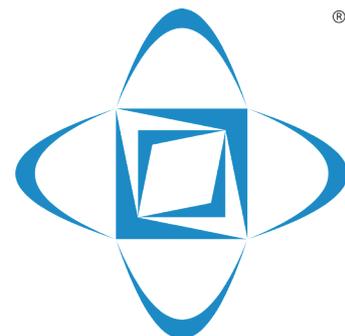


Crunching
Reviews,
8 Million &
Counting!

Reviewlattice Case Study

*Campground owners understand
their customers' sentiments and
address the grievances quickly with
this review aggregation engine.*



Codelattice

• connecting dots •



Abstract

Codelattice built a smart review aggregation engine, crunching reviews of 10,000+ camping grounds across Europe in one simplified platform. Crawling and fetching reviews from a single page is straightforward, but there are challenges in scraping millions of reviews from multiple platforms. Managing the spider code, collecting data, and maintaining a data warehouse are some of them. Over the years, we analyzed the sentiments of more than 8 million reviews from 16 various channels written in 15 different European languages. Here is a record of this feat.

Challenge

As the world has transitioned to online shopping, consumers spend an increased amount of time researching before booking a property for a stay. Customers spend about 93% of the time of their research on buyer reviews. Given this scenario, it is clear that online reviews establish a 'social proof' that drives bookings, and your business reviews absolutely cannot be ignored.

What's complicated with the management of reviews?

1. Too many reviews on too many platforms.
2. Separate sign-in on every platform to act on reviews.
3. Customers write reviews in different languages, so translating to your preferred language is a cumbersome task.
4. It is time-consuming to read through every review and understand the overall emotion conveyed.
5. When one is running against time, prioritizing reply to negative feedback can reduce the damage caused. However, it is not easy to filter the reviews that need immediate attention.
6. Prompt and timely replies to comments help build customer trust and engagement. To keep track of the recent reviews regularly is practically challenging.
7. It is even more complicated when you need to look at your competitors and infer how the customers receive their properties.
8. What features make you preferred over your competitors?
9. What issues need to be highlighted or fixed in your property?
10. How has the number of reviews and customer sentiments changed towards your property over the years?

With so many aspects to keep track of, it comes as no surprise how easily one can get lost in managing reviews without the right technologies and tools at hand.

Reviewlattice, the intellectual property of Codelattice, is a robust engine to simplify the review management of a property/product. We configured the solution for camping grounds in Europe when a client working in the travel domain sought us for the same.



Solution

We developed Reviewlattice with microservice architecture. We built the entire application with suites of independently deployable services. The architecture enables continuous improvement and faster product development. In case a specific microservice fails, that single service can be easily isolated, thereby preventing cascading failures that might cause the app to crash. Ultimately it reduces downtime. The smaller codebase of microservices makes it simpler to maintain the application.

We built the solution using MEAN Stack and Java, known for first-rate performance in creating robust and maintainable solutions. We configured web crawlers to fetch an existing and updated database of reviews from 16 popular online travel agents in a periodic automated manner.

Sentiment analysis is a complex process as there may be multiple implied meanings in a human-generated sentence. People express opinions in many ways; rhetorical methods like sarcasm, irony, and implied sense may lead to misinterpretation of sentiment.

We used text analysis and natural language processing to extract words' sentiment into positive, negative, or neutral categories. However, it may not be possible to categorize every review into such clear buckets, and some warrant further analysis. Can the review's conveyed emotion be split into happy, sad, angry, or bored? Or is it dimensional and needs to be evaluated on a bidirectional spectrum?

Leveraging Python libraries, we developed superior machine learning. After years of training, Reviewlattice gained the capacity of accurate sentiment analysis.

Reviews mention the good and bad aspects of a property. For example, visitors saying insects on a particular camping site. Reviewlattice maintains a collection of specific keywords and understands the intensity based on the weighted average reviews' words. We highlight the text insight to the property owner in a dashboard for appropriate measures.



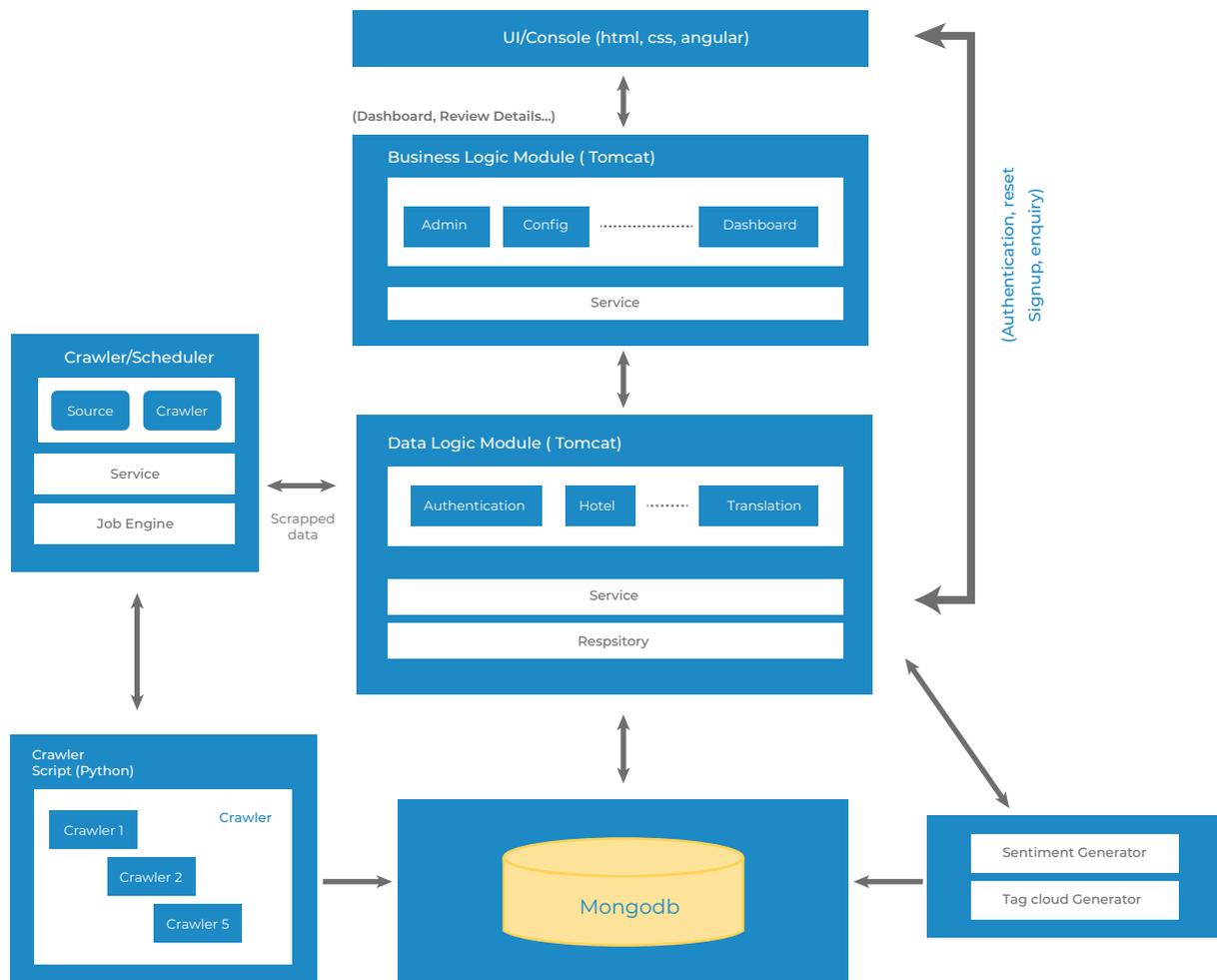
Architecture

We have an API-led microservice architecture to connect data to applications. We developed the APIs to play a specific role in unlocking data from the system, composing data from the process, and delivering an experience. Our application has three reusable layers to form new services and capabilities. It decentralizes and democratizes access to the data.

Experience-layer handles the data visualization & user interactions. We developed it to adapt to screens of all dimensions and browsers.

Business-layer accesses the core systems of record and insulates the user from complexity or any changes to the underlying systems. It is architected in a manner to reuse these APIs in multiple projects or dashboards.

Data-layer interacts and shapes data across systems. It interacts with the database and handles the authentication as well.





Deployment:

Reviewlattice has a CI/CD pipeline in AWS implemented with Jenkins. We leverage a functioning pipeline to create a fully managed build service that compiles our source code. The automated pipeline provides code artifacts that CodeDeploy uses to deploy our product automatically. CI/CD pipeline eliminates the need for manual actions to address custom scripts. An automatic build-and-test sequence alerts the developer with detailed feedback. Manual errors are minimal and faster iterations are possible with automated pipelines.

We used AWS CodeDeploy to deploy the Reviewlattice application, lambda functions, and static files to AWS computing services. We deployed a Python Flask application with docker to host using a GitHub code repository, a Jenkins CI service, and AWS CodeDeploy to deploy to AWS EC2. We had a few plugins installed to implement AWS CodeDeploy and Jenkins together, such as the File Operation plugin, the AWS CodeBuild plugin, and the HTTP Request plugin.

Multizone availability

We enabled the application to withstand isolated zone failures with Multi Zone availability.

Information Security

Through AWS, the data in the application is automatically encrypted at the physical layer. VPC cross-region peering traffic and customer or service-to-service TLS connections provide additional encryption layers.

Optimize and Monitor

Amazon CloudWatch Events detect changes for AWS Health and give an overview of operational health. It provides actionable steps to monitor applications and respond to system-wide changes in performance. It can optimize resource utilization.

Maintenance & Backups

Regular automatic incremental backup is scheduled to Amazon S3 and Glacier. We have routine maintenance checks on - Disc Usage, CPU Utilization History, Memory Utilization History, Network status, Backups, logs, EFS File system & Database Connections.

Code Repository and version control

GitLab makes Code Management easy. It helped us to do the project management, branching, issue tracking, and code reviews in one place. It helped us with merge requests to high-frequency integrations and acceptable code quality practices. Developers, Product Managers, and Designers were able to collaborate better. We were able to reduce the cycle time while keeping our intellectual property secure and track all changes.

Scheduler/Crawler

We leveraged python libraries and code to find out the HTML page reviews in an HTTP response object. We built a metadata extractor to obtain meaningful information out of the scraped reviews. Our system has smart schedulers to trigger incremental crawling in periodic time intervals without bothering the OTAs.



Outcome

Reviewlattice engine has proved its resilience. Our AI-enabled sentiment analysis gets better day by day. The aggregator engine has crunched more than 8 million reviews of 10,000+ campgrounds in Europe for three years, making the sentiment analysis close to 'accurate.'

Our survey respondents reported about a 70% reduction in the time spent on the review management. Campground owners believe, Reviewlattice contributed an average increase of 15% in sales annually. They could better engage with customers by immediately addressing customer grievances and leaving a note of appreciation on the good reviews.

Following are few highlights

- ▶ An intuitive dashboard visualizes data and user interactions.
- ▶ Sentiment Score on each review is displayed with a visual representation of emotion such as sad, angry, happy, neutral, etc. The emoji representation of the customer sentiment made it easier to filter out and prioritize the reviews with negative feedback.
- ▶ Ratings from all the OTAs.
- ▶ Reviews from all sources (OTAs)
- ▶ Aggregated reviews and ratings are plotted for a month on month and year on year comparisons. The insights of changing trends are evident through this.
- ▶ Reviews translated into 15 different languages.
- ▶ Keyword Cloud gives a quick idea of what's being talked about the property.
- ▶ We assign the 'Relative Rank' of the camping ground compared to the average ranking of other properties.
- ▶ We established the benchmark scores. The campground owners can compare their position relative to the industry benchmark.
- ▶ Provision to respond to the reviews in all OTAs from a single Reviewlattice dashboard.
- ▶ We promptly notified the users of the latest reviews.



Campingnavigator has been a leading company in the Dutch campsite market for about 30 years. Campingnavigator transformed itself into an online portal with thousands of campsites throughout Europe. Our partnership with Codelattice helps us deliver a delightful experience to our customers by leveraging NLP, Artificial Intelligence, and Machine Learning. Reviewlattice is a unique product that best fits our requirements.

Robert J. Meerpoel

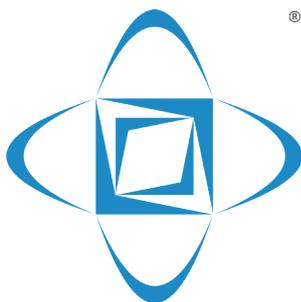
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Thank You

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Codelattice is a technology solution provider established in 2009. We are a team of 200+ technocrats spanning across 8 countries. We help our clients to Activate, Elevate and Accelerate their endeavors. Guided by a decade of experience, Codelattice offers customizable Digital Solutions, off-shelf Software Products, and bespoke IT Services. By partnering with industry pioneers such as Google Cloud, GoDaddy & AWS we provide the imperative digital edge.

We Make You Digitally Immortal ®



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