RESEARCH & DEVELOPMENT REPORT 2017

Introduction

Humans have developed language as an "ambiguous medium of communication" in order to allow for the freest forms of communication. To this end, humans engage in the process of perceiving and interpreting said ambiguity. This process is also required for information processing, which works to find the subtleties of others by understanding their language. However, it is difficult to reproduce the process of clarifying ambiguity. This is considered to be the reason why artificial intelligence (AI) has yet to be successfully applied to the field of language processing, even though progress has been accelerated in the research of AI-related technologies on the strengths of the current AI boom, with computers that excel human capabilities appearing in certain application fields such as image recognition.

Since before the arrival of the current AI boom, we at FRONTEO have continuously conducted research and development in language processing technologies, which extract patterns of human communication under particular conditions and work to clarify inherent ambiguity. As a result of our pursuit for technologies to effectively solve problems on the front line of business operations, we have created KIBIT, an AI engine that learns the subtleties of human thought. We have introduced KIBIT in multiple domains, including cross-border litigation support and investigation, and successfully established a "human way of language processing" at the core of our business.

Excellent technologies can change how the world revolves. We are resolved to creating new technologies that bring about foresight on the next era, and work to lead the future.

KIBIT, our AI Engine

KIBIT is FRONTEO's own AI engine created in Japan. The name KIBIT is derived from the Japanese word "kibi" (meaning subtlety) and "bit," the smallest unit of information in computing. KIBIT thus incorporates our desire to develop AI that can understand the subtle elements of human thought.

KIBIT has an essential function of "ordering." By extracting latent universality hidden in a small volume of relevant documents selected by users, KIBIT learns the subtleties of the users themselves (learning phase). It then sorts through big data resources to collect text data that reflect latent universality, attributing higher scores to such data and lower scores to other data (inference phase). The users review the data, beginning from those with the highest scores, and determine whether the data is what they want. Given 80 percent of the data sought by users are found in the top 20 percent of scoring data, this function can drastically enhance the efficiency of the business processes in which "data discovery" holds large weight.

More specifically, KIBIT performs information processing through the learning phase and inference phase as described below.

KIBI (subtleties): the subtleties of human thought
BIT: the smallest unit of information

KIBIT, our AI Engine

1.Learning phase

KIBIT extracts morphemes from relevant documents and applies a "weight" to each, based on a concept known as transinformation which is a measure of how specifically or how frequently the morphemes occur in the documents. The measurement value is higher for the morphemes that occur far more frequently in relevant documents than in non-relevant documents, and larger weights are given to such morphemes.

For example, if a certain morpheme appears only in the relevant documents and not in non-relevant documents, the morpheme is considered to be important as the foundation on which to estimate that unseen documents containing it are "relevant documents." In effect, KIBIT puts a larger weight on the morpheme. On the other hand, KIBIT will assign a smaller weight to a morpheme that occurs evenly in both relevant and non-relevant documents, as this morpheme is less likely to be a factor to determine the relevance of the documents.

In this manner, the weights given to respective morphemes are calculated based on the discriminatory occurrence of the morphemes in the relevant documents selected by users. Thus, the aggregation of the weights indicates the universality of the relevant documents.

2.Inference phase

KIBIT computes the score of each document in a way in which the value is greater for a document that contains more morphemes assigned with larger weights, and rearranges all the documents in a descending order based on score. Because high scores are given due to the morphemes that occur in a one-sided manner in the relevant documents selected by the users, documents with higher scores mean that they are more likely to be relevant documents.

As described above, KIBIT convolutes the morpheme occurrence with weights, and based on these weights, aggregates the confidence in relevance judgment per unseen document as the value called "score." This process enables KIBIT to ingeniously overcome the difficulty in analyzing unstructured text and, with only a small volume of data, promptly delivers decision making support to the people in frontline roles struggling to resolve issues.
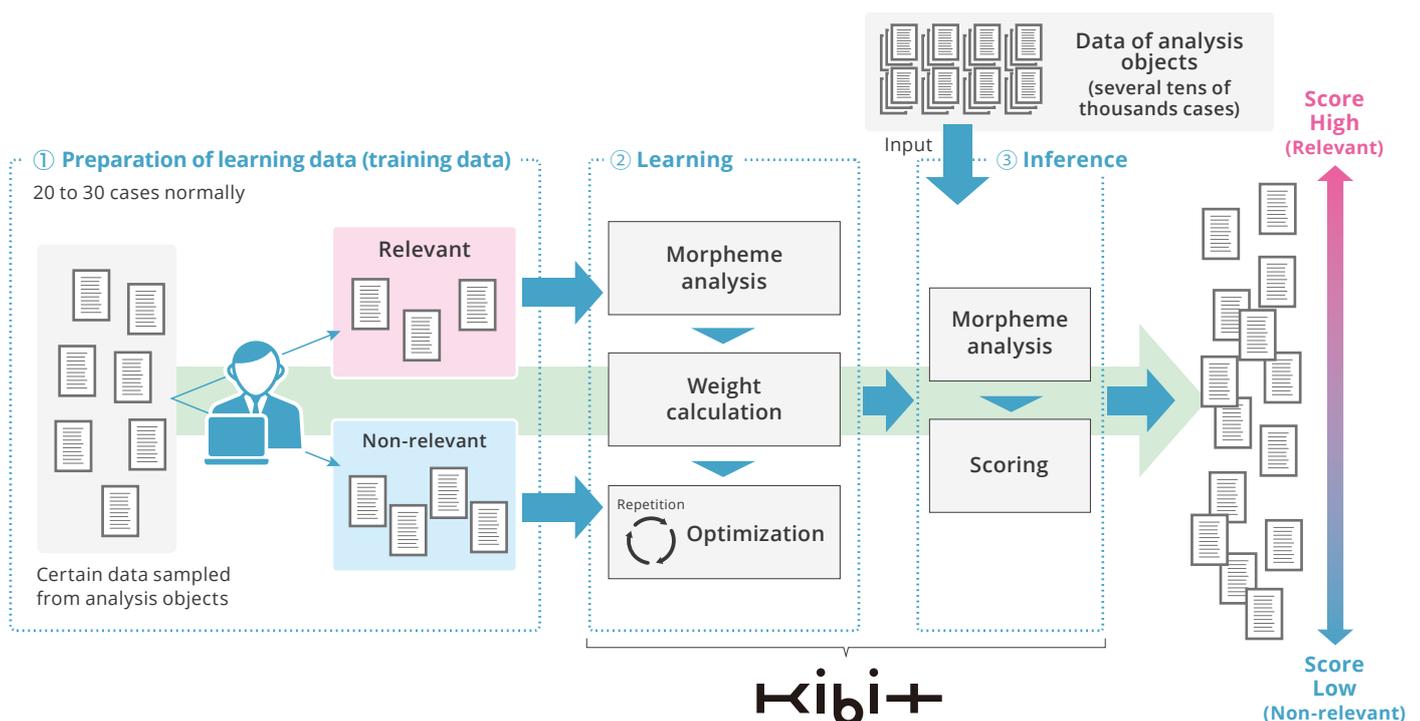
Achievements with KIBIT

Installed in all the systems provided by FRONTEO, KIBIT provides its universal functionalities of reading the subtleties of human thought to a variety of business domains. Utilizing KIBIT, FRONTEO applied the "human way of language processing" beginning with legal domains, and has eventually expanded the application into the three areas of healthcare, digital communications and business intelligence.

In order to maximize the universal functionalities of KIBIT, no particular software has been prepared to address certain specific issues. Our data scientists specialized in language processing form client issues into concrete shapes, and work to solve them by using systems dedicated to the respective domain.

This approach has enabled FRONTEO to introduce KIBIT to a variety of workplaces in diversified domains. For example, we made the following achievements by utilizing KIBIT Knowledge Probe, our business data analysis support tool. As advanced cases representing FRONTEO, they have garnered significant attention from the market. FRONTEO identifies the real issues facing its clients, and provides solutions by employing the language processing technologies it has fine-tuned. That is the business FRONTEO conducts.

Finding signs of people leaving their jobs

KIBIT analyzed interview records of a client and detected at an early stage the subtleties of employees feeling inclined to leave their jobs. This enabled the client to reduce costs related to human resources and labor management.

Maximizing marketing opportunities

KIBIT analyzed sales reports on financial instruments to identify possible opportunities for increasing sales, leading to enhanced efficiency of marketing.

Heightening efficiency of information collection

KIBIT analyzed daily updated news articles and exclusively extracted articles that catch the attention of clients. By doing so, KIBIT helped improve the quality and preparation efficiency of market survey reports.

Our vision after the next 3 years

At present, KIBIT is incorporated in FRONTEO's applications to operate as an "AI engine." Going forward, FRONTEO intends to separate KIBIT from applications and evolve it into an "AI platform" that operates autonomously in response to requests from outside.

One may call such a platform as "a team of specialists who can address high-level issues." Under the platform, multiple AI machines would operate autonomously to independently cover areas determined by the combination of domains (such application fields as litigation, healthcare and finance) and modalities (types of data including texts, images and voices). The results of operations would be integrated to create high-level, comprehensive judgment for abstract matters. These are the functions the platform would have.

To achieve these functions, FRONTEO plans to equip KIBIT with a mechanism to accumulate and utilize domain-specific know-how over a long term and a scheme that will enable analysis of data from multiple modalities. The future KIBIT platform will serve as the base to support these complicated structures, autonomously process big data and integrate the results. Stay tuned for the next-generation of KIBIT that will drive and shape a new future.

Realize the distributed autonomous platform that makes it possible to create comprehensive judgment, and generate new business using the platform

Accelerate and semi-automate processing by employing distributed processing and enhancing versatility, and expand the scope of customer segments

Introduce improved technologies to smooth system operations, including faster processing, and expand the scope of business

Incubation of AI-related businesses utilizing language processing technologies under way

Kibit

Present status

Phase 1

Phase 2

Phase 3

KIBIT Platform

Company Information

Name: FRONTEO, Inc.

Established: August 8, 2003

Head Office: 2-12-23 Kounan, Minato-ku, Tokyo 108-0075, Japan

Representative Director: Masahiro Morimoto

Capital: JPY 2,481,621,000 (as of March 31, 2017)

Net Sales: JPY 11,207 million (consolidated sales, fiscal year ended March 2017)

Website: www.fronteo.com/global/

Stock Market Listings: Mothers Market, Tokyo Stock Exchange (code: 2158)
NASDAQ Stock Market (ticker symbol: FTEO)

Contact: +81-3-5463-6344