A person in a dark suit and tie is holding a tablet. A glowing blue brain composed of circuit lines is superimposed over the person's chest area. The background is dark blue.

# Machine Learning In Medical Imaging

Research and Report by Reaction Data: 2018

**Reaction**  
—Data—

# Executive Summary

Machine Learning (an exciting sector of the artificial intelligence universe) is garnering an enormous amount of attention in every industry, and healthcare certainly is no exception. Almost every analyst firm, think tank, advisory outfit worth its salt\* states that AI, and specifically machine learning, is here to stay. More to the point, there are dozens of new companies claiming machine learning acumen especially in the field of medical imaging. At RSNA 2017 the most prevalent topic was machine learning and how much of an impact it will really have on the practice of medicine and on the business of healthcare overall.

Over the past year, tech titans like Amazon, Google, IBM, Apple, and even Salesforce have spent tens of billions of dollars on AI and machine learning. In the healthcare arena specifically, major players such as Change Healthcare, Nuance, Hologic, and many other healthcare-specific bellwethers have launched major AI initiatives. In addition, dozens of emerging disruptors garnering enormous venture capital funding (Zebra Vision, Arterys, and DeepMind just to name a few) triangulates towards the fact that machine learning is more than just the latest shiny toy that physicians just “have to have”.

The primary motivation behind this study is the sheer amount of hype going on in healthcare, specifically in radiology and imaging, around AI – deep learning and machine learning. In essence, the machine learning buzz is, quite literally, through the roof. Again, it was on the lips and minds of almost every attendee at RSNA. However, as with all hot topics, there comes a certain element of healthy professional skepticism. How truly useful is AI? Where is it most useful and applicable? Are organizations really going to pay for it? And if so, how will they do so with the many downward cost pressures they face?

With all of this as our background, we launched this study in late December 2017 to get into the minds of imaging and radiology leaders. We wanted to see what all the hype was about and to uncover the real story of AI and machine learning.

\*Hype Cycle Research Methodology | Gartner Inc.

Magic Quadrant Research Methodology | Gartner Inc.

Artificial Intelligence | McKinsey & Company

# Demographics

## Organization Type

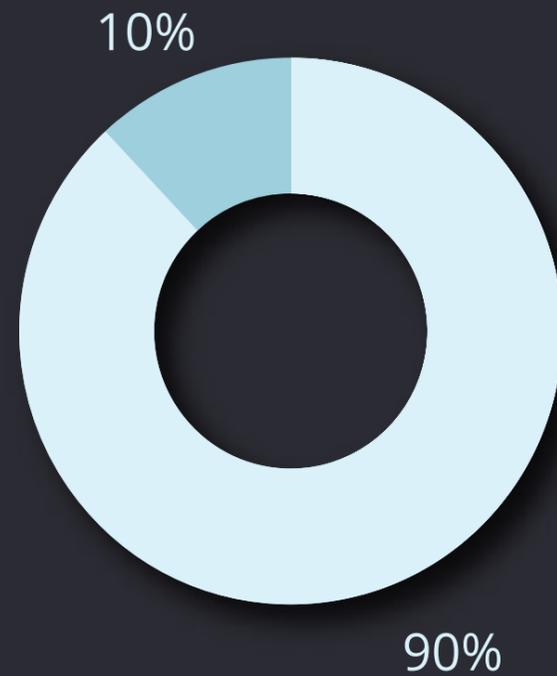
We received a very healthy amount of feedback over the Christmas/holiday break, which points to the significant amount of interest there is in machine learning.

## Participants

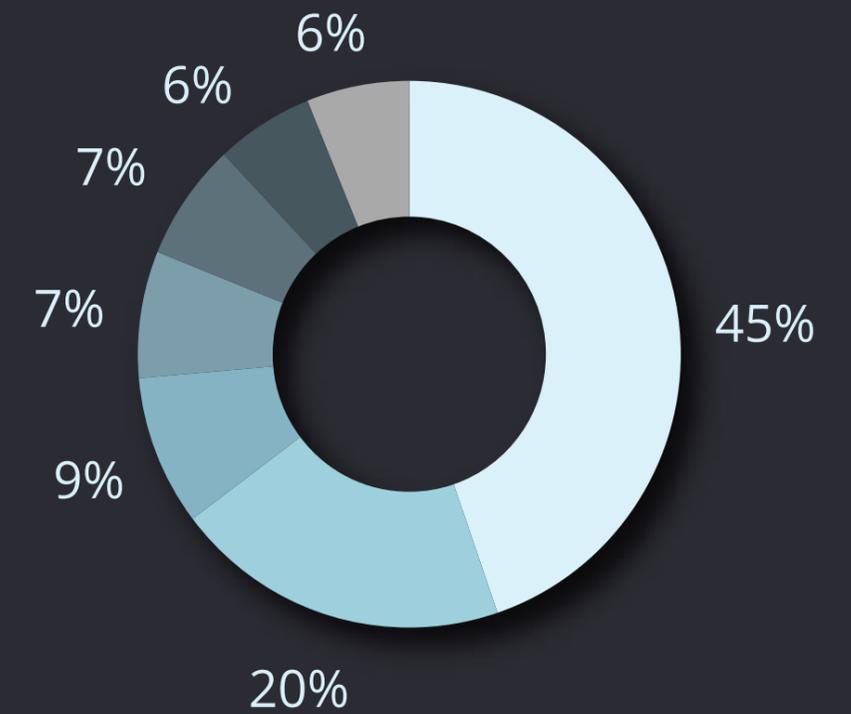
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With this type of research, it is critical to get a broad perspective from as many different decision-makers and influencers as possible. So, our data does just that, feedback from the techs all the way up to directors.

- Acute
- Imaging Center



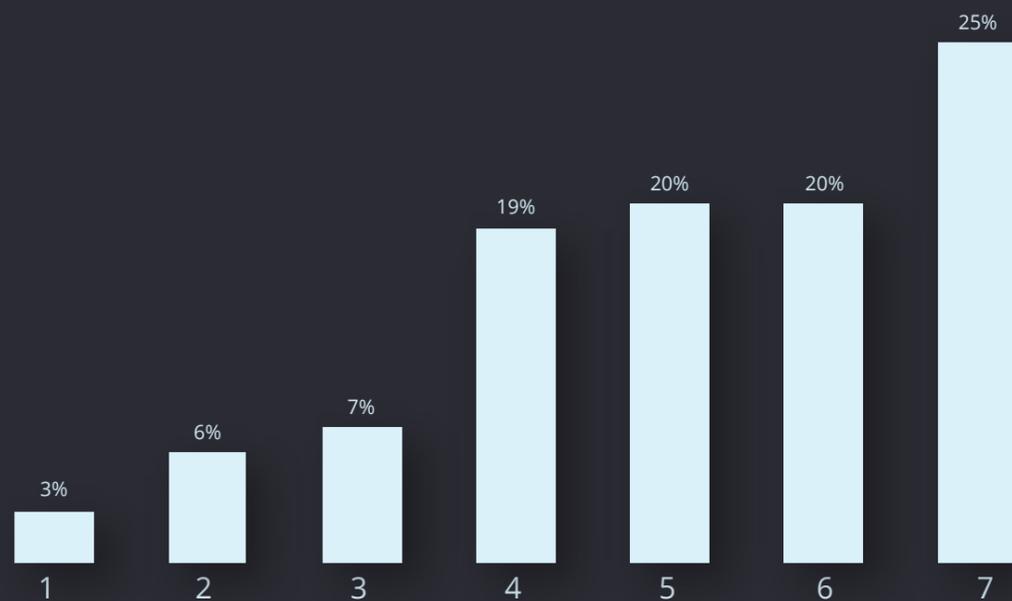
- Director of Radiology
- Radiologist
- Imaging Director
- Radiology Manager
- Chief of Radiology
- Tech
- PACS Admin



# Importance

## How Important Is Machine Learning?

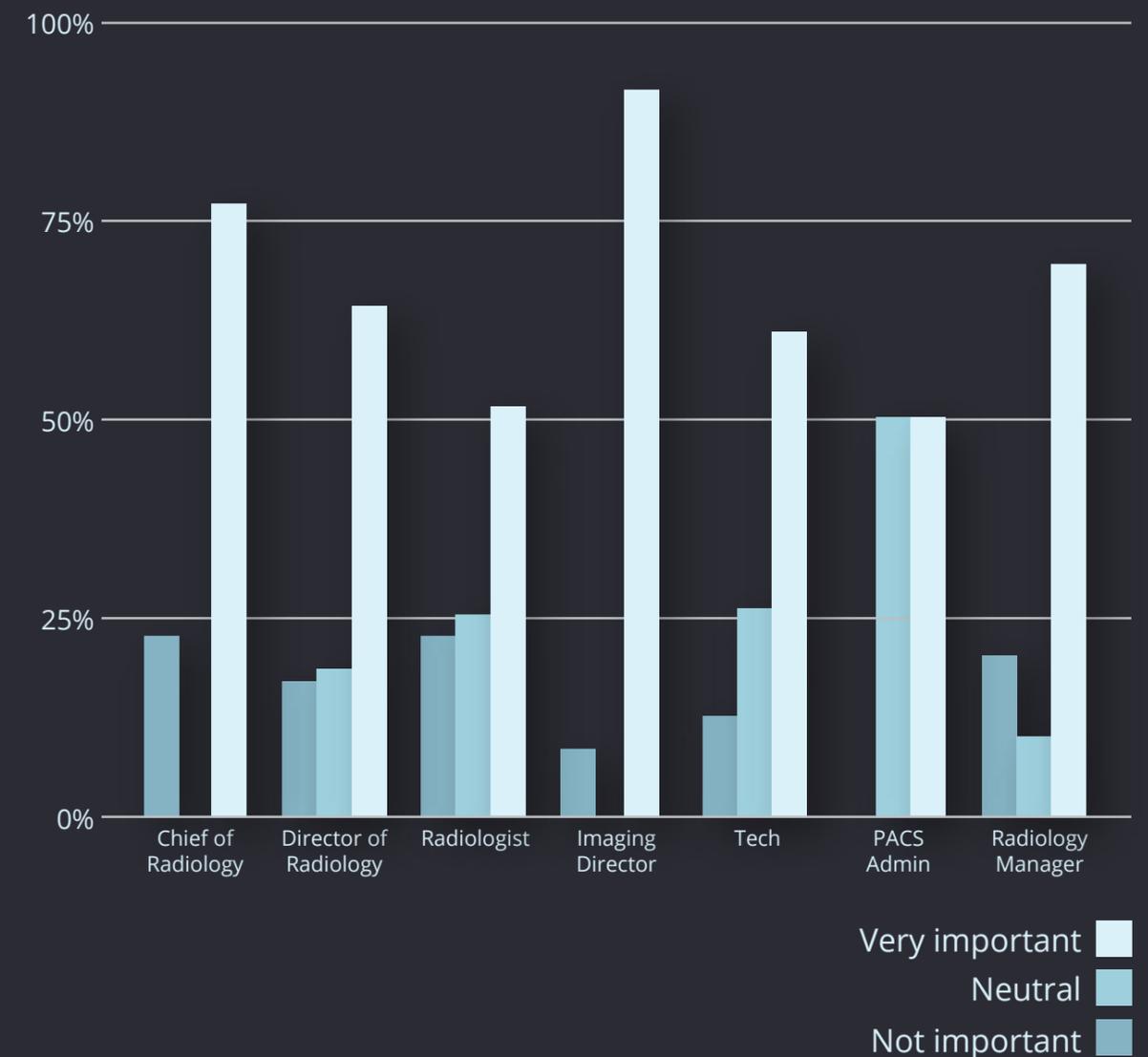
Only 16% of respondents think machine learning just isn't that important, with the vast majority viewing machine learning technology as being either important or extremely important in medical imaging.



1 Not important - 7 Extremely important

## Importance By Job Title

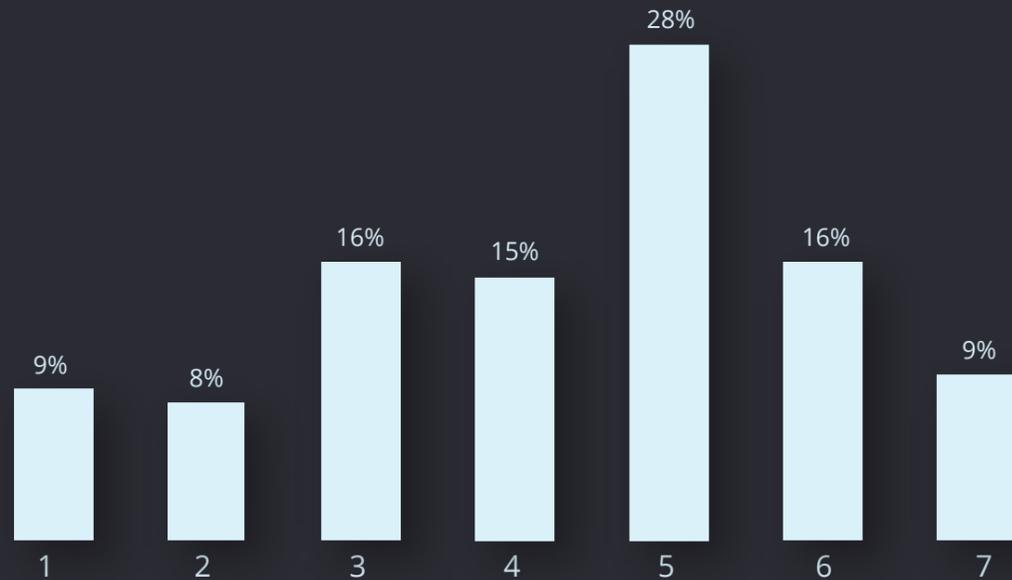
It's interesting to note that practicing radiologists are the more skeptical of machine learning's applicability and usability, with department leadership holding a more optimistic opinion of this new technology.



# Familiarity

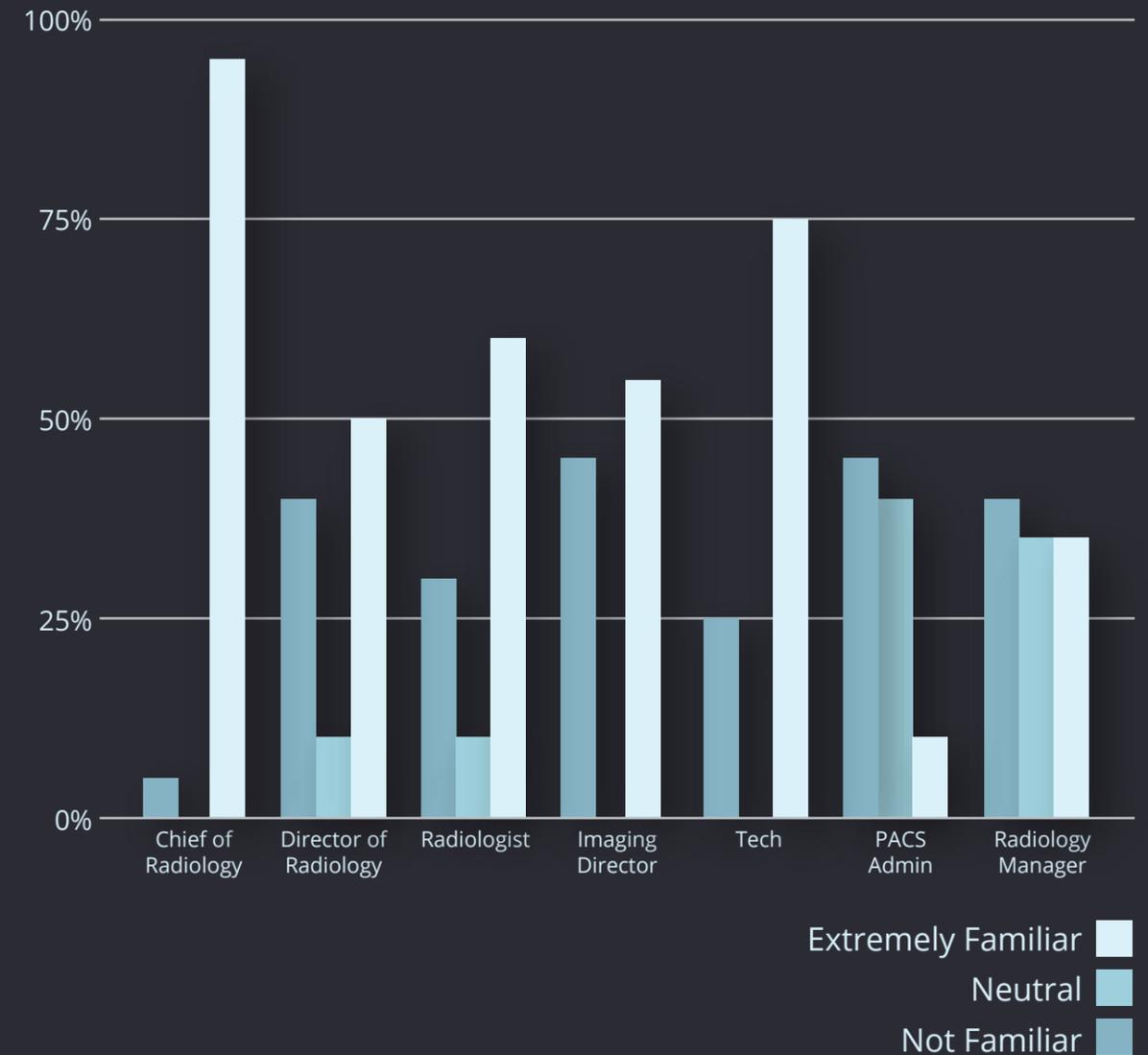
## How Familiar Are You With Machine Learning?

Chiefs of Radiology think they are the most familiar with machine learning. However, other titles that are a lot less familiar with ML think it is more important. This indicates we may be dealing with a mild case of FOMO (fear of missing out). They responded that they aren't that familiar with machine learning, but they feel it's incredibly important. They catch wind of the all the buzz, and all of a sudden you have something important.



1 Not Familiar - 7 Extremely Familiar

## Familiarity By Job Title

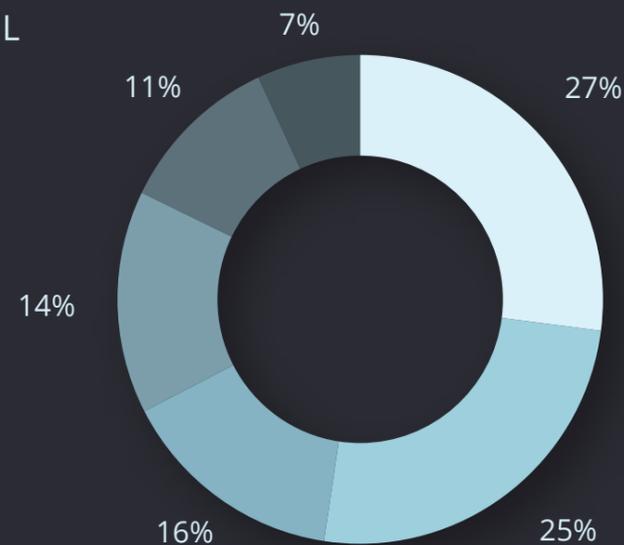


# Adoption Rate

## When Do You Plan To Adopt Machine Learning?

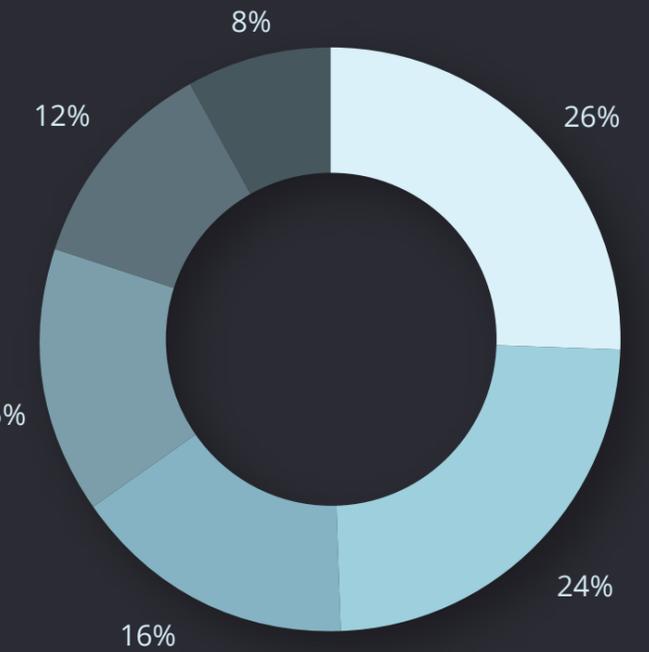
A very small group (16%) of medical imaging professionals say they have no plans to adopt machine learning. It's very exciting to note that most radiology departments and imaging centers plan to jump on the ML train before 2020, with the remainder of organizations towing the line just a few years after that. One of the most fascinating findings to come from this research is that there has been very little adoption by imaging centers; all of the adopters are hospitals. This is something we did not expect, as oftentimes imaging centers are less risk-averse than are their hospital counterparts.

- We're 1-2 years away from adopting ML
- We're 3+ years away from adopting ML
- I don't think we ever will utilize ML
- We've been using ML for a while
- We're planning on adopting ML in the next 12 months
- We just adopted some ML



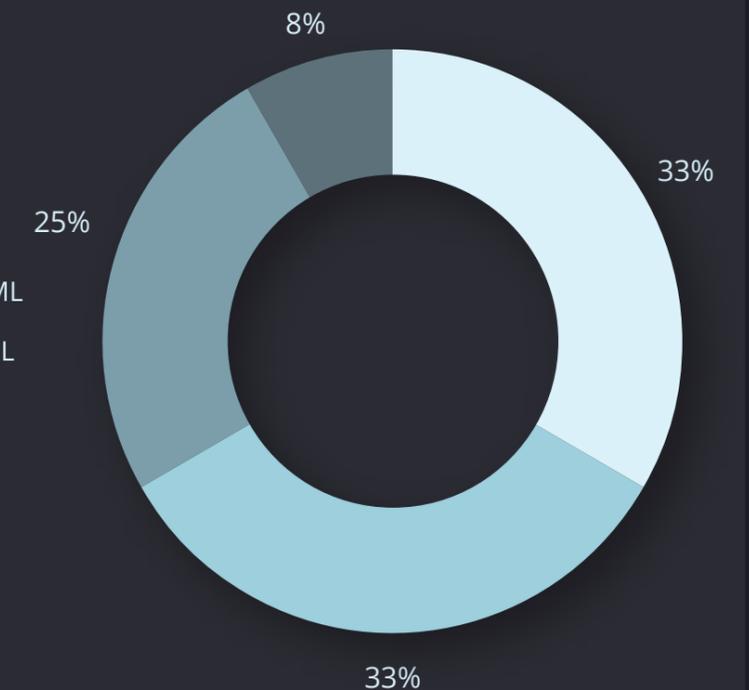
## Acute

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## Imaging Center

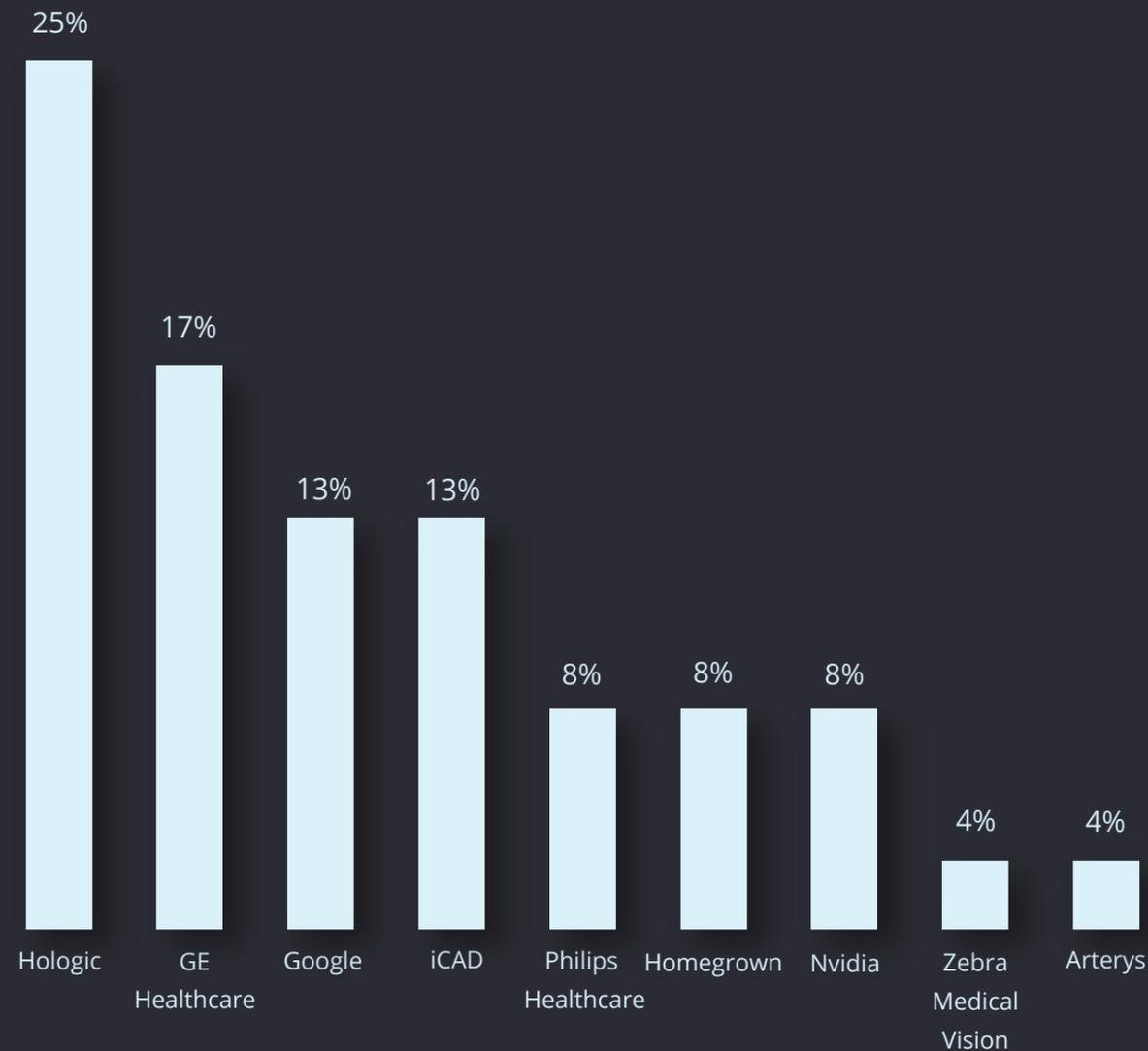
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# Current Vendors

## Who Do You Currently Use For Machine Learning?

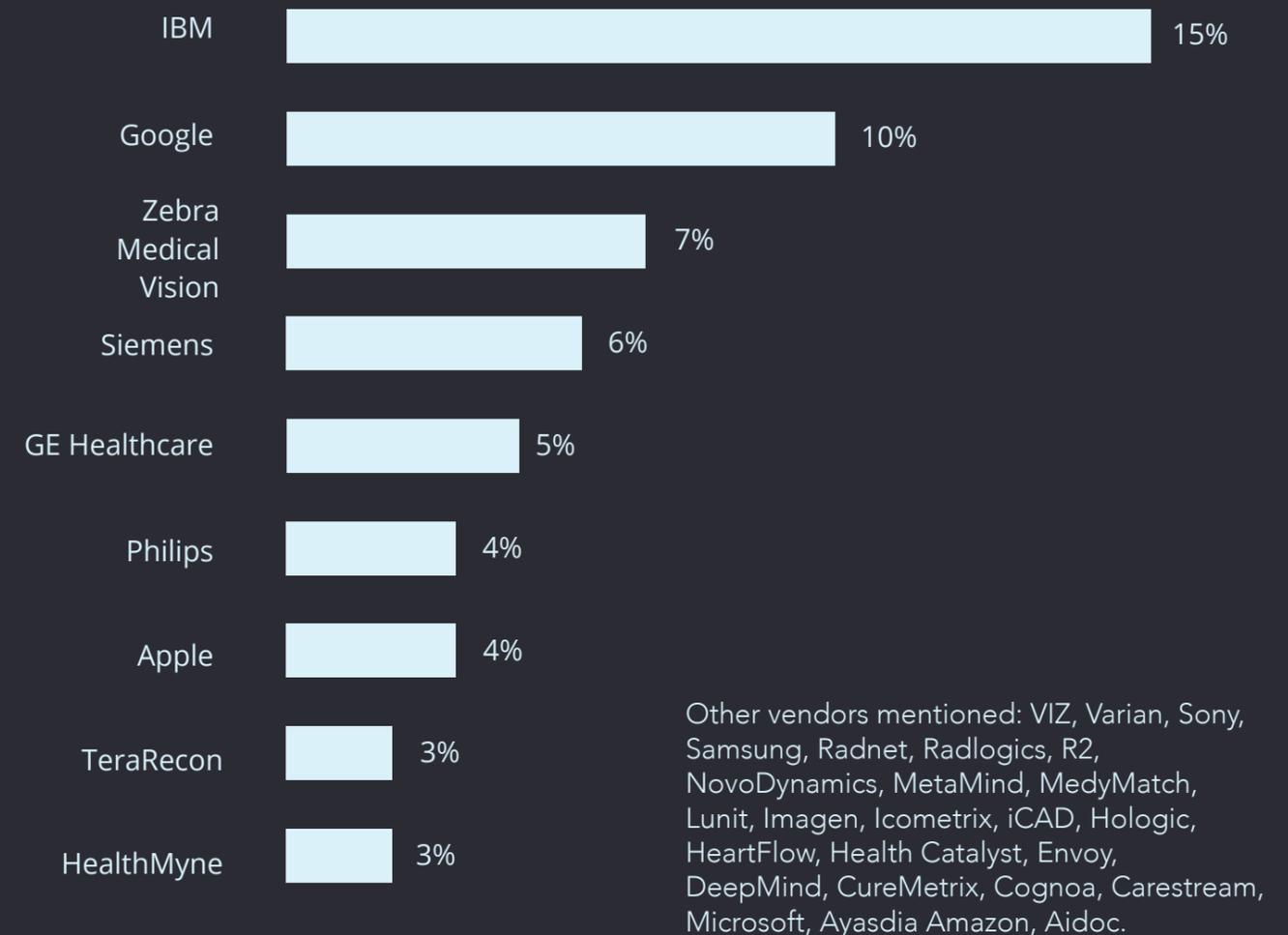
On the next page you'll notice the most common application for machine learning is in breast imaging. So it comes as no surprise that many of the top vendors being used are also long-standing industry leaders in breast imaging modalities and software solutions, with the notable exception being Google.



# Mindshare

## Who Do Providers Think Offers Machine Learning?

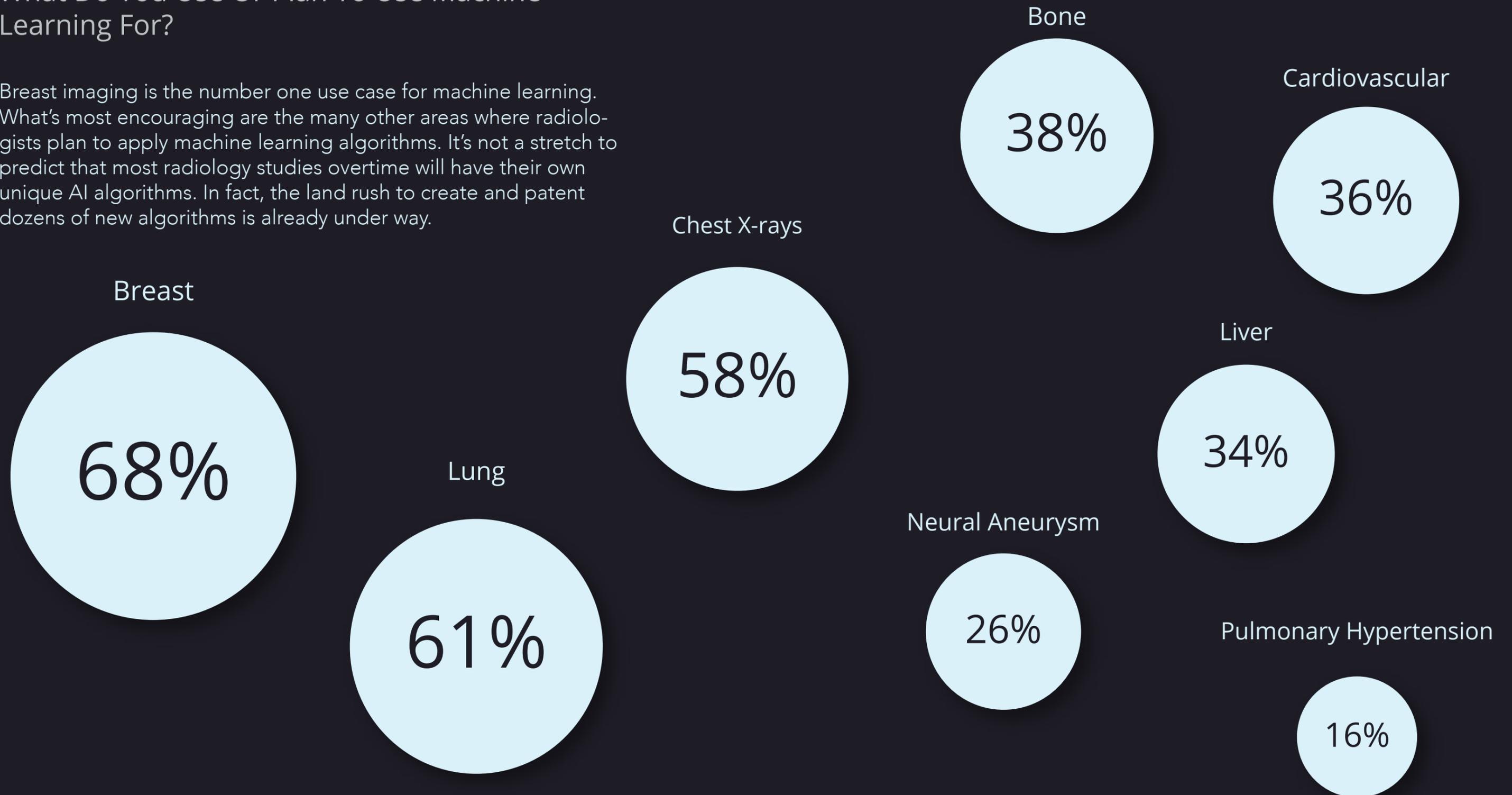
Ever wonder if all those marketing efforts really pay off? Here's some evidence that it does. Most of the top companies that people think offer machine learning don't actually have much mindshare among those that are actually being used. This finding in the research is incredibly revealing.



# Application

What Do You Use Or Plan To Use Machine Learning For?

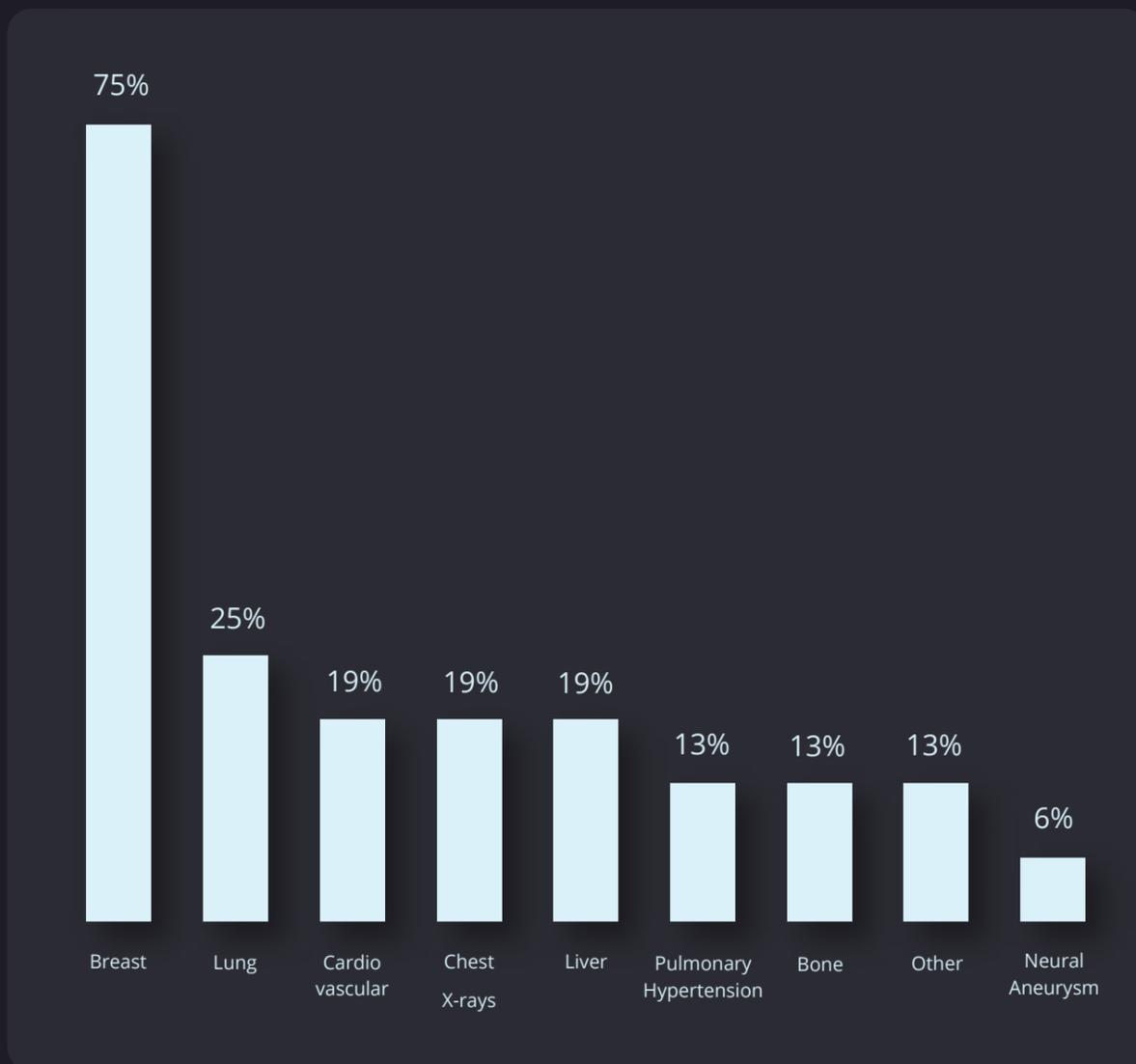
Breast imaging is the number one use case for machine learning. What's most encouraging are the many other areas where radiologists plan to apply machine learning algorithms. It's not a stretch to predict that most radiology studies overtime will have their own unique AI algorithms. In fact, the land rush to create and patent dozens of new algorithms is already under way.



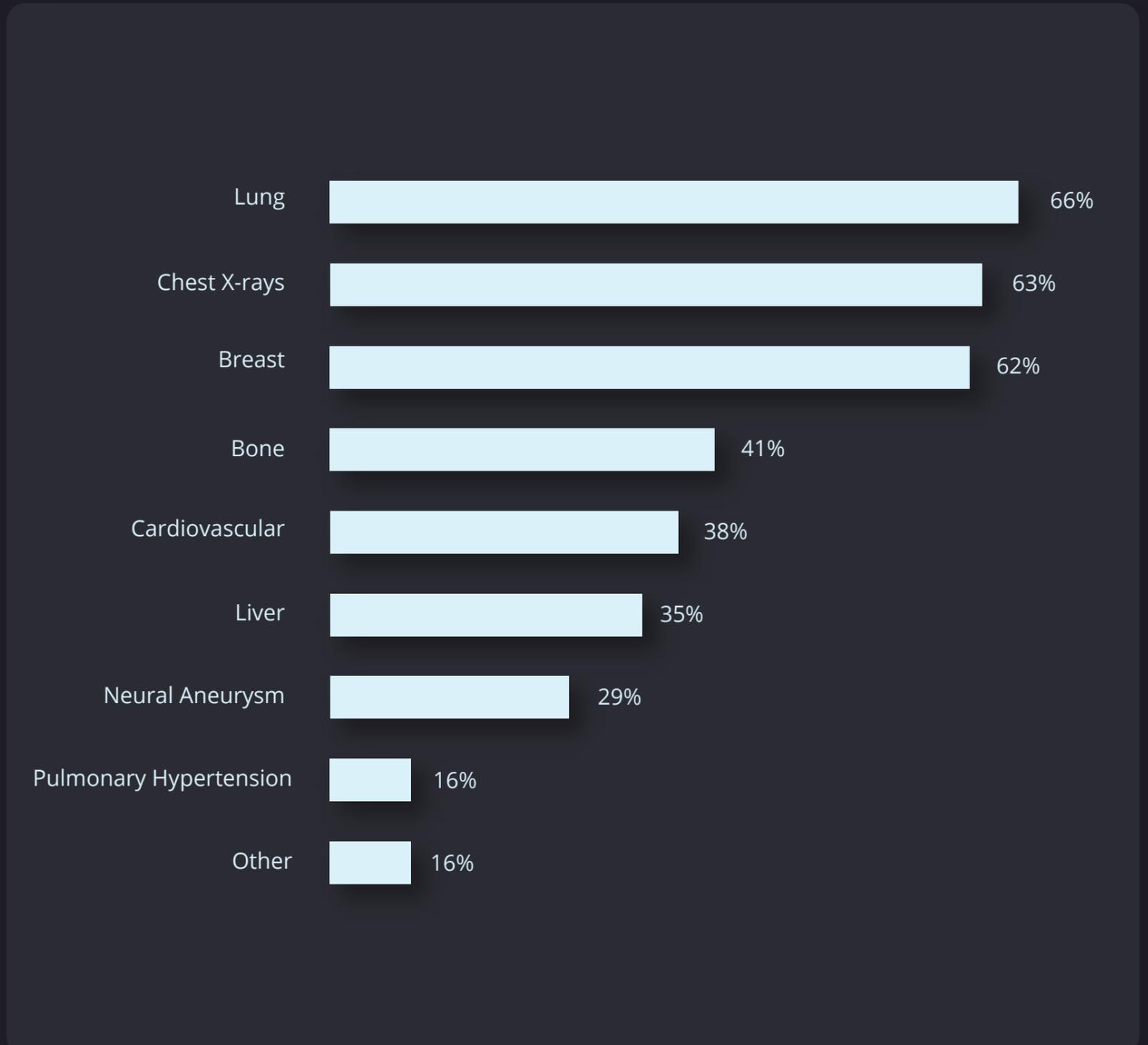
# Application

## Application By Those Using Machine Learning

Breast imaging is extremely far ahead of all other scan types right now in utilizing machine learning. What's interesting to see is the steep and rapid adoption, in the near future, of other studies such as Lung and even the ubiquitous chest x-ray scan. AI truly is a growth market.



## Application By Those Who Plan To Use Machine Learning



# Reasons To Not Adopt

## Why Won't Your Organization Ever Utilize Machine Learning?

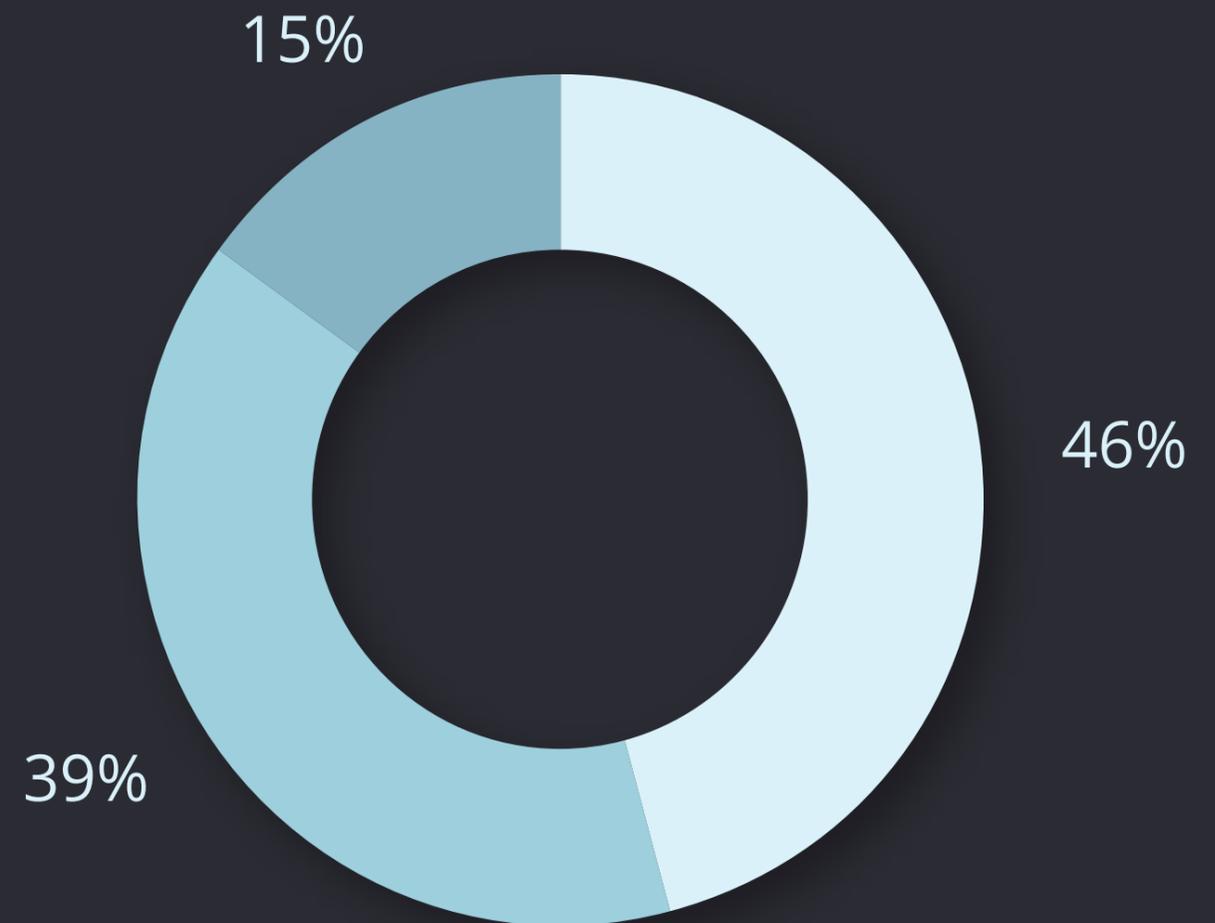
When reviewing the feedback of those who say they will never utilize machine learning we find their hesitancy to be rather fluid. If their respective organizations become more "forward thinking" and as AI continues to advance there is a strong chance these hold-outs will give in and join their peers in using AI algorithms.

"My experience is that machine learning doesn't have the ability to understand the nuances of various findings in individual cases and thus is prone to making mistakes."

"We are not usually on the cutting edge of this type of technology."

"We won't commit to new improvements until they have been clearly tested."

- Unsure of it's usefulness right now
- We just aren't that forward thinking
- Humans are better than AI



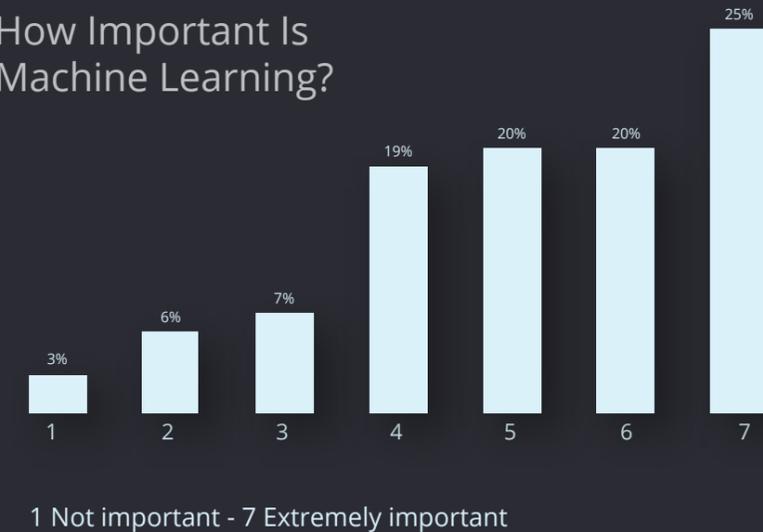
# Conclusion

As the research clearly reveals, Machine Learning in medical imaging is not hype at all. There's a ton of investment pouring into this segment, and for good reason - it's an exciting new technology with both broad and specific applications. Across the board, the majority of physicians and departmental leaders firmly believe there is utility and utilization of AI technology. But it's key to note that AI is not going to replace people. AI is like any other valuable tool – it is going to help clinicians do their jobs better. The end result being better patient care, and should also help control costs over the long term.

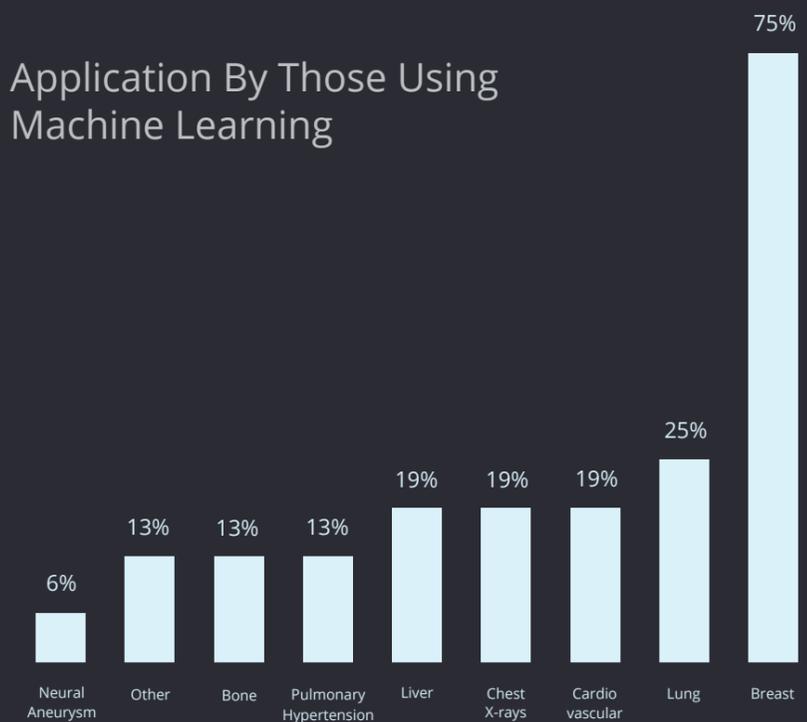
One critical issue is how are vendors going to make money selling their AI? Cost pressures in radiology and in other areas of medical imaging are very real. Reimbursement rate trends don't paint a rosy picture, so how are AI solution vendors going to justify the additional expense over the long-haul? How will a demonstrable ROI be realized? Will AI solutions end up replacing, or radically altering, current imaging solutions like PACS? Will AI just be an add on? Will it be a defensive play by PACS vendors?

In our opinion, AI is here to stay. The rapid level of adoption and AI's ability to aid clinicians in their critical jobs are both encouraging. But the proof's in the pudding, so we will ping the market again later in the year and see if the current trends hold. Stay tuned...

How Important Is Machine Learning?



Application By Those Using Machine Learning



# The Full Data Set

If you are a customer of Reaction Data, you can click [here](#) to login in and see the complete results.

If you have any questions about this report, or Reaction Data, feel free to email Taylor Madsen at [tmadsen@reactiondata.com](mailto:tmadsen@reactiondata.com)

**Reaction**  
—Data—