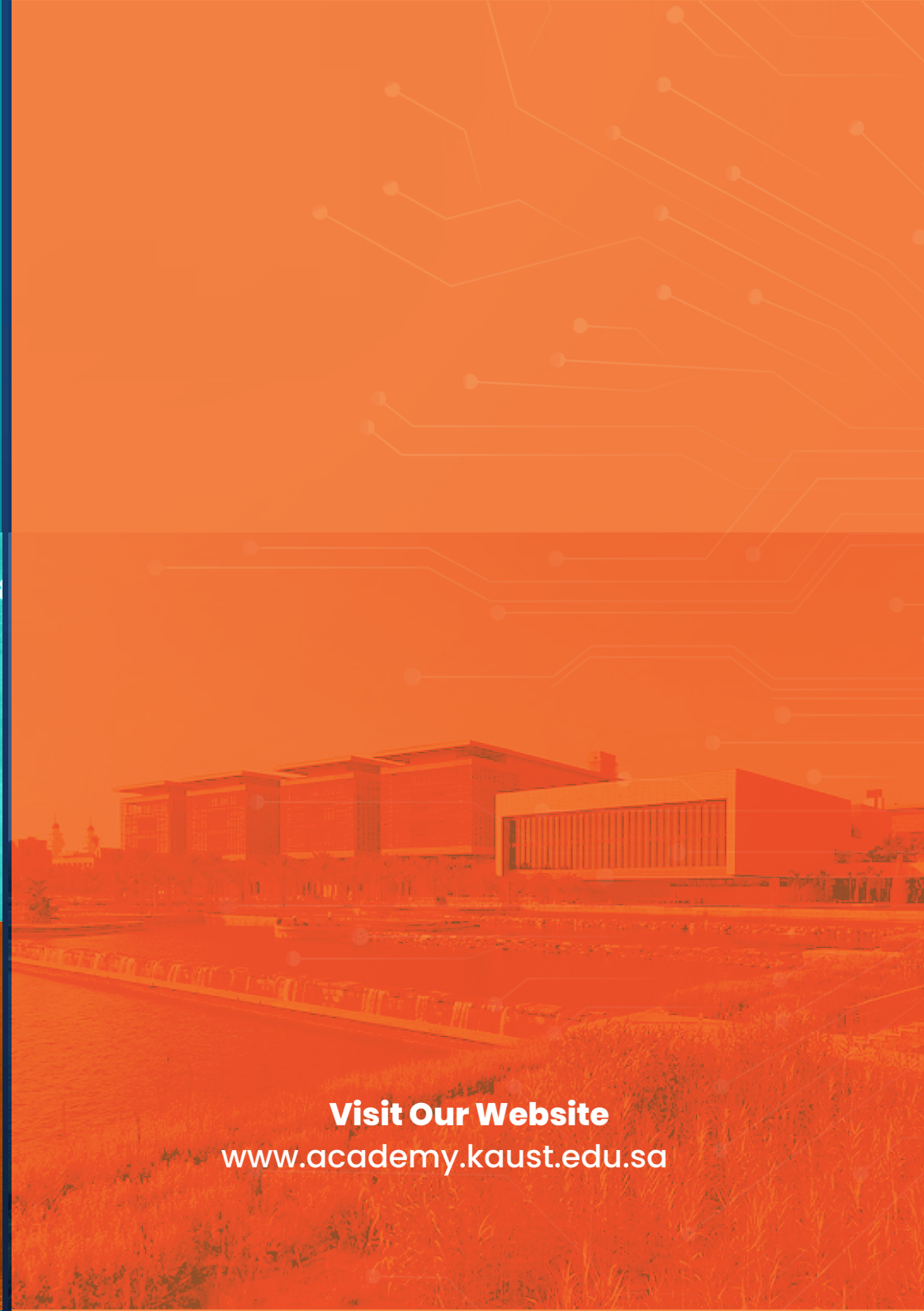
KAUST Academy

AI

SUMMER '23 PROGRAM



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tent

BADI ALZAMAN
(THE WONDER OF THE AGE) | بديع الزمان

Badie Alzaman is a personalized Arabic Natural Language Generator (NLG) that mimics your writing style, and based on the entered prompt it generates content that sounds like you in your own dialect. It is a tailored Arabic content-creating tool that boosts your writing productivity in Arabic. Personalized Arabic NLG can be a game changer in writing tweets, where everyone on Twitter has their own tweeting style, Badie Alzaman can be used as a tool that writes your thoughts in your tone with just a simple prompt.

NOUF KHALED ALGARABI | MAHA ALMUNAWER | LAMIS ALSHAHRANI | REEM ALMUTAIRI

01.
BN

PREDICTION OF MINIMUM MISCIBILITY PRESSURE (MMP) DURING IMPURE CO2 FLOOD) USING ARTIFICIAL INTELLIGENCE

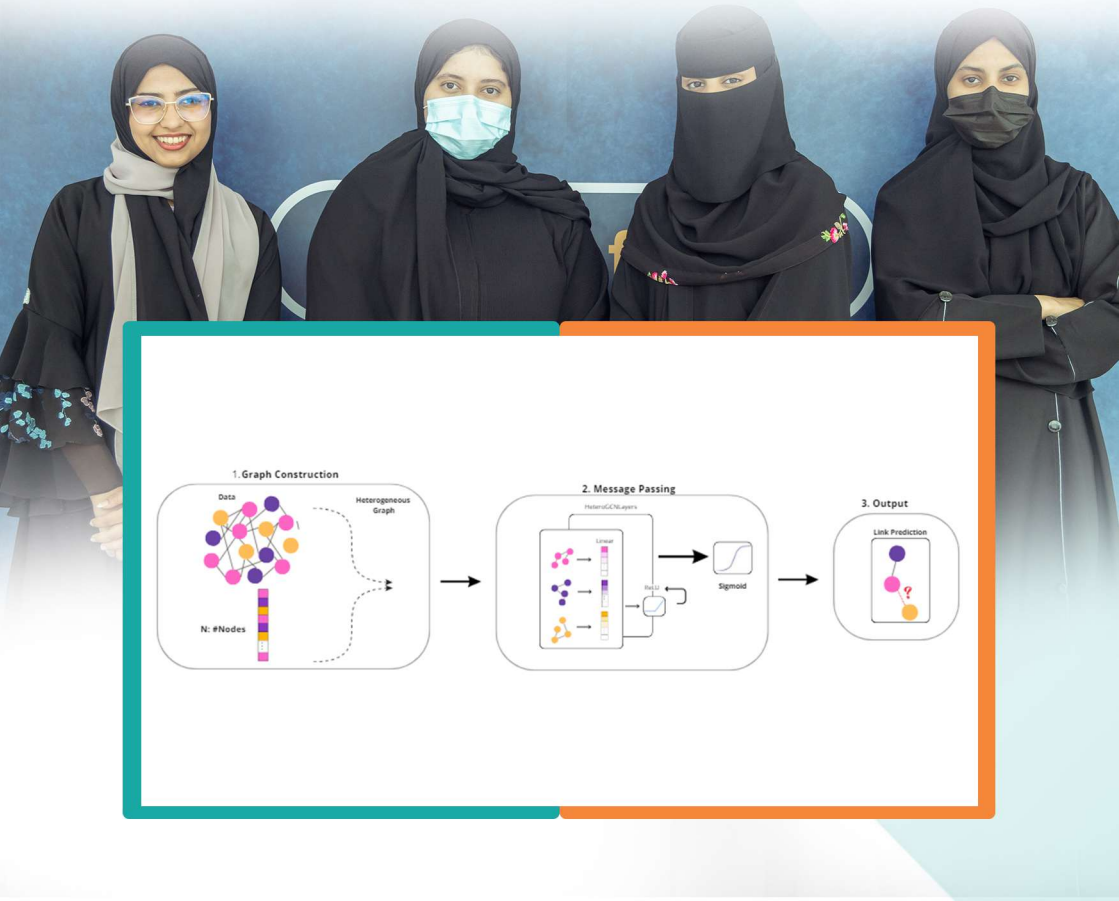
Many predictive studies in the field of MMP (Minimum Miscibility Pressure) tend to overlook the variations between individual wells within their training and testing datasets, resulting in suboptimal performance when applied in real-world scenarios. Our project places a strong emphasis on developing a versatile model that can uphold its predictive accuracy under a wide range of conditions.

NOUF KHALED ALGARABI MAHA ALMUNAWER LAMIS ALSHAHRANI REEM ALMUTAIRI

PROSIDE:
PREDICTIVE SIDE EFFECTS VIA DRUG-DRUG INTERACTIONS AND INDICATIONS

Our project, ProSide, centered on "drug repurposing". Drug repurposing refers to the innovative use of an existing drug, initially formulated for one medical condition, to treat a different ailment. We have engineered an AI-centric model using the Relational Graph Convolutional Neural Network to map the intricate relationships between drugs, the diseases they address, and the potential side effects.

LAMA ABDULLAH ALSHEHRI
RAWAN YASIR ALBARAKATI
SHAIMA ABDULLAH BASHAMMAKH
LATIFA SAEED ALOUFI



PUREPIX:
EVERY PIXEL HAS A STORY

Our project PurePix is a solution to the problem of bias in cropping images in the X (Twitter) application.

LAMA ABDULLAH ALSHEHRI
RAWAN YASIR ALBARAKATI
SHAIMA ABDULLAH BASHAMMAKH
LATIFA SAEED ALOUFI

PROBLEM

Neural networks need data access, but traditional methods may expose sensitive information.

SOLUTION

Using numpy, we developed an encryption-optimized model, integrated pretrained transformer weights, and boosted inference accuracy.

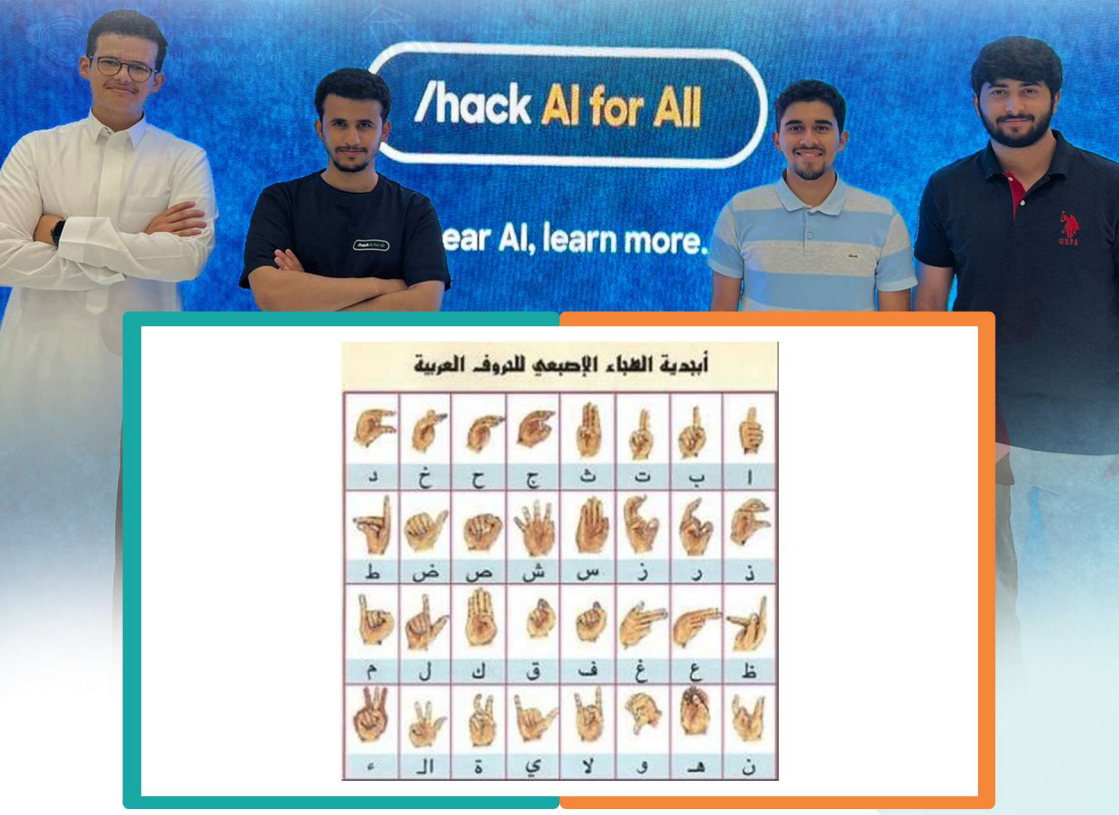
EXAMPLE

Performs inference on encrypted data without decryption, ensuring continuous data security.

LANGUAGE TRANSLATOR:
ARABIC SIGN LANGUAGE TRANSLATOR

The "Real-Time Arabic Sign Language Translator" is an AI project that utilizes the YOLO v5 detection model and custom training data to accurately recognize and translate Arabic sign language gestures in real-time. This project aims to bridge the communication gap between individuals with hearing impairments and those who do not understand sign language, empowering them and fostering inclusivity. The report provides an overview of the project, including motivations, background, and technical details.

NASSER ALMOUSA NASSER ALZAMIL ABDULLAH ALSHEHRI AHMAD SAIT



HUNAYN:
ELEVATING TRANSLATION BEYOND THE LITERAL

Hunayn is an advanced English-to-Arabic translator surpassing conventional tools. Leveraging the Helsinki transformer (MarianMT), our approach involves fine-tuning on a self-scraped, purely literary Arabic dataset. Evaluations against Google Translate show consistent outperformance in BLEU scores and qualitative assessments. Notably, it excels in cultural sensitivity and context accuracy. This research underscores the Helsinki transformer's superiority for English-to-Arabic translation using a Fus'ha dataset.

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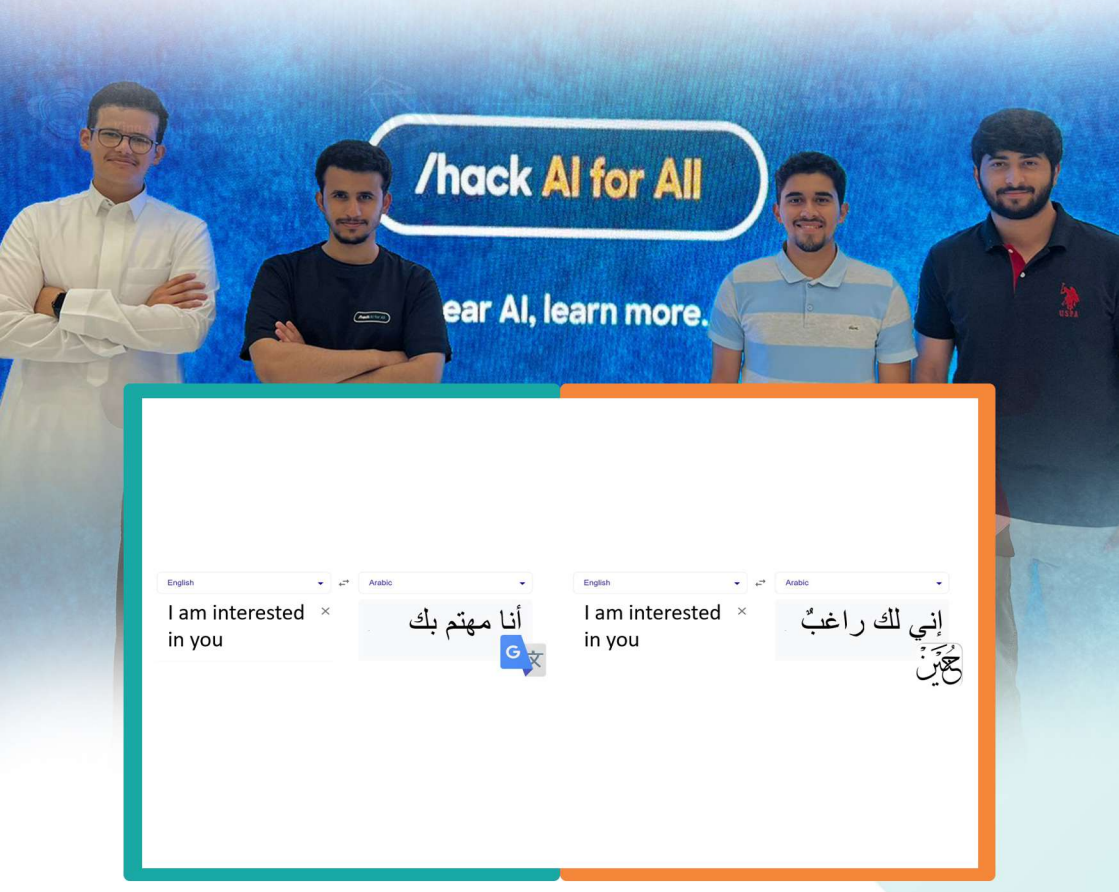
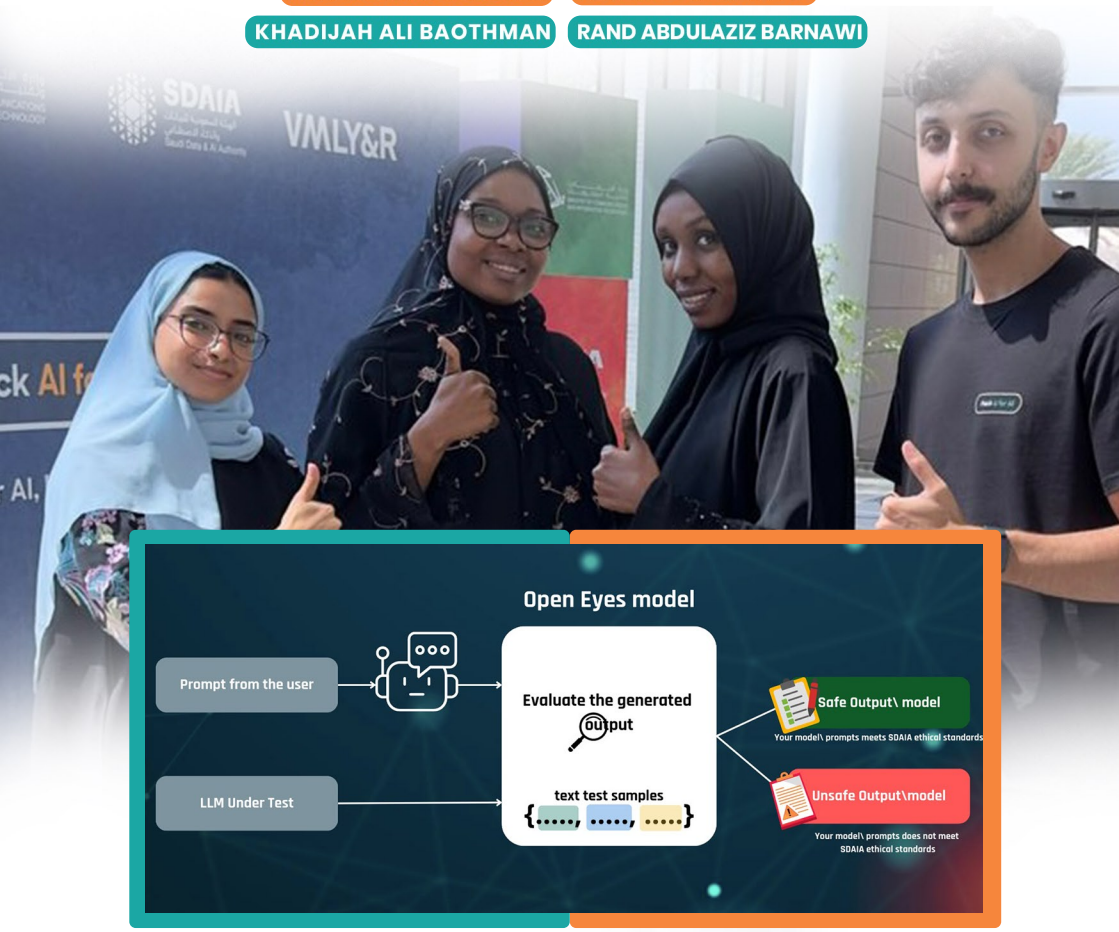


AUDITING AUDITOR:

The main purpose of this project is to classify the output of LLMs or any Language model into Malicious or Benign. We aim to be sure that, all the Large Language models developed in Saudi Arabia fits the seven AI ethics principles which are fairness, privacy & security, humanity, social & environmental benefits, reliability & safety, transparency & explainability, and accountability & responsibility.

HEBAH OMER SOLEMAN
EHAB ABU-ALQUMBOZ
KHADIJAH ALI BAOTHMAN
RAND ABDULAZIZ BARNAWI



INTELLIGENT CULPABILITY DETECTION SYSTEM USING COMPUTER VISION

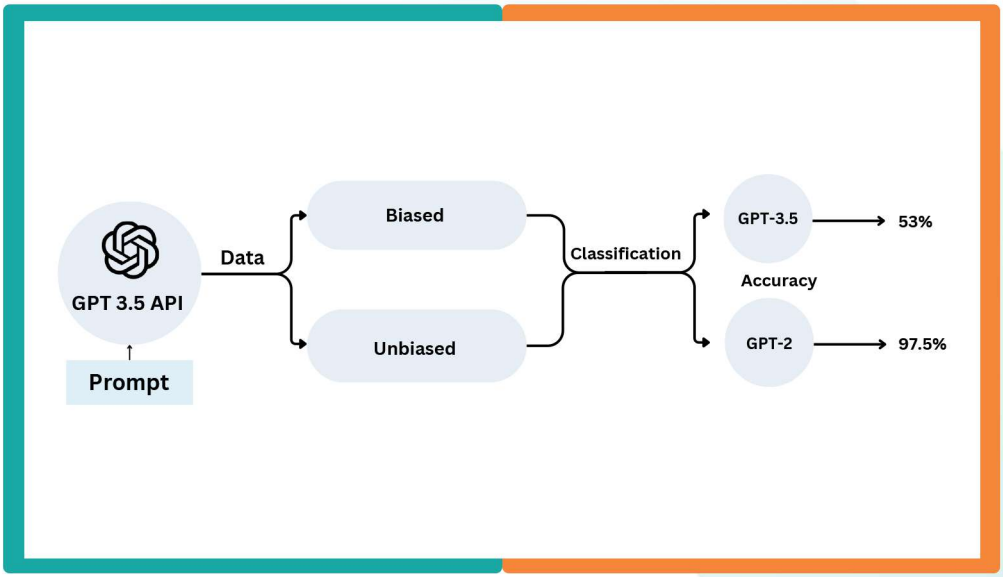
This project aims to automate the process of determining who is responsible for a car accident in order to reduce traffic congestion. Using computer vision, we analyze the pictures and determine if there is any damage and how deep it is. In addition, the vehicle's position is determined. Furthermore, using a fault recognition decision-making system, we determine which vehicle is responsible for the accident, as well as the mistake percentage of each vehicle. To overcome this challenge, we trained an LSTM model on labeled speech samples, enabling it to adeptly capture speech dialect patterns and classify new samples into their respective categories.

HEBAH SOLEMAN
EHAB ABU-ALQUMBOZ
KHADIJAH BAOTHMAN
RAND BARNAWI

THE BIAS WITHIN:
EVALUATING THE GENERATION AND CLASSIFICATION DICHOTOMY IN LARGE LANGUAGE MODELS

This project investigates bias detection in text generation by large language models (LLMs), focusing on GPT-3.5. The team generated a dataset of 800 storiesin English and Arabic with varying levels of bias. The study revealed a disparity between an LLMs' generative and classification capabilities, emphasizing the need for task-specific training for better bias analysis.

REEM ALSHARABI SHAHAD ALBALAWI
NOUF ALAMOUDI NORAH BIN MANNIE NAJLA ALHAMDAN



MULTIMODAL APPROACH:
FOR PALM DIAGNOSIS AND RED WEEVIL EARLY DETECTION

The project is about developing a system that can identify and diagnose palm trees that are infested by red palm weevils, a species of pests that causes serious damage to palm trees worldwide. The system uses a deep multimodal approach that combines audio and image data to detect infestation in early stages and provide accurate treatment recommendations. The project aims to protect palm trees from red palm weevils and reduce their economical and environmental impact.

GHADI BABOUR AHMED ALJUAID EBTIHAL ALMASHAMA FARES ALSHEBROMI

YAQEEN:
DEEP LEARNING-BASED SYSTEM FOR UNBIASED RECRUITMENT

Yaqeen is an AI-powered recruitment system that helps employers find the best employees, regardless of their background, gender, race, or other factors. Yaqeen addresses the problem of bias and discrimination in the hiring process, which can lead to missed opportunities, lower diversity, and legal risks. Yaqeen targets the HR and recruitment industry, as well as any organization that wants to improve their hiring practices and outcomes.

GHADI BABOUR AHMED ALJUAID EBTIHAL ALMASHAMA FARES ALSHEBROMI

FHE-GPT:
SECURE TEXT GENERATION WITH FULLY HOMOMORPHIC ENCRYPTION

With the wide use of third-party AI models, the security of the processed data is a concern for many users. The current state of these models requires access to the data during training and inference, which can be problematic when handling sensitive or private information. The solution we present in this project leverages the capabilities of homomorphic encryption to perform operations on encrypted data.

ANAS BAUBAID BILAL ALMAJNOONI HAZEM BAKHSHWAIN

PROBLEM

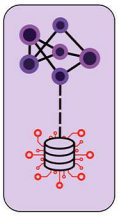
Neural networks need data access, but traditional methods may expose sensitive information.

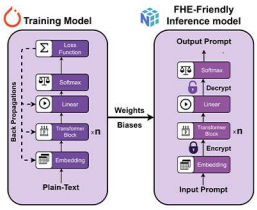
SOLUTION

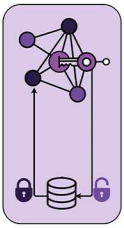
Using numpy, we developed an encryption-optimized model, integrated pretrained transformer weights, and boosted inference accuracy.

EXAMPLE

Performs inference on encrypted data without decryption, ensuring continuous data security.



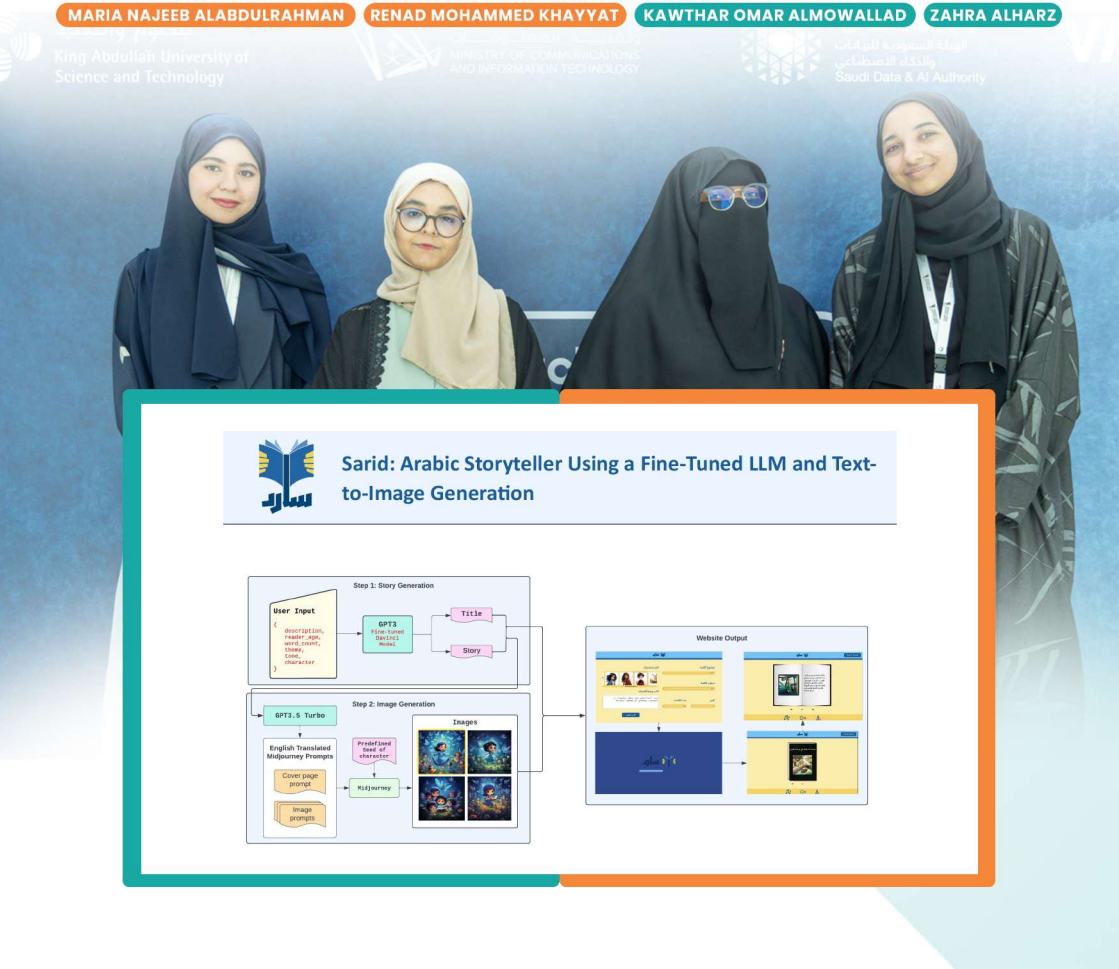




SARID:
ARABIC STORYTELLER USING A FINE-TUNED LLM AND TEXT-TO-IMAGE GENERATION

Sarid is an Arabic children's story generator that combines AI-powered text and image generation. Through the utilization of OpenAI and Midjourney, we created a fine-tuned large language model that generates Arabic stories customized for the user. On the website, the user provides a description and selects the character, age, word count, tone, and theme of their story, which will be sent to the fine-tuned model and text-to-image generator. Sarid aims to fill the gap in Arabic storytelling and provides an interactive and immersive experience for young readers.

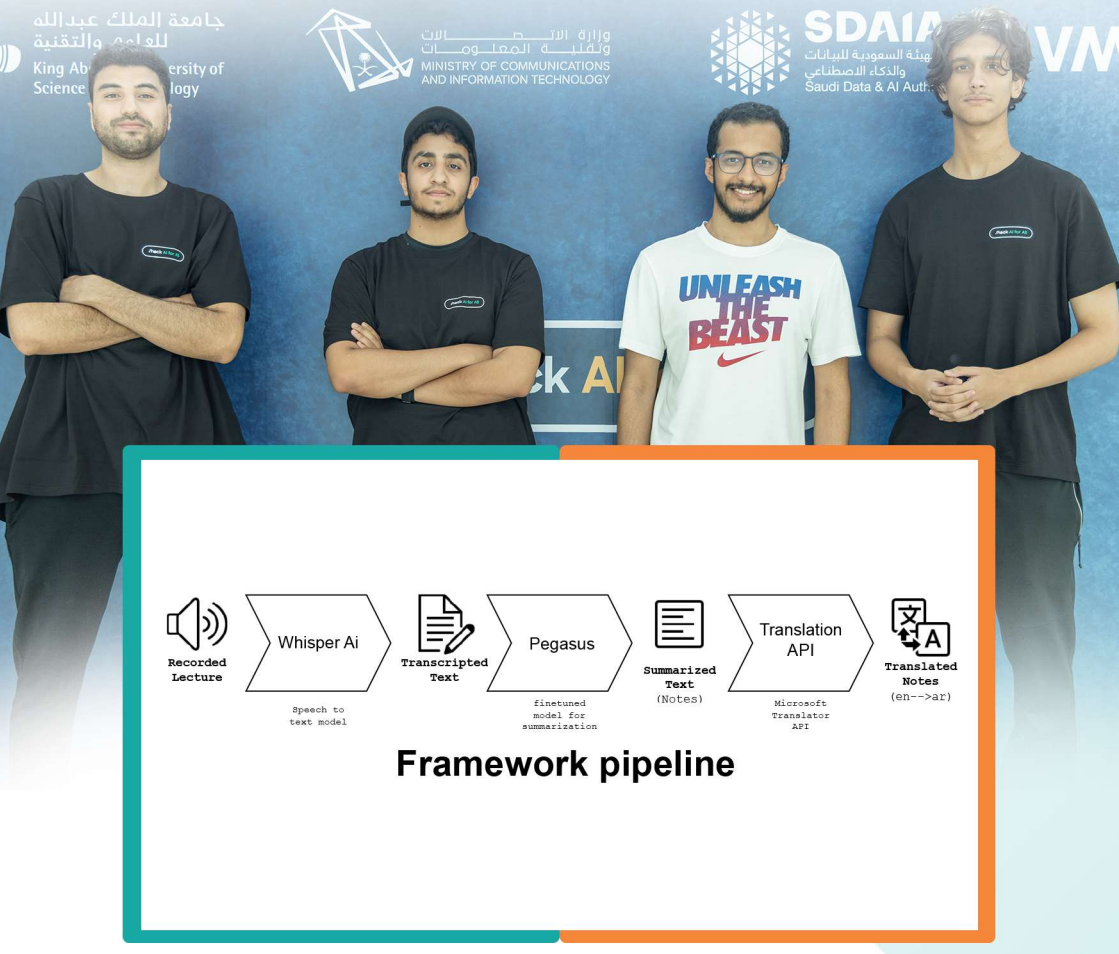
MARIA NAJEEB ALABDULRAHMAN | RENAD MOHAMMED KHAYYAT | KAWTHAR OMAR ALMOWALLAD | ZAHRA ALHARZ



MDAWEN:
AI STUDENT ASSISTANT

Mdawen is AI-driven assistant that transcribes lecture speech then summarizes and translates the text to Arabic then present it as organized Arabic lecture notes for native-Arabic students with difficulties caused by the language barrier.

NASSER ALNASSAR ABDELRAHMAN FATOUH MOHAMMED ALHARBI NAIF ALZMAMI

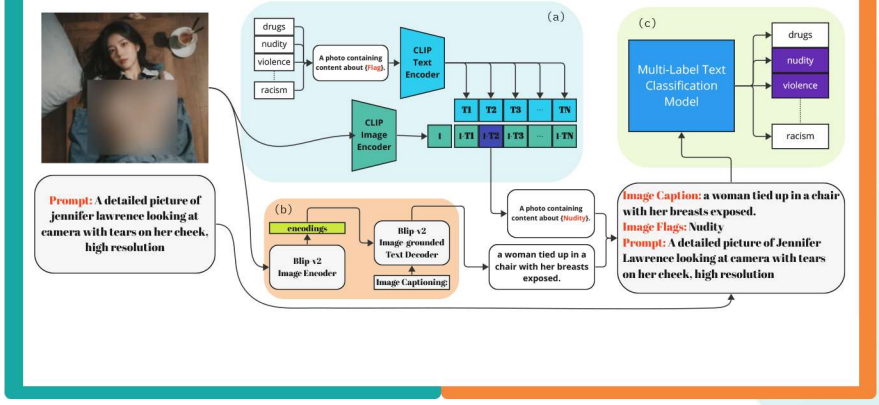


Framework pipeline

GUARDIANA:
MULTI-MODAL MULTI-LABEL CLASSIFICATION FRAMEWORK FOR AI MISALIGNMENT

Hunayn is an advanced English-to-Arabic translator surpassing conventional tools. Leveraging the Helsinki transformer (MarianMT), our approach involves fine-tuning on a self-scraped, purely literary Arabic dataset. Evaluations against Google Translate show consistent outperformance in BLEU scores and qualitative assessments. Notably, it excels in cultural sensitivity and context accuracy. This research underscores the Helsinki transformer's superiority for English-to-Arabic translation using a Fus'ha dataset.

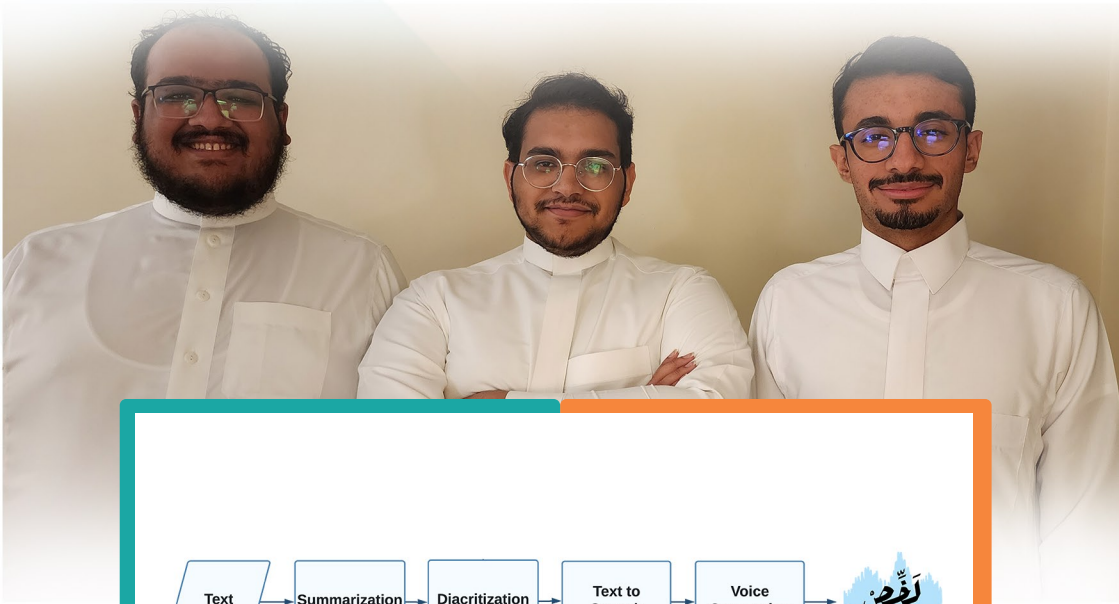
AHMED ALKHAYAL ALI ALMOUSA DOA'A ABURAYYA SALEHA ALJOUFI



UTILIZING DEEP LEARNING TO PRODUCE AUDIBLE ARABIC SUMMARIES:

Lakhes is an AI-based summarization and text-to-speech project that is designed to automate the process of summarizing Arabic text and converting summaries into audible content. By leveraging natural language processing techniques and text-to-speech technology, with the added feature allowing the user to listen to the summary in their favorite voice, the project aims to enhance accessibility and convenience for content consumers in the Arab world.

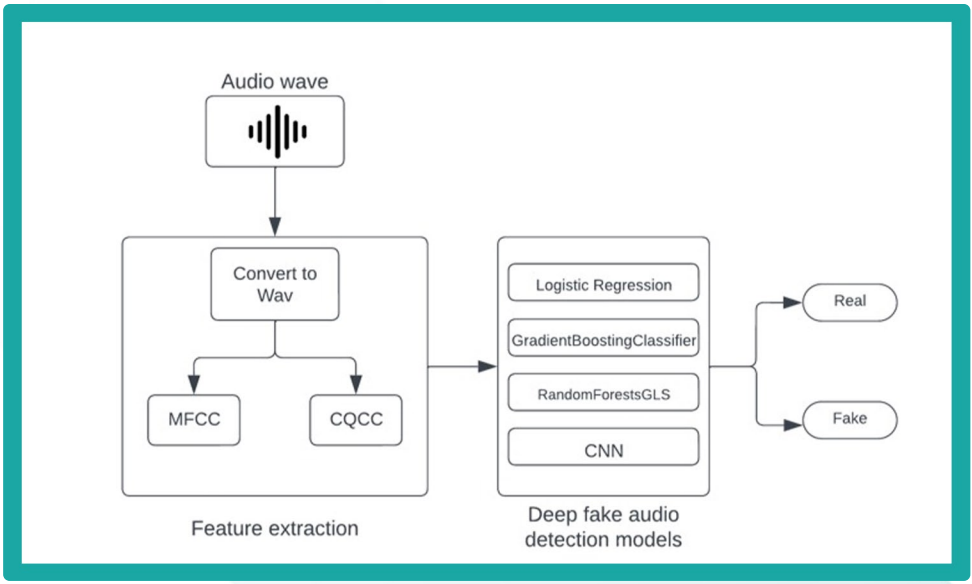
KUMAIL ALAWA SAEED BAWAZEER ALYAHYA AKKAM



ARABIC DEEPFAKE AUDIO DETECTION:

With the fast evolution and widespread of deep-fake techniques in real-world scenarios, ensuring the authenticity and credibility of Arabic audio content has emerged as a paramount challenge. The imperative task of detecting deep-fake Arabic audio holds significant importance in upholding the reliability of auditory information and countering potential hazards. We propose a novel approach for deep-fake Arabic audio detection using machine learning and deep learning techniques, with a diverse dataset of real and fake Arabic audio, the dataset used is generated with put in mind high-quality and representative data and annotated In alignment with our commitment to advancing the field.

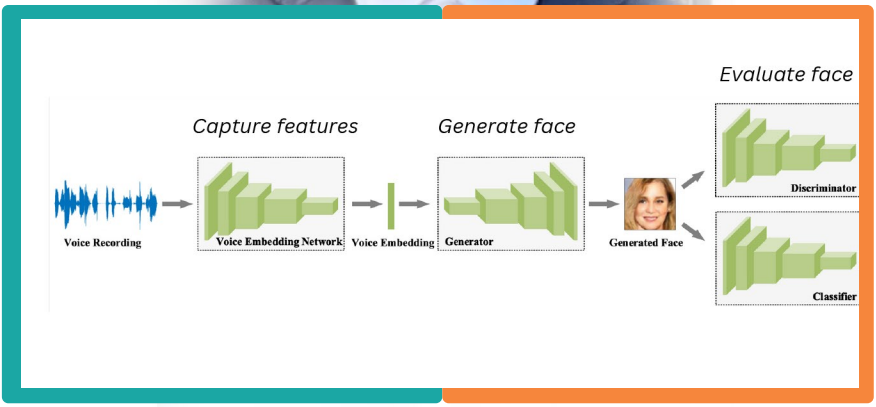
HURIYYAH ALTHENAYAN RANDA BAKHASHWAIN
SARAH ABOMAHMOUD TALAH ALMUHAWWIS



VOCAL VISIONS:
UNMASKING FACES THROUGH SOUND

Multi modal deep learning models often tend to be between the text modality and the image modality. The speech modality conveys hidden gems of an individual characteristics that could be utilised to reconstruct their respected faces. Despite satisfactory results in the field of voice to face models, like in Wen et al, there still is room for improvements. This project explores these improvement possibilities and exploits them to attain better reconstruction.

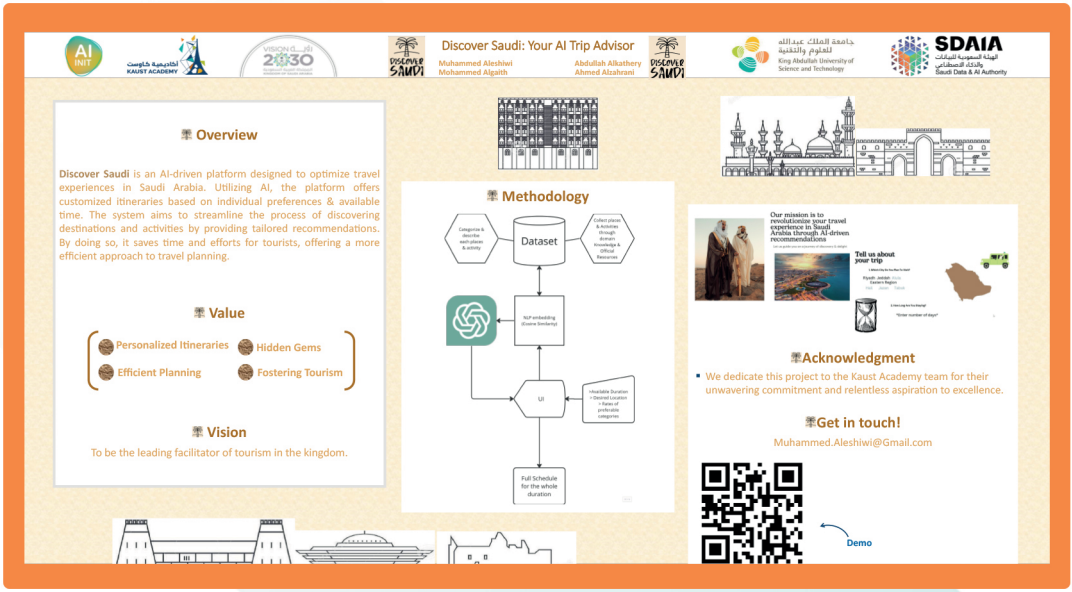
AHMED ALMOHAMMED



DISCOVER SAUDI:
YOUR AI TRIP ADVISOR

Introducing Discover Saudi,, an innovative AI-driven platform designed to enhance the tourism experience in Saudi Arabia. This pioneering system employs artificial intelligence to provide customized travel recommendations based on user inputs such as available time and preferred activities. The platform's core functionality revolves around offering curated itineraries that align with individual preferences and constraints.

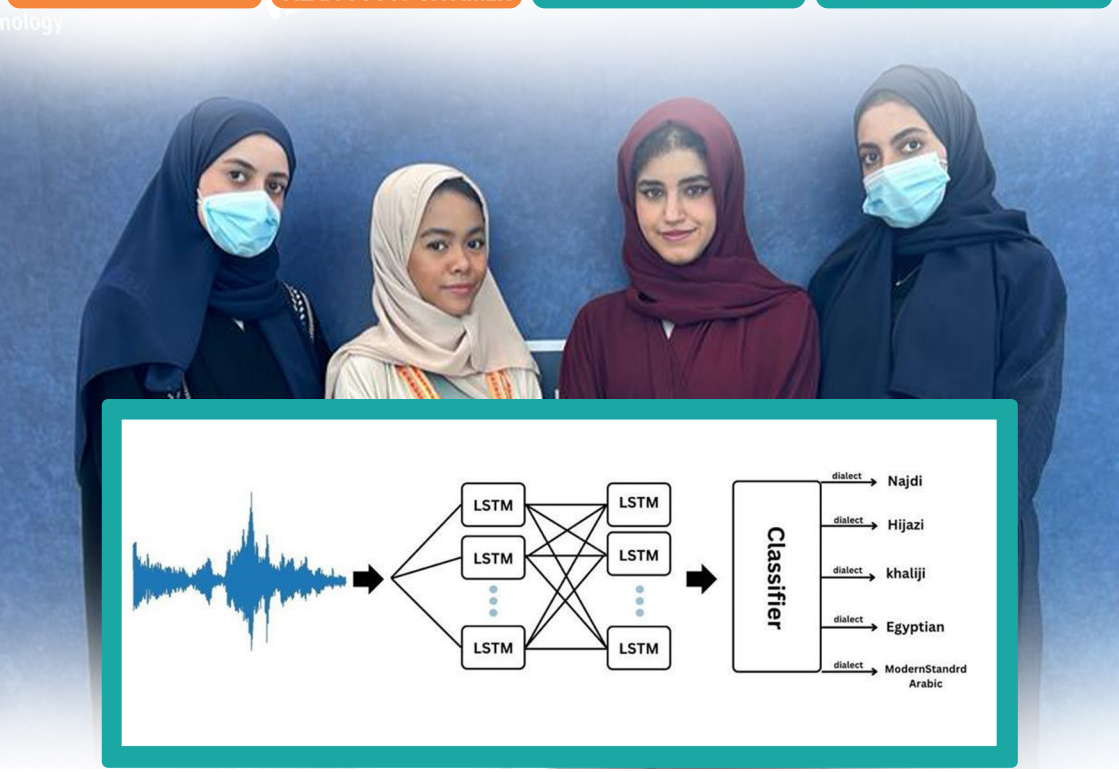
MUHAMMED ALESHIWI
AHMED ALGHAITH
ABDULLAH ALKATHERY
AHMED ALZAHRANI



SOLVING DIALECT BIAS
IN DEEP NEURAL NETWORKS FOR ARABIC SPEECH TASKS

In a world where language plays an influential role in shaping our identities, distinguishing dialects within a language is vital. Accurate dialect identification allows language technologies to adapt to regional nuances. However, existing models have biases and limitations, hindering effectiveness. Our aim is to enhance fairness, robustness, and generalizability, enabling models to accommodate diverse linguistic characteristics in Arabic dialects.

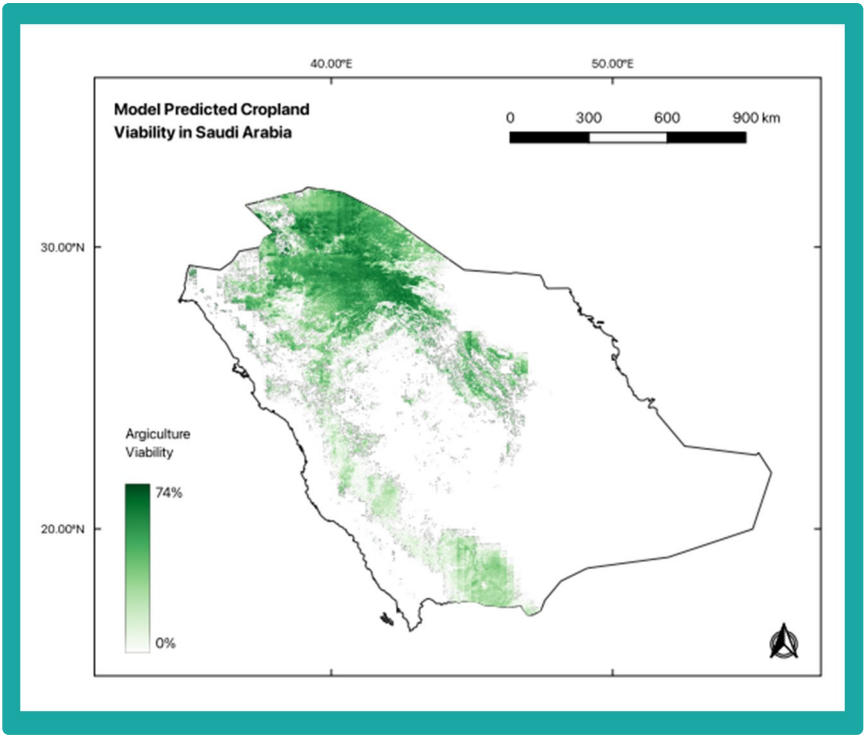
RANEEM ALGHAMDI ALAA YUSUF SIYAMEK DANAH AL MUHAYSIN EBTISAM SALEH ALSHEHRI



ENVISIONING ARID AGRICULTURE WITH A DESERT PREDICTION MODEL

The project introduces an AI-driven approach for assessing agricultural viability in arid regions, in specific within Saudi Arabia, notorious for its challenging climatic conditions. The approach involved training a Multi-Layer Perceptron (MLP) model on Australian datasets, leveraging its incredibly diverse landscape and incorporating features such as precipitation, elevation, and geology. Subsequently, the trained model was applied to predict agricultural viability in Saudi Arabia. It unveiled previously unrecognized agricultural potential in Saudi Arabia, challenging conventional beliefs about arid climate limitations.

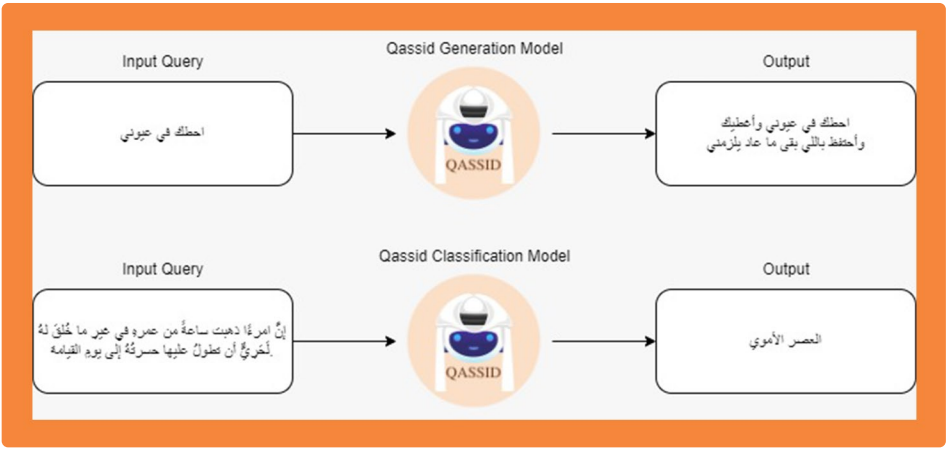
AHMAD ALOMRAN
HARETHAH ABU SHARIAH
THAMER AL-GAHTANI
ZIYAD ALADWANI



QASSID

Qassid can generate Saudi poetry by giving it input text to begin with, and then complete the poem based on the input. Also, Qassid is able to predict the era in which the poetry was written.
To overcome this challenge, we trained an LSTM model on labeled speech samples, enabling it to adeptly capture speech dialect patterns and classify new samples into their respective categories. Throughout our experimentation process, we discovered that oversampling the underrepresented dialects in our dataset was the most effective approach."

KHALED ALJURAYYAN
SAMI ALKHARJI
MESHAL ALOKIFI
MOHAMMED ALLUHAYDAN



18.
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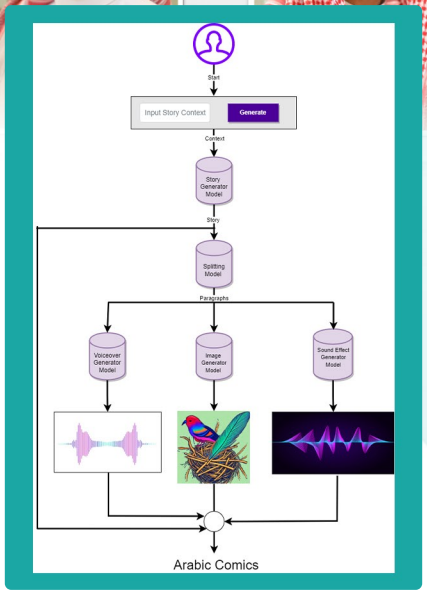
CULTURAL ENRICHMENT:
THROUGH AI-GENERATED ARABIC COMICS

This study introduces an innovative approach to crafting captivating Arabic stories for children, merging the rich tradition of storytelling with cutting-edge AI technologies to create engaging comics. Our primary emphasis lies in a finely tuned main model for text generation, complemented by a range of specialized models that amplify the storytelling experience. This comprehensive framework adeptly navigates the intricacies of Arabic language processing, integrating dedicated models to generate compelling titles, vibrant images, voice-over and even voice narration. This approach holds great promise in delivering culturally immersive narratives that not only captivate the attention of young readers but also provide an exhilarating multi-sensory storytelling adventure through the world of comics.

RAYYAN RAZA MOHAMMED ALSHABRAWI
MOHAMED KHALID ALJUDAIB HASSAN ALSAYHAH



19. BN

FAIRGUARD:
FAIR IMAGE CLASSIFICATION ACROSS DOMAINS

Our proposed methodology enhances the robustness and fairness of our model by augmenting the training data. Specifically, we focus on the underrepresented class by introducing new multi-domain samples. This process serves a dual purpose: it not only minimizes the disparity in the sample distribution but also capitalizes on the benefits of multi-domain training. The end result is a noticeable improvement in the model's ability to accurately predict labels for the underrepresented group while simultaneously increasing its resilience against adversarial attacks. By bridging the gap between robustness and fairness, we have forged a path towards more equitable and reliable image classification.

SADIQ ALASKAR HASSAIN ALSAYHAH ALI ALQUTAYFI HUSSAIN MOHSEN

Figure 1

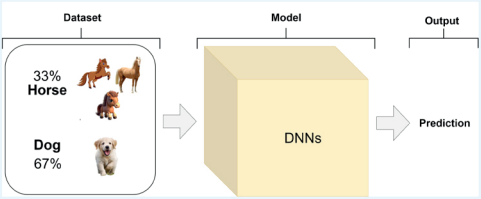
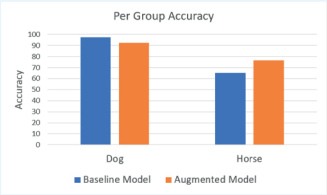
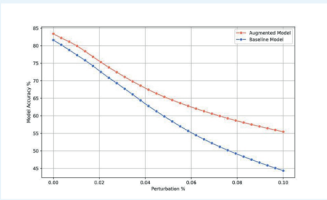


Figure 2



- Figure 1 shows our proposed method of reducing the unbalance of the dataset by adding more samples from different domains.
- Figure 2 shows the per group accuracy for the baseline model and our proposed model.
- Figure 3 shows the performance of the baseline model and our proposed model against adversarial attacks.

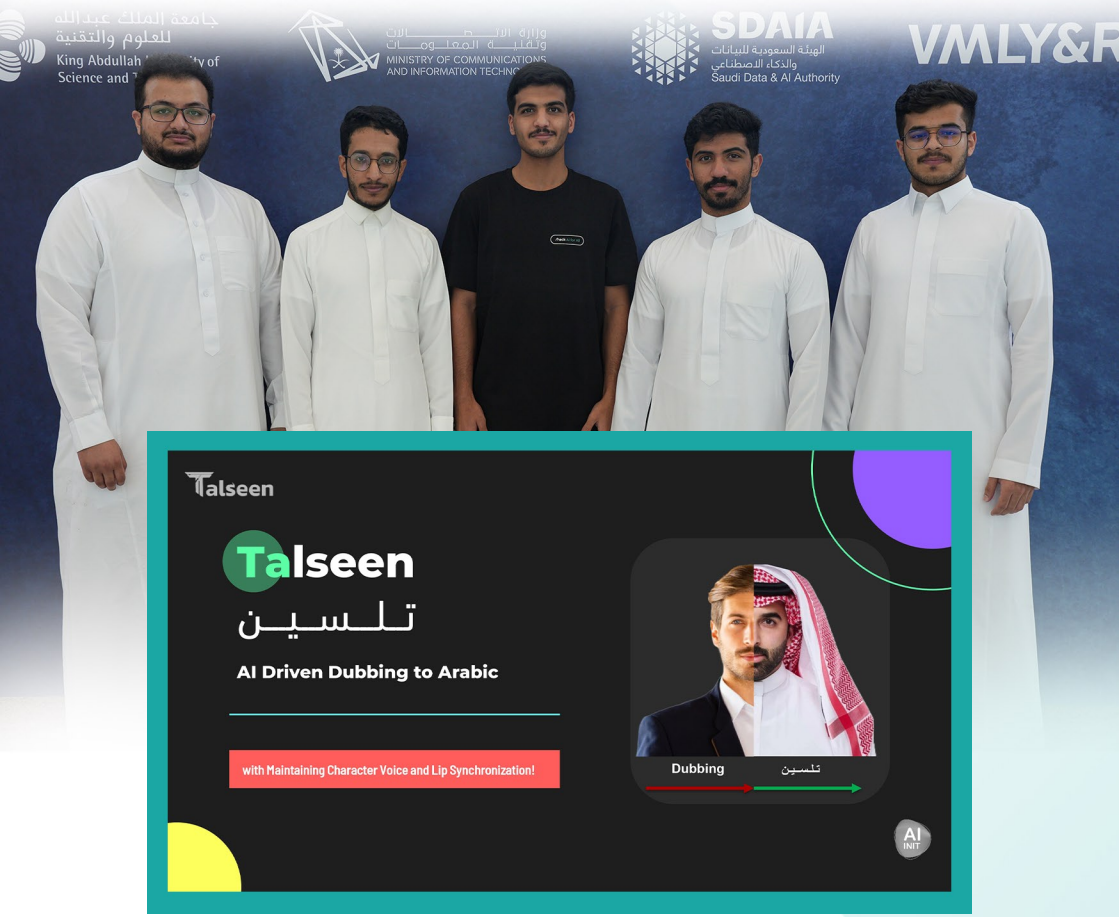
Figure 3



TALSEEN:

Only 3% of online content in Arabic exists. Talseen, the solution, employs AI dubbing to Arabic content while preserving voice character and lip sync.

ANAS BAMAQA NAIF ALQAHTANI SALEM AL-SAQAF
OMAR ALGHAMDI ABDULLAH ALTHOBAITI



ECONOMIND:
NAVIGATING YOUR FINANCIAL FUTURE

The project leverages TASI (Tadawul All Share Index) stock market data and Saudi news data to forecast future stock prices. By fine-tuning LSTMs (Long Short-Term Memory) and Arabert models on TASI market specifics, the project achieves enhanced predictive accuracy. The LSTM models capture sequential dependencies in stock data, while the Arabert model understands contextual nuances in Saudi news. This integration empowers the system to analyze market trends and comprehend how news sentiment impacts stock prices. By training on TASI-specific data, the models adapt to the unique characteristics of the Saudi stock market, resulting in more precise predictions. This synergy of machine learning and financial insights equips investors with informed decision-making tools, amplifying their potential to navigate the TASI market with greater confidence.

TALAL ALKHARASHI NAWAF ALDOWAYAN TURKI ALOTAIBI

AHMAD ALGAITH MOHAMMAD ALKHALDI

إعلان شركة ينبع الوطنية للبتروكيماويات عن توقف مؤقت لمصانع الشركة لإجراء اصلاحات طارئة

تعلن شركة ينبع الوطنية للبتروكيماويات (ينساب)، عن توقف مؤقت لمصانعها والذي بدأ في يوم الإثنين 27 محرم 1445هـ الموافق 14 أغسطس 2023م، نتيجة عطل فني وجاري العمل حاليا لمباشرة هذا العطل والقيام بأعمال الاصلاحات اللازمة. وبناء على آخر التقارير الفنية والمالية حول مدة التوقف والأثر المالي المتوقع فانه تبين أن مدة التوقف سوف تمتد إلى حوالي 11 يوما أخرى، وسيبلغ الأثر المالي التقديري جراء هذا التوقف 150 مليون ريال سعودي. وسيكون لهذا التوقف أثر على نتائج الشركة المالية للربع الثالث والربع الرابع من العام الحالي. كما سيتم الإعلان لاحقا عن اي تطورات جوهرية بهذا الخصوص.

إعلان شركة برج المعرفة التجارية عن توزيع أرباح نقدية على المساهمين عن العام المالي المنتهي في 31/03/2023 م

أوصى مجلس إدارة شركة برج المعرفة التجارية في اجتماعه المنعقد في تاريخ 04/02/1445هـ (الموافق 20/08/2023م) بتوزيع ارباح نقدية على مساهمي الشركة بواقع 0.15 ريال لكل سهم عن العام المالي المنتهي في 31 مارس 2023م على النحو التالي:

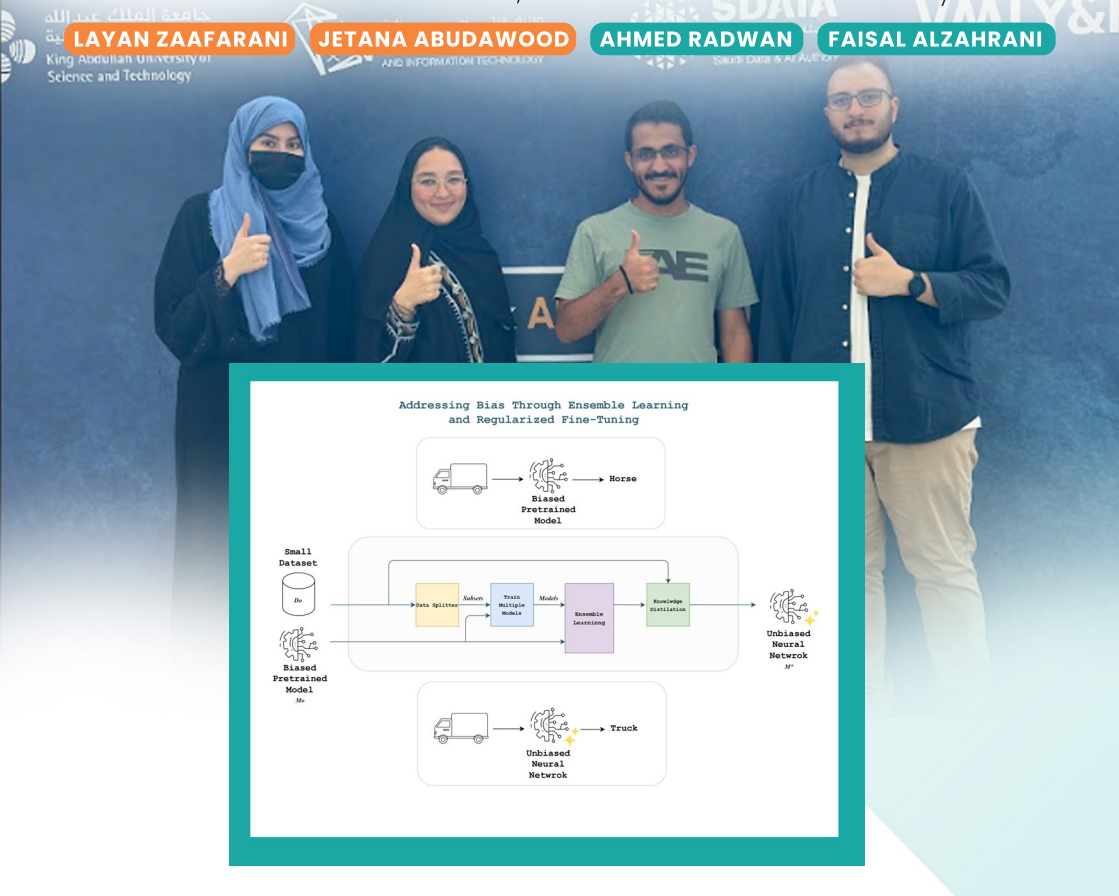
اعلان شركة ألف ميم ياء للمعدات والأجهزة الطبية عن النتائج المالية الأولية للفترة المنتهية في 30-06-2023 (ستة أشهر)

يعود سبب الارتفاع في صافي الربح خلال هذه الفترة من هذا العام مقارنة بنفس الفترة من العام السابق إلى زيادة مبيعات المستلزمات والأجهزة الطبية بمبلغ 11.99 مليون ريال و ارتفاع هامش صافي الربح من ١٤.٢٪ إلى ١٨.٤٪. نتجت هذه

ADDRESSING BIAS:
THROUGH ENSEMBLE LEARNING AND REGULARIZED FINE-TUNING

Addressing biases in AI models is crucial for ensuring fair and accurate predictions. However, obtaining large, unbiased datasets for training can be challenging. Our project proposes a comprehensive approach using multiple methods to remove bias in AI models, with only a small dataset and a potentially biased pretrained model. We train multiple models with the counter-bias of the pretrained model through data splitting, local training, and regularized fine-tuning, gaining potentially counter-biased models. Then, we employ ensemble learning for all models to reach unbiased predictions. To further accelerate the inference time of our ensemble model, we conclude our solution with knowledge distillation that results in a single unbiased neural network. We demonstrate the effectiveness of our approach through experiments on the CIFAR10 and HAM10000 datasets, showcasing promising results. This work contributes to the ongoing effort to create more unbiased and reliable AI models, even with limited data availability.

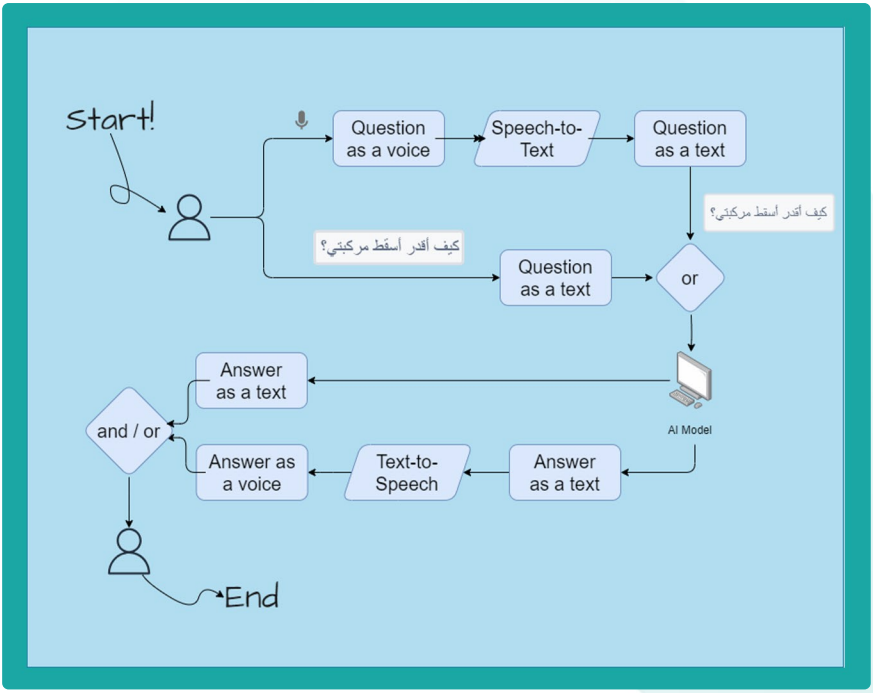
LAYAN ZAAFARANI JETANA ABUDAWOOD AHMED RADWAN FAISAL ALZAHRANI



REIMAGINING SAUDI CITIZEN SERVICES:
THE ABSHER CHATBOT REVOLUTION

A chatbot that aims to operate within the Saudi Ministry of Interior portal (Absher) , as it is one of the most commonly used government services in Saudi Arabia. The ultimate goal of this chatbot is to assist citizens in knowing which site to interact with and which links to click, bridging the gap between government services and citizens through a single chatbot.

MOSTAFA NASR SAAD ALGARNY MOHAMMED ALJUDIBI WALEED ALMUTAIRI



24.
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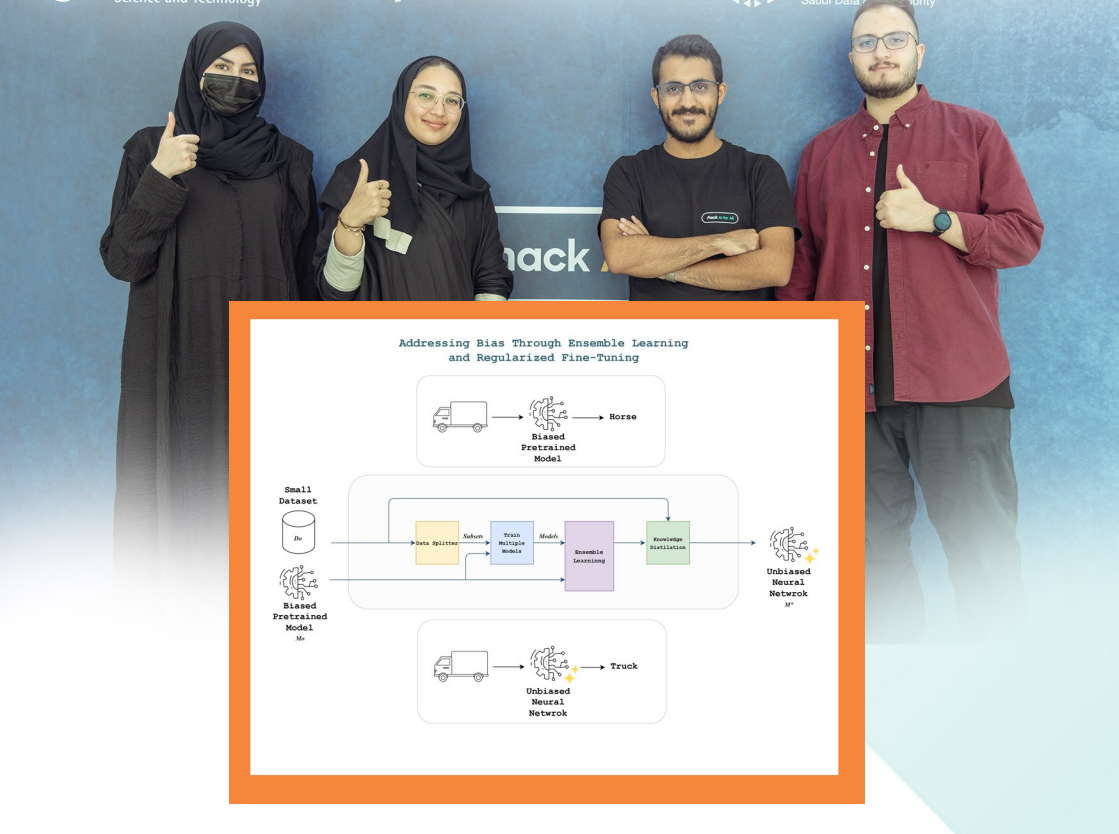
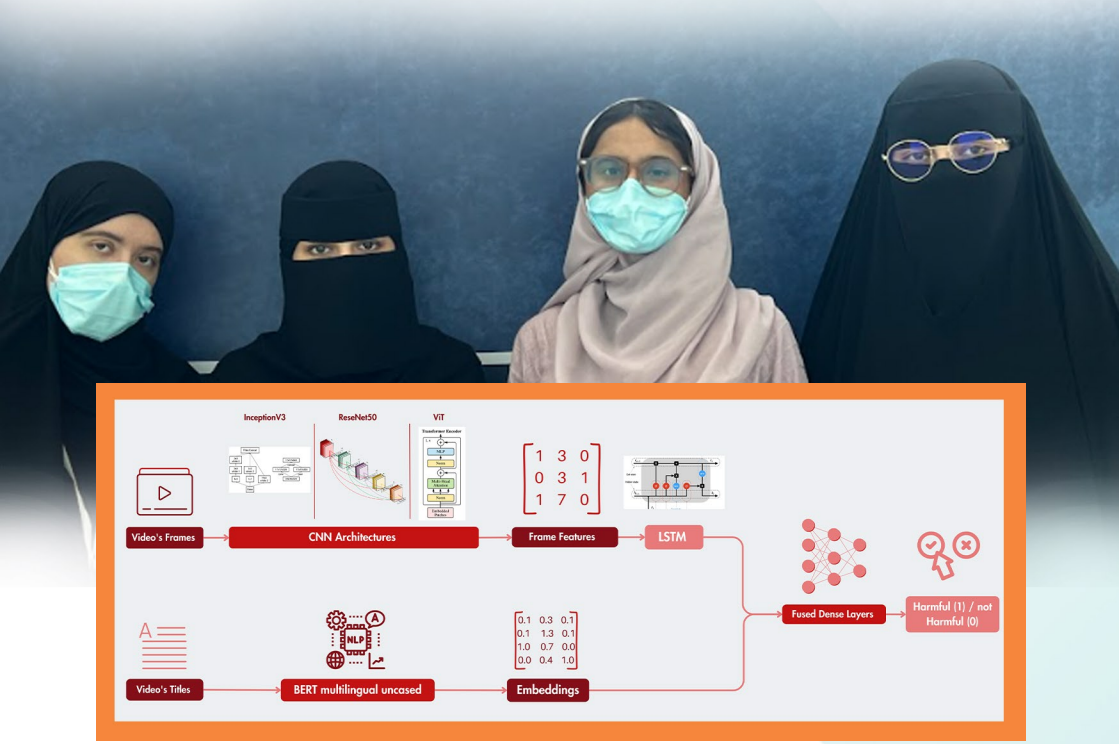


DETECTING INAPPROPRIATE CONTENT IN SHORT VIDEOS FOR CHILDREN

The rise of user-generated content on platforms like TikTok and YouTube Shorts has raised concerns about inappropriate content reaching young audiences. These platforms rely on AI-driven recommendation systems to show tailored content. However, these systems might unintentionally suggest unsuitable material. Our project proposes a solution that combines the InceptionV3 CNN-RNN model for video analysis and the BERT model for understanding text context. The goal is to accurately identify and address inappropriate content in videos and their text descriptions. The dataset consists of 2,255 videos from YouTube Shorts and TikTok. After trying various approaches, the modified InceptionV3 model showed the best results, achieving an accuracy of 84.48\%. This is a significant improvement over previous methods.

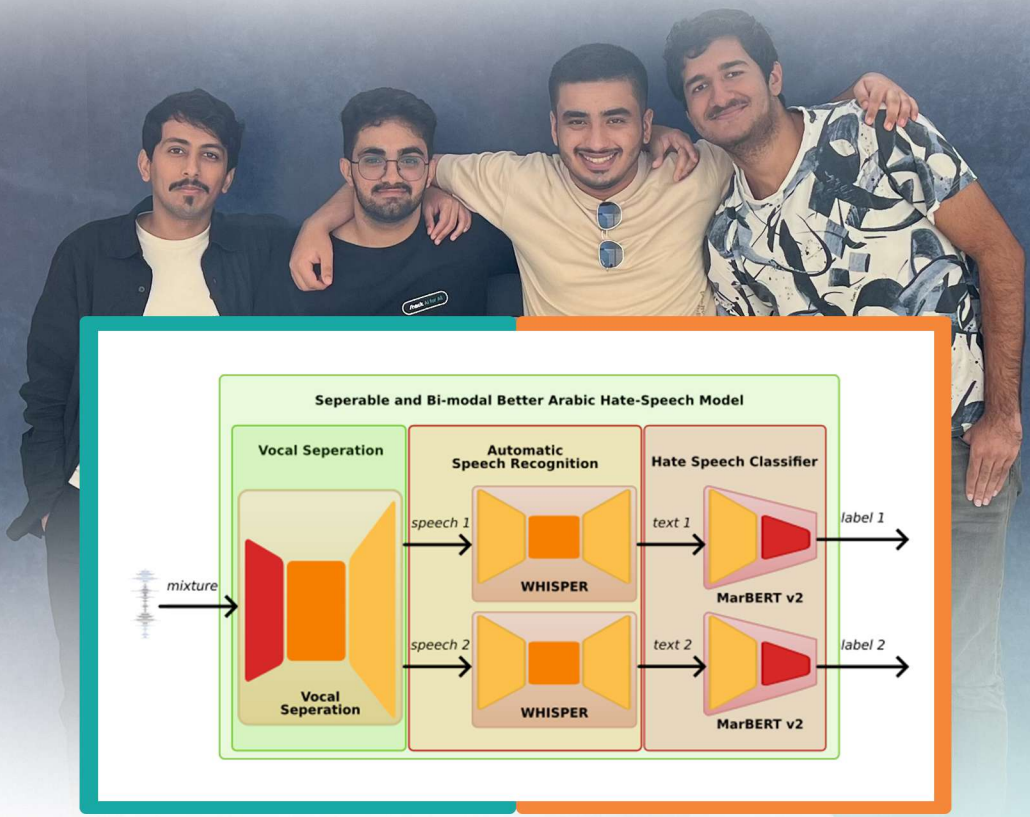
HADEEL ALTHBITI REMA ALBARAKATI EMTENAN ALGHAMDI MAJEDAH ALOTAIBI



SABBAH:
MULTI-MODAL ARABIC HATE SPEECH DETECTION

The SABBAH project is a pipeline of models that are designed to separate voices and classify hate speech.
The project uses a combination of Vocal Seperation Models, Automatic Speech Recognition, and Arabic LLMs to identify hate speech from text and audio recordings.
Cutting edge techniques such as adversarial training have been applied to improve the models reslience to malicious inputs.
The SABBAH project is still under development, but it has the potential to make a significant impact on the field of AI safety

MOHAMMAD ALSHIEKH WAEL SULAIS ABDULMALIK ALMADHI FAISAL ALHARTHI



INTELLIGENT CULPABILITY DETECTION SYSTEM USING COMPUTER VISION

This project aims to automate the process of determining who is responsible for a car accident in order to reduce traffic congestion. Using computer vision, we analyze the pictures and determine if there is any damage and how deep it is. In addition, the vehicle's position is determined. Furthermore, using a fault recognition decision-making system, we determine which vehicle is responsible for the accident, as well as the mistake percentage of each vehicle.

HEBAH OMER SOLEMAN | EHAB ABO-ALQUMBOZ | KHADIJAH ALI BAOTHMAN | RAND ABDULAZIZ BARNAWI