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PAGE B8

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TECHNOLOGY

NEW PROGRAM RAPIDLY DETECTS HOMES DAMAGED BY WILDFIRES



PHOTO BY M. GALANIS ET AL

A satellite image shows the aftermath of the 2018 Camp fire in Butte County. A new computer program called DamageMap identified buildings as damaged (red) or not damaged (green).

San Lorenzo Valley residents say such a program would have been invaluable last year

By **McKenzie Prillaman**
newsroom@santacruzsentinel.com

A new computer program powered by artificial intelligence takes mere minutes to determine whether homes and buildings have been destroyed by wildfires once the smoke has cleared.

Developed by scientists at Cal Poly San Luis Obispo and Stanford University, DamageMap evaluates the destruction by scrutinizing post-wildfire aerial and satellite images.

San Lorenzo Valley residents who were evacuated during the CZU Lightning Complex fire in the summer of 2020 say that having such a program would have relieved them of a lot of stress and anguish.

"I spent days thinking, 'My house could be burning right now,'" said Lisa Smith Beasley, a Boulder Creek resident who was ordered to leave her home during the devastating event.

Beasley's home survived the flames. But she and her neighbors often waited weeks to hear from authorities whether their homes had made it through the fire.

Andrew Fricker, a spatial ecologist at Cal Poly who co-developed DamageMap, said that the program should drastically reduce that waiting period. Once fully developed, the program would be available for



SHMUEL THALER — SANTA CRUZ SENTINEL FILE

The home Andrew Wilson lived in with his father on North Spring Creek Road in Boulder Creek is gone, among more than 600 houses destroyed by the CZU Lightning Complex fire.

free to the public and emergency responders.

"There are so many people in California who are impacted by this every single fire season," Fricker said. "And it's only going to get worse."

Fricker and his colleagues at Cal Poly and Stanford published their peer-reviewed work on the program in the November issue of the International Journal of Disaster Risk Reduction.

Computer programs that detect damage from natural disasters from aerial and satellite photos have been in

development for a quarter century. But most of them require that before-and-after photos be taken with similar angles, lighting and photo quality, an imperfect system that requires a costly and continuously updated catalog of images.

To determine which structures have burned, DamageMap relies solely on post-wildfire images and a digital database showing the locations of homes and buildings.

For the past four decades, the number of burned acres and homes throughout the

west has grown substantially, fueled in part by climate change.

California's deadliest and most destructive wildfire — the 2018 Camp fire in Butte County — inspired the creation of DamageMap.

The inferno severely damaged Fricker's childhood home in Chico, where his parents were still living, but luckily didn't burn the house to the ground.

Downloading maps

During the evacuation, Fricker struggled to find out

PROGRAM » PAGE 2

COLORADO WILDFIRE

Over 500 homes feared destroyed

By **Brittany Peterson, Patty Nieberg and Colleen Slevin**
The Associated Press

SUPERIOR, COLO. » One couple returned home Friday to find the mailbox about the only thing left standing. Charred cars and a burned trampoline lay outside smoldering houses. On some blocks, homes reduced to smoking ruins stood next to ones practically unscathed by the flames.

Colorado residents driven from their neighborhoods by a terrifying, wind-whipped wildfire got their first, heartbreaking look at the damage the morning after, while others could only wait and wonder whether their homes were among the more than 500 feared destroyed.

At least seven people were injured, but remarkably there were no immediate reports of any deaths or anyone missing in the aftermath of the blaze outside Denver.

Cathy Glaab found that her home in the town of Superior where she lives with her husband had been turned into a pile of charred and twisted debris. It was one of seven houses in a row that burned to the ground.

"The mailbox is standing," Glaab said, trying to crack a smile through tears. She added sadly, "So many memories."

COLORADO » PAGE 2

OBITUARY

Betty White, TV's Golden Girl, dies at 99

By **Frazier Moore**
The Associated Press

LOS ANGELES » Betty White, whose saucy, up-for-anything charm made her a television mainstay for more than 60 years, whether as a man-crazy TV hostess on "The Mary Tyler Moore Show" or the loopy housemate on "The Golden Girls," has died. She was 99.

White's death was confirmed by her longtime agent Jeff Witjas in a phone call Friday with publicist Pam Golum. White would have turned 100 on Jan. 17.

She launched her TV career in daytime talk shows when the medium was still in its infancy and endured well into the age of cable and streaming. Her combination of sweetness and edginess gave life to a roster of quirky characters in shows from the sitcom "Life With Elizabeth" in the early



White

WHITE » PAGE 2

TRANSPORTATION

Bay Area bridge tolls climb \$1 starting today

Drivers will see \$7 tolls across all seven state-owned bridges, and up to \$8 on the Bay Bridge at peak traffic times. **PAGE A3**



NEW YEAR'S

Omicron's cocktail: Sorrow, fear, and hope

New Year's Eve feels like a case of déjà vu as COVID-19 again fills up hospitals and changes travel plans. **PAGE A7**

BUSINESS

- ↘ **Dow Jones**
36,338.30 (-59.78)
- ↘ **S&P 500**
4,766.18 (-12.55)
- ↘ **Nasdaq**
15,644.97 (-96.59)

SOCIAL MEDIA

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Pete Pearson | The Real Estate Guy

"As the year winds down and we start to focus on the new year, please allow me to share how grateful I am for all of the support that I have received during the past two challenging years. We are so blessed to live in such an amazing community of caring, and loving people. My family and I wish you good health and much happiness."

Pete Pearson
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TODAY IN HISTORY
1863

President Abraham Lincoln issued the Emancipation Proclamation, declaring that slaves in rebel states shall be "forever free."

1892

The Ellis Island Immigrant Station in New York formally opened.

1953

Country singer Hank Williams Sr., 29, was discovered dead in the back seat of his car during a stop in Oak Hill, West Virginia, while he was being driven to a concert date in Canton, Ohio.

1959

Fidel Castro and his revolutionaries overthrew Cuban leader Fulgencio Batista, who fled to the Dominican Republic.

1979

The United States and China held celebrations in Washington and Beijing to mark the establishment of diplomatic relations between the two countries.

1985

The music cable channel VH-1 made its debut with a video of Marvin Gaye performing "The Star-Spangled Banner."

1993

Czechoslovakia peacefully split into two new countries, the Czech Republic and Slovakia.

Birthdays

Documentary maker Frederick Wiseman is 92. Rock singer-musician Country Joe McDonald is 80. Rapper Grandmaster Flash is 64. Actor Morris Chestnut is 53. Olympic gold medal ice dancer Meryl Davis is 35.

Star report

Guthrie's birthday bash still on for New Year's Eve

Savannah Guthrie's husband Michael Feldman still plans to host his wife's "Today" co-stars, family and others at her belated 50th birthday party on New Year's Eve, despite a surge of COVID-19 cases in New York state. Page Six reported that the party will still take place at the Mirbeau Inn and Spa and that Hoda Kotb, Al Roker, Carson Daly, and Jenna Bush-Hager are among the 60 confirmed guests. New York state reported a new single-day high of 67,090 cases on Wednesday, a 64.5% increase from just the day before. — Martha Ross, Bay Area News Group

LOTTERY

THURSDAY'S WINNING NUMBERS
Daily 3 Afternoon: 7, 0, 5
Daily 3 Evening: 5, 9, 2
Daily 4: 3, 0, 5, 0
Fantasy 5: 6, 13, 16, 17, 18
DAILY DERBY
1st: 12, Lucky Charms
2nd: 2, Lucky Star
3rd: 7, Eureka
Race time: 1:48.62
SUPER LOTTO PLUS
Wednesday's drawing: 1, 29, 30, 43, 47
Mega number: 3
Saturday's estimated jackpot: \$11 million
MEGA MILLIONS
Tuesday's drawing: 3, 5, 8, 31, 38
Mega number: 4
Friday's estimated jackpot: \$221 million
POWERBALL
Wednesday's drawing: 2, 6, 9, 33, 39
Powerball: 11
Saturday's estimated jackpot: \$500 million

Colorado

FROM PAGE 1

Despite the devastation, she said they intend to rebuild the house they had since 1998. They love that the land backs up to a natural space, and they have a view of the mountains from the back.

The wildfire erupted Thursday in and around Louisville and Superior, neighboring towns about 20 miles (32 kilometers) northwest of Denver with a combined population of 34,000.

Tens of thousands were ordered to flee as the flames swept over drought-stricken neighborhoods with alarming speed, propelled by gusts up to 105 mph (169 kph).

At a Costco in Superior, two store employees came running toward the check-out lines, one of them shouting, "Everyone evacuate, evacuate, evacuate!" said Katrina Peterson, who was inside.

A video she made showed dark skies and whirling debris outside. The falling ash filled her ears, and she had



Debris surround the remains of homes burned by wildfires after they ripped through a development in Superior, Colo., on Friday. DAVID ZALUBOWSKI — THE ASSOCIATED PRESS

to squint to keep it from getting in her eyes.

The cause of the blaze was under investigation. Emergency authorities said utility officials found no downed power lines around where the fire broke out.

With some roads still closed Friday, people walked back to their homes to get clothes or medicine, turn the water off to pre-

vent the pipes from freezing, or see if they still had a house. They left carrying backpacks and pulling suitcases or wagons down the sidewalk.

David Marks stood on a hillside overlooking Superior with others, using a pair of binoculars and a long-range camera lens to see if his house, and those of his neighbors, were still

there, but he couldn't tell for sure whether his place was OK. He said at least three friends lost their homes.

He had watched from the hillside as the neighborhood burned.

"By the time I got up here, the houses were completely engulfed," he said. "I mean, it happened so quickly. I've never seen anything like that. ... Just

house after house, fences, just stuff flying through the air, just caught on fire."

By first light Friday, the towering flames that had lit up the night sky had subsided and the winds had died down. Light snow soon began to fall, and the blaze, which burned at least 9.4 square miles (24 square kilometers), was no longer considered an immediate threat.

"We might have our very own New Year's miracle on our hands if it holds up that there was no loss of life," Gov. Jared Polis said, noting that many people had just minutes to evacuate.

The wildfire broke out unusually late in the year, following an extremely dry fall and amid a winter nearly devoid of snow so far.

Boulder County Sheriff Joe Pelle said more than 500 homes were probably destroyed. He and the governor said as many as 1,000 homes might have been lost, though that won't be known until crews can assess the damage.

"It's unbelievable when you look at the devastation that we don't have a list of 100 missing persons," the sheriff said.

White

FROM PAGE 1

1950s to oddball Rose Nylund in "The Golden Girls" in the '80s to "Boston Legal," which ran from 2004 to 2008.

But it was in 2010 that White's stardom erupted as never before.

In a Snickers commercial that premiered during that year's Super Bowl telecast, she impersonated an energy-sapped dude getting tackled during a backlot football game.

"Mike, you're playing like Betty White out there," jeered one of his chums. White, flat on the ground and covered in mud, fired back, "That's not what your girlfriend said!"

The instantly-viral video helped spark a Facebook campaign called "Betty White to Host SNL (please?!)," whose half-million fans led to her co-hosting "Saturday Night Live" in a much-watched, watch-hailed edition that Mother's Day weekend. The appearance won her a seventh Emmy award.

A month later, cable's TV Land premiered "Hot In Cleveland," the network's first original scripted series, which starred Valerie



Actors from the television series "The Golden Girls" stand together on Dec. 25, 1985, during a break in taping in Hollywood. From left are, Estelle Getty, Rue McClanahan, Bea Arthur and Betty White. NICK UT — THE ASSOCIATED PRESS FILE

Bertinelli, Jane Leeves and Wendie Malick as three past-their-prime showbiz veterans who move to Cleveland to escape the youth obsession of Hollywood. They move into a home being looked after by an elderly Polish widow — a character, played by White, who was meant to appear only in the pilot episode.

But White stole the show, and the salty Elka Ostrovsky became a key part of the series, an immediate hit. She was voted the Entertainer of the Year by members of The Associated Press.

"It's ridiculous," White said of the honor. "They haven't caught on to me, and I hope they never do."

By then, White had not only become the hippest star around, but also a role model for how to grow old joyously.

"Don't try to be young," she told The AP. "Just open your mind. Stay interested in stuff. There are so many things I won't live long enough to find out about, but I'm still curious about them."

Such was her popularity that even White's birthday became a national event: In January 2012, NBC aired

"Betty White's 90th Birthday Party" as a star-studded prime-time special. She would later appear in such series as "Bones" and "Fire-side Chat With Esther" and in 2019 gave voice to one of the toys, "Bitey White," in "Toy Story 4."

White remained youthful in part through her skill at playing bawdy or naughty while radiating niceness. The horror spoof "Lake Placid" and the comedy "The Proposal" were marked by her characters' surprisingly salty language. And her character Catherine Piper killed a man with a skillet on "Boston Legal."

But she almost wasn't cast as "Happy Homemaker" Sue Ann Nivens in "The Mary Tyler Moore Show" in 1973. She and her husband, Allen Luden, were close friends of Moore and Moore's then-husband, producer Grant Tinker. It was feared that if White failed on the show, which already was a huge hit, it would be embarrassing for all four. But CBS casting head Ethel Winant declared White the logical choice. Originally planned as a one-shot appearance, the role of Sue Ann (which humorously foreshadowed Martha Stewart) lasted until Moore ended the series

in 1977. "While she's icky-sweet on her cooking show, Sue is really a piranha type," White once said. The role brought her two Emmys as supporting actress in a comedy series.

In 1985, White starred on NBC with Bea Arthur, Rue McClanahan and Estelle Getty in "The Golden Girls." Its cast of mature actresses, playing single women in Miami retirement, presented a gamble in a youth-conscious industry. But it proved a solid hit and lasted until 1992.

White played Rose, a gentle, dim widow who managed to misinterpret most situations. She drove her roommates crazy with off-the-wall tales of childhood in fictional St. Olaf, Minnesota, an off-kilter version of Lake Wobegon.

The role won her another Emmy, and she reprised it in a short-lived spinoff, "The Golden Palace."

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Program

FROM PAGE 1

if the house was still standing. "I was frantically trying to download any satellite images that I could get, trying to get information for myself and our neighbors," he recalled.

Wanting to prevent others from experiencing the same distress, Fricker gathered aerial images of the Camp Fire's destruction and Cal Fire's door-to-door structure damage assessments. With this data, he and a team of Cal Poly undergraduates created a rudimentary prototype of DamageMap.

He took the prototype to Google's 2019 Geo for Good Summit, where he met Krishna Rao, a Stanford graduate student. At the event, the two built an improved version of the program. And in the years that followed, they continued collaborating and recruited more scientists to work on the project.

Last year's CZU Lightning Complex fire in Santa Cruz and San Mateo counties was California's ninth most destructive wildfire. The event scorched more than 80,000 acres and destroyed nearly 1,500 structures, 911 of them Santa Cruz County homes.

Despite the evacuation orders, many of Beasley's neighbors stayed behind. If a program such as DamageMap had been available to continually update evacuees on the status of their houses, she said, more people probably would have fled to safety.

"It was the not knowing that made it so bad because you couldn't look forward at all," said M'Liss Jarvis

Bounds, another Boulder Creek evacuee. She waited three weeks to hear that her house had survived the flames.

DamageMap works by first building a database of pre-fire home and building locations using satellite images or aerial photos. Then it looks at post-fire photos and decides which structures are damaged based on characteristics such as crumbled or blackened roofs.

Buildings ID'd

The application uses "machine learning," a form of artificial intelligence, or AI, to identify burned buildings.

Typically, computer programmers feed tens of thousands of images into a program so that it learns to identify specific patterns. Facebook, for example, uses machine learning to recognize faces and suggest people to "tag" in photos.

In developing DamageMap, researchers fed nearly 50,000 images of both burned and intact structures into the program, including photos from the 2017 Tubbs fire in Santa Rosa, the 2017 SoCal fire in Los Angeles and the 2018 Woolsey fire in Los Angeles and Ventura counties. Afterward, the programmers tested how well DamageMap had learned what a fire-damaged structure looks like by showing the application another 18,000 images from the Camp fire and the 2018 Carr fire in Shasta and Trinity counties.

The program correctly identified charred structures in the second set of photos at least 92% of the time in about 18 minutes,

according to the published paper. But it made mistakes when trees or other objects blocked buildings from view and when roofs blended in with the surroundings.

Although it isn't meant to replace post-fire assessments performed by people, technology that can quickly and accurately evaluate damage appeals to emergency responders.

"As the technology and machine learning technology develops, we'll certainly use it in the unfortunate event of another Camp fire or Tubbs fire, where it mows down a lot of structures at once," said Will Brewer, a geographic information system analyst and developer at Cal Fire.

Feeding data

For now, Fricker and his team are improving the program by feeding DamageMap more data to learn from. The more post-wildfire images it sees, the better it becomes at identifying damage.

The developers say a lack of funding is holding the program back from being available for broader use. So far, an \$18,000 grant from Cal Poly has been the main source of funding, but Fricker estimates another \$80,000 will be needed to get the application up and running for the public.

Fricker said he needs to pay dedicated computer programmers to continue training it, and he must find a suitable online platform to host the program, which could be costly.

"The code works, and we have a lot of data," Fricker said. "If people were motivated to get this out to the public for the next fire season, it could be done."

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