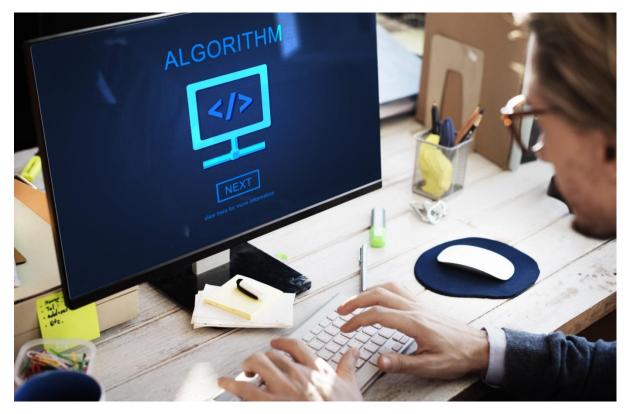# CFO's Guide to Using Algorithms

By Michael Kightley

You already make decisions using common-sense and data. Algorithms help by making it practical to use a lot more data. - if you have it. The logic behind the decisions, with or without algorithms, is often the same.

For example, you already make decisions and predictions based on your understanding of relationships like the causal relationships between your sales spend and sales volume. You already try to understand your customers by grouping them together into segments based on similarity or differences - perhaps on their propensity to spend or their preferences - so that you can treat them appropriately. Perhaps by sending them different messages, messages that will resonate more.

If you have the data, algorithms can process it in a reasonable time to come up with a better understanding of relationships and better groupings (classifications) - perhaps by revealing patterns that you were not aware of before.

Commonplace Examples

- Predictions

  If you want to predict what sales will be next year, then you could assume that there is a direct relationship between sales and the spend on salespeople. If you are increasing the numbers of salespeople you could predict a corresponding increase in sales, with some

adjustment for ramping up. If you want to consider more factors, then you might want to assess the relative importance of investments in marketing, customer service, trade discounts and revenue growth management activity. Algorithms use data on relationships between these factors and sales to make a sales prediction. Such approaches can help create powerful marketing data analytics and sales analytics.

- ### Ranking Prospects
  If you wanted to identify where to focus the attention of your B2B salesforce then you could simply assume that company size is the best predictor of potential and rank prospects for your sales team in order of their prospects' annual sales turnover.

  If you want to consider more features than just turnover size, then you would want to use your understanding of current key accounts to check which other features are relevant and produce meaningful sales analytics. For example, does industry sector affect sales to customers, does growth rate, does turnover per employee? Algorithms use data to check these relationships for significance and group customers accordingly.

  Now you could group new prospects on how similar they are to these groups of existing customers. If you assemble data on a hundred thousand companies, many that your salespeople will know nothing about, you can use an algorithm to group and prioritise them efficiently by similarity with your current best customers.

Relationship Algorithms

Relationship algorithms base their predictions on the relationships between values using mathematical methods (e.g. regression, Markov chains).

- ### Clickstream Analytics
  Clickstream analytics tracks relationships between clicks - in what sequences or chains of clicks do people click through the pages of your website? One click leads to another and so each click has a certain probability of following another. You can predict the likelihood of the next click. For marketing purposes, you can cluster clickstreams to identify different types of users following different paths – assigning different personas to these paths. You can do clickstream analysis in real time, (using tools that work on data steams) to predict visitor clicks and decide which ads or messages should be shown to the visitor next.

- ### Credit and Liquidity Risk
  In lending, you can use relationship methods to predict a probability of default and price the risk better. You can use relationship methods on quite complex scenarios, for example, in banking, what are the chances of a combination of related events occurring such that a bank runs out of cash?

Classification Algorithms

Grouping algorithms use a mathematical process called classification. There are different algorithms to use depending on complexity. Clustering algorithms help you explore and organize data (K-means and support vector machines) - dividing your data up into like groups. Some make allocations based on decision trees (e.g. random forest) making an allocation decision at each node in the tree. You can use classification methods to answer similarity questions like: "is this prospect in the high potential group or the low potential group?" As a lender you can also use

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classification to identify customers who are a credit risk based on their similarities with past defaulters.

- **Dynamic Segmentation**
  You can find new ways to define customer segments, grouping them together on the features that are shown by the data to be significant for your business. Not just from their demographics but using all the data that you have on them and their behaviour; including when they visit your website, communicate with you, or buy from you.

- **Customer Churn Predictive Analytics**
  You can use classification methods to predict when customers are going to stop doing business with you, by their similarities in behaviour or situation with other customers who churned – so you can intervene to stop them - dealing with the underlying service issue or making them a new offer.

- **Predictive Maintenance**
  You can use classification to predict when a machine is at risk of breaking down, based on patterns of machine operation that are similar to those preceding previous breakdowns.

- **Visual Recognition**
  There are algorithms that can classify images based on their similarity to other images, so they can answer questions like; is this circuit board OK or not OK?

- **Fraud Detection**
  There are also algorithms to identify anomalies or outliers in data, for example for checking for anomalous transactions that don't fall into the "normal" group to help to detect fraud.

- **Recommendations**
  There are algorithms to generate recommendations based on similarities in people's demonstrated preferences. For retailers, this is groups of products that are often bought together.

- **Bundle Pricing**
  You can use your data on products which are often bought separately to predict the discount that will sell the goods as a bundle and increase profit.

Matching Algorithms

- **Propensity to Consume**
  There are matching algorithms that estimate the propensity of someone to buy a specific product, (or, in medicine, to respond to a specific treatment).

- **Text Matching**
  There are algorithms that can match text, classify documents accordingly, and transform textual data into a more useful format.

Conclusion - Choosing Algorithms

Choosing algorithms is common-sense. If you have the data, they can add greater understanding and validation to your decision-making. Compare these example cases to what you want to achieve. Express what you want to do in a way that algorithms can address. Then there will be obvious algorithms to choose from. Try them out to see which algorithm works best. There are practical

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trade-offs between data volume, processing time and cost, accuracy, bias, speed and efficiency and you will only discover the optimal solution by iterating through the options. You will see where you have enough data and where you don't. You will be able to assess the value that sourcing additional data might have.

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