OneClick.ai Uses Deep Learning for Fast, Accurate Demand Forecasting and Sensing

Intel® architecture and Intel AI technologies optimize algorithms, delivering 23 percent faster training¹ on time-series datasets

Accurate demand forecasting and sensing is the lifeblood of any business. Reliable analytics of time-series data and a broader range of demand signals drives operations like revenue planning, supply chain management, labor demands, and more. Retail and Consumer Packaged Goods (CPG) are especially sensitive to accurate forecasting; helping businesses keep the right amount of stock on the shelves and inventory costs manageable, while reducing waste and lost sales.

OneClick.ai accelerated their AI-enabled augmented forecasting platform with Intel architecture and Intel AI technologies, empowering front-line business planners to quickly capture the future demand of their business, reduce any bullwhip effect and optimize downstream processes such as replenishment, assortment, pricing, promotion, and workforce planning.

Predicting the Future with AI-Driven Demand Forecasting and Sensing

Demand forecasting and sensing are key functions that drive day-to-day operations in Retail and CPG. In their attempts to adapt to market demands and changing consumer expectations, these industries can be overwhelmed by an increasing number of product SKUs with shorter lifecycles and more frequent product launches. Those trends introduce complexities that can contribute to less accurate forecasting, resulting in frequent stockouts and increasing inventory costs along with rising challenges in promotion planning.

During a pandemic like COVID-19, the radical changes in people's behavior, transportation, and production cause all the traditional forecasting algorithms to work poorly and become irrelevant. Instead, companies will need to use much more recent data and leverage external labor, trading, and events data in order to capture significant shifts in demand patterns with less delay.

With the OneClick.ai Augmented Forecasting platform, organizations that need to extract correlations from time series-based historical transactions and contextual data like events, demographics, and customer behaviors, can quickly produce accurate forecasts without complex manual analytics. Through a simple, intuitive interface, demand planners, supply chain managers, and marketing managers exercise a few clicks to produce forecasts at any granular level, efficiently deal with an increasing number of SKUs, and better plan marketing budgets to maximize sales. One fast fashion retailer with a few thousand stores is able to leverage OneClick's solution to achieve double digit forecasting accuracy improvement, sense demand shift on a daily basis and optimize promotion strategy to score significant revenue lift.

The Augmented Forecasting platform leverages deep learning and proprietary time-series algorithms to automatically generate forecasting models from neural networks trained on multi-dimensional time series data. The generated models are based on the time-series encoder-decoder model, using gated recurrent unit (GRU) cells for recurrent neural networks (RNN).

“The input received from Intel’s AI Builders program helped us improve performance and save on infrastructure cost. Many of our on-prem customers don’t have GPUs available and can benefit from such improvements greatly.”

-Ning Jiang, CTO, OneClick.ai
OneClick.ai deep learning-based time-series algorithms enable businesses to:

- Utilize multi-dimensional inputs: transactions, product page impressions, clicks, weather, social sentiments and more, a differentiating ability to process multi-streams simultaneously to build the forecasting model.
- Increase productivity and accuracy by simultaneously making accurate forecasts for hundreds of thousands of SKUs at any store, DC, month, week, and day.
- Use information from older SKUs to learn and improve newer SKU forecasts where products have little history.
- Improve new product introductions with better forecasts of new SKU launches using learnings from previous launches.
- Use “what-if” analysis to optimize marketing resource allocations to boost overall sales.

**Intel-Optimized Algorithms Result in 23 Percent Faster Training**

The OneClick.ai Augmented Forecasting model generation is a combination of feature engineering and model training. Forecasting algorithms use the latest computing and deep learning approaches, including the following:

- Non-Uniform Memory Access (NUMA)
- Python language
- TensorFlow framework
- Parallelism and distributed computing

The company’s approach enabled them to quickly benefit from Intel Xeon® processors and Intel AI technologies, which are ideal resources for accelerating deep learning processes. To maximize performance of their Augmented Forecasting platform, developers worked with Intel engineers to optimize training of their algorithms on Intel technologies. Developers implemented several enhancements to their model training workload, including the following:

- Architected the software to reduce global memory access from threads on NUMA enabled systems.
- Trained models on Intel Xeon Scalable processors and 2nd generation Intel Xeon Scalable processors.
- Used the Intel Distribution for Python.
- Integrated Intel Optimizations for TensorFlow, which includes the Intel Math Kernel Library for Deep Neural Networks (Intel MKL-DNN).
- Used Intel MKL-enabled NumPy, Scikit-Learn, and Pandas modules.
- Ran the Intel VTune™ Suite for profiling and performance tuning.

Incorporating Intel technologies and tuning their code with Intel VTune profiler resulted in 23 percent faster training time.

OneClick.ai Augmented Forecasting can be deployed on Amazon AWS and Microsoft Azure cloud services or on-premise systems using bare metal and virtual environments. Intel technologies are available in both AWS and Azure. The platform is supported on single or multiple nodes running Ubuntu 16.14 or later systems with at least eight cores and 32 GB of memory per node.

Most OncClick.ai customers choosing on-prem deployments do not use GPUs. The Augmented Forecasting platform is optimized for adaptive resource management, making it possible to share resources with other applications, while providing room for future expansion. Thus, customers deploy Intel Xeon processor-based servers to give them optimal cost/performance and the flexibility to multi-purpose their hardware investments.
Solution Brief | OneClick.ai Uses Deep Learning for Fast, Accurate Demand Forecasting and Sensing

**Settings**
- Forecast Frequency: 1 Day
- Forecast Horizon: 7
- Starting Date: 03/26/2020
- Metrics: Mean Absolute Error (MAE)
- Allowed Price Range: $39 to $129

**Step 1:** Setup forecast horizon, pricing rules, promotion policy and adjustment frequency.

**KPIs Optimization**

<table>
<thead>
<tr>
<th>Year</th>
<th>Season</th>
<th>Category</th>
<th>Sell Through Rate</th>
<th>Last Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>Winter</td>
<td>Running Shoes</td>
<td>40 %</td>
<td>34.2%</td>
</tr>
<tr>
<td>2019</td>
<td>Winter</td>
<td>Basketball Shoes</td>
<td>30 %</td>
<td>22.3%</td>
</tr>
<tr>
<td>2019</td>
<td>Winter</td>
<td>Tennis Shoes</td>
<td>15 %</td>
<td>12.9%</td>
</tr>
</tbody>
</table>

**Step 2:** Define business KPIs to optimize: increase sales volume, sell through rate, profit, reduce stock-outs and more.

**Dates**
- **2020-03-26** to **2020-04-01**

<table>
<thead>
<tr>
<th>Year</th>
<th>Season</th>
<th>Category</th>
<th>Style</th>
<th>Size</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>Spring</td>
<td>All</td>
<td>All</td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Sales</th>
<th>Sales Volume</th>
<th>Margin</th>
<th>Sell Through</th>
<th>Next Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>$93582</td>
<td>1232</td>
<td>32.6%</td>
<td>82.8%</td>
<td>85.7%</td>
</tr>
</tbody>
</table>

**Step 3:** Monitor key KPIs on the daily basis and alerts will be triggered for exceptions and outliers.

**SKU-123 Details**

<table>
<thead>
<tr>
<th>Product Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKU</td>
</tr>
<tr>
<td>Category</td>
</tr>
<tr>
<td>Volume</td>
</tr>
<tr>
<td>Stores</td>
</tr>
<tr>
<td>Avg.Price</td>
</tr>
<tr>
<td>Sell Through Rate</td>
</tr>
<tr>
<td>Margin</td>
</tr>
</tbody>
</table>

**SKU-123 Sales Performance**

**Step 4:** Daily calculation of optimized prices and demand on any SKU, store level.
Conclusion

Accurate demand forecasting and sensing by today’s retail and CPG industries are complicated by the many new SKUs and product launches companies must deal with.

The traditional forecasting approach in ERP and BI software is designed for simple data like historical transactions, and not able to process broader range of contextual data and multi-dimensional time series. OneClick.ai has developed an Augmented Forecasting platform using AI and deep learning algorithms that can automatically uncover the complex demand patterns across both transactional and contextual data, turning data visibility into actionable insights and optimizing operations of inventory replenishment, pricing, promotion, and workforce planning.

Optimizing their algorithms on Intel architecture and Intel AI technologies, OneClick.ai achieved 23 percent faster model training. Faster training enables customers to refresh the forecasting model on daily or even hourly basis to capture ever-shifting customer demand patterns more accurately and with less delay.