Technical Specification - MACHINE WISE - Explore phase

1. TECHNICAL SCOPE

In Explore phase we have taken the following steps in order to understand the data/challenge and propose the solution:

- Gathered additional data from data provider's (DP) open RSS feed: https://www.vrt.be/vrtnws/nl.rss.headlines.xml
- Developed additional configurable workflow for AI enrichments of textual data, as part of our Content Insights solution, in order to adjust our solution to DP's data
- Developed generative AI user interface to directly tackle DP's challenge

Main challenge we are tackling is generation of interesting, unseen, cover images for news stories. To understand the domain, topics and data characteristics better, we took liberty to enlarge the provided data available for the Explore phase, from 5 articles available on REACH platform to more then 300 news articles and images gathered from VRT's RSS feed, which publishes 5-20 articles a day.

As powerful as it already was, our Content Analysis solution was not ready to work with textual data (only images and videos) so we extended it with configurable workflow that can take news article in Dutch (or other languages) and perform many AI-enrichment steps, including translation, keywords extraction, entity recognition and audio synthesis.

As main task for Explore phase, we used transformed data to experiment with generative AI for image co-creation. We have developed a custom models and user interface to directly tackle DP's challenge and help create best possible and engaging cover images for written news articles.
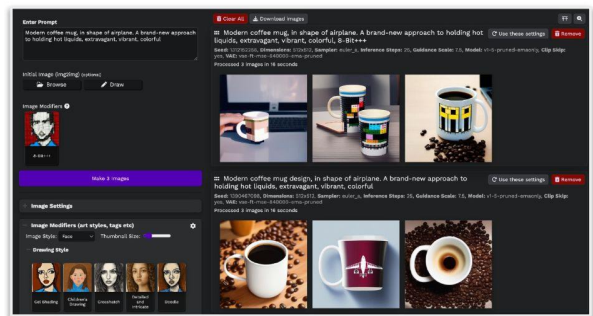
Realized solution can be accessed at: cas.apps.machinewise.io
with temporary login credentials for REACH Explore: *reachDEMO / REACH_Paris_23*
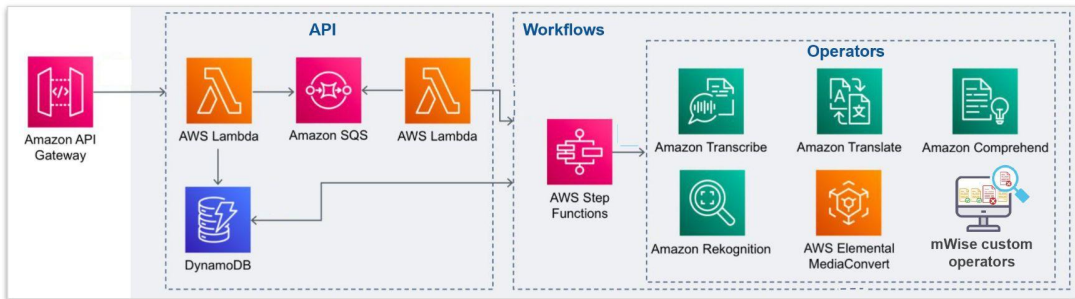
High-level solution architecture is provided below:

Content Analysis UI
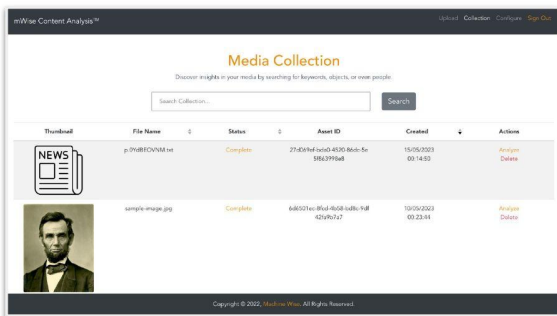
Image Co-creation UI

Media Insights Engine

2. ALGORITHMS, TOOLS AND CONCLUSIONS

To tackle main challenge we are primarily using Stable Diffusion, a novel open source algorithm and their pre-trained models for image creation from textual prompts. Since challenge revolves around written word by professional journalists we hypothesize that this and other generative AI tools can be a great asset in their toolbelt for co-creation of online content. We have used latest pre-trained models as well as fine-tuned derivatives to experiment with image creation and provide best possible features for our future users.

Other AI and big data tools used in our solutions, from AWS AI toolset, are: Transcribe, Translate, Polly, Rekognition, Comprehend, S3, EC2, DynamoDB, OpenSearch, Amplify, Cognito, Step Functions, Lambda and few more! Main pillar of our solution architecture are step functions, state machines that constitute processing workflows and ensure data provenance as well as scalability.

REACH dataset used are json files with article content, summary and images linked. We have used public RSS feed to enlarge the dataset from 5 to few hundreds of articles, and have ingested and processed many articles as part of Explore phase. By comparing cover images to the ones created by our fine-tuned models it was evident that co-creation with AI can offer so much in terms of image modifications, inpainting, style transfer or completely start image creation from article content alone. Our further development would hugely depend on the data provider's feedback and feedback from other potential media domain users, who we started interviewing.

3. SCALABILITY AND FLEXIBILITY OF THE SOLUTION

Scalability is guaranteed by main engine architecture, which we base off of reference AWS architecture for media analysis at scale. From scalable data ingestion via data APIs; storage that can hold terrabytes of media assets and millions of metadata values; processing in orchestrated fashion with step functions, queueing, and fault-tolerant retry mechanisms; to scalable UI serving with load balancing, as well as scalable indexing of metadata with ElasticSearch - this solution is made to be scalable from day one.

As for flexibility: we support different media types, like images and videos, as input to processing workflows. In the future we plan to support more specific media outlet's formats like RSS feeds. We cater to different needs of different user roles, like editors and journalists, with different set of features and some of our future development would revolve around mapping our user journey of each persona we support and developing different views of our soulution based on the role of our user.

By it's design, our solution provides insights in digital assets and ensures value of your assets in a data-value-chain is maximized. Different media outlet departments can draw value from insights we provide: immediately journalists, but also editors by analysing whole portfolio of the outlet, or marketing departments by getting insights into topics, coverage and other derived statistics of the portfolio. More over, in our opinion, role of Ai and especially generative AI in enriching data value in DVCs is enormous: data production increases, automatic insights are drawn at marginal costs, reuse and combining data sources are at hearth of the AI use-case and at the end uptake and delivery of data and derivatives is done at greater overall satisfaction. We see pur solution as valuable engine for media outlets, but also gaming platforms, public forums with a lot of user-generated content (UGC) and entertainment industry.

4. DATA GOVERNANCE AND LEGAL COMPLIANCE

Our solution uses security best practices for cloud: data encryption in transit and at rest, secure connections between services, scoped roles and permissions, least-priviledge principle and Cognito pool of users. GDPR concerns, like right to be forgotten, are ensured by baked-in procedures to search for and delete all user-related (meta)data, since we provide full data provenance.

We recognise new and specific legal challenges of IP rights concerning generative AI and are taking all the measures to mitigate risks. Specific AI-generated content usage policies are provided with the solution and can be consulted at any time.

We also pay special attention to problems of content moderation and harm by misinformation, so we plan to include our proprietary misinformation detection tool as one of the operators for journal editors or forum managers as personas we plan to support with our solution. In some of next iteration of our solution we will support most-granular content moderation policies configuration, making our solution a perfect gateway before generated data publishing.

5. QUALITY ASSURANCE AND RISK MANAGEMENT

Our development process, as well as deloyment procedures are taking testability seriously. Our deployments are automated and we leverage best devops practices, including testing our builds and our models against ground truth data and against wide test cases.

One of the features of our solution can be used as filtering tool for quality assurance - that is a confidence score filter. Users can query insights we provide by filtering results of each one of AI tools by confidence. This approach ensures that only highly-confident derivative data get's passed on and used.

We identify as main risk a subjective nature of the challenge we are solving for: what constitutes the best cover image for given text is highly dependant on the co-creator opinion, journalist-a-person, or taste of the audience. Therefore we are looking forward to iterate over our solution features together with data provider and ensure that we measure success of proposed solution in most objective ways.

Another recognized riks - that of AI-generated content being offensive or inappropriate is solved for on many levels: First, users can leverage other parts of the solution, namely content moderation, to flag those case; Second, AI-generated content is never automatically published, so we keep gateways for data propagation and human-in-the-loop; and Thidly, models we are using and fine-tuning are improving source data filtering and we leverage a support of huge communities that fight misuse of private or inappropriate data.