1. **Proposal Information**

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| **Project title** | **SLIEA (Sign Language Interpreter - English/Arabic)** |
| **Project Challenge Area** | assistive technology and communication accessibility for the hearing-impaired community |
| **School / College / University** | Modern Academy for Engineering and Technology |
| **Department/Faculty (for University)** | Faculty of Engineering |
| **Industrial partner**  **(if any)** | - |

1. **Advisor Information**

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| **Advisor Name** | Sabry Mohammed Abdelmoaty |
| **Title** | Doctor |
| **Work Address** | X8V7+72P, El-Hadaba El-Wosta-Elmokattam Close to Mokattam Central, El Mokattam |
| **Mobile** | 01015540222 |
| **E-mail** | sabry.amoaty@eng.modern-academy.edu.eg |
| **Brief summary of expertise** | Dr. [Sabry Abdelmoaty] is an accomplished engineer with a PhD. degree, specializing in various domains of expertise. With extensive experience as a database, artificial intelligence, software engineering, and image processing instructor, they possess a diverse skill set that allows for comprehensive guidance and instruction in these fields. As a graduation projects advisor, they provide invaluable support to students, nurturing their innovative ideas and helping them bring their projects to fruition. With a strong academic background and practical knowledge, Dr. [Sabry Abdelmoaty] offers a wealth of expertise in cutting-edge technologies and serves as a mentor, empowering students to excel in their academic pursuits and professional careers. |

1. **Project Members Information**

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| **#** | **Full Name** | **year grade** | **Strengths (special skills and capabilities)** | **Mobile number** | **Email** |
| 1 | Omar Hany Mohamed Hussien | 5th year | Machine Learning, Animator, UI/UX Designer, and video editor | 01013767684 | omarhany2k@gmail.com |

\* Please note that the first name will be referred to as the main **CONTACT PERSON** for the whole group.

1. **Project Description**

Applicants shall provide a brief description of their project. This description should include the following **according to the distribution of scores**:

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| 1. **Overview** |
| (i) Problem definition, (ii) approach and tools/techniques, (iii) overview of system modules  (v) **references** and (iv) **possibility to make research paper** |
| **(i) Problem Definition:**  The project aims to address the communication gap between the hearing-impaired community and the general public by developing a comprehensive sign language interpretation system. The challenge lies in accurately translating sign gestures into text and voice, enabling effective communication for individuals who are not familiar with sign language. The project seeks to overcome this barrier by leveraging advanced technologies such as computer vision, artificial intelligence, and image processing.  **(ii) Approach and Tools/Techniques:**  The project will adopt a multi-faceted approach that combines computer vision algorithms, natural language processing, and text-to-speech technologies. Computer vision techniques will be employed to recognize and interpret sign gestures captured through a mobile device's camera in real-time. Natural language processing will then convert these recognized gestures into written text, while text-to-speech technology will provide audible voice output. The system will be developed using programming languages such as Python, leveraging popular libraries and frameworks for computer vision and natural language processing.  **(iii) Overview of System Modules:**  The system will comprise several interconnected modules, including:  a. **Gesture Recognition Module:** Utilizes computer vision algorithms to recognize and interpret sign gestures captured through the camera.  b. **Translation Module:** Implements natural language processing techniques to convert recognized gestures into written text.  c. **Voice Generation Module:** Incorporates text-to-speech technology to transform the translated text into audible voice output.  d. **User Interface Module:** Provides an intuitive and user-friendly interface for capturing gestures and displaying the translated results.  **(iv) Possibility to Make Research Paper:**  This project presents ample opportunities for research and academic exploration. The integration of computer vision, artificial intelligence, and language processing techniques for sign language interpretation holds the potential for new algorithms, optimizations, and advancements. Additionally, the project's outcomes, system performance evaluation, and user feedback analysis can form the basis for a research paper that contributes to the field of assistive technology and communication accessibility.  By combining innovative technologies and an interdisciplinary approach, this project not only aims to address a pressing societal challenge but also offers a fertile ground for academic exploration and knowledge dissemination through potential research paper publication. |

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| 1. **Impact** |
| Why do you consider this project? What is its impact on community/market/end user/**sustainable development of Egypt 2030…?** |
| This project is considered due to its significant impact on the community, market, end users, and the sustainable development goals of Egypt 2030.  The reasons for considering this project are as follows:  **Empowering the Hearing-Impaired Community:** By developing a comprehensive sign language interpretation solution, the project addresses a critical communication barrier faced by the hearing-impaired community. It enables them to effectively communicate with others who may not understand sign language, promoting inclusivity, and empowering individuals to participate fully in social and professional settings.  **Enhanced Accessibility and Inclusion:** The project contributes to creating a more accessible society by bridging the communication gap between the hearing-impaired community and the general public. It fosters understanding, empathy, and equal opportunities for all individuals, regardless of their hearing abilities.  **Market Potential:** There is a growing demand for assistive technologies and solutions that cater to the needs of the hearing-impaired community. By developing a robust and user-friendly sign language interpretation system, the project has the potential to address this market need, leading to commercial opportunities and economic growth.  **Sustainable Development Goals (SDGs):** The project aligns with several SDGs outlined in Egypt's sustainable development agenda for 2030. It contributes to Goal 4 (**Quality Education**) by promoting inclusive education and facilitating communication in educational settings. It also supports Goal 10 (**Reduced Inequalities**) by reducing barriers and ensuring equal opportunities for individuals with hearing impairments.  **Technological Advancement:** The project leverages cutting-edge technologies such as **computer vision**, **artificial intelligence**, **Computer Graphics**, and **natural language processing**. By pushing the boundaries of these fields, it fosters technological innovation, research, and development in Egypt, positioning the country as a leader in assistive technologies.  Overall, this project's impact lies in its ability to empower the hearing-impaired community, promote inclusivity, address market needs, contribute to sustainable development goals, and foster technological advancements in Egypt. |

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| 1. **Novelty and Features** |
| Explain (i) novelty (ii) features, and (iii) related products, if any. |
| **(i)** **Novelty:** The proposed sign language interpretation system brings several novel aspects to the field:  **Integration of Computer Vision and AI:** The system leverages computer vision techniques to accurately recognize and interpret sign gestures in real-time. This integration of computer vision with artificial intelligence algorithms enhances the accuracy and reliability of gesture recognition, making it a novel approach in sign language interpretation.  **Animated Character Simulation:** One unique feature of the system is the inclusion of an animated character that visually represents the input words through sign gestures. This animated character enhances the user experience and facilitates better understanding and engagement.  **(ii)** **Features:** The sign language interpretation system offers the following key features:  **Real-time Gesture Recognition:** The system utilizes computer vision algorithms to recognize and interpret sign gestures captured through a camera in real-time. This enables immediate translation and communication.  **Translation to Text and Voice:** Recognized sign gestures are converted into written text using natural language processing techniques. Additionally, the system employs text-to-speech technology to generate audible voice output, ensuring effective communication between sign language users and non-sign language users.  **Language Support:** The system focuses on translating sign gestures between Arabic and English, catering to a wide user base. This language support expands the system's usability and accessibility.  **Intuitive User Interface:** The system features an intuitive user interface that allows users to capture sign gestures easily. The interface is designed to be user-friendly and accessible, ensuring a seamless user experience.  **(iii) Related Products:** While there may be existing sign language interpretation systems or assistive technologies available, the proposed system distinguishes itself through its integration of computer vision AI, animated character simulation, and focus on Arabic and English sign gesture translation. It offers a unique combination of real-time gesture recognition, text-to-speech conversion, and visual representation through an animated character, providing a comprehensive and engaging user experience.  By incorporating these novel features and leveraging emerging technologies, the proposed sign language interpretation system aims to advance the field and provide an innovative solution for effective communication between sign language users and the general public. |
| 1. **Deliverables** |
| What is the project final outcome (HW device, SW package, simulation ...)? Do you foresee any potential marketing or customers? |
| The outcome of the project will be a software package comprising a sign language interpretation mobile application. The software package will include the necessary modules, algorithms, and user interfaces to enable real-time gesture recognition, translation to text and voice, and visual representation through an animated character.  The software package will be designed and developed to run on mobile devices, such as smartphones and tablets, making it easily accessible to a wide range of users. The deliverables will consist of the compiled application files, documentation, and any required installation instructions.  Regarding potential marketing and customers, there is significant market potential for the sign language interpretation system. The primary target audience includes:   1. **Individuals with Hearing Impairments:** The system caters to the needs of the hearing-impaired community, providing them with a tool for effective communication in various settings, including educational institutions, workplaces, and social interactions. 2. **Educational Institutions:** Schools, colleges, and universities that have programs for hearing-impaired students can benefit from the system as a learning and communication tool. It can be used by teachers, students, and support staff to facilitate communication and enhance the educational experience. 3. **Healthcare Facilities:** Healthcare providers and professionals working with hearing-impaired individuals can utilize the system to improve patient care and communication in medical settings. 4. **Assistive Technology Organizations:** Organizations focused on developing and promoting assistive technologies can collaborate with the project to further enhance and distribute the sign language interpretation system.   In addition to these specific customer segments, there is a broader market potential for the software package among individuals, institutions, and organizations aiming to promote inclusivity and improve communication accessibility.  By addressing the needs of the hearing-impaired community and providing an innovative and user-friendly solution, the project has the potential for successful marketing and uptake among the identified target customers. |

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| 1. **Role of the Industrial Partner (if any)** |
| What is the type of support to be provided by the industrial partner (technical, financial, access…)? |
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| 1. **Estimated Expenses** | | | | | | | |
| An estimate of the itemized costs: Equipment & tools; printing | | | | | | | |
| **Item** | **Type (Hardware/ Software/ Other)** | **Specifications (brief description)** | **Justification (why is this item needed?)** | **Vendor/Source** | **Unit Cost** | **No. of Items** | **Total Cost of Items** |
| 1 | Other | Documentation and User Manuals | Printing documentation and user manuals for the sign language interpretation system will facilitate user understanding and provide offline references. | Local Print Shop | - | - | - |
| 2 | Hardware | Sign Language Translation Gloves | The gloves are needed for the alternate branch solution of translating sign language to voice. They capture hand movements and gestures, enabling real-time translation. | Assistive Technology Supplier | 7000 L.E. | 1 pair | 7000 L.E. |
| **Total Cost of project (under development)** | | | | | | | 7000 L.E. |