

VISEE - Visual Search Engine

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Introduction

Some novel search engine

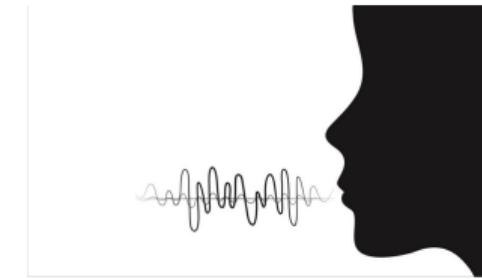


Traditional Approaches

- **Full text search:** Full text can be thought as a document, product meta-data, description, title, .. and many other kind of data can be represented in natural raw text, even mathematics formula.
- **Webpage search:** Similar to full text search, however a webpage search algorithm can aggregate more information than the natural full text search. Because webpage space is a structured graph, each page is a node and link to many other node. This kind of graph provide rich information for webpage search engine based on graph mining algorithm like **page rank**.
⇒ Search on structured data spaces.

How about unstructured data?

- Data come from natural almost unstructured. Such as image, music, voice or video, ...

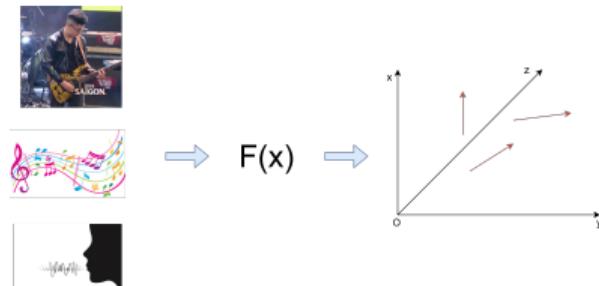


⇒ How to deal with unstructured data?

Related Work

The world of embedded vector

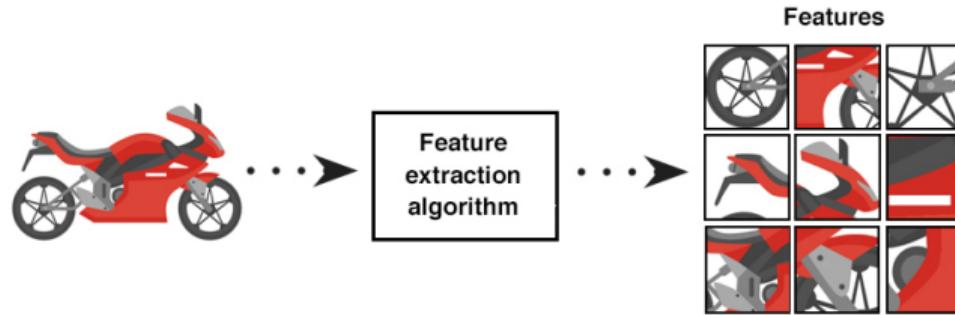
- **Idea:** Feed each piece of data through a transformation function, this function transform and project raw data to a vector space. In plain english, our raw data are now represented as a bunch of vector with fixed dimension. Inside vector space, each dimension should describe a property of the real data.



⇒ Search in unstructured data \approx search for related vector in vector space.

How to do F?

- **Feature engineering:** Extract properties of data manually to create handcraft embedded vector.
- **Automated feature engineering:** Extract properties of data automatically. Many algorithms based on deep learning methods can do that. Especially modern deep learning model are efficient to extract latent properties from raw data, which is very hard for person.



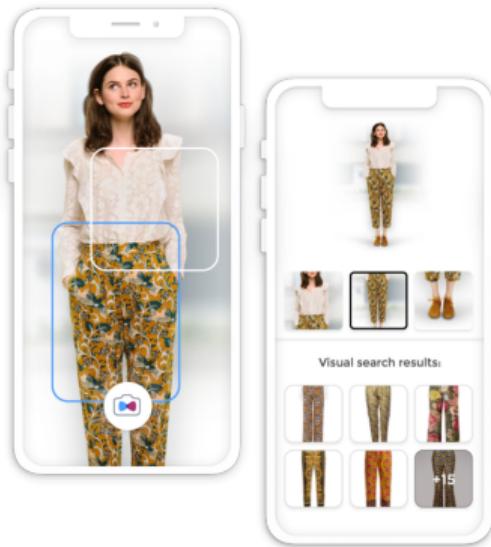
The case of visual search

- **Visual search** is a type of perceptual task requiring attention that typically involves an active scan of the visual environment for a particular object or feature (the target) among other objects or features (the distractors)¹.
- Google and Pinterest are the leading company in the field of visual search technology.
- Many start-up was found to tackle the problem of visual search with "trillion dollar potential"².

¹Treisman, AM; Gelade, G (January 1980). A feature integration theory of attention. *Cognitive Psychology*.

²Molly St. Louis., The Trillion Dollar Potential of Visual Search All Boils Down to Getting the Full Picture . <https://gritdaily.com> (2019).

How a visual application should work?³



³Image credit: Techcrunch. Syte snaps up \$21.5M for its smartphone-based visual search engine for e-commerce.

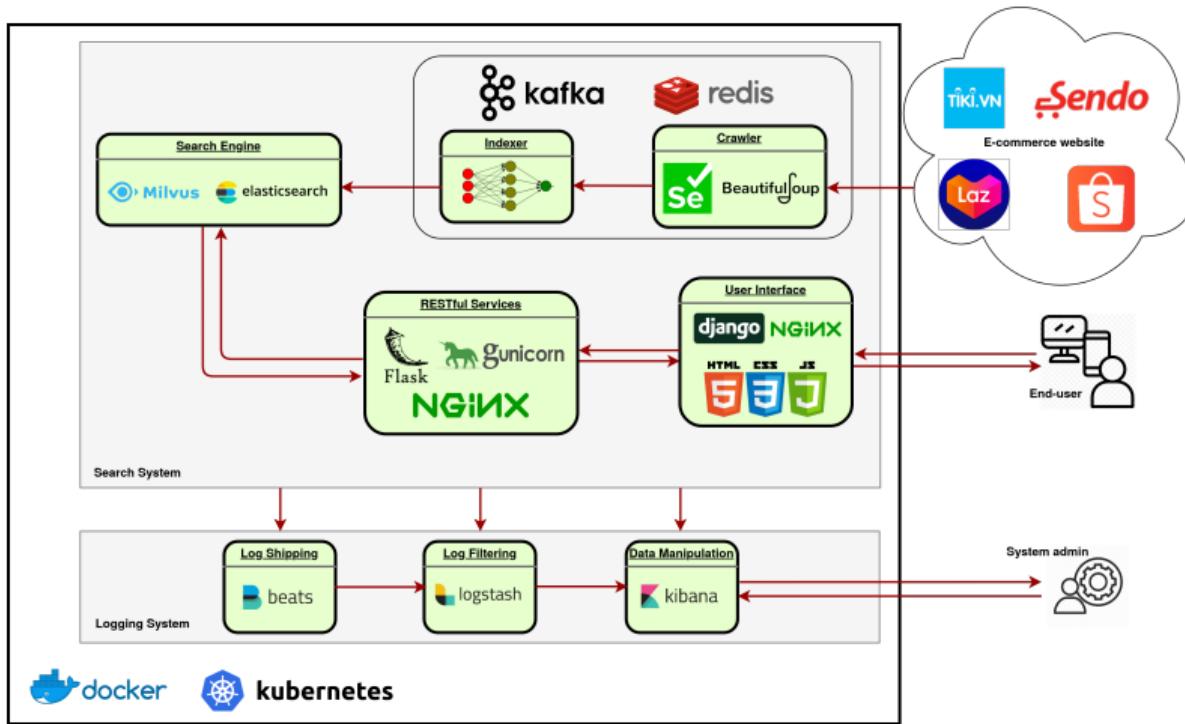
Some statistics⁴

- Image Recognition Market worth **\$25.65 Billion** by 2019 - MarketsandMarkets.
- **21%** of advertisers believe visual search is the most important trend for their business in 2019 - Marin Software.
- **45%** of retailers in the UK now use visual search - Tech HQ.
- **35%** of marketers plan to optimise for visual search through 2020 - Search Engine Journal.
- When shopping online for clothing or furniture, **more than 85%** of respondents respectively put more importance on visual information than text information - The Intent Lab.
- The Global Visual Search Market is estimated to surpass **\$14,727M** by 2023 growing at CAGR +9% during the forecast period 2018–2023 - Report Consultant.

⁴Clark Boyd. Visual Search - Thu Ultimate Guide: Statistics, News, Trends, and Tips.

System Architecture & Technical Stack

Our Approaches

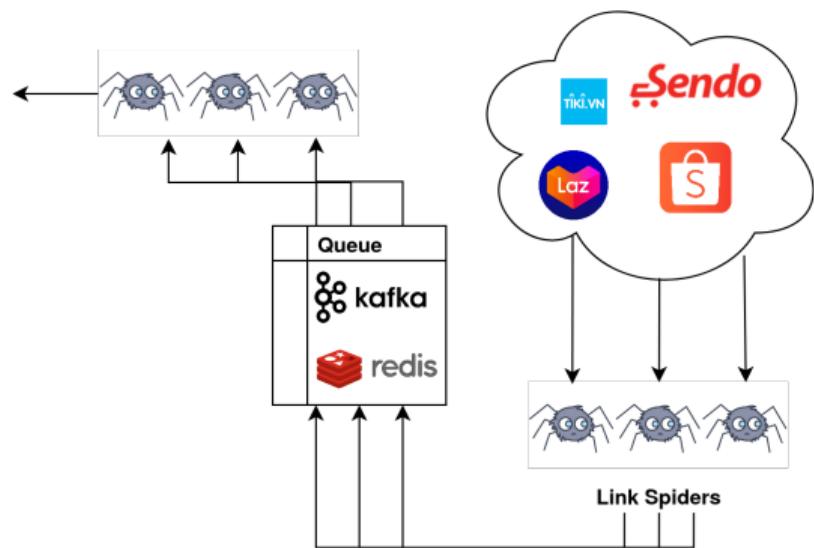


Goals

- Reliable of instant query response
- Speed
- Scalability

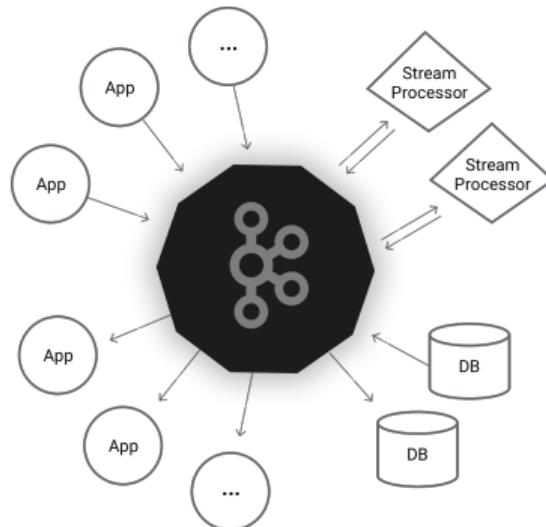
Crawler

- There are N spiders, each of them belong to **link scraper** or **item scraper**.
- **Link scraper** travel around e-commerce website and collect item's link to **share queue**.
- **Item scraper** receive link from **share queue** and retrieve information for web page.
- **Share queue** is built on top of Apache Kafka and caching with Redis.



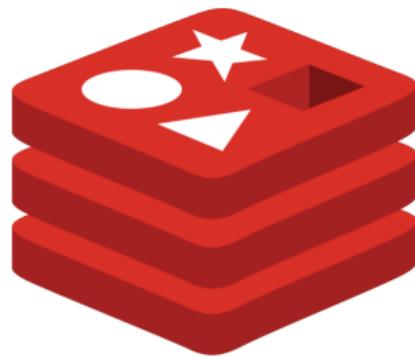
Apache Kafka

Apache Kafka is an open-source distributed stream-processing software platform developed by LinkedIn and donated to the Apache Software Foundation, written in Scala and Java. The project aims to provide a unified, high-throughput, low-latency platform for handling real-time data feeds.



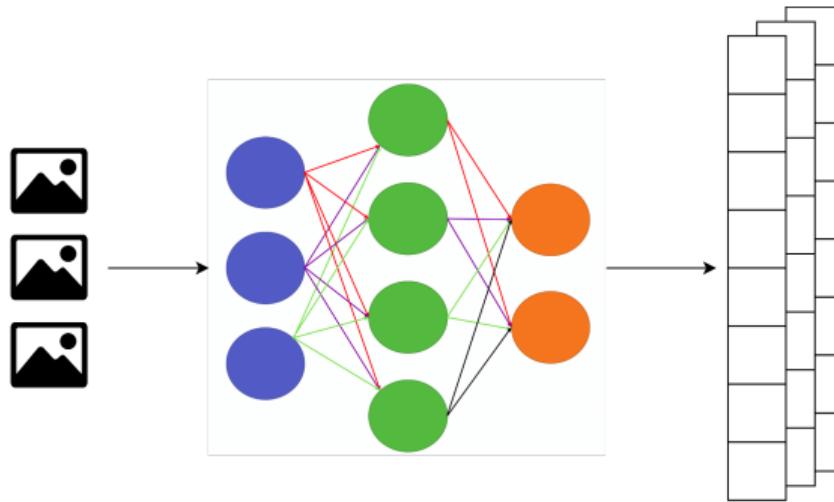
Redis

Redis is an open source, in-memory data structure store, used as a database, cache and message broker. It supports data structures such as strings, hashes, lists, sets, sorted sets with range queries, bitmaps, hyperloglogs, geospatial indexes with radius queries and streams.



Indexer: Neural network for visual feature extraction

Each image will be transformed to a vector 2056×1 by state-of-the-art EfficienNet⁵.



⁵Mingxing Tan, Quoc V. Le. EfficientNet: Rethinking Model Scaling for Convolutional Neural Networks. ICML 2019.

Search Engine: Elasticsearch

Elasticsearch is a distributed, RESTful search and analytics engine capable of addressing a growing number of use cases. As the heart of the Elastic Stack, it centrally stores your data for lightning fast search, fine-tuned relevancy, and powerful analytics that scale with ease.



Search Engine: Milvus

Milvus is an open source similarity search engine for massive-scale feature vectors. Built with heterogeneous computing architecture for the best cost efficiency. Searches over billion-scale vectors take only milliseconds with minimum computing resources.



RESTful Service: Flask, Gunicorn, Nginx

- RESTful service provide interface for communication between font-end application and back-end service.
- **Flask** is a lightweight WSGI web application framework. It is designed to make getting started quick and easy, with the ability to scale up to complex applications.
- **Gunicorn** is a Python Web Server Gateway Interface (WSGI) HTTP server. It is a pre-fork worker model, ported from Ruby's Unicorn project. The Gunicorn server is broadly compatible with a number of web frameworks, simply implemented, light on server resources and fairly fast.
- **Nginx** is a web server which can also be used as a reverse proxy, load balancer, mail proxy and HTTP cache.

End-user Use case

- User can use two services separately:

- Full-text search: Enter keyword into text-box and hit search button.
- Visual search: Upload, crop and send image.



End-user Use case

The screenshot shows the Visee search interface. At the top, there is a logo with the word "Visee" and a magnifying glass icon. Below the logo is a search bar containing the text "áo khoác". To the right of the search bar are two small icons: a camera and a magnifying glass. On the far right of the header is a close button (an "X").

Below the header, there are filter options: "Price" and "Seller", each with a dropdown arrow. Underneath these filters, it says "10 results in 0.02s".

The search results are listed below, each with a thumbnail image, the product name, and a brief description.

- Áo Khoác Nữ REEBOK Favorite Bomber Jacket**
Price: 2.199.000 ₫ <https://www.lazada.vn/products/ao-khoac-nu-re>
Đây là sản phẩm được bán bởi Nhà Bán Hàng bên thứ ba và việc xuất hóa đơn VAT (nếu áp dụng) sẽ được thực hiện bởi Nhà Bán Hàng ...[see more](#)
- Ozalctree Nữ Tập Thể Hình Áo Khoác Dây Kéo Chạy Áo Khoác Dài Tay Tập Yoga T...**
Price: 372.842 ₫ <https://www.lazada.vn/products/ozalctree-nu>
Sản phẩm được nhập trực tiếp từ nước ngoài. Hoá đơn bán hàng không được hỗ trợ trong trường hợp này. Giới tính Phụ nữ Phù hợp ...[see more](#)
- Phụ Nữ Mới Của Mùa Hè Nắng Bảo Vé Quần Áo Hoang Dã Áo Khoác Thời Trang K...**
Price: 322.000 ₫ <https://www.lazada.vn/products/phu-nu-moi-cua>
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Figure: Full-text search

End-user Use case

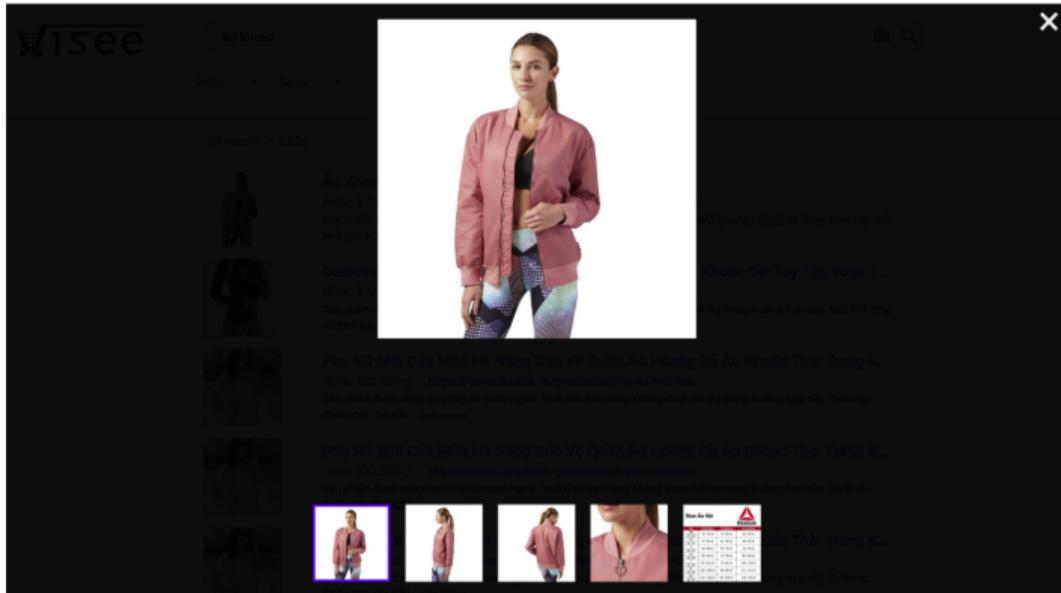


Figure: View results

End-user Uses case



Áo Khoác Nữ REEBOK Favorite Bomber Jacket

Price: 2.199.000 ₫ <https://www.lazada.vn/products/ao-khoac-nu-re>

Đây là sản phẩm được bán bởi Nhà Bán Hàng bên thứ ba và việc xuất hóa đơn VAT (nếu áp dụng) sẽ được thực hiện bởi Nhà Bán Hàng theo quy định của pháp luật BR8983_Hãy phối chiếc áo khoác bomber dáng dài này với quần legging in hoặc khoác ngoài bộ bodysuits liền mảnh của chúng tôi. Dù phối theo cách nào thì bạn vẫn trông thật sự phong cách dù là ở phòng tập hay khi đi dạo phố. Thiết kế khóa kéo chắc chắn với chất vải bắt sáng tinh tế khiến đây trở thành một chiếc áo khoác must-have có phong cách hiện đại. BR8983_Hãy phối chiếc áo khoác bomber dáng dài này với quần legging in hoặc khoác ngoài bộ bodysuits liền mảnh của chúng tôi. Dù phối theo cách nào thì bạn vẫn trông thật sự phong cách dù là ở phòng tập hay khi đi dạo phố. Thiết kế khóa kéo chắc chắn với chất vải bắt sáng tinh tế khiến đây trở thành một chiếc áo khoác must-have có phong cách hiện đại. Đặc tính sản phẩm Áo Khoác Nữ REEBOK Favorite Bomber Jacket Thương hiệu Reebok SKU 362814107_VNAMZ-599536775 Loại bảo hành No Warranty Bộ sản phẩm gồm Áo Khoác x1 [show less](#)

Figure: Item details

End-user Use case

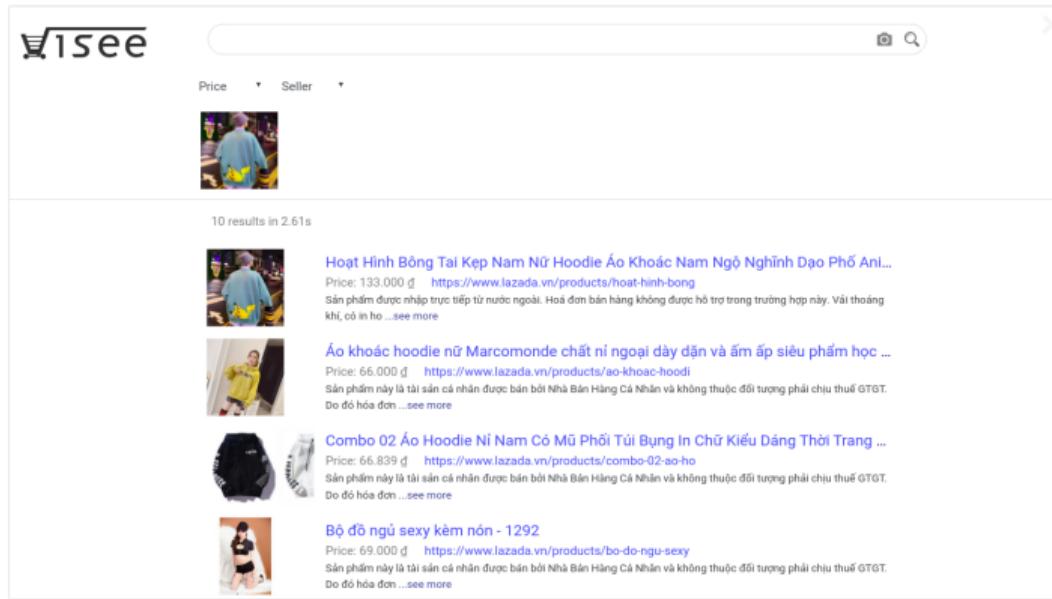


Figure: Image search

Logging System: ELK+ Stack

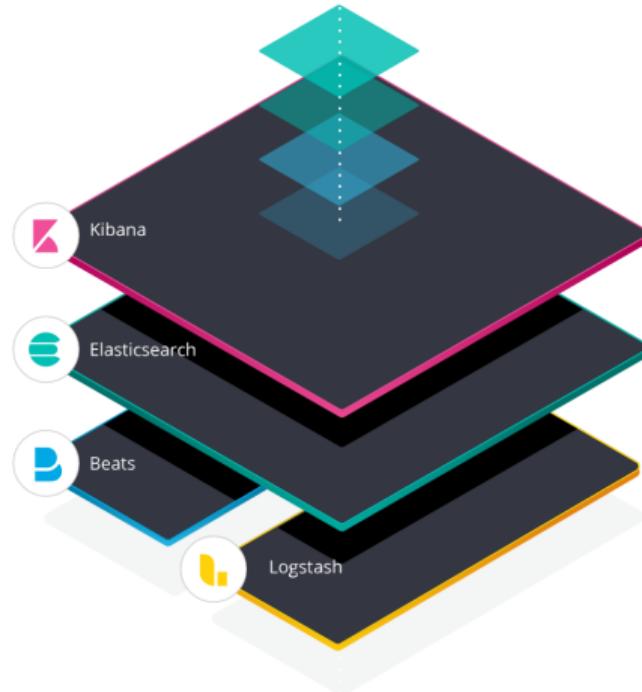
Up until a year or two ago, the **ELK Stack** was a collection of three open-source products — **Elasticsearch**, **Logstash**, and **Kibana** — all developed, managed and maintained by Elastic. The introduction and subsequent addition of **Beats** turned the stack into a four legged project and led to a renaming of the stack as the Elastic Stack⁶.

⁶Daniel Berman. The Complete Guide To The ELK Stack. 2019

Logging System: ELK+ Stack

- **Elasticsearch** is a search engine based on the Apache Lucene library. It provides a distributed, multitenant-capable full-text search engine with an HTTP web interface and schema-free JSON documents.
- **Logstash** is an open source, server-side data processing pipeline that ingests data from a multitude of sources simultaneously, transforms it, and then sends it to a favorite "stash" (i.e Elasticsearch).
- **Kibana** is an open source data visualization dashboard for Elasticsearch.
- **Beats** is the platform for single-purpose data shippers. They send data from hundreds or thousands of machines and systems to Logstash or Elasticsearch.

Logging System: ELK+ Stack



System Administrator Use Case

- Managing and visualizing data
- Monitoring system
- Debugging and troubleshooting

The screenshot shows the VISEE search interface. The left sidebar has a 'Discover' tab selected, followed by 'New', 'Save', 'Open', 'Share', and 'Inspect'. Below these are buttons for 'Search', '+ Add filter', and a search bar. A dropdown menu 'Selected fields' is open, showing '_source' is selected. To its right is a list of available fields: '_id', 'description', 'images', 'link', 'price', 'title', '_index', '_score', '_type', 'domain', 'rating_count', and 'rating_point'. The main area displays search results for 'visee*'. It shows a total of 1,152 hits. One result is expanded, showing its source code in JSON format. The JSON object includes fields like '_index', '_type', '_id', '_score', '_source', '_version', 'link', 'title', 'price', and 'description'. The 'description' field contains a detailed product description in Vietnamese. At the bottom of the expanded view, there is a note: 'View single document'.

Implementation

- For a month, our project has reached 262 commits on github.
- Our project source code: <https://github.com/vndee/visee>

THANKS