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PREFACE

Welcome to the inaugural volume of the **Progress in Computing and Mathematics Journal (PCMJ)**, a publication proudly presented by the College of Computing, Informatics, and Mathematics at UiTM Cawangan Melaka.

This journal represents a significant step in our commitment to fostering a vibrant research culture, initially providing a crucial platform for our undergraduate students to showcase their intellectual curiosity, dedication to scholarly pursuit, and potential to contribute to the broader academic discourse in the fields of computing and mathematics. However, we envision PCMJ evolving into a beacon for researchers both nationally and internationally. We aspire to cultivate a space where groundbreaking research and innovative ideas converge, fostering collaboration and intellectual exchange among established scholars and emerging talents alike.

The manuscripts featured in this first volume, predominantly authored by our undergraduate students, are a testament to the hard work and dedication of these budding researchers, as well as the guidance and support provided by their faculty mentors. They cover a diverse range of topics, reflecting the breadth and depth of research interests within our college, and set the stage for the high-quality scholarship we aim to attract in future volumes.

As editors, we are honored to have played a role in bringing this journal to fruition. We extend our sincere gratitude to all the authors, reviewers, and members of the editorial board for their invaluable contributions. We also acknowledge the unwavering support of the college administration in making this initiative possible.

We hope that PCMJ will inspire future generations of students and researchers to embrace research and innovation, to push the boundaries of knowledge, and to make their mark on the world of computing and mathematics.

Editors
Progress in Computing and Mathematics Journal (PCMJ)
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UiTM Cawangan Melaka

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A MOBILE TECH HELPER RECOMMENDATIONS APPLICATION USING GEOLOCATION WITH AUTOMATED WHATSAPP MESSENGER

Irdina Syakirah Binti Suhaimi
College of Computing, Informatics and Mathematics
UiTM Cawangan Melaka Kampus Jasin
irdina1284@gmail.com

Ts Dr Alya Geogiana Binti Buja
College of Computing, Informatics and Mathematics
UiTM Cawangan Melaka Kampus Jasin
geogiana@uitm.edu.my

Article Info

Abstract

Our aim with this paper was to provide users with an efficient and convenient way to receive personalized tech-related assistance and recommendations based on their location. EasyFix is an application for Android users to find nearby technician for their mobile phones. It uses location services to recommend the closest mobile tech helper. Since our phones are crucial in daily life, it's important to fix issues quickly. With EasyFix, users can easily find help anytime. The application also connects with WhatsApp, allowing tech helper to connect and communicate with their customers. EasyFix simplifies the process of getting quick and convenient assistance for mobile phone issues. Individuals have difficulty with finding the nearest mobile tech helper, especially in an emergency. It is difficult when tech helper is located far away or in great demand. Customers generally visit a service center to get their devices repaired. It is inconvenient when tech support is unavailable, especially for people who live far from service centers or have restricted mobility. The application can offer location-specific support through location based on the device's location capabilities. We analyse this enables users to access relevant services which are relevant to their current location, especially when looking for nearby mobile service store and professionals for in-person help. Additionally, the application integrates with ChatGPT, a smart computer program which helps users to rapidly answer their inquiries. We found that with all of these features combined, like location-based, users do not need extra effort to find technicians nearby. Customer information, including their location, name and problems are also easily sent through WhatsApp. In conclusion, EasyFix offers a helpful tool or application to individuals who are looking for support with their devices.

INTRODUCTION

The Mobile Tech Helper application or "EasyFix" is an application for users especially android users to find tech helper for their mobile phone nearby their current location. This application recommends any nearest and relevant mobile tech helper using geolocation. Since mobile phone is important in our daily life, it is better for the user to solve the problem or fix the phone as soon as possible. By having this application, it can ease users because they can fix their mobile anytime. Furthermore, after selecting tech helper, user information such as location, name, and the specific problem will be sent to the selected tech helper through WhatsApp. Within the application, selected individuals will get notifications.

Tech helper is a person or service that provides technical assistance and support related to devices that are highly trained experts who diagnose and fix problems with devices. A tech helper can provide a wide range of services, such as resolving common issues, setting up new devices, configuring settings, providing guidance on security and privacy, and supplying recommendations on device maintenance. This application is absolutely important because some customers do not have a flexible time to go to the service shops. By having this application, they can get any helper that available based on their current location.

Geolocation is detecting the geographical location of a device or user is on the internet. It is a third-party service that allows developers to access geolocation information about a device or person. Plus, it is also offering a number of resources and techniques to retrieve location information such as longitude, latitude, and precision. This may be accomplished by utilising a number of distinct technologies in connection with one another, such as global positioning system (GPS) which is a satellite-based navigation system that provides location, velocity, and time coordination through a worldwide satellite network, cellular network, wireless fidelity (Wi-Fi), and IP address tracking. By having geolocation, users can find any nearest helpers that available based on their current location.

WhatsApp is an instant messaging application for smartphones (Cunningham et al., n.d.). WhatsApp is a well-known messaging software that allows users exchange text messages, make audio and video conversations, share media files, and participate in group

discussions. It is available on a variety of mobile devices and is well-known for its end-to-end encryption, which ensures the privacy and security of user conversations. WhatsApp, which is owned by Facebook, has grown to become one of the most popular messaging applications in the world. By having WhatsApp Messenger, mobile tech helper can directly get users information such as location and problem, once they are selected by the users.

OpenAI introduced ChatGPT in 2020 as a large-scale and powerful natural language model. It intended to interpret and create human-like text, making it an adaptable tool for a variety of applications. The model excels at language tasks, including question answering and text production, and has been integrated with Bing search. OpenAI is an extra feature of the EasyFix mobile application that allows customers to easily get relevant information about their mobile phone difficulties. Additionally, it eliminates the need to launch additional application such as Google for assistance.

Overall, the EasyFix mobile application is a highly convenient alternative for users, providing a number of features that simplify the process of locating a mobile tech helper depending on their current location. Users may conveniently connect with available tech helpers without having to physically find for helper through the integration of geolocation and WhatsApp Messenger. The integration not only saves users time but also makes communication easier by automatically providing important details, such as location, name, and the specifics of the problem, via WhatsApp Messenger. Having an OpenAI also can ease users to find any information regarding their mobiles and problems. In conclusion, the EasyFix mobile application not only simplifies the search for a tech helper via geolocation, but it also improves the overall user experience with its seamless interaction, establishing it as a highly reliable and accessible solution for individuals in need of mobile tech helper.

LITERATURE REVIEW

Literature review determining the best approach to achieving the project goal based on the research. This chapter explains about tech helper, location-based services, API which stand for application programming interface, mobile operating system, framework that will be use, mobile application development such as native application.

Tech Helper

Tech helper is a technician in an organization or company who is responsible for the installation, testing, and improvement of hardware, or even software. Tech helper is important in an organization for assisting customers and users with queries, services, technical assistance regarding products or services (Murmanto et al., 2022). On the other hand, tech helper is the structure of systems, platforms, and automated solutions that facilitate the flow of information and improve communication. It may speed up information search, access, and retrieval while also improving communication across users (Rahman et al., 2022). One of the significant external factors is technical assistance, which is essentially provided by professionals to users on software and hardware related items or problems as needed (Hammad Alshammari et al., 2016). This Mobile Tech Helper application or EasyFix, could provide users with guidance and assistance with their mobile devices, in-person.

Location-Based Services

Location-based services (LBS) are programmes that use a mobile device's location data to give the user with specific and relevant information or services. It basically requires knowledge about where the mobile device is geographically located. To be more specific and easier to understand, a location-based service (LBS) serves as a service that responds to queries containing a user's geographical location (Schmidtke, 2020). Plus, this software service also gathers geodata, which is data obtained in real time using one or more location tracking technologies. Location-based services are any types of services that take an entity's geographic location into consideration.

LBS involves a number of components. There are five technological components and one human related component, which are Positioning System, Communication Network, Service and Application Provider, Data and Content Provider and Mobile Devices while the human related component is the user itself. To make it work, a number of components are necessary which are a mobile device, positioning capabilities, a communication network, and a service and content provider (Huang & Gao, 2018). Geolocation will be used in this project since it is more suitable for this application.

Geolocation

Geolocation uses positioning systems to monitor an individual's locations to the precise latitude and longitude coordinates, or more concretely, a physical address, because gadgets are used by people (Othman et al., 2022). Geolocation allows users to access all forms of information in real time and pinpoint the user's location at any given point in time from any device connected to the Internet. Other than that, it offers the basis for location-aware services and applications. Geolocation also works by determining the location of a device or user through the integration of several technologies such as GPS (Global Positioning System), Wi-Fi, cellular networks, and IP (Internet Protocol) addresses. GPS is a satellite-based technology that can pinpoint the exact current position of a user or receiver (Hussien et al., 2023). It may also receive GPS satellite signals and estimate its latitude and longitude coordinates.

The use of geolocation technology allows for the real-time integration of an estimated actual position, with a precision range of 3 to 6 meters (Afanador et al., 2020). Consequently, positions located throughout this 3-to-6-meter range are recognized as accurate, highlighting the dependability of the Geolocation technology used in EasyFix mobile application. In conclusion, Geolocation technology is a valuable feature in Mobile Tech Helper application, as it significantly enhances the user experience. Additionally, geolocation enables this application or EasyFix to offer localized recommendations, such as nearby service centers specific to the user's location. It provides a precise location of the user or device, allowing for location-specific information and functionality to be delivered in real-time.

Application Programming Interface (API)

Application Programming Interface, is software that consists of a set of rules and requirements that software programmes can follow in order to communicate within devices (Altayaran & Elmedany, 2021). APIs are essential in the growth of software, data interchange, and the supply of functions between software components and services (Ajam et al., 2020). APIs define how software components should communicate and share data, allowing developers to create applications that make use of the capabilities of other apps or services. Generally, APIs are an essential element of current software development and are required for the creation of complex programmes that make use of the functionality of numerous systems

and services. For Mobile Tech Helper application, Google Maps API, WhatsApp Messenger API and OpenAI API are the features that are used that might ease users.

Google Maps API

Google Maps is a popular programme that allows users to travel around different locations (A et al., 2019). Google offers services in the form of a Google Maps API, which may be used to integrate in third-party websites or applications for the advantage of the web or even applications itself. The Google Maps API is an application interface that can be retrieved using JavaScript, Python, HTML, and other programming languages (Universitas Telkom. IoT Center et al., n.d.). The API allows developers to programmatically show maps, search for locations, acquire directions, and conduct geocoding and reverse geocoding.

Then, by using Google Maps API, trip duration, distance, and routes can be directly and precisely gathered using background high performance platforms and exact geographical information (Xia et al., 2018). Google Maps API is important to this project because it is the main feature to give direction of nearest tech helper that is available based on users' current location. Plus, it also gives direction of customers' current location that have been accepted to the tech helper. By making it easier for users to browse and engage with the app, Google Maps API help this application create a better user experience.

WhatsApp Messenger API

Social media platforms, like Facebook, Twitter, and LinkedIn, have been widely used for communication. Another current popular social network is the WhatsApp application. WhatsApp Messenger is a proprietary, cross-platform instant messaging programmed for smartphones (Fathy et al., 2015). A survey conducted in Malaysia discovered that 97% of Malaysians use WhatsApp, despite the availability of other instant-messaging applications including WeChat, LINE, Viber, Telegram, IMO, and email (Cunningham et al., n.d.).

Automated messaging is a key feature of the WhatsApp API. Those who engage may automate message sequences for responses common user queries, offer order updates, and provide tailored suggestions. Automated messaging saves time and resources while ensuring consistent interactions with clients (Mustafa et al., 2023). For EasyFix, it is convenient and

efficient in handling users or customers location sharing and information through WhatsApp once tech helper that available selected.

OpenAI API

AI is a branch of computer science that mimics human cognitive processes and learning abilities. OpenAI has created the ChatGPT virtual assistant, which is an AI-powered support chatbot (Santhosh et al., 2023). Furthermore, OpenAI's ChatGPT is a massive language model that uses deep learning to create human-like writing (Hashana et al., 2023). ChatGPT is intended to understand and answer to a wide range of queries and issues, making it an effective tool for natural language processing, chatbot creation, and other applications requiring natural language understanding and output (Kumar Patra et al., n.d.). ChatGPT is developing a platform that will allow developers to quickly and simply construct conversational AI services (Santhosh et al., 2023).

ChatGPT use Language Modelling to anticipate the upcoming word of a sentence based on preceding words, allowing it to understand context and write meaningful content (Hashana et al., 2023). In EasyFix mobile application, OpenAI's ChatGPT can provide assistance and information regarding a wide range of topics, including mobile problems. ChatGPT can offer troubleshooting tips, suggestions, and explanations for common mobile problems which can helps user in better and easier way.

Mobile Operating System

The operating system is an element of software that acts as a bridge between the device's user and its hardware. An operating system's principal aim is to create an environment in which a user may execute the specified tasks in a user-friendly and efficient manner (Chandrashekar et al., 2021). Operating systems are present on smartphones just like other computers. It maintains the device's hardware and software components as well as offering a user interface by means of which users can interact with the device. Android, and iOS are some of the most popular mobile operating systems. Mobile operating systems are continually transforming. They are frequently updated to meet the expanding needs of users and to make the most of the most recent technological improvements.

Android

Android applications may be constructed using a variety of languages, including Kotlin, Java, C #, and C ++. The project will be compiled using the Android SDK Feature to create an APK file, which is used to install on devices. Some features of android are storage that a lightweight relational database SQLite, for purposes of data storage it is used. Then, connectivity which supports many connectivity technologies like WIFI, Bluetooth, and CDMA. Then, messaging which are both mms and SMS, web browser, multi-touch, multi-tasking and also tethering (Deshmukh et al., 2018). Following that, because of its widespread use, rich development environment, and user-friendly features, the Android operating system is an excellent choice to develop EasyFix. With a significant share of the market in the mobile industry, Android provides a wide potential user base, allowing the application to have a larger reach and more opportunity to have an effective impact instead of the iOS operating system.

Mobile Application Development

The rapid growth of mobile technology, which includes mobile communication, mobile hardware, and mobile software, is now clearly seen. Mobile phone features are primarily determined by software. A mobile application is a component of software that is designed to operate on mobile devices such as smartphones and tablet computers. Mobile application development offers more complex capabilities than PC software, such as potential interaction with other programmes, information transformation between local and cloud databases, security management, and user interface for touchable screens (Liu et al., 2022).

Native Application

A native app is designed for a specific operating system platform, such as iOS, Android. Native applications are often written in a type of imperative programming language. Android apps, for example, are written in Java, whereas iOS apps are written in Objective-C or Swift (Ma et al., 2018). These programmes have access to all sorts of APIs that originate with the OS vendor, and they are always unique. The most significant advantages of native apps are quick execution, high efficiency, simpler access to mobile device modules and sensors. For example, camera and GPS, better use of user interface components, and simple distribution in application stores. Other than that, there are other tool kits available for different mobile operating systems.

For example, Android SDK, Android Jetpack for Android OS, iOS SDK, XCode for Apple iOS, and so forth (Pulasthi & Gunawardhana, 2021).

METHODOLOGY

Mobile tech helper application, EasyFix, project framework is based on a waterfall model and there are five phases consisting of requirement analysis, application design, application development, testing and documentation. Figure 1 below shows the framework for this project.
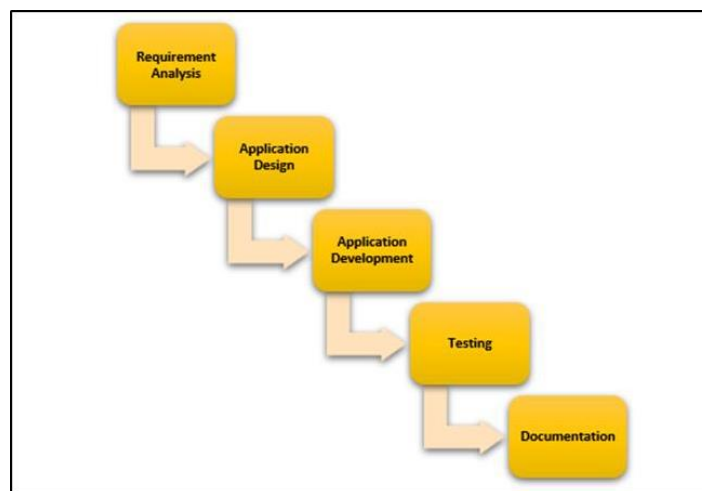

Figure 1: EasyFix Framework

The waterfall model process proceeds in a straight line from requirements analysis to system design, development, testing, deployment, and maintenance (Umeugo & Lowrey, n.d.). Starting with requirements, because the waterfall approach requires that requirements be fully defined before any other project phase begins. The design process includes both the conceptual and physical design phases. The logical design is an abstract representation of how software data flows at the outputs. It is typically represented visually as a data flow diagram. Then, during the implementation phase, programmers code the software according to the design specification. This enables for continuous implementation, followed by unit-level testing by the developers. The Waterfall model also offers several advantages which can ease developer and end-user. It is easy to understand, easy to explain, easy to implement and manage, testing is inherent in every phase and also minimizes planning overhead.

System Architecture

In system architecture, Figure 2 below, a visual that illustrates the conceptual structure and interactions between components or modules of an application system. It gives an in-depth understanding of how different elements relate to and interact with one another in order to accomplish system functionality. The diagram focuses on the system's logical or functional features, abstracting away implementation specifics and practical implementation issues.
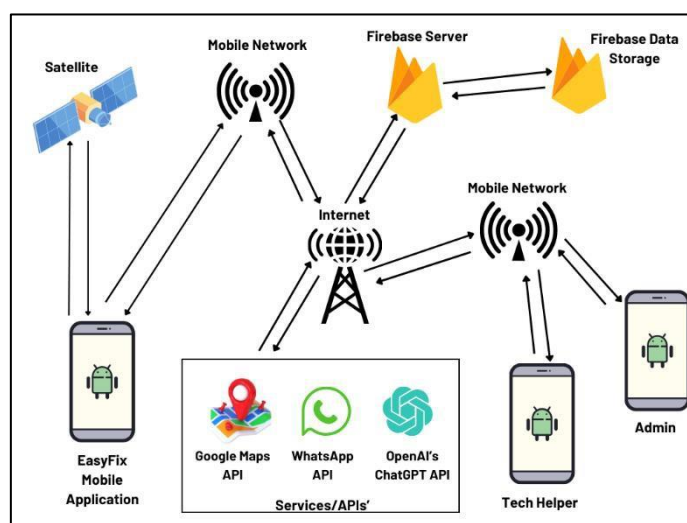

Figure 2: System Architecture

RESULT AND DISCUSSION

Result and discussion focus mainly on the thorough system testing of the EasyFix mobile application, which includes all of its essential components. The main goal of this testing step is to comprehensively evaluate the application, measuring its functionality and accuracy. The process entails evaluating every aspect of EasyFix to ensure its smooth integration and compliance with the established requirements.

Accuracy Testing

The geolocation accuracy testing of the EasyFix mobile application, which involved five different locations or scenarios and utilized both geolocation and the Google Maps API, has shown highly positive outcomes. The thorough comparison of actual and obtained longitude and latitude coordinates showed a great degree of accuracy. The EasyFix mobile application has demonstrated its reliability in accurately calculating and presenting user

locations, as evidenced by the successful passing of all test results without any exceeding a range of 6 meters. These results are essential for improving the overall geolocation capabilities of the application, highlighting the commitment to user satisfaction and the reliability of the EasyFix mobile application. The positive outcome of this testing indicates the efficacy of the geolocation feature and offer a more accurate and dependable user experience. The EasyFix mobile application's accuracy testing overview is shown in Figure 3 below.
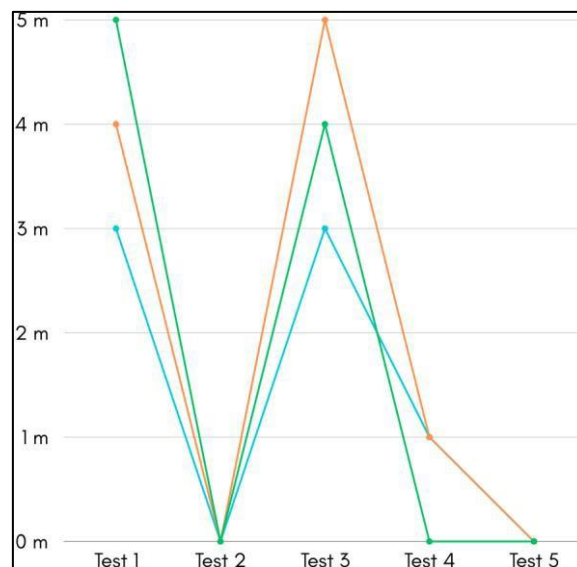

Figure 3: Line Chart of Accuracy Testing

Functionality Testing

Functional testing was performed on the EasyFix mobile application to ensure and verify that all of the components of each module perform as expected. There were three testers who were responsible for the functionality testing. These testers were lecturers and an information technology officer. Figure 4 below shows the diagram provides a concise overview of the functionality testing conducted for all users, including customer, tech helper, and admin. The following bar chart depicts the percentage of successful functionality tests conducted by three testers. The presence of bars associated with a specific test ID implies a high success rate in functionality testing. The high pass percentages indicate that the application is effective and reliable in terms of functioning for all user categories. Summarizing, the bar chart's positive outcomes indicate a successful phase of functionality testing, demonstrating that the evaluated

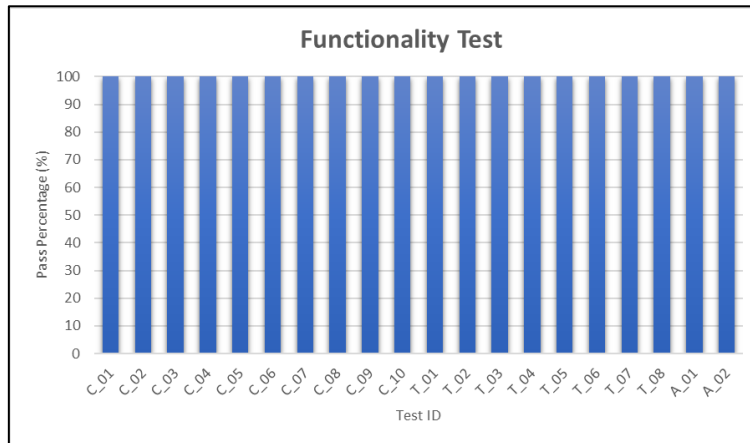features satisfy the desired requirements and function efficiently for customer, tech helper and admin.

Figure 4: Bar Chart of Functionality Testing

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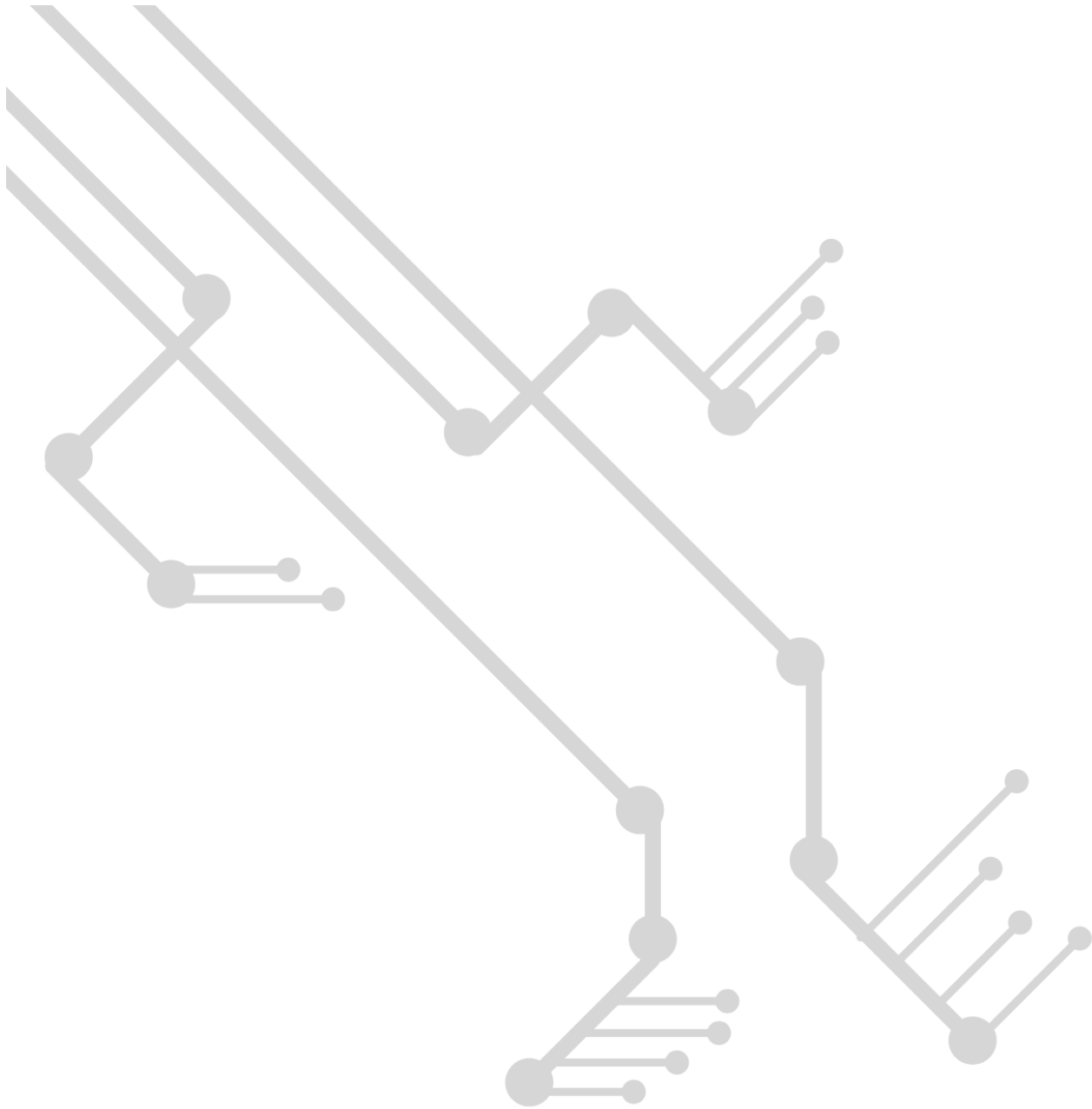
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