



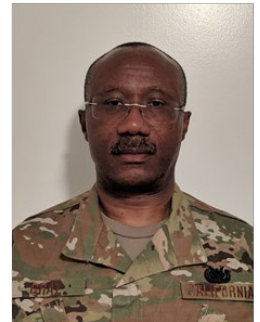
K-12 STEM Center: STEM Community outreach for 45 years

New Faculty Orientation – August 2023



Dr. Darin Gray

- Bachelor's degrees in
 - Biomedical and Electrical Engineering
 - Mathematics
- Master's degree – Teaching with an emphasis in math
- Master's Degree - Cybersecurity
- Doctorate– Education Technology
- 15 years as an Electrical Engineer (Hughes Aircraft and QED Enterprises)
- 26 years as a high school and adult education teacher
- 26 years as a STEM Educator
- 10 years as Engineer (Communications, Cybersecurity, IT) - California State Guard
- DoD STEM Ambassador
- NSF Reviewer
- National Academies of Sciences, Engineering, and Medicine Workshop Proceedings Reviewer



*2023 Recipient California Medal of Merit
2022 The Engineer's Council Outstanding STEM Educator Award
2020 James E. Ballinger Engineer of the Year Award*

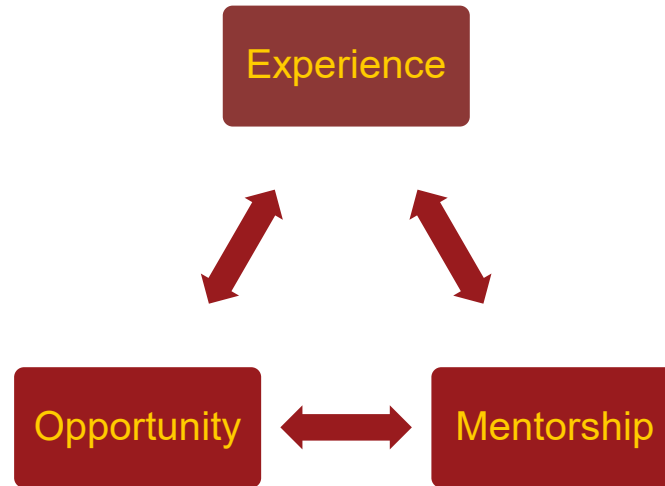
Center's Mission

The K-12 STEM Center is committed to providing equitable, culturally responsive opportunities for youth, families, and schools. Diversity, equity, and inclusion guide our work to actively address systemic inequities in STEM Education and build personally relevant knowledge and skills, self efficacy, and leadership within a community of learning and practice.





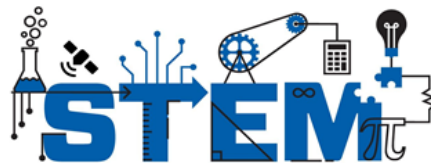
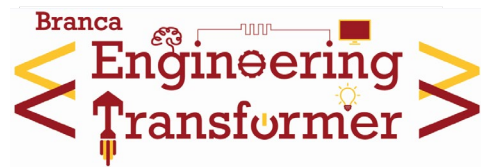
Center's Vision



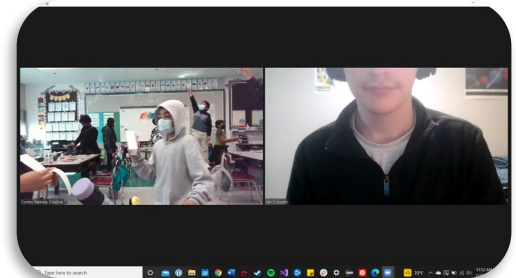
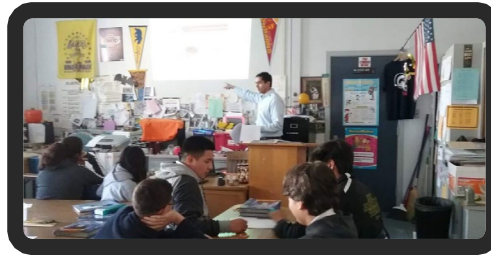
- **Real-world STEM Experiences for students**
- **USC students & faculty STEM mentors**
- **STEM Pipelines and Pathways**



Real World STEM Experiences



USC students & faculty STEM Mentors

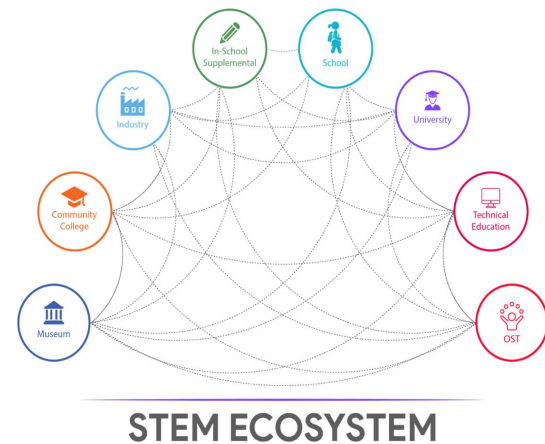




STEM Pipelines and Pathways

Inspiring Programs in STEM

INSIGHT highlights innovative higher education institutions and organizations working to recruit and retain underrepresented individuals in science, technology, engineering, mathematics, and beyond with our 2022 Inspiring Programs in STEM Award



Ensuring ALL our students graduate
READY FOR THE WORLD



Center's Impact



USC Viterbi
School of Engineering
K-12 STEM Center

School Year 22-23 by the numbers

- ~5,000 K-12 students
- ~100 K-12 teachers
 - Impact: 12,000
additional K-12 students
- 160 Viterbi students
- 45 USC faculty members





Center's Role in K-12 at USC

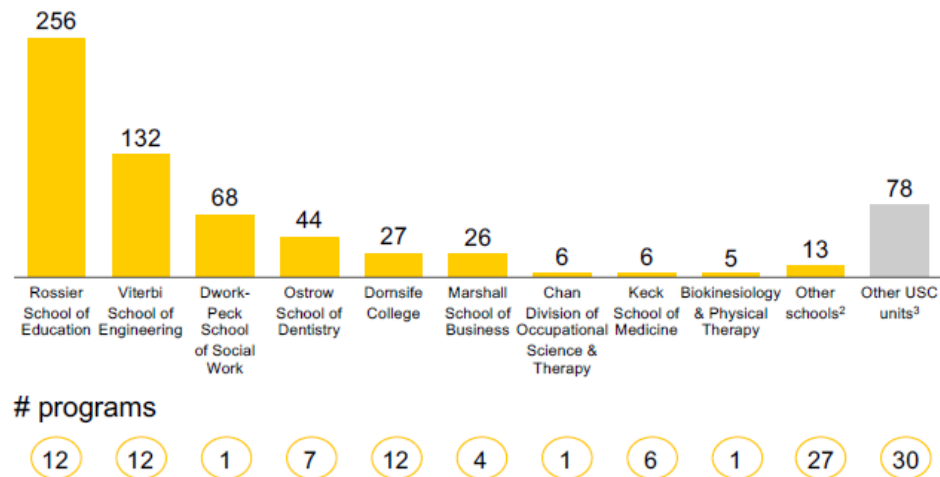
19 USC schools contribute to USC's PreK-12 impact in LA

19 USC schools

500+ PreK-12 schools in LA across 5 school districts

100+ Unique programs

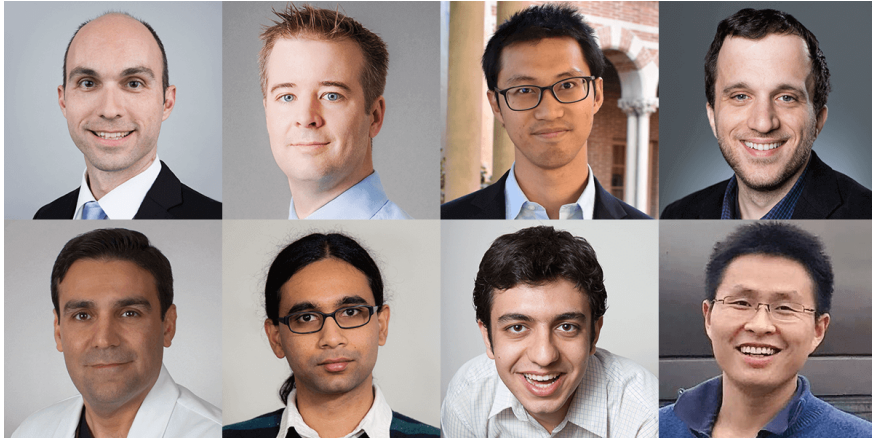
Reaching 500+ unique PreK-12 schools in LA¹, including over 20% of schools in the LA Unified School District, the 2nd-largest district in the US



<https://viterbi12.usc.edu/broader-impacts/>



Priorities, Projects & Partnerships



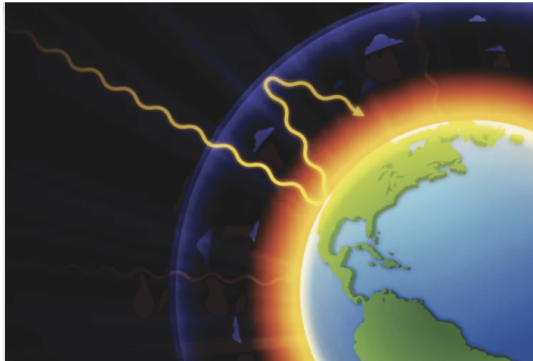
The K-12 STEM Center has helped the NSF Early Career Award winners of the past few years with their Broader Impacts



<https://viterbi12.usc.edu/broader-impacts/>



Programs, Projects & Partnerships



Chem Ed Week: Teacher Training on Greenhouse Gases

Teachers will walk away from this interactive session with a proven lesson plan and the ability to engage students with the free 3D molecule modeling software, IQmol, to learn about greenhouse gases.

Free, full lesson plan and training in the software IQmol will be provided Meredith Brandon (Hawthorne Math and Science Academy), Kareesa Kron and Professor Shaama Sharada (both in USC Viterbi Chemical Engineering).

The free training is limited to 25 teachers, and the workshop will be filled on a first-come, first-served basis.

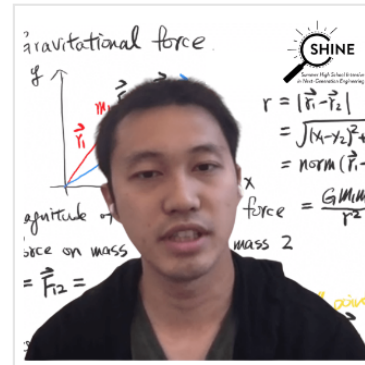
**Saturday, October 24
9:30 - 11 AM PST**

[Register Today](#)

Space is Limited

Learning MATLAB & Computational Physics with USC Electrical Engineering Professor

July 9, 2021 / [Leave a Comment](#)



Conozca una Ingeniera Aqui!

May 23, 2018



Mariachi music and jazz standards enlivened the multi-school Fair last Saturday sponsored by Los Angeles Unified School District's Local District East. Families with students attending these schools stopped at many of the Festival's over 80 booths. [\[Read more\]](#)

Broader Impacts Pathway



| | | |
|---|---|--|
| Tap into STEM Center Event Speak/Judge Join SHINE or other programs | Identify possible partner school for lab tour or speak/judge | Develop relationship with the partner school |
|---|---|--|

During the year you submit CAREER proposal:

Fall: brainstorm, STEM Center helps identify partner possibilities, meet Principal or Administrators

Spring: interaction with Partner (lab tour, meet faculty, etc.)

May: ask for a letter of collaboration from STEM Center & Partner Principal



L.A. County Racial-Behavioral COVID-19 Modeling

Joy Cheng (jcheng22@windwardsschool.org)
Windward School, Class of 2022

USC Viterbi Department of Industrial and Systems Engineering, SHINE 2021



Introduction: ISE Lab Work

Work in the Industrial Systems and Engineering Lab spans topics such as chronic diseases, medical decision making, and telemedicine. Recently, Professors Shinyi Wu and Sze-chuan Sun have been working together on a project that involves modeling COVID-19 in L.A. County to assist health policymakers.

- Professor Sun is building an innovative mathematical COVID-19 model for the county that considers traffic flow between geographic areas.
- Professor Wu runs focus group interviews with members of five L.A. communities to understand and quantify differences in behavior for the model.

Goals and Impact of Research

Geographic and Racial Considerations
In my research, I wanted to explore the relationships among race, behavior, and aspects of the pandemic in L.A. County and build a model schematic of COVID-19 for different parts of the county to incorporate these complexities. L.A. County is divided into eight service planning areas (SPAs): (1) Antelope Valley, (2) San Fernando Valley, (3) San Gabriel Valley, (4) Metro L.A., (5) West L.A., (6) South L.A., (7) East L.A., and (8) South Bay. I chose to view L.A. County at the SPA level because the county observes SPAs from a health standpoint and each SPA captures a unique set of communities in L.A. In addition, I chose to analyze trends for the five most prominent racial groups in the county: Asian (including Pacific Islander), Black, Hispanic, Native, and White (in alphabetical order). Different SPAs have different racial breakdowns:

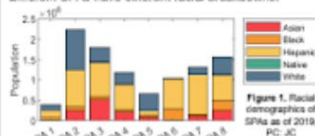


Figure 1. Racial demographics of SPAs as of 2019. PC: JC

Research Question

My goal was to figure out whether different racial groups have different pandemic-related situational or behavioral patterns that influence COVID-19 case/vaccination levels and that ultimately impact rates of flow between health states in a disease compartment model. I sought to examine this question by using MATLAB to visualize data from the Understanding America Study (UAS) by USC Dornsife and the Vaccine and COVID-19 Surveillance Dashboards provided by the L.A. County Department of Public Health.

Data Visualization

Behavior and Race

The data in Figures 2 and 3 were collected in the form of "Yes," "No," and "Unsure" answers.

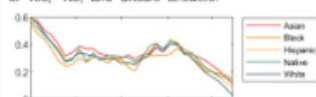


Figure 2. Participation in in-person social activities by race from April 2020 to May 2021. PC: JC

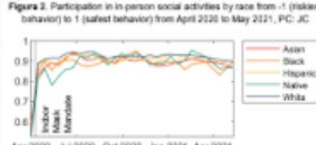


Figure 3. Participation in mask wearing by race from April 2020 to May 2021. PC: JC

Living Situation/Financial Insecurity and Race

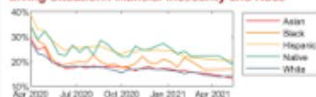


Figure 4. Perceived chance of running out of money in the next three months from April 2020 to May 2021. PC: JC

COVID-19 and Race

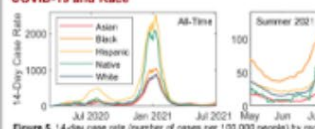


Figure 5. 14-day case rate (number of cases per 100,000 people) by race from March 2020 to July 2021 and from May to July 2021. PC: JC

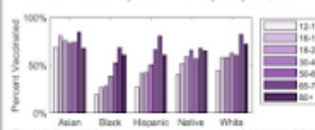


Figure 6. Percent of each race vaccinated by age as of July 2021. PC: JC

COVID-19 and SPAs

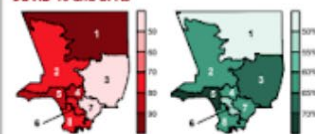


Figure 7. 14-day case rate in each SPA as of July 2021. PC: JC



Figure 8. Percent vaccinated in each SPA as of July 2021. PC: JC

Conclusions and Predictions

Trends in Data

There are behavioral and situational differences among racial groups that correlate with variations in case levels and vaccination rates. Trends may be caused by limited access to resources, free time, and/or vaccines for some races; a higher perceived risk of disease by Asians; a mistrust of vaccines because of historical atrocities; COVID-19-related misinformation; and more. Potential biases in behavioral survey data include social desirability and the fact that there are only three response options. These biases could explain why trends in mask-wearing data are not as clear as expected given information gleaned from focus groups.

Predicting SPA Behavior

Because each SPA has a different racial breakdown, we hypothesize that the behaviors of each SPA reflect the behaviors of the racial groups that constitute that SPA. One way to predict the general behaviors of each SPA is to take the weighted average of the most recent data across racial groups for each behavior. We can use our findings to inform rates of flow in a COVID-19 model.

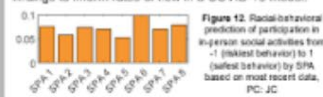


Figure 9. Racial-behavioral prediction of participation in in-person social activities from April 2020 to May 2021. PC: JC

Reflections and Next Steps

Over the course of SHINE, I learned many useful skills including reading and searching for scholarly literature, using MATLAB to visualize data and solve problems, and properly following social and behavioral research best practices when handling data involving human subjects. Most of all, I valued learning about the modeling process from the professors and my mentor's work and discovering pandemic-related trends in L.A. County. In the future, I would love to dive deeper into the mathematical aspect of model schematics and try calibrating and testing a model with different health policies. I would also like to conduct more research on why certain behavioral trends exist for different races.

Acknowledgements

Special thanks to Dr. Katie Mills and Monica Lopez for their dedication in organizing SHINE, Professors Shinyi Wu and Sze-chuan Sun for sharing their research and welcoming me into their lab, Anthony Nguyen for being an incredible and supportive mentor, Maya Neuenchwander for her help and kindness, Ashley Park for being an amazing lab partner and friend, my Center for Innovation & Entrepreneurship (CIE) for making my summer so inspiring!

Simple and Complex Modeling

To model the pandemic in a manageable way given time constraints, I built an uncalibrated susceptible-infected-recovered (SIR) model based on L.A. County COVID-19 parameters and graphed the spread of the disease over 100 weeks using Insight Maker.



Figure 10. Simple model schematic for COVID-19 in L.A. County. PC: JC

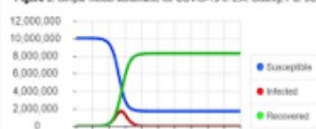


Figure 11. Disease spread over 100 weeks based on SIR model. PC: JC

I designed a complex model schematic for COVID-19 in L.A. County that includes racial categories because of behavioral and situational differences among racial groups that affect rates of flow from box to box.

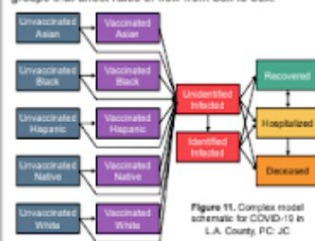


Figure 12. Complex model schematic for COVID-19 in L.A. County. PC: JC



Questions?

daring@usc.edu

<https://viterbik12.usc.edu/>