Association for Computing Machinery

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Contacts

Jim Ormond
Communications Manager
Association for Computing Machinery
212.626.0505
ormond@hq.acm.org

Stacy Jeziorowski
Marketing and Communications Lead
Computer Science Teachers Association
872.221.2771
stacy.jeziorowski@csteachers.org

For Immediate Release

ACM and CSTA Announce 2023–24 Cutler-Bell Student Winners
Four Students Recognized for Engagement in Computer Science

NEW YORK, NY, May 15 2024 — The Association for Computing Machinery (ACM) and the Computer Science Teachers Association (CSTA) announced four high school students were selected from among a pool of graduating high school seniors throughout the US for the ACM/CSTA Cutler-Bell Prize in High School Computing. Eligible students applied for the award by submitting a project/artifact that engages modern technology and computer science. A panel of judges selected the recipients based on their projects' ingenuity, complexity, relevancy, and originality.

The Cutler-Bell Prize promotes the field of computer science and empowers students to pursue computing challenges beyond the traditional classroom environment. In 2015, David Cutler and Gordon Bell established the award. Cutler is a software engineer, designer, and developer of several operating systems at Digital Equipment Corporation. Bell, an electrical engineer, is Researcher Emeritus at Microsoft Research.

Each Cutler-Bell Prize winner receives a $10,000 cash prize. The prize amount is sent to the financial aid office of the institution the student will be attending next year and is then put toward each student's tuition or disbursed. This year's Cutler-Bell Prize recipients will be formally recognized at the Computer Science Teachers Association's 2024 Annual Conference, July 16-19, in Las Vegas.

The winning projects illustrate the diverse applications the next generation of computer scientists is developing.

Shobhit Agarwal, Reedy High School, Frisco, Texas

Every three years, Shobhit Agarwal visits his grandparents in Jhansi, India, a town with the poorest healthcare infrastructure in northern India—where 85% of the population does not attend yearly checkups. After seeing a mental decline in his grandfather, Agarwal immersed himself in his grandparents' hometown, interviewing local citizens and doctors. He was driven to create a low-cost system that recognizes a variety of diseases while simultaneously forecasting the progress of the disease. This system is OmniDoc, a framework that accurately predicts diagnoses, prognoses, and treatments given a patient profile. This system is currently deployed in Jhansi in two ways. First, hospital volunteers at the Naja Hospital conducted door-to-door visits to collect patient information. This data is inputted into Agarwal's framework, and if the algorithm detects a disease, a patient books a free appointment with a local physician; the model data is subsequently forwarded to the doctor. Five hundred homes were visited, and nearly 40% of those patients were sent to clinics based on algorithm-identified risk. Hospital statistics show that 95% of the patients who arrived in the clinic due to the campaign had the algorithm's diagnosis subsequently confirmed by a physician, indicating that the model accurately identified patient condition with minimal data. This success led to the deployment of OmniDoc at the Jhansi Orthopedic Hospital for their 15-person radiology department.

Franziska Borneff, Hidden Valley High School, Cave Spring, Virginia

During her junior year, Franziska Borneff became interested in monitoring the flow rates of Arctic rivers. Using her newly developed coding skills, she began to plot and trend analysis for climate research. Her own research aligned with the news articles about climate change, and this influenced her to continue to study these data trends. The Arctic rivers are important in the process of detecting climate change, as they directly influence ecosystems and the livelihoods of humans. Borneff researched the relationship between atmosphere and waterways, concluding that air temperature, river discharge, and sea ice concentration are the most significant data points. Her research creates a method to track critical dates related to the spring thaw of Arctic rivers and assess their impact on local populations. She collected daily temperature, river discharge, and sea ice cover data from publicly available sources for the six major Arctic rivers, finding the thaw date is earlier than ever. Borneff then connected with the students of the Yupik Eskimo Village in Marshall, Alaska, to see how the earlier thaw impacted the local community. Through this meeting, she read stories about how the familiar rhythms of nature have been disrupted and the uncertain future of the Yupik people as a result of these

shifts. Borneff hopes her research will spark studies in sensitive Arctic regions and enlighten politicians to initiate government action that is informed by scientific understanding. The collaboration between quantitative data documenting warming and human narratives testifying to the accuracy of the data is essential.

Daniel Mathew, Poolesville High School, Poolesville, Maryland

Daniel Mathew's project, MiniMesh, danced between invention and improvement. Starting out on his bedside desk, Mathew dumped out scrap electronic parts and assembled a device named PreVis to track the location of a single point on a human for movement analysis with a LiDAR mounted on a controllable servo. PreVis went everywhere, from discussing him in Congress to presenting him at research conferences. PreVis was Mathew's first step toward human-computer interaction. PreVis then evolved into MiniProse, a free mobile application. Mathew studied the mathematics of current pose estimation solutions and then developed the core algorithm for MiniProse. The final algorithm, MiniMesh, scrapped the original two prototypes and was built from the ground up. Mathew developed a new framework. Mathematically proving optimization identities and writing machine learning algorithms, MiniMesh could reconstruct the entire human mesh with thousands of points. Mathew took this algorithm to companies for skin cancer research and military organizations for augmented-reality surgery. By predicting the location of thousands of points on the human body on portable devices, all in real-time, MiniMesh has applications in several fields. In the original biomechanical use case, MiniMesh could be used for at-home gait analysis by tracking joint locations and improving sports techniques by analyzing the metabolic cost of human movements. For assistive surgery, MiniMesh accurately and efficiently maps the human topology to aid surgeons. For animation, MiniMesh replicates expensive VFX, enabling amateur animators at no cost.

Kosha Upadhyay, Bellevue High School, Bellevue, Washington

Kosha Upadhyay watched her neighbor of eight years struggle with dementia. Following his passing, she wanted to understand the struggle of people with dementia and began volunteering at a dementia care center. Upadhyay knew she couldn't give these patients back what they lost but wanted to preserve what they had left. This inspired her to work on creating a better therapy for those suffering from dementia. This therapy, MemSpark, is an automated end-to-end system that creates a novel brain-training therapy using virtual reality and tracks dementia progression through artificial intelligence. Upadhyay studied brain morphology and neurodegeneration to create a therapy that affected dementia at its root cause. Since decline can affect any part of the brain, she designed a novel set of games that exercised all parts of the brain. Eight serious games were designed to exercise all cognitive functions by considering a set of promotive factors (immersion, confidence, focus) and preventive factors (anxiety, frustration, self-pity). Each serious game produced a set of two features—accuracy and time which were then inputted into an AI model for profiling. The data generated by the Virtual Reality (VR) system was pre-processed and passed into an AI model. After studying multiple AI models, Upadhyay chose a multi-layer perceptron neural network due to its suitability for the

mode of data, along with its high accuracy and regression adaptability. The neural network produced cognitive profiling scores across three categories: recall, reasoning, and executive function. The profiles were aligned to the ADAS-Cog test–an industry standard test for evaluating dementia. Upadhyay tested her therapy across 14 people split into experimental and control groups. Her solution was able to slow down dementia progression by 65%—which surpasses current mainstream therapies and presents the potential to enhance the way we approach dementia care.

“ACM is proud of its partnership with the Computer Science Teachers Association,” said ACM President Yannis Ioannidis. “Reading about this year’s Cutler-Bell Prize recipients was both inspiring and surprising. It’s inspiring that these students are putting their knowledge and creativity toward making the world a better place—especially in the areas of healthcare and the environment. In addition, the level of sophistication of these projects is surprising. If I didn’t know the ages of the recipients, I might have thought these projects were devised by Ph.D. graduates. This award encourages students not just to learn new knowledge and acquire skills but to become inventors. On behalf of the entire ACM community, I congratulate these students, their parents, and especially their teachers for guiding them during these formative years and look forward to more exciting contributions from the youngest members of our community.”

"This year's recipients of the Cutler Bell Award represent the future leaders of the digital age," said Jake Baskin, Executive Director of CSTA. "Their remarkable projects underscore the importance of equipping young people with the skills and knowledge to tackle real-world challenges through computing. I commend their creativity, perseverance, and commitment to making a positive difference in the world through computer science. Congratulations to the winners for their outstanding achievements, and thank you to Gordon Bell and David Cutler for their commitment to fostering excellence in computing education."

About the Association for Computing Machinery (ACM)
ACM (acm.org) is the world’s largest educational and scientific computing society, uniting computing educators, researchers, and professionals to inspire dialogue, share resources and address the field’s challenges. ACM strengthens the computing profession’s collective voice through strong leadership, promotion of the highest standards, and recognition of technical excellence. ACM supports the professional growth of its members by providing opportunities for lifelong learning, career development, and professional networking.

About the Computer Science Teachers Association (CSTA)
CSTA’s (csteachers.org) mission is to empower, engage, and advocate for K-12 computer science teachers worldwide. CSTA is a membership organization that supports and promotes the teaching of computer science and other computing disciplines. The Association for Computing Machinery founded CSTA as part of its commitment to K-12 computer science education.

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