Dr. Hejtmancik from the National Institute of Health (NIH) National Eye Institute when developing Eyeagnosis, a platform to inexpensively diagnose diabetic retinopathy using a mobile device, using their EYEGENE database to work on the project. The NIH also helped us test and develop the Eyeagnosis system in India and Mexico through the Aravind Eye Care program with doctors on the ground triaging patients using the Eyeagnosis device. I hope to continue working in and with research organizations like Alphabet's Verily and Apple's Health Division where I would be able to continue performing computer science research into applications that could potentially impact millions of lives.

Specifically, I'm interested in solving the problems of artificial intelligence explainability and GPU parallelism. Once solved, these "millennial problems for computer science" would forever change the way we view computer intelligence. Solving the problem of explainability would enable researchers to gain insight into the complex decisions artificial intelligence models make and would inspire confidence in the machines. For instance, without explainability, doctors cannot justify a computerized cancer diagnosis to a patient. Solutions to these problems would form the basis of AI usability in the future.

As I pursue my academic and career goals, I will continue making an impact on education by helping students learn about the importance of STEM. Throughout clubs at school and in GirlsComputingLeague, I have reached students that wouldn't traditionally have a computer science education. I hope to continue this passion and reach millions of students by partnering with companies like Iridescent and AI4ALL to help students understand the importance of computer science.

Recently, at the International Society for Computational Biology's (ISCB) Youth Bioinformatics Symposium, I helped Professor Iosif Vaisman hold a workshop on the use of machine learning platform WEKA in computational genetics. Once we had a student joking about classifiers being lazy when classifying incorrectly, we knew we had changed their perspectives on this field. As the students ran various models on their computers, I loved seeing their faces light up when one classifier did better than the other and their excitement when they correctly determined the confusion matrix of the model's performance. Holding these symposiums around the world, I hope to ignite many other students' passions for computer science.

Through these experiences, I have been mentored by a community of professionals willing to

nurture the interests of a high school student fascinated by their fields. Professionals, teachers, doctors, and friends have inspired me to continue on this track of helping society. In the future, I hope to give back to the community and mentor students just as I have been.

3.

What activities and/or hobbies demonstrate your leadership, creativity and uniqueness?*

Flight

At 12, I began actively seeking to get my pilot's license by going to the Leesburg Executive Airport to learn to fly a Cessna 172 Skyhawk. At first, I was fascinated by the technical feat that culminated in the airplane, but as I began to fly more, I realized that flying gave me the opportunity to experience nature and travel to new places. Although I am unable to fly a plane solo until I have my pilot's license, I look forward to the opportunity of exploring the world from the sky.

Independent Project: Acefolios

I first became interested in the mechanics of resume writing when I wrote my first resume freshman year of high school. My friends and I talked about how dated and frustrating the paper resume was in this age of LinkedIn and Facebook. Writing work experience and accomplishments without the chance to visualize them didn't give me the appeal that displaying my work should have. That frustration and desire for something better lead me to create Acefolios, an upgraded portfolio platform that can be customized for anyone. Students, artists, IT professionals, business owners, and more can upgrade their typical website and CV with integrated document viewing for many types of references. I've been working on the creation of Acefolios for the past year. Everyone can make eportfolios at https://www.acefolios.com. Currently, I have been talking to Fairfax County Public Schools (FCPS), Blackboard, and many other educational organizations to see if Acefolios can be integrated into their platforms. I have also started to talk to private schools like the World School in New York for implementation in their school systems.

GirlsComputingLeague

As I took numerous computer science courses in high school, I noticed the lack of girls and underrepresented minorities in advanced CS courses. As the cofounder of GirlsComputingLeague (https://www.girlscomputingleague.org), a nonprofit that supports students from underrepresented backgrounds in computer science, I sought to bridge the gap in STEM education. I lead a group of volunteers to work with students, teachers, and professionals to develop solutions to various technology disparity problems. I have created partnerships with the White House's CS4All Initiative and the DC Housing Authority to start five coding clubs in the DC area.

Every month I visit each club with the GCL team to provide resources and learning material to help students learn computer science. In 2015 and 2016, we held several series of fall and spring workshops at the Children's Science Center's Lab. During these workshops, we worked with students from elementary to middle school and taught basic programming concepts such as

objects and methods, introduced visual programming languages such as Scratch and MIT AppInventor, and demonstrated basic Python commands with graphical representations. The sparkle in students' eyes when their code compiles and runs properly reminds me of the time I fell in love with coding and of the importance of working with these students.

With the Tiger Woods Foundation, I helped teachers harness the ability to inspire other students with the world of computer science. At monthly conferences, I show teachers how to incorporate computer science into their curricula through teacher development workshops. I targeted teachers from schools without a computer science department so they could introduce these important concepts to students who wouldn't otherwise get them. In the past four years, GirlsComputingLeague has reached over 3,800 students. I hope to continue empowering and preparing students of all backgrounds to tap into the world of opportunities offered by a quality STEM education.

To show students the power of artificial intelligence and its applications, GirlsComputingLeague hosts an annual AI Summit (https://aisummit.girlscomputingleague.org). This year over 300 students heard from industry experts, including Google's Peter Norvig and WebMD's Chief Medical Officer John Whyte. Through partnerships with technology companies such as Apple, AWS, and NVIDIA, I raised over $76,000 for the 2018 summit and provided access to lessons and interactive activities. Additionally, $22,000 of the sponsorship money from 2018's AI Summit went to funding our coding clubs.

BattleCode

For the past two years, I have participated in the annual MIT Battlecode where our team creates a virtual player in a video game. At first, we each scrambled to do as much as possible without planning how to share the workload. Our code sharing software (github) even started to malfunction due to the duplication of code! After a quick loss in the first tournament of the series, I realized the importance of assigning tasks to different members to more efficiently work together. After working collaboratively instead of repetitively, our virtual player placed in the top 10 of overall high school competitors.

4. Describe your participation in extracurricular or community outreach activities?*

TJSTAR - Annual Research Symposium

An important part of conducting research is the dissemination of new knowledge by sharing findings with peers. By attending research conferences, I have learned important lessons in the fields of machine learning and medical informatics that I have used to improve my research. Wanting to create this same experience for other students who may not be able to attend international conferences, I lead the organizing committee of TJSTAR, the annual research symposium for Thomas Jefferson High School. Students present their research. Companies talk about research opportunities, and researchers, economists, executives, and engineers share their work. I invite speakers, raise money from our sponsor organizations, and lay out the plan for the

day, including keynote speakers and room assignments. Walking through the halls during the symposium inspires me every year as I witness students glowing in pride when their peers appreciate their work or the excitement in a professional's voice when they announce their groundbreaking work to an audience of mesmerized students.

MITRE Internship

This past summer, I interned at the MITRE Corporation. Working in the DEEPLANG group, I worked to enable physically disabled and mute patients to communicate with a Brain-Computer interface (BCI), which would translate thoughts to speech. I developed methods to build such an interface, linking EEGs to signal processors, which were connected to a mobile unit capable of deciphering text from the EEG signal.

Working in a commercial research institution such as MITRE gave me a new perspective on collaborative research. My mentor encouraged me to reach outside my group and ask others for help in their areas of expertise. When denoising EEG signals, I asked Julia Windham, an applied math researcher at MITRE, for advice on selecting the best machine learning model for my task. When faced with the task of experimental design, I consulted with behavioral scientists and linguists to get their advice on specific protocols for the experiment. Overall, my internship expanded my teamwork skills through the interaction of other interns and experts in various fields and honed my research skills in a commercial setting.

Varsity Math Team and Computer Team

As the youngest captain of the Thomas Jefferson Math Team, as well as the most experienced officer, I am responsible for organizing team events and meets, holding practices, writing practice problem sets and selection tests, and holding lectures on a variety of math topics ranging from elementary combinatorics to abstract algebra. Additionally, I work with company sponsors and middle schools in the DC-Metro Area to host the annual TJIMO competition, the middle school olympiad that the math team hosts. I compile problems for the four rounds of competition as well as plan the logistics, including reserving the building for the weekend.

Another club I captain is the TJ Computer Team, which hosts over 150 students weekly with interactive lectures in algorithmic programming. Functional programming, algorithmic development, and theoretical computer science are among the many skills taught. The teams participate in various HSPC contests, ACSL, and other CS contests. The officer core also selects students for collegiate computer science contests and hosts in-house contests.

As a captain of multiple STEM clubs, I feel I can connect to the hundreds of students I help in these clubs because I once was the information-hungry student who learned as much as possible from these clubs. When I was 12, the Varsity Math Team invited me to their Monday after school practices. After hearing lectures on lifting the exponent, combinatorial nullstellensatz, barycentric coordinates, and so much more, I was able to understand so much more about non-elementary mathematics as well. After I became an officer last year, and the Monday practices were about to

be canceled because of a lack of officer willingness to lecture, I took it upon myself to write and teach every Monday to ensure that others had the same opportunity to learn math that I did.

CCLJ - Centerville Commission for Labor Justice

As a part of the CCLJ team, I work to restore wages stolen from day laborers, allowing them to make a living. I have helped restore tens of thousands of dollars over the past two years. I also talk with local members of the Virginia General Assembly and the local Department of Labor and Industry to draft legislation to protect the rights of day laborers and provide them with a livable wage. The CCLJ has helped draft tens of legislation and has had multiple pieces of legislation pass in the local and state levels.

5. How did you hear about RSI? What aspects most appeal to you? Why did you apply?*

I spent the summer of 2017 at MIT for MIT Launch's entrepreneurship camp to learn skills necessary for the launch of Acefolios, and there I met many RSI members. I also hear about RSI when attending math and computer science competitions from past attendees, including Prathik Naidu, Franklyn Wang, and Siona Prasad, all students at Thomas Jefferson.

Whenever anyone describes their experience at RSI, they talk about the strong connection between mentor and student. It is that aspect of RSI that most intrigues me. I am currently working with MIT postdoctoral fellow Adrian Dalca to continue his work on 3D image registration using machine learning, and I consistently seek his help to further my knowledge in the fields of machine learning and biology. Working closely with him has made me realize the power of collaboration between researchers. Attending RSI would give me the opportunity to learn from and work with even more esteemed researchers.

Another reason I applied to RSI is to be part of a community of student researchers. I have seem many of my friends that are RSI alumni attend reunions, having joined a strong community of people, some of who are 20 to 30 years older, who share their passion of research. At MITRE, my mentor Shamik Das, who proudly displays his RSI plaque on his desk, told me numerous times the strength of the researcher community of RSI. At ISEF, I witnessed the huge student body of researchers and their shared devotion to research, and I wanted so badly to be a part of that group. Interacting with students from all around the world, and learning about their education program, desire to research, and passions inspired me to learn so much more about their culture.

Of all the places I could go this summer, only RSI contains both of these aspects as a common ground for scientific research from students with a strong passion. To be a part of this community would be an incredible opportunity.

IIc. Course Work - 2019 Applications

(* = required)

In the reference section, the applicant will indicate a school counselor or official who will submit school transcripts on the applicants behalf. On this page, the applicant should specify any additional mathematics, science, computer programming or engineering coursework that have been completed, or will be completed as of June 2019, beyond what is covered in the transcripts. Expected or actual dates of completion may be approximated (within a window of a few weeks):

1. Additional STEM Courses

Please indicate any courses, not covered in your transcripts, that were taken in math, science, computer programming and/or engineering. This could include, but is not limited to, courses taken at a local community college or university, during the summer, and/or online. Please indicate course subject, where the course was taken and the date the course was (or will be) completed. (E.g. Physiology - University of Virginia - June 2019)

Course Subject	School/Program	Completion Date
Classical Physics	MIT OCW	N/A (Online)
Machine Learning	Coursera (Stanford)	N/A (Online)
Object Oriented Java Programming: Data Structures and Beyond (Specialization)	Coursera (UC San Diego)	8/30/17
Algorithms (Specialization)	Coursera (Stanford)	6/7/17

IId. Standarized Test Scores

(* = required)

The applicant should self-report his or her best standardized test scores here. Be sure to include the date of administration for each exam listed. Copies of official score reports for all tests administered by the College Board, ETS or ACT, Inc. (as well as those offered by the MAA, if available) should also be uploaded as a PDF (one document max) at the bottom of the page. Though no particular standardized tests are required, at minimum the PSAT is strongly recommended:

1. PSAT Scores

Please indicate the date of your exam, your overall score, evidence-based reading and writing score and your math score below

Overall Score	Reading and Writing	Math	Exam Date (mm/yyyy)
1490	730	760	10/2018

2. SAT Scores

Please indicate the date of your exam, your overall score, your evidence-based reading and writing score and your math score below. If you took the Essay Portion, please indicate that score as well. If you took an earlier version of the exam, indicate your exam dates and scores in the comment section at the bottom of the page.

3. ACT Scores

Please indicate the score you received in each section in the table below. In the follow up question, please indicate the exam date and composite score.

4. TOEFL Scores

Please indicate your overall score and the score you received in each section in the table below. In the follow up question please, indicate your exam date.

5. SAT Subject Tests

Please enter details for any SAT Subject tests you have taken in the table below. In the first column list the test subject, your score in the second column and the test date (mm/yyyy) in column three.

Test Subject	Test Score	Test Date (mm/yyyy)
Chemistry	770	05/2018
Math 2	800	05/2018

6. AP Exams

Please enter details for any AP exams you have taken in the table below. In the first column list the test subject, your score in the second column and the test date (mm/yyyy) in column three.

Test Subject	Test Score	Test Date (mm/yyyy)
AP Calculus BC	5	2017
AP Computer Science	5	2016
AP Biology	5	2017
AP Chemistry	4	2018

7. MAA Exams

The Mathematical Association of America (MAA) organizes and administers the American Mathematical Competition (AMC) exams, as well as the American Invitational Mathematics Examination (AIME) and the US Junior Mathematical Olympiad (USAJMO) and Mathematical Olympiad (USAMO) qualifying exams. Please enter details for any MAA exams you have taken in the table below. In the first column list the test name, your score in the second column and the test date (mm/yyyy) in column three.

Test Name	Test Score	Test Date
USAMO	3	04/2018
USAJMO	27	04/2017
AIME	11	03/2018
AMC 12	136.5	02/2018
AMC 10	138	02/2017

8. Other National or International Exams/Tests:

Please enter details on any other standardized exams or test taken below. In the first column list the exam/test name, your score in the second column and the exam/test date (mm/yyyy) in column three.

9. Comments:

Optionally, the applicant may provide some brief comments or clarifying notes here regarding standardized tests or test scores. If you are providing scores from an earlier version of the SAT or PSAT, do so here:

10. Score Upload

Please attach a PDF of your test score report (this should be the official copy you received from the testing service that administered the test) you self-reported above. Include all test scores you intend to share in one PDF file.

NeeyanthKopparapu_Scores.pdf

IIe. Computer Skills

(* = required)

Please report familiarity with: commonly-used operating systems; programming, scripting, or markup languages; or analysis packages or environments.

While CEE does not require fluency with any particular programming language, it is strongly recommended that applicants have some experience with a tool or framework that facilitates the ability to model systems, perform symbolic or numerical mathematics, and/or analyze data. MATLAB, Mathematica, R, Python, Java, or C/C++ are common choices:

1.

Please indicate the computer programs and systems of which you are familar at a Beginner level of experience. Beginning experience implies some exposure or occasional past use.

Please indicate the operating systems, programs, languages, systems, tools and software, that you have a Beginner level of ability in using. Examples: (Operating) MacOS, Windows, Android, Linux/Unix; (general programming) C/C++, Java, Python, Basic; (scripting) Perl, Lua; (web/markup) HTML, Javascript,LaTeX; (database) SQL/PL, Access; (statistical/data-processing) R, Excel; (PPLs) Church, WebPPL; (algebra /math processing) MATLAB, Mathmatica, Maple; (plotting/image processing) Gnuplot, Origin, Graphpad; (engineering/design) LabVIEW, AutoCAD; etc.

I am familiar with:
Android (OS and Application Development),
Linux/Unix,C,HTML,Excel,MATLAB,Mathmatica,AutoCAD,R

2.

Please indicate the computer programs and systems of which you are familar at an Intermediate level of experience. Intermediate experience implies moderate exposure or frequent use.

Please indicate the operating systems, programs, languages, systems, tools and software, that you have an Intermediate level of ability in using. Please see examples in question 1.

I have an Intermediate experience with:
Windows (OS), Caffe (BAIR), Pytorch, SKLearn, Bash

3.

Please indicate the computer programs and systems of which you are familar at an Advanced level of experience. Advanced experience suggests development expertise or extensive use in one or more significant projects.

Please indicate the operating systems, programs, languages, systems, tools and software, that you have a Advanced level of ability in using. Please see examples in question 1.

I have an Advanced Level of Ability in using:
Java, Javascript, Python (For use in ML and AI), C++, Keras, Tensorflow, CNTK, CUDA, LaTeX

4.

Briefly describe any past or ongoing experience with computer programing, modeling and/or data analysis you indicated an Intermediate or Advanced level of familiarity with in questions 2 and 3, addressing both questions posed and methods and tools employed.

PDGAN - Parkinson's Diagnosis and Generation of Synthetic MRI Images
Tools Used: Python, C++, Bash, Keras, Tensorflow, PyTorch, LaTeX, R
PDGAN was looking for an improvement on traditional Parkinson's disease diagnosis using computational models. The primary coding language used was Python, where all of the ML models were built. C++ was used for the CUDA library to speed up parallelism between multiple GPUs. The classifier models were built in Keras, whereas the Segmentation and GANs had Keras, Tensorflow, and PyTorch versions. Bash was used for scripting, moving files and organizing directories. LaTeX was used to write a final research paper. R was used for data analysis of genetic information that was stored in a proprietary format that only R was capable of handling.
Code is here: https://github.com/neeyanthkvk/Parkinsons1819.

Voxelmorph - Web Platform for Unsupervised Learning for Image Registration (Ongoing)
Tools Used: Javascript, Node.js, Python, Tensorflow
Voxelmorph is a 3D image registration platform specifically used for medical image mapping. To easily create a web version, I have been working on voxelmorph.js, a WebGL optimized platform. Voxelmorph.js uses Javascript and Node as the primary coding language and platform, performing machine learning tasks using the tensorflow.js library. Python and the regular tensorflow package was used to extract data from the original voxelmorph project for use in this one.
Code is here: https://github.com/neeyanthkvk/voxelmorph.js
Original project's code: https://github.com/voxelmorph/voxelmorph

TweePression - Detecting Student Depression through Social Media Scans
Tools Used: Python, Keras, CTNK, PyTorch, Caffe, Scikit-Learn, NLTK
TweePression was an online platform that used machine learning and natural language processing to search for negative sentiment patterns among students with Twitter handles to diagnose Depression. TweePression used NLTK and Keras to develop sentiment analyzers and used Scikit-Learn to create the final SVM for classification in Python. CTNK, PyTorch, and Caffe were the libraries used to built image analysis models for MRI scans of patients to look for Depression, and also for images posted through Twitter.
Link for final models here: https://github.com/neeyanthkvk/TweePression

MITRE Internship Work

Tools Used: Python, Bash, Keras
My internship work at MITRE involved creating a portion of a Brain-Computer interface (BCI) capable of deciphering EEG signals of mute patients into thoughts of speech. Python was used for the machine learning models using the Keras framework. Bash was used for scripting and for using the MOAB job scheduler through MITRE's HPC.

Eyeagnosis - Diagnosing Diabetic Retinopathy through Smartphone Pictures of the Retina
Tools Used: Python, Tensorflow, Keras, Android Studio, AutoCAD
Eyeagnosis was a machine learning platform to diagnose diabetic retinopathy through a smartphone application. The phone application would communicate to a server hosting a machine learning model written in Tensorflow for processing and Keras for building the model. The phone app was written in Android Studio. To get a good picture of the eye, a 3D-printed lens holder was created using AutoCAD designed for being held on a phone.
Link to Mobile App and Server App here: https://github.com/Eyeagnosis

Computer Science Contests
Tools Used: C++, Java, LaTeX
To do algorithmic computer science contests, including USACO and Codeforces contests, I use Java and C++. I am familiar with Java, as I have used it for Battlecode in 2018 and for USACO since 2016. I am also familiar with C++'s STL and its use in algorithmic computer science. I also do many lectures on computer science, all written in LaTeX.
Link to Battlecode 2018's codebase here: https://github.com/neeyanthkvk/BattleCode1718
Link to USACO codebase here: https://github.com/neeyanthkvk/USACO

IIf. Applicant Awards and Accomplishments

(* = required)

The applicant should concisely list awards, achievements, activities, and accomplishments in academics, research, and extracurricular activities. Please include approximate dates, but prioritize by importance rather than sort chronologically, so that any national or international awards are showcased.

Do not send CEE a supplemental resume or curriculum vitae. Further details of activities of particular significance to the applicant may be explored in the Personal Statements:

1.
Please list (concisely) major awards, activities, and accomplishments in science, technology, engineering, or mathematics:
*

Give some measure of the extent of participation and accomplishments, and awards or recognition received, in STEM-related areas, including for example: olympiads, academic bowls, math competitions, science fairs, talent searches, robotics competitions, hackathons, academic or scholarship competitions or prizes, STEM clubs, research internships, science or math camps, scientific publications or conferences, etc.:

Mathematics:
USAJMO Qualifier (2015, 2017) - highest score - 27/42.
USAMO Qualifier (2018).
AMC 10 (2018) - 138.
AMC 12 (2018) - 136.5.
AIME (2018) - 11.
CMIMC Algebra (2017) - 11th Place.
ARML (2017) - 2nd Place Overall.
PUMaC (2017) - 16th Place Team, top 30 in Algebra.
CMIMC (2018) - 7th Place Team, 8th Place Number Theory.
ARML (2018) - 1st Place Overall, Individual Finalist Qualifier.
PUMaC (2018) - 3rd Place Overall.
HMMT (2018) - 12th Place Overall.
Varsity Math Team - Captain (2017-2018), Finance Officer (2016-2017).

Computer Science:
USACO - Qualified for Platinum at the end of 2016-2017 season. In December 2018 contest - placed 34th overall, 10th among juniors. Codeforces Expert rated 1660.
ACM@UVA HSPC (2018) - 2nd Place Team.
Virginia-Tech ACM-HSPC (2018) - 8th Place Team.
VCU HSPC (2018) - 3rd Place Team.
ACSL All-Stars (2017) - 1st Place Team.
Computer Team - Captain (2017-2018).
Bioinformatics Society - Biocode Chair (2016-2018).
BattleCode (2018) - 9th Place High School Team.
PicoCTF (2018) - Top 50 High School Teams.

Research:
ISEF (2017) - 3rd Place in Translational Medical Science; Samvid Education Foundation: Agni Second Place Award of $500; Sigma Xi, The Scientific Research Honor Society: Second Life Science Award of $1,000; Association for the Advancement of Artificial Intelligence: Honorable Mention.
State Science Fair (2017) - Overall Grand Prize and Governor's Award; 1st Place in Biomedical Health Sciences Category; Leidos Award in Computational Science; Honorable Mention from the Virginia Dental Association.
Local Science Fair (2017) - 1st in category of Translational Medical Sciences.
Siemens (2016) - Semifinalist.

Toshiba ExploraVision (2015) - National Honorable Mention.
Conrad Spirit of Innovation Challenge (2017) - Winner of Health and Life Sciences Category.
MIT INSPIRE (2018) - Semifinalist.
Claes Nobel Scholar (2018) - Invited attendee at the Nobel Lectures in Physics, Chemistry, and Economics.
Presenter (2018) - NVIDIA's GPU Technology Conference in Silicon Valley: "A Computational Approach to Diagnose Depression Using Twitter and fMRI Scans," O'Reilly Artificial Intelligence Conference: "Using Artificial Intelligence in the field of Diagnostics."
Research Intern (2018) - MITRE's Emerging Technology Department: investigated the use of Machine Learning to develop Brain Computer Interfaces (BCI).

2. Science Fairs and Competitions:

CEE neither presumes nor requires that you have presented work at a science fair or competition. If you have done so, please indicate science fairs and competitions to which you may have submitted work. If you received a medal or place at this competition, please note it in question 1 above.

Local/Municipal Science/Engineering Fair|State/Regional Science/Engineering Fair|Google Science Fair|Siemens Competition in Math, Science, and Technology|Intel International Science and Engineering Fair (ISEF)|Conrad Spirit of Innovation Challenge|Toshiba/NSTA ExploraVision

3.
Please list (concisely) the applicant's most important non-STEM awards, activities, and accomplishments:
*
Give some measure of the extent of participation and accomplishments, and awards or recognition received, in other areas, including for example: performing, visual, or literary arts; athletics; outside hobbies; clubs; journalism or blogging; student government or leadership; education, public service, philanthropy; or entrepreneurship.

Middle School Public Debate Program (2015) - Top 10 nationally.
Russian National Literature and Essay Writing Contest - Honorable Mention (2016), Gold Medal (2017).

Boy Scouts (2013-2016) - Life Scout.

Piano National Guild (2008-2016)- 9 years Guild Pianist .
Centerville Commission for Labor Justice (CCLJ) and the Centerville Immigration Forum (CIF) (2015-2019) - Recovered $26,248 dollars for 200+ day laborers. Helped draft 4 pieces of local legislation that were enacted.

MIT Launch Summer Program (2017) - Learned about entrepreneurship and launching a

successful startup, including maintaining financial records, various methods of turning an innovation into a successful startup through venture capital firms, cold calling, and networking.

GirlsComputingLeague (2016-2019) - Founder. Nonprofit dedicated to educating underprivileged students in Computer Science and Artificial Intelligence. Secured partnerships with the White House's CS4ALL and the Tiger Woods Foundations to host workshops for students learning computer science, as well as teachers looking to integrate computer science into their curriculum. Plan the annual Artificial Intelligence Summit (2017, 2018) for 300+ students. Raised $76,000 in sponsorships from Apple, Google, AWS, NVIDIA, and more to have an all-day workshop of learning and keynote speakers, including WebMD's Chief Medical Officer John Whyte, Google's Peter Norvig, and more.

4. Previous STEM Research:

CEE neither presumes nor requires previous scientific research projects to attend RSI, but if the applicant has undertaken research, the RSI selection committee will be interested in hearing about his or her most significant previous experience, whether undertaken in an academic, corporate, non-profit, or governmental setting.

Please indicate whether you have performed any previous STEM research:

Yes

4.1. Previous Research Topic:

Briefly describe the topic of your most significant or most recent research project. Please also indicate how much time (hours per weeks, weeks total) you spent working on this project. Do not include standard classroom laboratory exercises:

Since August of 2018, I have been working on an automated system to diagnose Parkinson's Disease. Parkinson's disease is the second most common neurodegenerative disorder and affects millions of patients across the world. Unfortunately, due to the lack of concrete, objective diagnostic tools, the disease is not diagnosed until its later, irreversible stages. Currently, doctors must comb through years of medical data looking for symptoms to diagnose Parkinson's, and doctors have no way to determine if a patient will develop Parkinson's and can only detect Parkinson's once symptoms are present.
Even with the rise of automated prediction algorithms paired with the generation of massive amounts of raw data, the automatic diagnosis of Parkinson's Disease has not caught up to traditional methods of diagnosis. This is commonly attributed to the lack of useful data, as most computational systems require a tremendous amount of medical data that isn't readily available as gathering the data can be expensive.
A common impedance to the advancement of medical research is the lack of a robust dataset. Although medical devices now collect hundreds of types of information, researchers can only harness a small portion of the data collected for useful analysis. With the emerging power of artificial neural networks and their application in the fields of healthcare and pathology, new

solutions, including deep neural networks with tens of layers can include millions of parameters, are often limited by the lack of information. With only hundreds of images, complex neural networks built specifically to solve medical problems are unable to do so.
The system I developed, dubbed PDGAN, presents a step in removing this barrier to further progress and is split into 3 major parts. First, PDGAN utilizes an array of 2D and 3D image classifiers built on Convolutional Neural Networks to classify MRI scans on the prevalence of Parkinson's Disease. I used preconstructed networks including the VGG-18 and Resnet architectures and built my own custom classifiers fit specifically for MRI image analysis. The models were written in Keras and Tensorflow, and trained on a dataset acquired from the University of Southern California's Image Data Archive (PPMI).
PDGAN also uses Generative Adversarial Networks (GANs) to synthesize "fake" medical images to augment the small training dataset. My research showed that increasing the size of the dataset by just 15% can yield boosts in accuracy. Using a training dataset of patient images, PDGAN reached a final accuracy of 96.6% with a system of neural networks that specialize in image recognition. This final accuracy is 16% higher than current clinical methods of diagnosis. The GANs were written in Keras and builds off the research done by Wang et al. (2018 – Low Shot Learning from Imaginary Data) and Kingma and Welling (2014 - Auto-Encoding Variational Bayes), both of which described methods of data augmentation for low-data analysis procedures. Goodfellow et al. (Generative Adversarial Networks) was the first to describe the process of using GANs to generate images.
To ensure the Generative Networks are generating accurate MRI training samples, PDGAN uses image segmenters to determine the edges of the brain in the MRI image, and determine if the border created by the MRI image is "brainlike" – ensuring the generated images look real. 3-D segmenters were written in Tensorflow and PyTorch built with the functionality of modularity – any MRI from any machine can be segmented with these tools.
I've worked on this project for approximately 14 hours a week for 19 weeks. Currently, a provisional patent is pending on the basis of generating MRI images through machine learning. Relevant code is linked here: https://github.com/neeyanthkvk/Parkinsons1819.

4.2. Primary location of research:

Please indicate the primary location(s) where this research was undertaken; i.e. secondary school, college/university, governmental lab, corporation, field, home, etc.:

Home

5. Publications:

(This section is optional). CEE neither requires nor expects RSI applicants to have scientific publications, but the selection committee will review one article or paper that has either: been published or accepted for publication in a peer-reviewed journal; been posted as a preprint; or been submitted previously to an official national or international science fair, talent search, or other competition.

Please submit a link to the article or the abstract below.

N/A

IIIa. Applicant Releases and Affirmations-2019 RSI

(* = required)

Please read each statement carefully, and indicate understanding, affirmation, or agreement as indicated. Acceptance of these conditions is necessary for consideration for admission to the 2019 RSI:

1.
Information provided as part of this application may be reviewed by CEE staff, and will be shared with the RSI selection committee. If a student is selected to attend RSI, the completed application may also be shared with RSI academic staff and prospective research mentors.
*

I understand.

2. All Personal Statements (in Part II) were written by me.*

(Some editorial advice from teachers, mentors, supervisors, coaches, counselors, peers, or parents or other family members is expected and acceptable).

I affirm.

3.
I hereby waive any rights to examine, read, review, reproduce, or re-transmit any recommendations provided in support of this RSI application.
*

I agree.

4.
I intend to complete my final academic year of secondary school starting in the summer or autumn of 2019, and to enter college or university in the summer or autumn of 2020 (but not sooner).
*

(Please either affirm or explain how and why your academic trajectory differs):

I affirm.

5.

RSI is a voluntary educational enrichment program, which provides room, board, and local transportation to admitted students but does not offer any salaries, stipends, or course credit.

*

I understand.

6.

RSI is an intensive residential program, where all students are expected to remain in residence at MIT during the entire extent of the program (June 23 to August 3, 2019), and to devote their full effort and energies to RSI activities.

*

I understand.

7.

If an applicant is offered admission to RSI 2019, CEE and/or MIT will require from the applicant and/or the applicant's guardian further proof of insurance (for US students), waivers regarding liability, permission for use of photographs, etc.

*

I understand.

8.

The RSI application is considered copyrighted material by the Center for Excellence in Education. Apart from personal use and online submission via slideroom.com, any electronic or physical reproduction, transmission, or distribution of any part of this application without the explicit consent of CEE is not allowed.

*

I acknowledge.

9.

To the best of my knowledge, all information provided in this application is true and accurate.

*

I affirm.

10.

Please type your full name in the box below, to indicate that you have read, understood, and agreed to the conditions of application outlined above.

*

...Thank you for applying to RSI. We appreciate your interest, and look forward to reading your application....

Neeyanth Kopparapu

11. Date of submission.*

(in mm/dd/yyyy format):

01/14/2019

IIIb. Guardian Releases and Affirmations-2019 RSI

(* = required)

The following section must be completed by a parent or legal guardian of the applicant listed in part I.

1. At the time of application, the age of the applicant is:*

16

1.1.
If my child/dependent is selected for RSI, I will encourage him or her to participate in RSI/CEE activities through undergraduate and graduate years of study.

*

I agree.

1.2.
I know that parental support is essential. I will financially support and/or consider volunteering for CEE on our child's behalf.

*

I agree.

1.3.
I have read and understood all above affirmations/declarations made by my child/dependent, and endorse all of these declarations:

*

I affirm.

1.4.

To the best of my knowledge, all information provided in this application is true and accurate:

*

I affirm.

1.5.

By typing your full name in the box below, you indicate that you have read, understood and affirmed the statements above.

*

...Thank you for your interest in the RSI program, and for your support of your child's STEM passions and educational aspirations....

Rajani Kopparapu

1.6. Today's Date*

(in mm/dd/yyyy format):

01/14/2019

2. Please indicate the mode of payment of the suggested RSI application fee:*

To help defray costs, CEE requires a (US) $65.00 application fee with each completed application. (This fee may be waived upon request. Please contact maite@cee.org to request a waiver).

Secure credit/debit card payment via www.slideroom.com

2.1.

Please check the box below to acknowledge that you have selected to pay the suggested application fee through Slideroom.

*

This payment must be completed online using a credit or debit card, before Slideroom.com will allow final submission of the application.

Acknowledged.

Kopparapu, Neeyanth

81213561642

REFERENCES

Jonathan Osborne

Mathematics Teacher

Thomas Jefferson High School for Science and Technology

jaosborne@fcps.edu

Math Teacher

Completed on January 14, 2019

Waived right to review

Samantha Wolf

Transcript Assistant

TJHSST

sswolf@fcps.edu

703-750-8300

School Official for Transcript Upload

Completed on December 21, 2018

Waived right to review

John Dell

Physics Teacher

TJHSST

jcdell@fcps.edu

Request emailed on December 18, 2018

Waived right to review

Mark Hannum

Neuroscience Lab Director, Physics Teacher

TJHSST

MSHannum@fcps.edu

Science Fair Mentor

Request emailed on December 18, 2018

Waived right to review

Printed January 14, 2019 11:42 CST/CDT