# SOTA (State of the art)

## What is SOTA?

SOTA is an acronym for State-Of-The-Art. In the context of Artificial Intelligence (AI), it refers to the best models that can be used for achieving the results in a task. SOTA models can be applied in many ways in AI. It could either be applied to

1. Machine learning (ML) tasks
2. Deep Neural Networks (DNNs) tasks
3. Natural Language Processing (NLPs)
4. Generic tasks

## How does SOTA help in AI?

Using SOTA models in AI has many benefits of its own. The main benefits are:-

### Increases task precision

First, we need to check the parameters that we define in the SOTA model. These parameters could be the recall or the precision, or the area under the curve (AUC). It could be any matrix we choose. After that, we can determine the value of the SOTA for each of the chosen metrics. If these metrics get a high score (like 90%-95%) in performance accuracy, then it can be called SOTA. Now it is pretty obvious that these models score high on accuracy, so the AI task will be as close to what the users need to do.

### Increases reliability

Because the precision of the SOTA models is high, as we mentioned above, the reliability of the AI task also increases. If it is a machine learning task or a deep neural network task, then be assured that the results are pretty much what we are looking for. The model can be trusted and should not be considered a random test of sorts.

While we are building the SOTA test, it would be better if we ran noise experiments on the SOTA model. It will help us in measuring the standard deviation in the many identical test runs that we are subjecting the model to. We can use this measurable deviation as a sort of shift or tolerance, and then we can compare the original SOTA result and the reproduced result. Testing the results will help us verify the features that are required in the algorithm in the future.

### Ensures reproducibility

If we want our AI product to be agile and lean, then we need to be able to ship the minimal viable product (MVP or a minimal version of our envisioned product) quickly to all our customers. We can then proceed to get user feedback and improve iteratively. Therefore, reproducibility in our SOTA model can be considered to be a good practice. It will help us in making compromises in our algorithm. We can also ship our algorithm quickly. And yes, about the customer feedback we have collected, we can use it as a guide for all our efforts in future product improvements.

### Reduces generation time

Since the SOTA model helps us in the reproducibility of the algorithm or the product, it also helps us in saving time when we put the entire process on the conveyor belt. That means we can make a saleable product from a prototype in less time than we would have made the same product from scratch. All we need is to reproduce the algorithm on the parameters on which it needs to be tested are already in possession, so yes, we can save a lot of time in the generation of the product.

## When should we use an SOTA test?

We should run SOTA tests as frequently as possible. Frequent SOTA tests are a rule of thumb in AI. But it is advisable to run them once a week. We should also run SOTA tests when we are incorporating important changes. It is advisable to run the SOTA tests should be run on a cloud virtual machine using a good pipeline like Jenkins.

## Where can the SOTA models be used?

SOTA models are used in various artificial intelligence activities:-

1. Object detection using deep neural networks
2. Single-shot multi-box detectors
3. Self-adaptive tasks like choosing variable patterns

This list is not exhaustive, as the possibility of using SOTA encompasses many branches of AI. To sum up, SOTA models have played a crucial role in advancing AI and ML technologies. It has introduced structural efficiency that has boosted performance.