ARTURO

Hurricane Exposure:
The State of Gulf Homes

About the Report

Arturo's Hurricane Exposure Report analyzes 17,398,366 single-family residences across Texas, Louisiana, Mississippi, Alabama, Florida, Georgia and South Carolina to glean the state of property across the Gulf Coast in advance of hurricane season.

As climate change increases the frequency and severity of natural disasters, it may feel like little can be done to protect our homes and combat the hazards to come. But preventing losses first begins with understanding the state of how things are — and making an action plan to strengthen and adapt, be it shoring up a home's roof, trimming tree branches or leveling up your insurance policy.

Many insurance carriers are seeking to move towards this proactive model, where risk is understood precisely and completely upfront. Through this, any changes that occur to a property over time, like the growth of a tree over a roof, the addition of solar panels or other items that result in underinsurance, are detected as they appear. This model allows the carier to have the heart of a teacher, fostering a productive partnership between the insurer and the insured to reduce risk and premiums.

So when the storm does come, you're ready.

Wind Exposure

A Rise in Wind Loss

The National Oceanic and Atmospheric Administration (NOAA) released its official forecast for the 2022 Atlantic hurricane season, calling for an above-average year with:

14–21
named storms

6–10
hurricanes

3–6
major hurricanes

To understand the exposure of these coastal states, it's important to understand the basics about where damage often occurs to the home: the exterior and, most notably, the roof.

There are two major components to hurricanes. The first is wind. Hurricanes are best known for their Category intensities (as measured by the Saffir-Simpson Hurricane Wind Scale) which are based upon sustained wind speeds. The higher the Category, the more intense wind, with Category 5 storms bringing over 157 mph winds.

Wind can be incredibly damaging to property. According to LexisNexis Risk Solutions' U.S. Home Insurance Trends Report, wind loss costs rose 63% year-over-year in 2020. Three of the five highest wind claim states were Louisiana, Florida and Georgia, all occupying the Gulf region analyzed in this report.

HURRICANE CATEGORY	SUSTAINED SPEEDS	POTENTIAL DAMAGE
1	74-95 mph	Very dangerous winds will produce some damage
2	96-110 mph	Extremely dangerous winds will cause extensive damage
3 (major)	111-129 mph	Devastating damage will occur
4 (major)	130-156 mph	Catastrophic damage will occur
5 (major)	157+ mph	Catastrophic damage will occur

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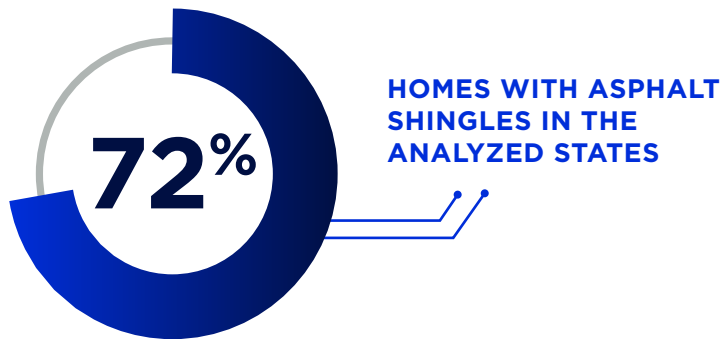https://www.nhc.noaa.gov/aboutsshws.php

The Best Roof for High Winds

In the U.S., asphalt shingle is the most common roof type, present in 71.9% of roofs in the analyzed states. Another 13.5% are concrete tile (which includes terra cotta), 0.6% are wood and 6.1% are metal.

Metal roofs are the most wind-resistant, able to withstand hurricane-force winds up to 160 mph (Category 5 intensity). Asphalt shingle, on the other hand, at its best, can't handle more than 110 mph, or Category 3 intensity. Older or degraded asphalt shingles can be as weak as withstanding 50 mph winds or tropical-storm-force winds.

42.3% of homes in the Gulf have a hip roof, whereas 49.6% have a gable roof. A hip roof is defined as a roof where all sides of the roof slope downwards, with no vertical ends. The roof can look somewhat like a pyramid. A gable roof, by contrast, has the wall extend upward between the roof's edges.

Studies have shown hip roofs tend to perform better under windy conditions, but on the whole, gable roofs tend to be more common, as they are cheaper to build.

**72%** HOMES WITH ASPHALT SHINGLES IN THE ANALYZED STATES

50% HOMES WITH GABLE ROOFS IN THE ANALYZED STATES

Spotlight on Roof Shape

**Regionality plays a big role in the prevalence of roof shapes.**

In Texas, Louisiana and Florida, which often see a strong presence of hurricane and other wind-related activity, hip roofs comprise 52%, 47% and 44% of the state respectively. This is particularly notable as hip roofs are typically more expensive to build than gable roofs, as the shape is more complex and requires more materials, but their strong structural design makes them an appealing choice in areas that require durability in the face of the elements.

In contrast, nearly three-quarters of roofs are gable in South Carolina. And across the entire United States, two-thirds of all roofs are gable roofs. As hurricane season unfolds, understanding the inherent structural vulnerabilities of potential landfalling states is essential to knowing how they will fare.

HIP ROOF

52%	47%	44%
TX	LA	FL

GABLE ROOF

73%	67%
SC	ACROSS US
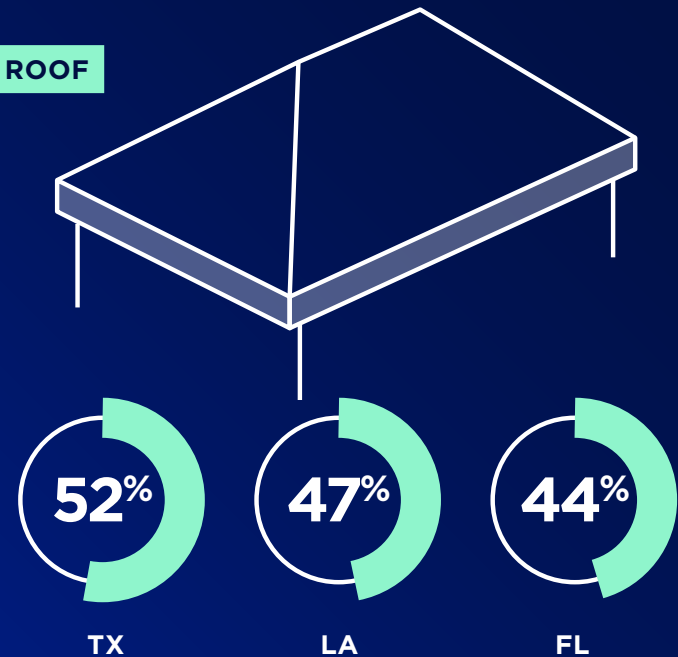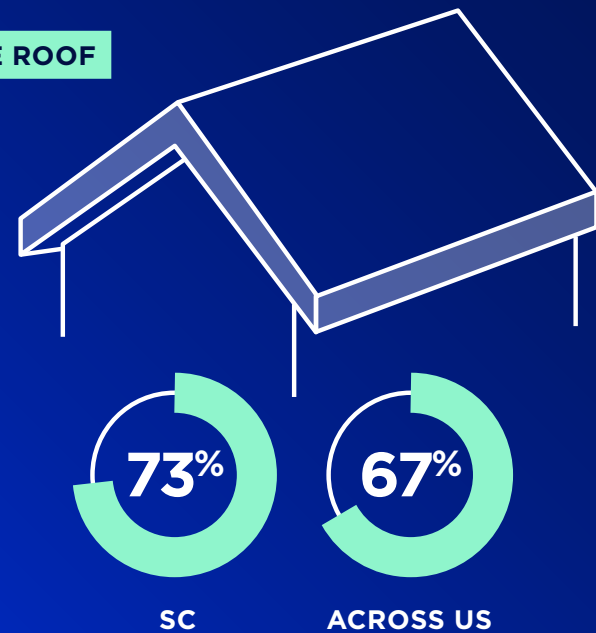
Water Exposure

Water Exposure

The second major component of a hurricane is water. In recent years, as a result of hotter air and warmer oceans, rainfall-forward hurricanes have become more commonplace. Of note, infamous hurricanes Harvey and Florence in back-to-back years stalled over land and dumped a deluge of rain. Hurricane Harvey broke the record for the highest tropical cyclone-related rainfall total in the U.S., with 60 inches of rain.

This type of storm has become so prevalent that, to couple with the traditional Saffir-Simpson rating, a group of researchers has proposed the Extreme Rain Multiplier, or ERM, to enable forecasters to communicate the potential for rainfall in reference to the heaviest rainfall the geography usually receives in a two-year period. Hurricane Harvey's ERM was 6.4, showing that the storm was over six times more severe than the heaviest rainfall events normally expected in that area.

691K+
HOMES WITH SKYLIGHTS IN THE ANALYZED STATES

6.5M
HOMES WITH GROUND AC UNITS IN THE ANALYZED STATES

There are a total of 691,663 homes with skylights in the analyzed states. As skylights age and deteriorate, they can become a major source of leaks. They're also particularly vulnerable to damage from hail or debris.

According to HomeAdvisor, it costs an average of $1,737 to install a skylight. Across the analyzed states, that would cost over $1 billion — and that's to replace the skylight alone, not accounting for any damage that may have occurred inside when it was compromised.
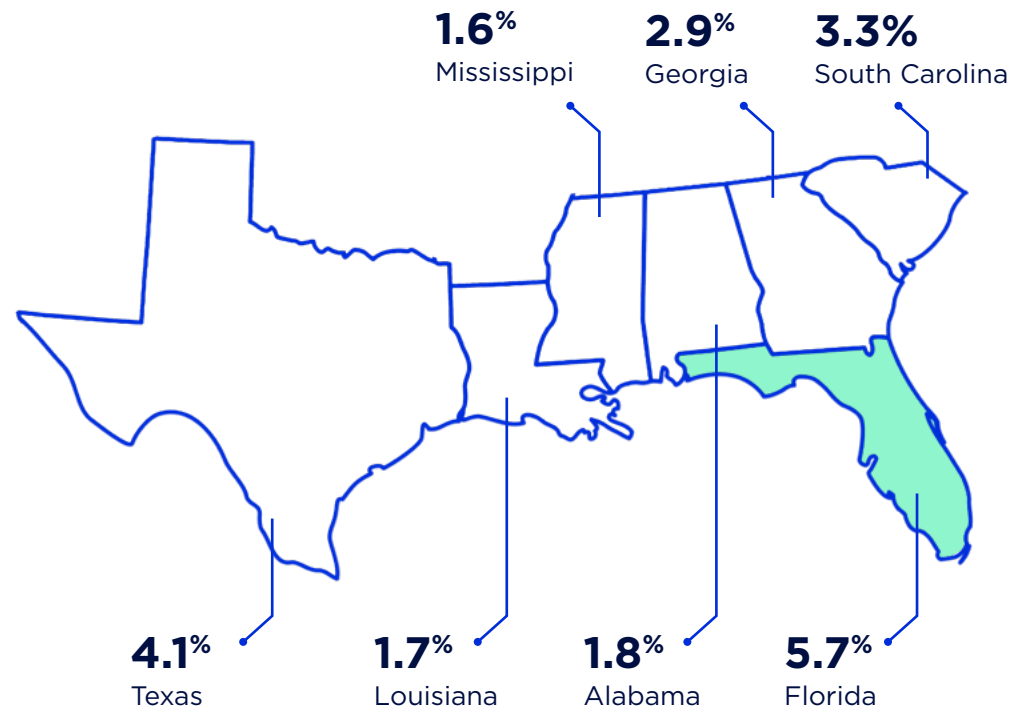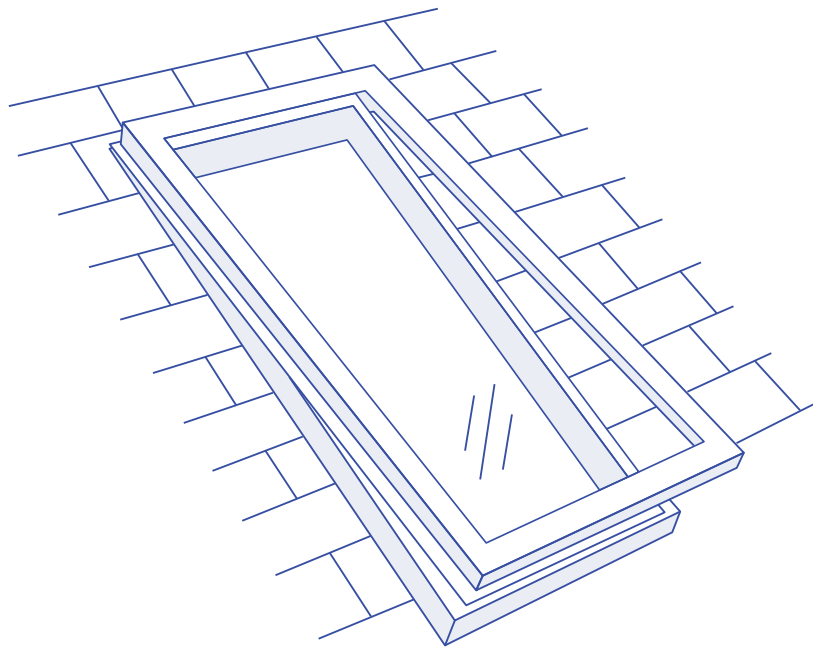
Unsurprisingly, the southeast U.S. has a great fondness for air conditioning. There are nearly 6.5 million homes with ground AC units across the seven analyzed states.

When a major flooding event occurs, these exterior ground units are at risk of flood damage. The average cost to replace an AC unit is $5,687 according to HomeAdvisor.

Spotlight on Skylights

In the sunny south, skylights can really brighten a home, but they do come with risk.

In Florida, the sunshine state, 5.7% of homes have skylights. In a hurricane, rife with both projectiles flying in the wind and pouring rain, skylights present a serious risk to the interior of a home. Ensuring any skylights in a home are well-maintained and sealed is an important step in preventing water damage.

1.6% Mississippi

2.9% Georgia

3.3% South Carolina

4.1% Texas

1.7% Louisiana

1.8% Alabama

5.7% Florida

Underinsurance

Underinsurance

People often also have costly and vulnerable assets outside of their homes, including pools, trampolines and solar panels. In the Sun Belt, it's no wonder the prevalence of these is high. Damaged solar panels and pools can present a costly problem in the wake of a storm, and trampolines can disappear altogether.

These three items share one key thing in common: often, homeowners will install them and not think to inform their insurance company. This can render them underinsured as the addition of these can increase the replacement cost and liability of a home. Insurance is a vital financial safeguard that allows people to bounce back more quickly in the event of a disaster, so taking a close look at your coverage is imperative to resiliency.

257K+

**HOMES WITH SOLAR PANELS IN THE ANALYZED STATES**

In the Gulf, 257,148 homes have solar panels, and they're only increasing in popularity. According to a study conducted in 2019 by Pew Research, 46% of Americans said they had given "serious thought" to adding solar panels to their homes, up from 40% in 2016.

Although cloudy days reduce their ability to produce energy, the good news is that solar panels are generally waterproof. Wind is also generally not a problem, provided the solar panels are strongly secured to the roof, preventing uplift.

17%

HOMES WITH POOLS IN THE ANALYZED STATES
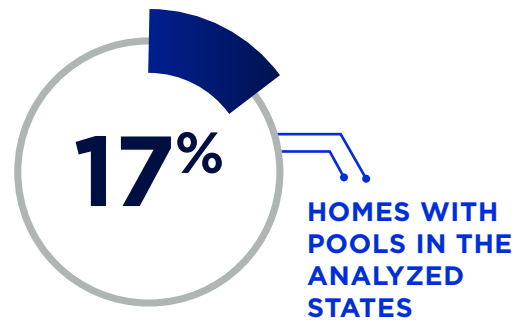
It's clear. People love their pools, with 17% of homes in the analyzed states having one. But pools can be expensive when damaged, and protecting them from hurricanes may not be intuitive. Best practices include not covering the pool, keeping the pool filled and ensuring all electrical pool equipment is shut off and protected from moisture.

800K+

**HOMES WITH TRAMPOLINES IN THE ANALYZED STATES**
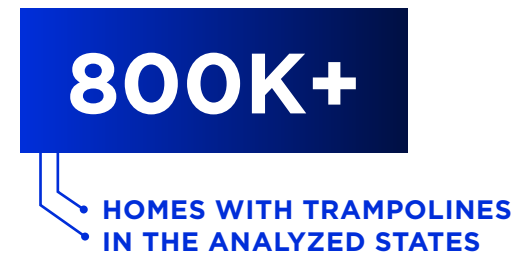
There are over 800,000 homes with trampolines across the seven states. Much like pool accessories, a trampoline can become a projectile during a hurricane, damaging your home and other items. Options to prevent this include anchoring the trampoline or just disassembling it entirely. Winds as low as 40 mph, or tropical-storm-force winds, can pose a flight risk to trampolines.

Spotlight on Solar Panels

While solar panels are generally waterproof, hurricanes can spawn other types of hazards besides rainfall as they traverse across land, including lightning, tornadoes and hail, collectively referred to as severe convective storms. These storms can pose a risk to solar panels, which can shatter from large hail or be critically damaged from a lightning strike.

Florida (2.1%) and Texas (1.9%) have the greatest presence of solar panels followed by South Carolina and Louisiana, tied at 1.5% each. Other than properly grounding the panels and ensuring their installation is secure, a great way to protect solar panels is to ensure your home insurance company is aware of their existence, so they can be adequately financially protected.

2.1%
FLORIDA

1.9%
TEXAS

1.5%
SOUTH CAROLINA + LOUISIANA
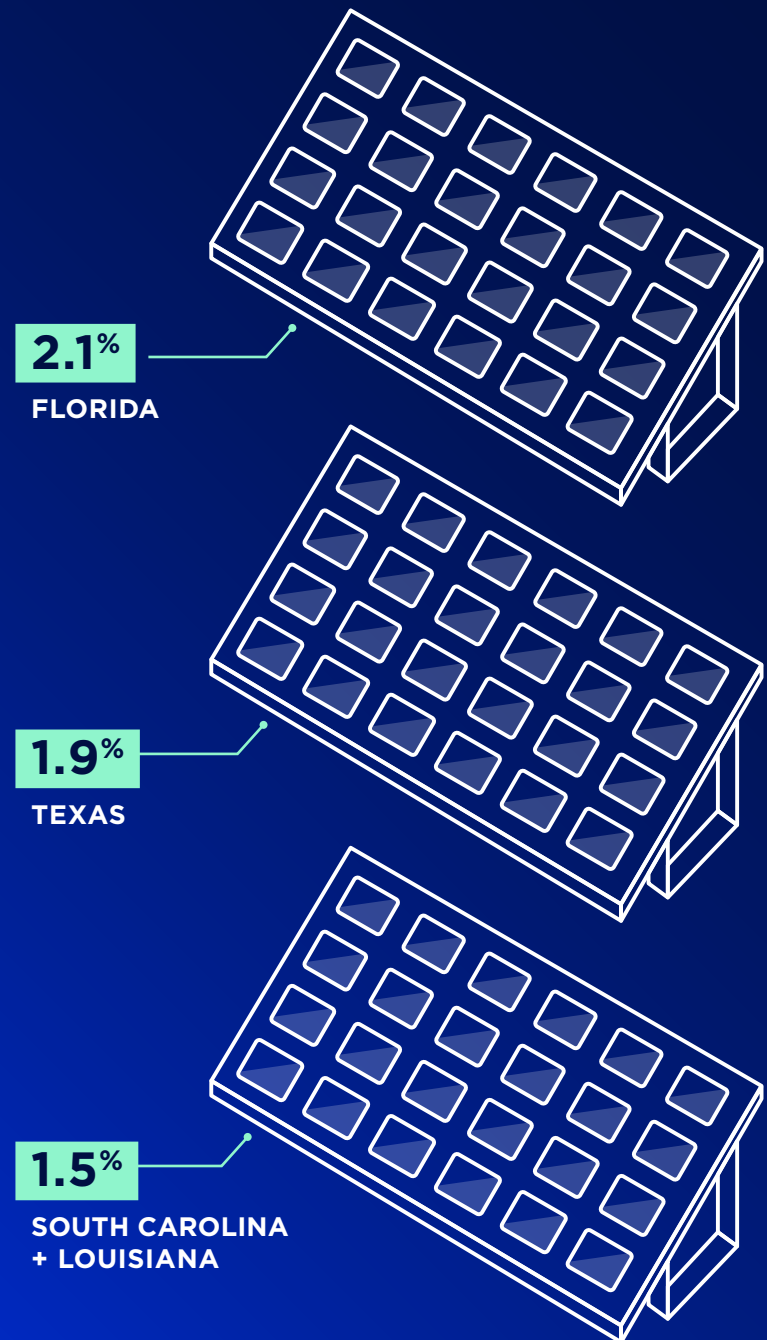
Spotlight on Pools

Much like roof shape, pool presence is also highly regional.

In Florida, nearly one-third of all homes have a pool, with the majority of those pools being in-ground. As compared to the seven-state average of 17%, Florida has roughly twice as many pools as everyone else in the area.

In Florida, in-ground pools are often enclosed in screens to guard against mosquitos and other pests that thrive in the humid weather. However, in the event of a hurricane, the pool enclosure can act as a sail in the wind, and projectiles can result in the screens tearing as well. Eliminating or securing projectiles around the house like pool or other yard accessories can help to prevent them from both blowing away and damaging other things, including your house.

GULF POOL PRESENCE

17%

SEVEN-STATE AVERAGE

31%

FLORIDA ONLY
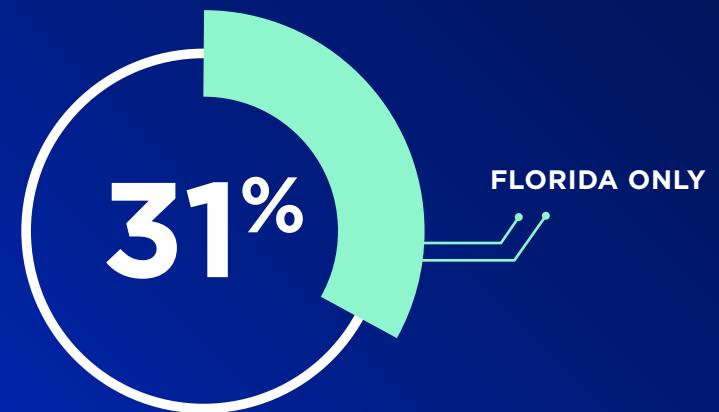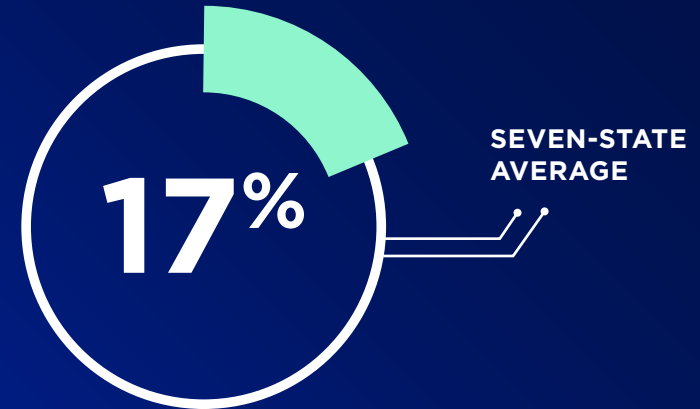
Adaptation

Adaptation

Over the past few years, homebuyers have moved southeast, flocking to Florida, Texas and the Carolinas in search of warmth and affordability. People love the beach, the sun and the outdoorsy lifestyle afforded by these warmer locales. With cheaper taxes and more land, homes tend to be newer. Land for construction is more abundant than in the comparably more dense northeast.

Simultaneously, the chances that La Niña conditions persist through the summer are just under 60%. Studies have shown a strong link between La Niña conditions and more intense storm activity. This is reflected in the above-average forecast for the 2022 Atlantic Hurricane Season, with the NOAA projecting 14 to 21 named storms, six to 10 hurricanes and three to six major hurricanes, an uptick from the average of 14 named storms, seven hurricanes and three major hurricanes.

The convergence of these migratory and climatic changes has put more people and more homes squarely in the path of natural catastrophes. The exposure inherent in these homes presents an opportunity to adapt, a concept underscored in the Intergovernmental Panel on Climate Change (IPCC) report. Their report outlines that adaptation "plays a key role in reducing exposure and vulnerability to climate change."

INSURERS

Insurance companies responsible for helping protect policyholders can adapt by educating homeowners on the best way to reduce their inherent exposure and risk. This could be as easy as exchanging a reduction in premium for a roof repair or educating policyholders on what their homeowners' insurance actually covers, so they are adequately protected for what may come.

INSUREDS

Homeowners can adapt by fulfilling these actions and keeping a wary eye on their home, addressing problems as they arise.

Mother Nature will do what it will. But we have the power to **decide with intelligence** on how to handle the risk.

Methodology

Cognitive Diversity

Arturo's Exposure Report analyzed 17,398,366 single-family residences across Texas, Louisiana, Mississippi, Alabama, Florida, Georgia and South Carolina. All homes were analyzed using highly trained artificial intelligence (AI) models in the spring of 2022, using the most recent imagery available for the property.

At Arturo, our AI team trains models by focusing on a strong foundation of ground-truthed inputs. There are many ways to train a computer to identify objects and features, and they are typically grouped into supervised and unsupervised learning algorithms. The difference between the two is the availability of ground truth or labeled data. To the extent the labeled data has sufficient variety and variability, the deep learning algorithm can robustly extract discriminative information from it and use these learnings to recognize the object or feature it was trained to find.

Our teams create extensive and detailed labels, or annotations, on an image, from which our cloud-deployed algorithms learn what a roof is, from what material it is comprised, in what condition it is and how all of these property characteristics can look across millions of different images. Doing this thoroughly and across a wide array of imagery with rigorous oversight is the central component of building a reliable model with

benchmarked performance. Without this rigor in development, the models can be overly biased and have unbalanced predictions; for example, the model could mistakenly overpredict asphalt shingles as roof material.

We also work closely with our customers to retrain our models periodically and continuously improve our model performance. This is done by either giving our models new labeled data to consider when expanding into a new geography or when augmenting the attribute classes or by testing newer deep learning architectures to optimize our model selection. We have an iterative model validation process, ensuring the experiences and depth of knowledge from an underwriting or claims department are being taken into account and that our models properly address critical customer questions.

The AI team at Arturo, solely focused on property, is growing rapidly, and they bring to the table the final, critical piece of the puzzle: cognitive diversity. A machine learning model is ultimately only as good and unbiased as the people who thoughtfully design it. A large and diverse team ensures a wealth of experiences and perspectives to make the Arturo models the best they can be and minimize bias. Our cognitive diversity is a key ingredient in the culture of innovation and technical resilience we foster at Arturo.

Appendix
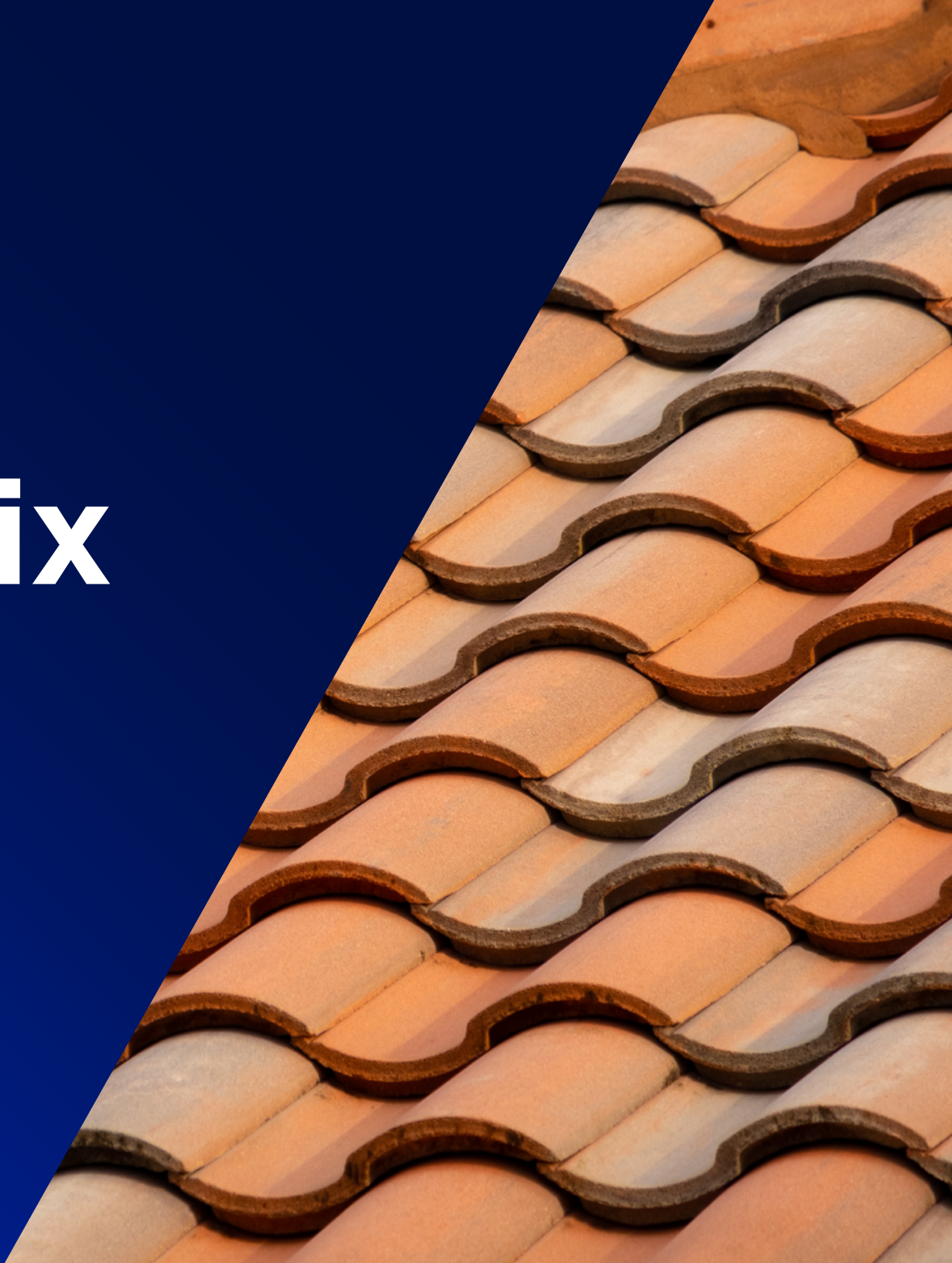
Stats by State

		TEXAS	LOUISIANA	MISSISSIPPI	ALABAMA	FLORIDA	GEORGIA	SOUTH CAROLINA
	Total Single Family Residence Records	6,416,487	1,001,270	442,808	1,102,566	4,781,610	2,443,280	1,210,345
Roof Material	Asphalt Shingles	5,352,547	715,491	319,571	752,230	2,728,667	1,783,750	852,808
	Concrete Tile	439,692	66,958	32,311	115,678	1,266,902	253,622	166,983
	Metal	237,319	95,695	28,695	104,885	437,251	104,154	60,510
	Flat	86,192	14,268	3,283	7,666	128,753	28,889	15,543
	Wood	17,450	5,133	2,187	9,683	14,692	33,691	10,963
Roof Shape	Hip	3,368,349	479,847	155,529	366,800	2,139,467	628,270	218,176
	Gable	2,657,406	401,584	225,727	615,880	2,279,347	1,561,689	879,630
	Flat	101,054	15,921	3,244	7,385	157,438	13,945	8,900
Property Characteristic	Pool count	869,242	110,717	41,126	112,745	1,476,620	216,115	127,928
	Trampoline count	439,317	44,479	23,376	58,865	103,657	112,612	56,294
	Skylight count	265,596	17,451	7,089	19,628	271,742	70,110	40,047
	Solar Panel count	119,687	14,527	561	498	99,157	5,169	17,549

ARTURO

Arturo is the proptech company that delivers intelligent analytics from individual property to portfolio. We combine AI and machine learning models with property images to help businesses decide with intelligence.

arturo.ai