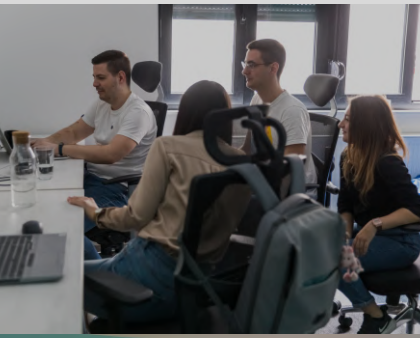


# Health Tech

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BRAIN POWERED AI COMPANY



## Introduction

SmartCat is a service-based company specializing in delivering comprehensive data solutions for businesses. With eight years of experience, our team of experts is dedicated to expanding their knowledge and incorporating new technologies and methods. While our expertise lies in leveraging the power of data to help businesses unlock their true potential, we also prioritize HealthTech and Telemedicine solutions in addition to our presence in the PropTech industry.

At SmartCat, we excel in creating robust data platforms and foundations that enable true analytics and AI capabilities. We understand that data holds immense value beyond its mere collection. That's why we have developed a holistic approach to product development, ensuring a comprehensive and seamless process. Our end-to-end solutions cover every aspect of the product development lifecycle, empowering businesses to make informed decisions.

Through our dedicated Labs, we invest in knowledge and develop cutting-edge solutions that address various levels of the data science pyramid, from data analytics to AI integration. Our commitment to innovation and expertise enables us to deliver tangible results to our clients in both the SmartCat service offerings and the dynamic HealthTech and Telemedicine industries.

For more information you  
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Case study:

# The Virtual Assistant for Clinical Trials

## About the Client

The client is a startup focused on digitalizing daily diary and monthly diary entries for patients in clinical trials through a chatbot solution instead of complex forms.

## Problem

The challenge for our client, a startup focused on digitalizing daily diaries and monthly diary entries for patients in clinical trials, was to create an enterprise-level, AI-powered, GDPR-compliant chatbot and analytics platform. **The client needed a solution that could be used by patients, clinicians, and regulatory personnel in clinical studies.** The specific pain points and obstacles included the need for regular engagement and form-filling for 2+ years, the tracking of private/anonymous data, and the requirement for an empathic virtual assistant to track data with a dashboard to synthesize data for doctors and sponsors.

## Solution

The SmartCat team **addressed the challenge by helping the client define the MVP and optimal trade-off combination to yield the best ROI.** The team structured the ML work in usable components to bring value even before the full-blown AI platform was completed. They prioritized functional over non-functional requirements, resulting in a highly available platform **prioritizing security and privacy in line with the latest regulatory and industry standards.**

The team also ensured the **platform stability through a suite of over 1000 functional end-to-end and unit tests, allowing for changes and iterations on changing requirements with confidence.**

Regarding the AI aspect, the team used a novel approach to overcome the lack of data. **They generated a dataset that simulated patient behavior** based on several weeks of real user activity. The predictive data model built on top of the generated data showed surprisingly good results. Over time, as more users started using the platform, the pipeline created more value and became more tuned according to real-world data instead of the generated one.

## Results

By making smart and hard trade-offs, the SmartCat team managed to put the platform into production on time for a clinical study to start. **The platform provided an empathic virtual assistant to track data with a dashboard to synthesize data for doctors and sponsors.** The platform was also **GDPR-compliant, highly available, and prioritized security and privacy aspects.**

## Technologies Used

The project utilized IBM Watson and Java.

## SmartFact

According to a study by the Journal of Medical Internet Research, patients enrolled in clinical trials using digital health tools were more engaged and had better adherence to their treatment regimens compared to traditional methods.

## SmartTip

When building an AI-powered platform with limited data, consider generating a dataset that simulates user behavior to create a predictive data model.



Case study:

# Image processing for healthcare industry

## About the Client

The client is a healthcare company specializing in human reproduction and embryology. They faced the challenge of determining the success of insemination in the early stages based on videos of embryos.

## Problem

The specific challenge was to classify videos of embryos into three groups: Liveborn (embryo will result in a live birth), No implantation (embryo will not implant), and Miscarriage (embryo will result in a miscarriage). This classification would help doctors in deciding which embryo had the highest probability of resulting in a successful pregnancy.

## Solution

The SmartCat team addressed the problem by implementing a machine learning model using image processing techniques and deep learning algorithms.

- 1. Preprocessing:** The team converted the video files into a set of images (frames) using OpenCV. Various transformations were applied to extract embryos, and data augmentation techniques were used to increase the training set.
- 2. Dimensionality Reduction (Embedding):** The team employed unsupervised learning techniques, specifically Variational Autoencoder and Stacked Denoising Autoencoder, to extract features from the image frames and create a lower-dimensional representation as vector embeddings.
- 3. Video Classification:** The embeddings were used as sequences to make final predictions for the video. Support Vector Machine (SVM) was used for single image classification, and Long Short Term Memory (LSTM) was used for whole video classification.

## Results

The approach achieved solid results in classifying images and videos on the test set. The next step for the team is to extend the model with a larger video dataset and combine results from images and metadata to improve accuracy further.

## Technologies Used

Python, TensorFlow, Deep Learning, Neural Networks, OpenCV

## SmartFact

Embryo classification using image processing and deep learning techniques can significantly assist healthcare professionals in making informed decisions about successful pregnancies, potentially improving the outcomes of human reproduction procedures.

## SmartTip

In similar situations, it is important to consider using unsupervised learning techniques for dimensionality reduction and feature extraction, especially when dealing with video data. Data augmentation can also help expand the training set and improve model performance.



Case study:

# Telemedicine Apps & Chatbots for Improved Patient Care & Communication

The European healthcare clinic faced a significant challenge in **patient communications management**. They had a large number of patients who were seeking medical care and were **overwhelmed with phone calls and emails**. This situation put significant strain on their staff and prevented them from providing the best possible care.

## Problem

The client healthcare clinic struggled to manage a **large volume of patient communications**. They needed a solution that would help them streamline their processes and reduce the workload of doctors and assistants.

## Solution

SmartCat developed **two mobile applications, one for doctors and one for patients, that supported both Android and IOS platforms**. The applications offered common functionalities such as **profiles, real-time chat, notifications, and a patient passport that allowed patients to upload and share documents with their doctors**. In addition, the patient application featured a chatbot that provided quick information and advice, while the doctor application included a calendar for scheduling and managing appointments.

## Technologies Used

SmartCat used a combination of DevOps and Mobile development technologies, including IaC with Terraform, CI/CD with AWS Code Pipeline and Code Build, and AWS services such as S3 Bucket, Fargate, DynamoDB, and RDS. For the mobile applications, SmartCat compared Flutter and React Native before ultimately choosing Dart (Flutter) due to its larger community and easier code management.

## Results

The solution developed by SmartCat would have significantly improved the client operations. By **automating many of the communication processes, doctors and assistants would have been able to focus on providing high-quality care to their patients, while patients would have enjoyed a more streamlined and user-friendly experience**. This solution contributed to the development of **telemedicine** by automating communication processes, reducing the workload of healthcare staff, and providing mobile applications that enable patients to manage their healthcare needs remotely, resulting in a more streamlined and efficient healthcare experience for both patients and healthcare providers.

Overall, the project demonstrates the value of developing tailored solutions for healthcare providers, especially when it comes to managing patient communications. By leveraging the latest DevOps and Mobile development technologies, SmartCat was able to develop a solution that would have significantly improved the client operations, while also improving the experience of both doctors and patients.

## SmartFact

- According to a recent study, more than 80% of patients prefer to use mobile applications to manage their healthcare needs, highlighting the growing importance of mobile technologies in the healthcare industry.

## SmartTip

- When developing solutions for healthcare providers, it is essential to prioritize user experience and ease of use. Patients and doctors alike have unique needs, and solutions should be tailored to their specific use cases to ensure they are effective and efficient.



Case study:

# Using Chatbots to Streamline Diagnostics Data Acquisition in Healthcare

## About the client

Our client was a healthcare company providing home care to patients who could not or did not want to go to the hospital. Remote screening and **telemedicine** were key to their services, making diagnostics data acquisition a crucial part of their application.

## Problem

Our client, a healthcare company providing home care to patients, faced a challenge in acquiring diagnostics information from patients upfront. This process was cumbersome and time-consuming, leading to delays in providing effective care. The specific pain points included the need for a friendly interface with predefined questions (pathways) to walk patients through the diagnostics process, and a backend application for doctors to edit pathways and analyze patient responses.

## Solution

To address this problem, our team at SmartCat developed a solution that consisted of **three parts: a backend application, a decision support tool, and an integration point**. We started by developing a proof of concept (PoC) chatbot to acquire patient data using an existing chatbot solution on the **Azure platform**. Based on feedback from the client, we then built the whole backend, enabling doctors to edit and customize pathways, enter drugs, and visualize results. **We also built a decision support tool** that served as an integration point for a mobile application with a chatbot interface.

Finally, we developed an integration point to share data in the correct format with external systems, such as expert systems that provide recommendations for medicine.

## Technologies Used

Our solution was built using a combination of Azure cloud, C#, AngularJS, and databases such as Mongo and PostgreSQL.

## Results

The end result was a powerful **system that streamlined diagnostics data acquisition** for the healthcare company. The key metrics included faster and more accurate data acquisition, more efficient use of doctors; time, and improved patient outcomes. The quantifiable results of our efforts included a significant **reduction in the time it took to acquire patient data, improved accuracy of data acquisition, and increased doctor satisfaction with the system**.

## SmartTip

- When using AI in healthcare, it's important to be cautious since this is a heavily regulated area. While AI can help gather and visualize patient data, it's important to ensure that any advice-giving features are compliant with regulations and that the AI is capable of delivering accurate recommendations.

## SmartFact

- OpenAI's ChatGPT is a powerful tool for streamlining data acquisition in healthcare. However, it's important to remember that AI is still evolving and may not be ready for all aspects of healthcare regulation.



Health Tech

## Final Words...

When you choose SmartCat as your partner, you embark on a journey that begins with a visionary approach, followed by meticulous design and implementation and culminates in delivering production-ready systems. We are dedicated to providing a comprehensive service encompassing all the necessary steps for a successful project. With our brain-powered AI capabilities and offices in the Netherlands, USA, and Serbia, we bring together the essential departments crucial for AI development, including Data Science and Data Engineering, making us a one-stop shop for data projects in the ever-evolving HealthTech and Telemedicine industry.

To gain a better perspective on our impact in the HealthTech and Telemedicine sector, we would like to invite you to explore our industry presentation designed to showcase the value we bring to the table. If you're ready to take the next step, please get in touch with SmartCat, the leading provider of smart data solutions and ESG-driven innovations in the HealthTech and Telemedicine space.

For more information you  
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