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## What is Swarm AI?

**Swarm AI® technology** is a powerful combination of human networking and AI algorithms designed to amplify the intelligence of human groups. From business forecasting to consumer insights, Swarm AI enables you to build an “Artificial Expert” that quickly provides more accurate and expressive intelligence than traditional methods.

**Modeled after swarms** in nature, which harness input from large populations and converge on optimal solutions with extreme efficiency, our Swarm AI technology builds real-time human networks, enabling us to amplify insights from consumer groups, business teams, or any other target population.

**For business intelligence** applications, the rapid insights produced by Swarm AI systems have been shown in published academic studies to be significantly more accurate and expressive than traditional methods.

These studies are available at [unanimous.ai/publications](https://unanimous.ai/publications).

## Polls vs. Swarms

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**Throughout the 2016 Presidential Election season**, all major national polls predicted that Hillary Clinton would be the next president of the United States. According to the Pew Research Center, forecasters put Clinton’s chance of winning at anywhere from 70% to as high as 99% in the final days, and declared her the heavy favorite to win a number of key battleground states such as Pennsylvania and Wisconsin. Clearly the polls failed to provide accurate insights despite widespread deployment, causing those who relied upon the faulty data to make flawed decisions and take incorrect actions. While there are many reasons for this massive intelligence failure, a major culprit cited is that polls fail to capture complex sentiments in a form that can be accurately aggregated across a diverse population.

**Is there a better way?** Yes, through millions of years of evolution, nature has demonstrated that an ideal method for harnessing the knowledge, wisdom, opinions, and intuitions of a complex population is to enable that population to form a real-time system that can converge on “optimal solutions” in unison. This process is called Swarm Intelligence. It’s a primary reason why birds flock, bees swarm, and fish school as it enables them to optimize their collective intelligence and converge on insights that are significantly more accurate than the individuals could produce on their own. **Swarm AI** technology from Unanimous empowers human populations to provide that same intelligence amplification, enabling convergence on optimal insights.

**The following pages describe research conducted during the 2016 election cycle.** Unanimous AI was engaged by CBS Interactive to provide insights into voter sentiment during the Republican primary. Rather than polling thousands of people and asking them to report their personal feelings, Unanimous’ approach was to form real-time swarms of 80 to 100 voting-age Americans, moderated by AI algorithms, to predict the outcome of the primaries as a unified, amplified, intelligence. As documented in press reports, Unanimous consistently predicted that Donald Trump would win, even when polls and media pundits were providing strong guidance that he would not prevail.

**Why do swarms outperform polls?** It’s important to note that participants in a Swarm AI system serve a different function than the “respondents” in polls. In traditional crowd-based instruments, respondents are merely a source of data that is captured in isolation and combined statistically with data from other respondents. While such methods are often said to tap the “wisdom of crowds,” these instruments are structured such that no crowd actually exists. The “crowd” is just a statistical metaphor for data aggregation. Such methods do not enable a population to act, react, and interact as an emergent intelligence and converge on optimized insights.

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In a Swarm AI system, human participants are treated very differently. Rather than being used as a passive source of isolated data points, participants are active “data-processors,” empowered to interact with the full population, exploring the decision-space as system. Together the population converges on optimal solutions that leverage their collective knowledge, wisdom, and intuitions. Thus, while a “crowd” is a statistical metaphor for aggregating data, a swarm is an intelligent system that connects participants using AI algorithms. This enables the group to think together as an amplified intelligence that can accurately answer questions, make predictions, reach decisions and generate insights.

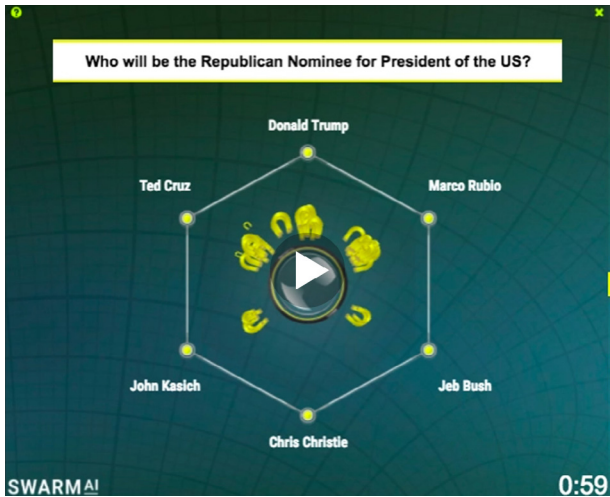
Furthermore, while polls and surveys ask participants to “report” their feelings, Swarm AI systems inspire participants to “act on” their feelings. This difference between reporting and behaving is significant, as many studies have shown that individuals are unreliable when asked to self-report their feelings. Compounding this problem, participants on surveys generally express their views as numerical values on linear scales. Studies have shown that people are nonlinear-thinkers and have different nonlinearities in the rating scales they employ. This means the underlying data used by traditional sampling methods can be highly distorted, tracking numerical values that appear similar on the surface, but mean different things to different respondents. Swarming addresses this problem by not relying on how participants report, instead processing how they behave as part of a dynamic system that connect all members. This means for every participant, a large set of time-varying behavioral data is collected that reflects authentic intentions, opinions, and/or beliefs, enabling them to converge not just on a common insight, but quantify that insight on a common numerical scale.

### **How Swarm AI Technology Predicted the Republican Primary**

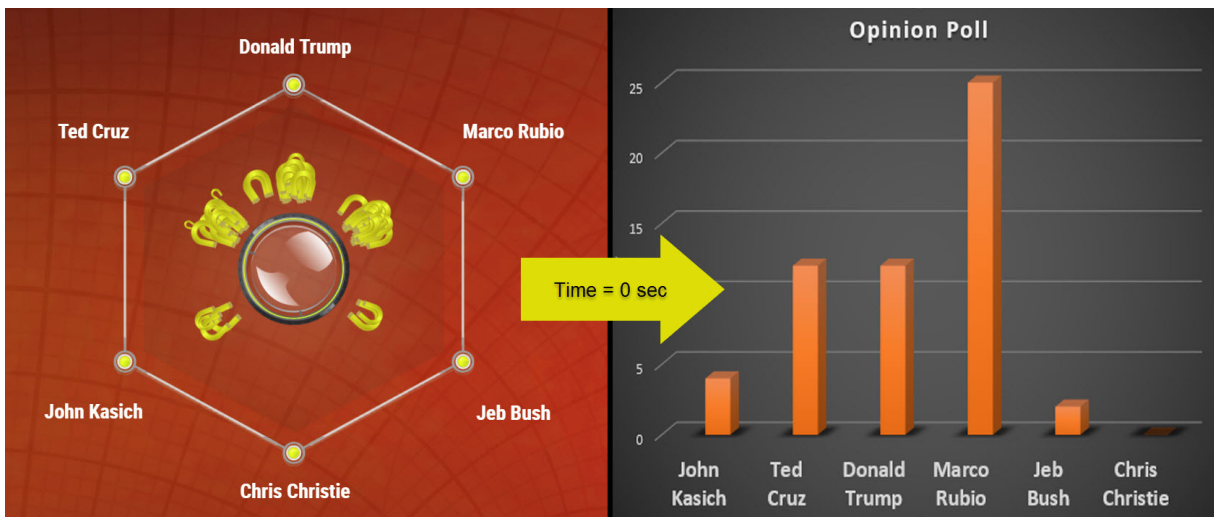
The 2016 Republican primary featured an atypically large field of nominees. As many as 17 candidates were in contention, making it difficult for anyone to remember all of their names, much less predict a winner.

This posed a serious challenge to researchers tasked with sorting the noisy data to generate an accurate forecast, and many different candidates were favored by pundits throughout the process. To meet this challenge, researchers at Unanimous formed a Swarm AI system composed of nearly 90 American voters.

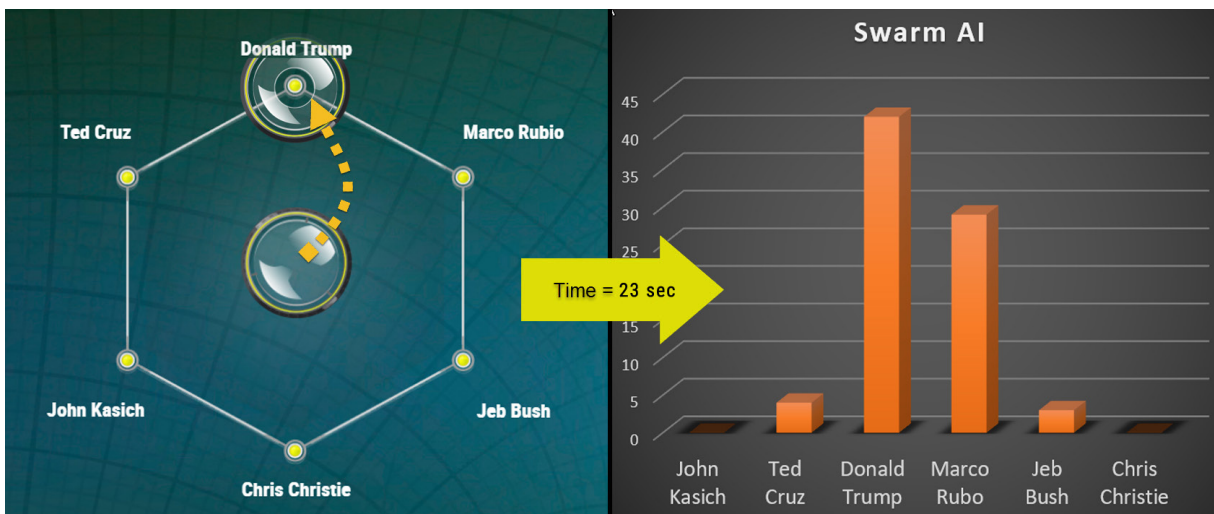
Below is a replay of that Swarm AI system converging on an optimized solution. Each magnet represents one member of the swarm, and the movement of the puck shows the group working together, in real-time, to amplify their intelligence with the help of AI algorithms.



The Swarm AI system converged upon its prediction that Donald Trump would win in just 23 seconds. But the accuracy and speed of the prediction is only part of the story. Since every magnet represents the input of one voter, their chosen positioning at the outset of the question serves as a proxy for how that individual would likely respond to a poll which asked them the same question.



A screenshot of how respondent sentiments were initially distributed

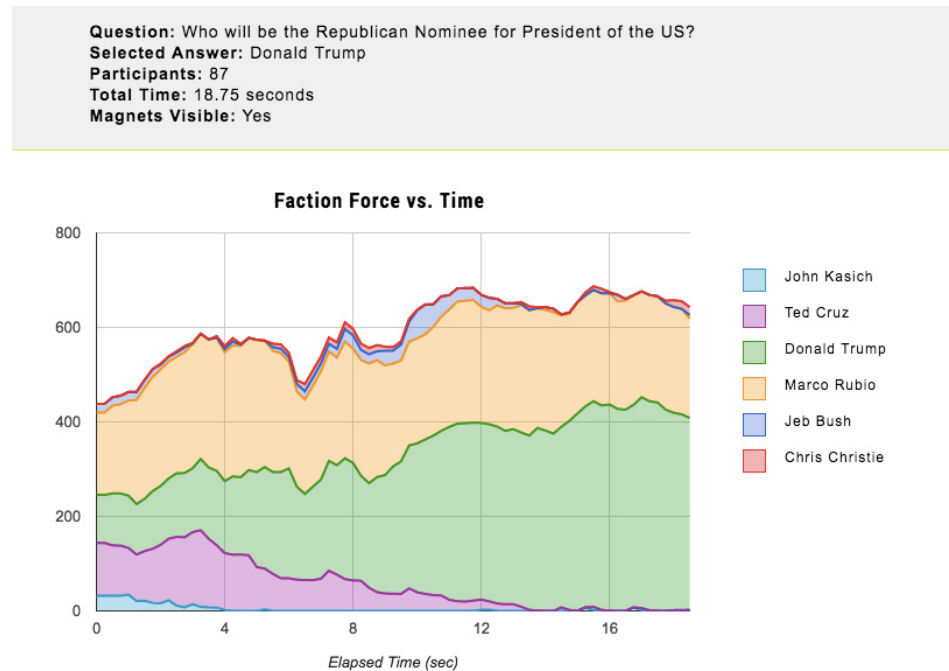


Converging on an optimized solution after 23 seconds

In this case, while the Swarm AI system may have correctly converged on Donald Trump as the most likely nominee, he was not the most popular choice at the outset. This highlights the power of Swarm Intelligence, as it enables optimized solutions to emerge.

To provide insight into how a Swarm Intelligence converges upon an optimized solution over time, Unanimous has developed a technique called Faction Analysis. This technique allows for the rapid visualization of the changing supports levels among the options under consideration.

An example of such a visualization is the Faction Analysis chart shown below. If we look at time=0 on this chart, we can see the initial open-loop responses provided by the population. This is what a poll would provide, and as the chart makes clear, no consensus existed.



But swarms work to converge upon an answer, revealing deeper – and more accurate - insights. In other words, while a poll of this same group of voters would have incorrectly identified Marco Rubio as the likely Republican nominee, the Swarm AI system enhances the intelligence of the output, converging upon an answer that optimizes the collective wisdom and amplifies the accuracy of the insight.

Further, because these systems are interactive, participants can continually adjust and re-adjust their conviction as the population collectively explores and converges on solutions. As a result, smaller sets of participants are required to achieve repeatable results than traditional polls, surveys, and markets.

In the case of the Republican primary swarm, that adjustment and readjustment had a profound impact on the final output. Rubio, the most heavily supported choice initially, failed to gain traction, while support for Ted Cruz, John Kasich, Jeb Bush and Chris Christie quickly ebbed and flowed over to Donald Trump. Eventually, some members of the Swarm AI system who originally pulled towards Rubio abandoned the effort and moved their support to Trump as the most likely nominee.

### Link to Study

For the full statistical analysis, you can view the academic paper here:

[Crowds vs Swarms: A Comparison of Intelligence](#)

### Swarms Are Significantly More Accurate than Polls

In order to test the efficacy of Swarm AI to amplify intelligence, Unanimous conducted a comparison of swarms vs. polls in collaboration with Oxford University. The published study, entitled [Crowds vs Swarms: A Comparison of Intelligence](#), pitted a survey of 469 football fans against a Swarm AI system of only 29 football fans to determine which group would more accurately predict the outcome of 19 official Vegas “prop bets” for the Super Bowl in 2016.

In this study, aggregating the most popular predictions from the poll of 469 fans achieved only 9 correct picks out of 19 wagers, demonstrating a meager 47% accuracy and generating a small gambling loss. Conversely, the Swarm AI system comprised of only 29 football fans, generated 13 correct picks out of 19 wagers, demonstrating an impressive 68% accuracy and a substantial 36% gambling gain. In other words, the swarm of randomly selected sports fans significantly outperformed the traditional polling method despite the fact that the swarming population was a small fraction of the size of the polling population.

These results indicate that, in comparison to polling, Swarm AI technology produced a statistically significant amplification of intelligence, outperforming traditional methods for aggregating insights.

### Conclusion

Polls, long thought to be the most accurate method for tapping the intelligence of a group, failed to predict the 2016 Presidential election.

At Unanimous AI, we looked to Mother Nature to amplify the intelligence of groups, and our Swarm AI platform is the result of many years’ worth of research.

Is human swarming a more effective and efficient method for harnessing the intelligence than traditional methods for aggregating forecast data? The results of this Super Bowl study, along with examples like the Republican primary, suggest that swarming provides not only more accurate insights, but it does so more efficiently with regard to number of respondents.

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