



USC Viterbi

School of Engineering
K-12 STEM Center



(L:R) Prof. Slaughter, Dean Yortsos, Prof. Ragusa greet two K-12 teachers.

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

New Faculty Orientation – August 2022

Co-Directors, Darin Gray, Ed.D. (daring@usc.edu) and Katie Mills Ph.D. (kmills@usc.edu)



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SHINE students in Professor Pahlevan's lab



Professor Jha presenting his petroleum research to students of John Adams Middle School

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



K-12 STEM Center Lead

Maja Matarić

Co-Directors

Darin Gray, Ed.D.

Katie Mills, Ph.D.

Staff

Mary Bonaparte-Saller, Ph.D.: Elementary STEM

Ben Louie: MESA Director

Jennifer Kolbauer: K-12 student programs

Monica Lopez: High School Research

Alexandra Gutierrez: MESA

Anne Areta: NSBE Jr, Virtual tutoring

Victor Kim: CS@SC

Florencia Lee: CS@SC

Lauren Guzman: Finance/Administration



LPL students building rockets with 42nd St school students



Priorities, Programs & Partnerships

Real-world STEM Experiences

Applying STEM concepts

USC students as Ambassadors/Mentors

Meaningful engagement and interaction

Systemic Change

STEM Ecosystem, District Partnerships

Real-world STEM Experiences



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

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

USC Viterbi Department of Industrial and Systems Engineering, SHINE 2021



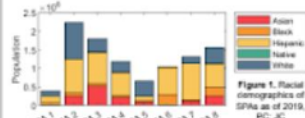
Introduction: ISE Lab Work

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

- **Professor Suen** 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:



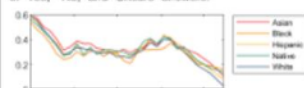
Research Question

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.

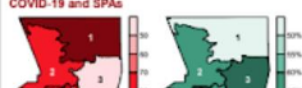
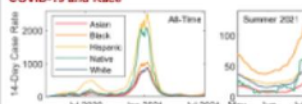
Data Visualization

Behavior and Race

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



COVID-19 and Race



Conclusions and Predictions

Trends in Data

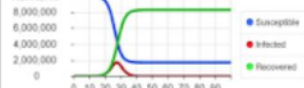
There are behavioral and situational differences among racial groups that correlate with variations in case levels and vaccination rates. Trends may be caused by limited access to resources, free time, and/or vaccines for some races; a higher perceived risk of disease by Asians; a mistrust of vaccines 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.



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.



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.



Reflections and Next Steps

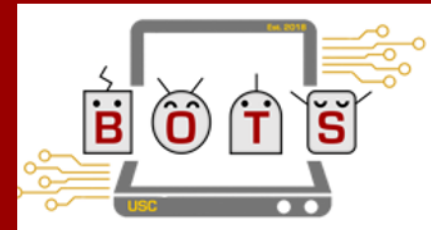
Over the course of SHINE, I learned many useful skills including reading and searching for scholarly literature, using MATLAB to visualize data and solve problems, and properly following social and behavioral research best practices when handling data involving human subjects. Most of all, I valued learning 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 Siz-chuan Suen for sharing their research and welcoming me into their lab. Anthony Nguyen for being an incredible and supportive mentor. Maya Neuenhofer for her help and kindness. Ashley Park for being an amazing lab partner and friend. My Center Mentor Monalisa Alegria for waking up early to meet with me and the rest of the SHINE team for making my summer so inspiring!

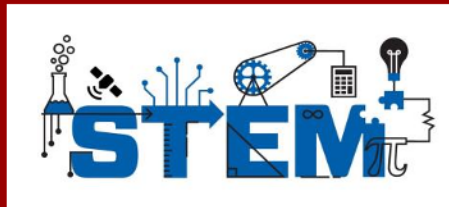


Priorities, Programs, & Partnerships





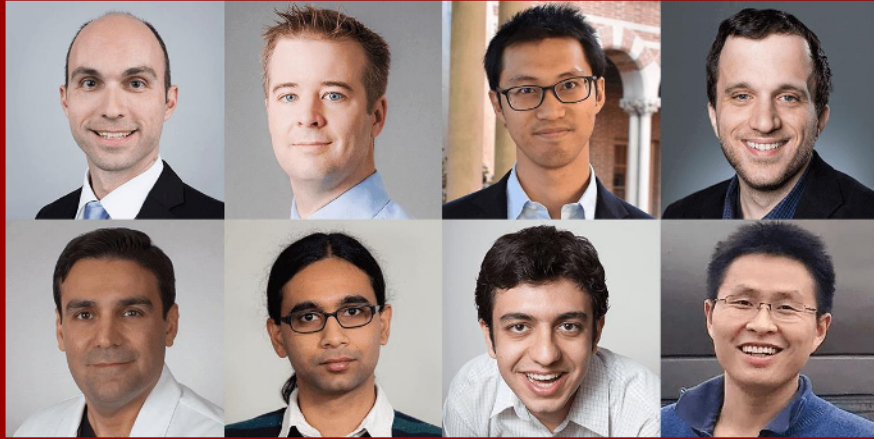
Priorities, **Programs**, & Partnerships



<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.

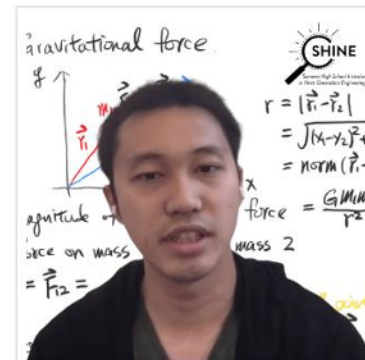
Saturday, October 24
9:30 - 11 AM PST

[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. [\[Read more\]](#)

<https://viterbi12.usc.edu/chem-ed/>

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



Programs, Projects & Partnerships



Broader Impacts Pathway



2022-23	2023-2024	2024-2025
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

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