## Abhay Kumar

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[LinkedIn Profile](https://in.linkedin.com/in/awesomeabhay) | [GitHub Profile](https://github.com/abhaymise/abhaymise.github.io)

## About Me:

Passionate and accomplished Machine Learning Professional with a decade of hands-on expertise in **Generative AI**,**LLM**, **VLM**, **NLP**, **Computer Vision** and solving complex problems. Proven track record of leading teams, engaging with clients, and contributing impactful research to the field. A dedicated individual with a passion for innovation and a drive to deliver cutting-edge solutions.

## Professional Experience:

### Machine Learning Lead - Target Corporation (Feb 2021 – Present)

* Collaborated with cross-functional teams to design and implement solutions that address business needs and drive value for the organization.
* Collaborated with the product managers to define project scopes, timelines, and deliverables, ensuring alignment with business objectives.
* Collaborated with the product team to integrate the solution into the platform, enhancing user experience and engagement.
* Led a team of Data Scientists and Machine Learning Engineers, providing mentorship and guidance to enhance their technical skills and professional development.
* Fostered a collaborative and inclusive team culture, encouraging knowledge sharing and continuous learning among team members.
* Developed and implemented best practices for model development, evaluation, and deployment, ensuring high-quality and scalable Machine Learning solutions.
* Led the development of innovative Machine Learning models and algorithms, leveraging cutting-edge techniques and technologies to solve complex business problems.
* Conducted regular code reviews and technical discussions to ensure the team’s adherence to coding standards and best practices.
* Contributed to the development of a Machine Learning platform, enabling rapid prototyping, testing, and deployment of models across the organization.
* Developed and maintained scalable data pipelines for processing and analyzing large datasets, leveraging Spark and Hadoop.
* Mentored junior team members, fostering their growth and enhancing the overall team’s performance.

#### Invoice Information Extraction System

* Did OCR model selection to identify the best OCR model for the task.
* Conducted OCR fine-tuning to detect specific fonts used in invoices.
* Implemented a system to extract tabular information from document images, enabling structured data extraction.
  + Fine tuned table transformer models to extract tabular data from invoices.
  + Digitized table data into structured JSON format, preserving row and column information as keys.
* Fine-tuned LayoutLM model to extract key entities from the document images.
* Used Advanced prompt engineering to extract multiple sections having named entities and other information.
* Used the extracted information to generate a structured JSON format for efficient search and retrieval.

#### Nutrient Information Extraction from Food Labels

* Developed a system to extract nutrient information from food labels, enabling accurate tracking of dietary intake.
* Used custom table detector to identify the tabular structure in the image
* Used OCR to extract text from the image
* Used LLM completions to extract multiple sections having nutrient and other information .

#### RAG powered Document Search and Query System

* Chunked the document into smaller sections for better searchability
* Created a summary of the chunk using LLM completions
* Reformulated the chunks into possible questions and answers using RAG flow
* generated embeddings for the summary and the questions and answers
* Indexed the embeddings alongwith the metadata for efficient search and retrieval
* Did a query expansion to elaborate the search query
* Used elaborated query to search the indexed documents sections
* Used retrieved sections to generate a summary and answer the query

#### Anomaly Detection System for Image Data Pipeline

* Developed an anomaly detection system to prevent corrupt images from entering the data pipeline.
* Identified and blocked 30% of anomalous images, resulting in substantial reductions in processing time
* Improved downstream algorithms, leading to an 8% enhancement in business metric.

#### Privacy Blur Feature Implementation

* Developed a privacy blur feature for archived video streams.
  + Employed lightweight object tracking and detectors to reduce processing needs.
  + Ensured real-time video processing while obfuscating individuals’ identities.
  + Collaborated for seamless integration and performance optimization.

### Senior Data Scientist - Embibe (May 2019 – Jan 2021)

* Collaborated with cross-functional teams, including Product Management, Engineering, and Customer Support, to align Machine Learning initiatives with business goals and customer needs.

#### Question Tagging and Topic Extraction System

* Designed and implemented an automated system to tag questions with subjects and extract relevant topics from text.
* Developed question tagging using both text and image content, enabling better content recommendation and search accuracy.
* Used BERT model for text embeddings extraction and Resnet based architecture for visual feature extraction.

#### Query Intent Classification and Routing

* Developed a system to classify queries based on intent, enabling efficient routing to the appropriate department.
* Identified questions subject and routed the customer query to the relevant SME or department.
* Improved customer query resolution time by 20% through efficient routing.
* Enhanced customer satisfaction by ensuring prompt and accurate responses to queries.

#### In-House Annotation Tool Design

* Spearheaded the development of a custom in-house annotation tool, incorporating user and project management workflows.
* Collaborated closely with Subject-Matter Experts (SME) and annotators to gather requirements, ensuring that user needs were at the forefront of the tool’s design.
* Integrated active learning capabilities into the system, enabling it to learn from initial observations evolve the annotation flow into an audit flow, where system-generated annotations were verified by annotators, leading to the rapid annotation of thousands of images with a small annotator team.

### Senior Data Scientist - ClipIndia (Sep 2018 – Apr 2019)

#### NSFW Video Classification

* Implemented a classification system to identify and filter out inappropriate content, reducing NSFW content
* Developed a video classification system, reducing inappropriate content by 28%.
* Enhanced content moderation capabilities, ensuring a safe and engaging user experience.
* Collaborated with cross-functional teams to integrate the NSFW classification system into the platform, enhancing content moderation and user safety.
* Conducted regular performance evaluations and model audits to ensure the NSFW classification system’s accuracy and reliability.

#### Video Asset Tagging

* Developed a video asset tagging system to improve content discoverability and feed ranking.
* Enhanced content organization and searchability, increasing user engagement by 3%.
* Collaborated with the product team to integrate the video asset tagging system into the platform, enhancing user experience and content relevance.
* Conducted regular performance evaluations and model audits to ensure the video asset tagging system’s accuracy and reliability.

#### Review Moderation System

* Designed an algorithm to identify NSFW comments with 95% efficiency.
* Developed a review moderation system to filter out inappropriate content, ensuring a safe and engaging user experience.
* Enhanced content moderation capabilities, reducing the presence of inappropriate comments on the platform.

### Senior Data Scientist - Cogknit Semantics (Sep 2015 – Sep 2018)

#### Catalogue Misplacement Detection System

* Developed a detection system to prevent incorrect product placements in the catalog.
* Identified and reorganized 12% of misplaced products, resulting in substantial reductions in incorrect placements.
* Improved downstream algorithms, leading to an 8% enhancement in business metric.
* Collaborated with the product team to integrate the solution into existing platforms, ensuring seamless user experience and value delivery.

#### Course and Instructor Review Classification

* Developed a system to classify course and instructor reviews, enabling better categorization and analysis.
* Identified review sentiments and classified them into categories, providing valuable insights for course improvement and instructor evaluation.
* Enhanced the review classification system by incorporating user feedback and iterative model improvements.
* Collaborated with the product team to integrate the review classification system into the platform, enhancing user experience and engagement.
* Conducted regular performance evaluations and model audits to ensure the review classification system’s accuracy and reliability.

### Sr. Research Analyst - Edureka (Dec 2013 – Sep 2015)

* Conducted extensive research on Machine Learning course content and collaborated closely with Subject Matter Experts (SMEs) to develop comprehensive technical content, including exercises, quizzes, and other learning materials.
* Served as a Teaching Assistant (TA), providing invaluable support to students in solving complex technical problems and facilitating their learning experience.
  + Recognized as the “Best Performer” for five consecutive months for outstanding contributions to student success and engagement.
* Contributed significantly to the community by authoring blog posts on advanced Machine Learning and Big Data topics.
  + Five of my blog posts became the highest-traffic generators on the platform.
* Led the initiative to create a comprehensive knowledge base, reducing the workload on the TA team and enhancing the overall efficiency of support and learning resources.

## Education:

* Bachelor in Computer Science, Visvesvaraya Technological University (VTU), 2013.

## Skills:

* **Generative AI**: Advanced Prompt engineering, LLM app development, RAG, LangChain, ChatGPT, Bert, LLAMA
* **Search Systems**: Elasticsearch, Milvus, FAISS
* **Computer Vision**: Object detection, image classification, image segmentation
* **NLP**: Text classification, topic modeling, Intent classification
* **Machine Learning**: Deep Learning (PyTorch, TensorFlow), Scikit-learn, Huggingface
* **Applied ML** : Model training, optimisation and deployment at scale, Algorithm research and selection
* **Data Processing**: NumPy, Pandas, Spark, Hadoop
* **Cloud Platforms**: AWS, Azure, Google Cloud
* **MLOps**: Git, CI/CD, MLflow, containerization (Docker), APIs
* **Team Skills**: Team building, leadership, project planning, data storytelling

## Publications and Presentations:

* Poster presentation on “Domain Adaptation of Image Caption Model for Video Descriptions” at AI & Deep Learning Conference (GTC 2018, NVIDIA).