Lumé: Intelligent Matchmaking and Emotion-Aware Dating App Powered by AI

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Choose an item.

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Declaration

The project submitted herewith is a result of my own efforts in totality and in every aspect of the project works. All information that has been obtained from other sources had been fully acknowledged. I understand that any plagiarism, cheating or collusion or any sorts constitutes a breach of TAR University rules and regulations and would be subjected to disciplinary actions.

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Abstract

This project proposes *Lumé: Intelligent Matchmaking and Emotion-Aware Dating App Powered by AI*, a web-based platform designed to transform the online dating experience through intelligent matching, emotional awareness, and enhanced safety. Existing dating platforms often rely on superficial matching mechanisms and suffer from poor user trust, limited emotional depth in interactions, and frequent incidents of harassment. In Malaysia, where over 40% of young adults have engaged with such platforms, these limitations highlight the urgent need for an improved solution. Lumé addresses these challenges by integrating K-Means clustering to recommend users based on deeper compatibility, and real-time sentiment analysis to interpret conversational tone, enhancing both connection quality and user experience. Toxic chat filters powered by the Perspective API and manual photo moderation are employed to maintain safety and authenticity within the platform.

The project is developed using an Agile incremental methodology, with two-week sprints allowing for iterative design, development, and refinement. The technology stack includes Angular for frontend development, .NET Core Web API for backend operations, and SQL Server for secure data storage. Cloud deployment is handled via Microsoft Azure, ensuring scalability and accessibility. Sentiment and toxicity detection models are integrated via external APIs, while clustering logic is implemented locally using ML.NET. Testing involves unit, integration, and usability assessments, focusing on system functionality, emotional tone accuracy, engagement responsiveness, and overall user satisfaction.

The results are expected to demonstrate Lumé's strength in fostering safe, emotionally attuned, and authentic connections compared to traditional platforms. Limitations may include challenges in accurately interpreting user sentiment and reliance on third-party APIs for moderation. Nevertheless, Lumé serves as a proof of concept that AI can enhance online dating by offering not only smarter matches but also a more respectful and human-centered communication space. Future plans include expanding to mobile platforms and refining AI models through user feedback and real-world usage data.

Table of Contents

Chapter 2

Literature Review

2.1 Introduction

The literature review for Lumé, an intelligent matchmaking and emotion-aware dating app powered by artificial intelligence (AI), serves as a critical foundation for its development. By synthesizing existing research and industry trends, this review aims to identify gaps in current online dating platforms and explore how advanced technologies can address these shortcomings to foster meaningful connections. The primary objectives are to understand the current landscape of online dating, including user behaviors, preferences, and challenges, particularly in Malaysia, where 32.4% of surveyed individuals have used dating apps and 47.8% continue to do so (Chan et al., 2023). Additionally, the review investigates the application of AI in dating apps, focusing on intelligent matchmaking, emotion detection, and user safety enhancements, while identifying best practices to ensure Lumé aligns with user expectations and cultural preferences. The review is structured around three key focus areas: intelligent matchmaking, emotion detection, and user experience and safety, each of which addresses specific user needs and technological opportunities in the online dating space.

The rise of AI-powered dating applications marks a transformative shift in the online dating industry, which is projected to reach $9.2 billion globally by 2025 (Statista, 2023). Traditional dating apps often rely on simplistic algorithms that match users based on superficial criteria such as location and age, leading to dissatisfaction, with 45% of users reporting frustration and 28% experiencing harassment (Anderson et al., 2020; Vogels and McClain, 2023). AI technologies, including machine learning and natural language processing, offer solutions by enabling more sophisticated matchmaking and real-time interaction monitoring. For instance, AI can analyze user profiles, behavioral data, and conversation patterns to suggest compatible matches, as seen in apps like SciMatch, which uses compatibility scores to improve match quality (Mallick, 2023). Additionally, AI-driven features such as sentiment analysis and toxicity detection are increasingly used to create safer and more respectful environments (Mirakyan, 2023; Li, 2023). However, the integration of AI is not without challenges. Recent studies indicate significant user skepticism, particularly among women, with only 10% agreeing that AI-powered dating apps lead to more successful relationships compared to 20% of men (Coduto, 2025). Ethical concerns also arise, with researchers warning that over-reliance on AI, such as bots crafting profiles or flirting on behalf of users, may erode authentic human connections (Brunning, 2025; The Guardian, 2025). Furthermore, risks like deepfake technology and fraudulent apps can undermine user trust and safety (BPS, 2024). These concerns are particularly relevant in Malaysia, where young adults prioritize safety and authenticity due to issues like profile faking (12% of users) and tweaking (23%) (Chan et al., 2023).

The literature review is structured around three key focus areas that are central to Lumé's development. First, intelligent matchmaking explores how AI algorithms, such as K-Means clustering, can match users based on deeper compatibility factors like values and behaviors, rather than superficial traits. This section reviews studies on user preferences, the effectiveness of matching algorithms, and their impact on user satisfaction, drawing on examples like SciMatch's compatibility-based approach (Mallick, 2023; Khalatian, 2023). Second, emotion detection investigates the role of sentiment analysis and natural language processing in understanding users' emotional states during interactions. It examines how these technologies can enhance communication and reduce misunderstandings, as demonstrated by apps using AI to craft responsive messages (Mirakyan, 2023; Li, 2023). Third, user experience and safety analyzes the importance of real-time engagement and safety features, such as toxic chat filtering via Perspective API and manual photo verification, in building user trust and retention. It also addresses ethical concerns and risks, such as deepfake technology, to ensure a balanced perspective on AI's role in dating apps (Brunning, 2025; BPS, 2024).

In the Malaysian context, where 41% of 16-24-year-olds and 43% of 24-34-year-olds have used dating apps (Chan et al., 2023), there is a clear demand for platforms that prioritize safety and authenticity. Lumé aims to address this by integrating AI-driven features that enhance both the quality of matches and the safety of interactions. However, the controversy surrounding AI in dating apps cannot be ignored. While AI offers potential for improved user experiences, concerns about reduced authenticity and risks like deepfake technology highlight the need for careful implementation (BPS, 2024; The Guardian, 2025). This literature review will provide a comprehensive understanding of these opportunities and challenges, informing the design and implementation of Lumé to ensure it meets the needs of its target audience—young adults aged 18-45 in Malaysia and Southeast Asia—while addressing global trends and ethical considerations in online dating.

2.2 Online Dating and Matchmaking Systems

2.2.1 Evolution of Online Dating Platforms

The journey of online dating platforms reflects a dynamic interplay between technological innovation and evolving social behaviors. In the mid-1990s, the launch of Match.com in 1995 marked the inception of online dating, offering users the ability to create profiles and search for matches using basic filters like age, location, and interests (DatingNews, 2025). These early websites represented a significant shift from traditional matchmaking, which often relied on family, community, or professional matchmakers to facilitate connections (Wikipedia, 2025). Despite initial public

skepticism, the growing accessibility of the internet fueled the adoption of online dating, with platforms like eHarmony (2000) and OkCupid (2004) introducing more advanced algorithms that incorporated psychological and personality-based compatibility assessments to promote long-term relationships (Capitol Technology University, 2024).

The introduction of smartphones in the late 2000s catalyzed a new era of mobile dating apps, significantly enhancing user accessibility and engagement. Tinder's launch in 2012 revolutionized the industry with its swipe-based interface, which gamified the process of selecting potential matches and prioritized quick, visual judgments (Daily Sundial, 2022). This model was followed by apps like Bumble (2014), which empowered women to initiate conversations, and Hinge (2017), which focused on fostering meaningful relationships through detailed profiles (DatingNews, 2025). These mobile apps made online dating more convenient and appealing to younger audiences, contributing to their widespread popularity.

In recent years, the integration of artificial intelligence (AI) has ushered in a new phase of innovation in online dating. Platforms like SciMatch leverage machine learning algorithms, such as K-Means clustering, to analyze extensive user data—ranging from preferences to behavioral patterns—to generate compatibility scores and improve match accuracy (WeblineIndia, 2025). Additionally, AI-driven features like sentiment analysis and toxicity detection, as seen in apps adopting tools like Perspective API, enhance user safety by monitoring interactions in real-time (Li and Mirakyan, 2023). This evolution from static, rule-based websites to dynamic, AI-integrated mobile apps demonstrates the industry's ongoing efforts to address user needs and leverage cutting-edge technology.

Traditional rule-based online dating systems, while pioneering, have significant limitations that impact user satisfaction and safety. One primary drawback is their reliance on superficial criteria, such as appearance and location, which often fails to account for deeper compatibility factors like values, personality, or long-term goals (Futuristic Lawyer, 2025). This focus contributes to user dissatisfaction, with studies indicating that 45% of online daters feel frustrated with their experiences and 28% report encountering harassment, particularly among younger women (Pew Research Center, 2020, 2023). These statistics highlight the inadequacy of traditional systems in fostering meaningful connections and ensuring safe interactions.

Another limitation is the lack of adaptability in rule-based systems. Unlike AI-driven platforms that learn from user interactions, traditional algorithms typically generate static match suggestions based on initial profile data, which may become irrelevant over time (Medium, 2018). This rigidity can lead to repetitive or mismatched recommendations, further exacerbating user frustration (WeblineIndia, 2025).

Safety and trust issues are also prevalent. Traditional platforms often lack robust moderation tools to effectively address fake profiles, scams, or toxic behavior, leaving users vulnerable to harassment and fraud (Pew Research Center, 2020). For instance, research notes that online romance scams are a significant concern, with fraudsters exploiting the lack of advanced detection mechanisms in traditional systems (ResearchGate, 2023).

Moreover, the abundance of choices on dating apps can lead to decision fatigue, a phenomenon known as the "paradox of choice," where users feel overwhelmed by numerous options, reducing their ability to form meaningful connections (Monday Economist, 2024). This issue is compounded by the lack of cultural and social nuance in traditional online dating, which contrasts with traditional matchmaking practices that involve family or community to ensure trust and compatibility (Wikipedia, 2025). The resurgence of interest in traditional matchmaking, as evidenced by popular media like Million Dollar Matchmaker and Indian Matchmaking, underscores a desire for more personalized and culturally relevant approaches (Wikipedia, 2025).

The shortcomings of traditional rule-based systems have paved the way for AI-driven solutions, as proposed by Lumé. AI technologies, such as machine learning and natural language processing, enable dynamic matchmaking that adapts to user behavior and preferences, offering more personalized and accurate matches (WeblineIndia, 2025). Features like sentiment analysis and toxicity detection enhance safety by monitoring interactions in real-time, addressing concerns about harassment and fake profiles (Li and Mirakyan, 2023). However, the integration of AI is not without controversy, as some users express skepticism about its impact on authentic human connections, with concerns about over-reliance on technology and risks like deepfake fraud (BPS, 2024; The Guardian, 2025). Lumé aims to balance these concerns by combining AI-driven features with manual verification processes to ensure both safety and authenticity.

2.2.2 Intelligent Matchmaking Techniques

Intelligent matchmaking techniques in dating apps leverage advanced computational methods, such as machine learning (ML) and deep learning (DL), to predict user preferences and facilitate meaningful connections. These approaches surpass traditional rule-based systems by analyzing extensive user data, including profiles, swiping habits, and interactions, to enhance compatibility predictions. This section provides a comprehensive exploration of ML and DL in preference prediction, alongside collaborative filtering, content-based filtering, and hybrid methods, drawing on the Lumé: Intelligent Matchmaking and Emotion-Aware Dating App Powered by AI project, supplemented by recent academic and industry sources, as well as social media insights from platforms like X.

Machine learning and deep learning have transformed preference prediction in dating apps by enabling precise and personalized matchmaking. ML algorithms, particularly supervised learning models, are trained on historical data—such as past matches and user interactions—to forecast potential connections. For instance, classification models can generate compatibility scores based on features like age, location, interests, and behavioral patterns (Towards Data Science, 2020). These models improve over time as they process more data, offering increasingly accurate predictions. Deep learning, a subset of ML, employs neural networks to handle complex, unstructured data, such as text and images. In dating apps, DL applies natural language processing (NLP) to analyze user bios and messages, extracting sentiment, topics, and personality traits that indicate compatibility (Fast Data Science, 2020). For example, an NLP model might identify shared interests or conversational styles from textual data, while computer vision techniques process profile photos to infer attributes like attractiveness or emotional expressions, further refining match predictions.

Schroeder (2023) highlights that ML and DL enable dating apps to analyze multimodal data, including messaging patterns and profile photos, to refine matchmaking processes, with accuracy improving as more behavioral data is collected. Similarly, a study by Zhang and Yasseri (2016) demonstrates that ML models can predict user preferences with high accuracy by analyzing interaction patterns, such as swiping behavior. The Lumé project employs K-Means clustering, an ML technique, to group users based on shared values and habits, addressing the 60% of users who find dating apps overly appearance-focused (Pew Research Center, 2023). Additionally, recent advancements in DL, such as transformer-based models, allow apps like Iris Dating to analyze facial features and refine recommendations based on user feedback, enhancing personalization (ITRex, 2024). However, challenges like data quality, algorithmic bias, and user trust remain, particularly in Malaysia, where authenticity is a priority for 42% of young adult dating app users (Chan et al., 2023).

Collaborative filtering (CF) is a cornerstone recommendation technique in dating apps, suggesting matches based on the behavior of users with similar preferences. CF operates in two primary forms: user-based CF, which identifies users with similar tastes and recommends profiles they have liked, and item-based CF, which finds profiles similar to those a user has previously liked based on shared features or interaction patterns. For example, if two users frequently swipe right on similar profiles, the app might suggest profiles liked by one to the other, assuming shared tastes.

Hinge exemplifies CF through its use of the Gale-Shapley algorithm, which ensures stable matching by considering mutual preferences, increasing the likelihood of reciprocal interest (GetStream.io, 2023). An X post by @T_DMac (2023) suggests Hinge groups users by attractiveness or popularity based on swipes, indicating a collaborative approach where users see profiles within their "tribe" (X, 2023). Similarly, Tinder historically used the Elo rating system, a CF method, to rank users by desirability, though its current algorithm remains undisclosed (Schroeder, 2023). An X post by

@atoyki (2024) notes that Tinder's system matches users by looks and popularity, reinforcing its collaborative nature (X, 2024).

Despite its effectiveness, CF faces challenges, such as the "cold-start" problem, where new users with limited interaction data receive less accurate recommendations (Fast Data Science, 2020). Additionally, CF may perpetuate biases if trained on non-diverse data, potentially leading to discriminatory matches (Hutson et al., 2018). A study by Deldjoo et al. (2020) highlights that CF algorithms can reinforce existing preferences, limiting diversity in recommendations, which underscores the need for careful design to ensure inclusivity.

Content-based filtering (CBF) recommends matches by analyzing user profile attributes, such as interests, hobbies, and demographics, creating a preference profile for each user and suggesting others with similar characteristics. For instance, if a user lists hiking as an interest, CBF might recommend profiles of other hikers, assuming shared interests indicate compatibility. This method excels when detailed profile data is available, offering personalized suggestions without relying on other users' behavior.

Grindr employs CBF by matching users based on preferences like gender, age, and location (GetStream.io, 2023). OkCupid also uses CBF, calculating match percentages based on weighted responses to questions like "Are you afraid of death?" (Harvard Data Science Review, 2022). However, CBF assumes users accurately report their preferences, which may not always align with actual attraction (Eastwick and Finkel, 2008). Schroeder (2023) notes that CBF is effective for initial matching but may miss behavioral nuances, suggesting the need for complementary techniques. Lumé enhances CBF by integrating K-Means clustering to focus on deeper compatibility factors, such as values and lifestyle, beyond superficial traits. A study by Pizzato et al. (2010) supports this approach, demonstrating that CBF can improve match quality when combined with behavioral data, though incomplete profiles can limit its effectiveness.

Hybrid methods combine collaborative filtering and content-based filtering to leverage their strengths, delivering more accurate and diverse recommendations. By integrating user behavior (CF) with profile features (CBF), hybrid systems mitigate issues like the cold-start problem and overspecialization. For example, a hybrid approach might use CF to identify similar users and then apply CBF to refine suggestions based on shared interests.

OkCupid exemplifies a hybrid method, combining CBF through extensive surveys with CF to calculate match percentages based on answer alignment (GetStream.io, 2023). DNA Romance takes this further by incorporating biological data, such as DNA and Myers-Briggs Type Indicator (MBTI) personality types, to enhance compatibility predictions (ITRex, 2024). A report by eHarmony (2015,

cited in Harvard Data Science Review, 2022) suggests future hybrid methods could incorporate geolocation or Internet of Things (IoT) data to assess offline compatibility. GetStream.io (2023) highlights that hybrid methods balance scalability and specificity, making them ideal for diverse user bases. Lumé adopts a similar hybrid philosophy, combining ML-driven clustering with user-provided data to improve match quality. Research by Adomavicius and Tuzhilin (2005) supports hybrid methods, noting their ability to improve recommendation accuracy by addressing the limitations of individual approaches.

The application of ML and DL in matchmaking introduces several challenges. Algorithmic bias is a significant concern, as models trained on non-diverse data may perpetuate discriminatory matches (Hutson et al., 2018; Deldjoo et al., 2020). For example, CF might reinforce existing preferences, limiting diversity, while CBF relies on accurate user input, which can be misleading (Eastwick and Finkel, 2008). Ethical issues, such as transparency and privacy, are also critical, with users potentially distrusting AI-driven matches or fearing data misuse (British Psychological Society, 2024). A study by Li et al. (2021) emphasizes the importance of transparent algorithms to maintain user trust, particularly in sensitive applications like dating.

2.2.3 Match Quality Determinants

The quality of matches in online dating platforms is a critical factor in user satisfaction and the success of forming meaningful relationships. As outlined in the Lumé: Intelligent Matchmaking and Emotion-Aware Dating App Powered by AI project, addressing the shortcomings of traditional dating apps—such as superficial matching and safety concerns—requires a nuanced understanding of match quality determinants. This section explores three key factors: psychological and behavioral profiling, communication compatibility, and data-driven insights for successful matching. These elements are supported by recent research and industry insights, ensuring alignment with Lumé's objectives of fostering authentic connections, particularly for young adults aged 18-45 in Malaysia, where 42% engage with dating apps and 47.8% continue their use (Chan et al., 2023).

Psychological profiling leverages frameworks like the Five-Factor Model (FFM), or Big Five personality traits—openness, conscientiousness, extraversion, agreeableness, and neuroticism—to assess users. Dyrenforth et al. (2010) found that similarity in these traits correlates with relationship satisfaction, suggesting that matching users with aligned personalities improves outcomes. Platforms like eHarmony employ detailed questionnaires to map these traits and pair users accordingly (eHarmony, 2023). Additionally, self-presentation in profiles—through photos and bios—reflects personality and influences perceptions of compatibility. Ranzini and Lutz (2021) note that a

professional photo might signal ambition, while a casual one suggests approachability, both informing psychological fit.

Behavioral profiling analyzes user activity, such as login frequency, swiping patterns, and messaging habits, to uncover preferences not evident in self-reported data. For instance, a user consistently engaging with profiles sharing specific interests (e.g., travel) can be prioritized for similar matches. Schroeder (2023) highlights how apps use these patterns to refine matchmaking and predict engagement, while Sharabi (2022) emphasizes that behavioral insights help forecast offline success, such as in-person meetings. However, challenges like inauthentic self-presentation—where users exaggerate traits—require algorithms to cross-validate data for accuracy (Finkel et al., 2012).

Psychological and behavioral profiling is fundamental to determining match quality in online dating, as it enables platforms to assess compatibility based on users' self-presentation and interaction patterns. Profile pictures and textual bios serve as primary tools for users to convey their personality, values, and lifestyle, significantly influencing potential matches' perceptions (Ranzini & Lutz, 2021). A study analyzing 524 mobile dating app profile pictures found that these images play a pivotal role in decision-making, with choices like selfies versus group photos signaling traits such as self-confidence or social connectedness (Ranzini & Lutz, 2021). For instance, a user opting for a professional headshot may project ambition, while a candid photo might suggest approachability, both of which inform psychological compatibility.

Beyond static profiles, behavioral profiling captures dynamic user interactions, such as messaging frequency, response times, and swiping patterns, which provide insights into engagement and communication styles (Brand et al., 2012). Research indicates that users with similar behavioral patterns, such as prompt responders, are more likely to form successful matches due to aligned interaction preferences (Botwin et al., 2020). However, self-presentation in profiles can sometimes lack authenticity, as users may exaggerate traits to appear more desirable, which can lead to mismatches (Finkel et al., 2012). In Malaysia, where authenticity is a priority for 42% of young adult users, Lumé's use of K-Means clustering to analyze behavioral data aims to enhance match accuracy by focusing on genuine compatibility factors (Chan et al., 2023). Ethical concerns, such as ensuring profile accuracy and avoiding stereotyping, remain critical to maintaining user trust (British Psychological Society, 2024).

Communication compatibility is a cornerstone of match quality, as effective interaction fosters trust and mutual understanding, essential for building lasting relationships. Research highlights that communication style—encompassing honesty, respect, and clarity—significantly influences early interactions in online dating (Expressable, 2024). For example, users who communicate openly about

their intentions and preferences are more likely to establish trust and assess compatibility early, reducing the risk of misunderstandings (Better Health Channel, n.d.). A study by eHarmony emphasizes that shared communication preferences, such as frequency and tone, are critical core values for relationship success (eHarmony, 2023).

In online dating, initial interactions through messaging or video calls serve as a testing ground for communication compatibility. Users with aligned preferences—for instance, those who both prefer frequent, casual messaging—are more likely to form positive connections (Refinery29, 2024). Conversely, differences in communication styles, such as one user favoring lengthy messages while another prefers brevity, can lead to frustration and perceived incompatibility (Refinery29, 2024). Lumé addresses this by integrating real-time sentiment analysis to monitor conversational tones and intervene in cases of negative interactions, aligning with the 75% of young singles who value clear communication (Hadjji-Vsiley, 2022). However, challenges arise when users misrepresent their communication styles or fail to disclose preferences, necessitating robust AI tools to detect and adapt to these nuances (Sharabi, 2023).

Data-driven insights, powered by big data analytics and machine learning, have transformed matchmaking by enabling platforms to predict compatibility with unprecedented accuracy. Dating apps collect vast datasets—Match.com, for instance, has amassed over seventy terabytes of user data—to analyze preferences, behaviors, and past match outcomes (Penn State University, n.d.). These insights allow platforms to generate compatibility scores and suggest matches that align with users' interests and interaction patterns. Machine learning algorithms, such as those used by Tinder and Bumble, continuously refine recommendations by learning from swiping patterns and messaging behavior, improving match quality over time (Imperial Business School, 2023).

Innovative approaches are emerging, such as Browser Dating, which uses AI to analyze up to 5,000 recent browser searches to create a "browsing personality profile," offering a novel way to assess compatibility based on online behavior (WIRED, 2025). Similarly, apps like OkCupid leverage hybrid methods combining user survey responses with behavioral data to enhance match accuracy (MakeUseOf, 2017). Lumé's use of K-Means clustering and sentiment analysis aligns with these trends, aiming to address the 60% of users dissatisfied with appearance-focused matching by prioritizing deeper compatibility factors (Pew Research Center, 2023).

However, data-driven matchmaking raises ethical concerns, including privacy breaches and algorithmic bias. Users may distrust platforms that collect extensive personal data, and biased algorithms can perpetuate discriminatory matches if trained on non-diverse datasets (Hutson et al., 2018; MakeUseOf, 2017). In Malaysia, where trust significantly influences app adoption, Lumé

mitigates these concerns through transparent data practices and manual verification processes (Chan et al., 2023). Ensuring fairness and inclusivity in algorithms is crucial for maintaining user confidence and achieving successful matches.

2.3 Emotion Recognition in Dating Applications

2.3.1 Overview of Emotion-Aware Technologies

Emotion-aware technologies in dating applications utilize advanced artificial intelligence (AI) techniques, primarily natural language processing (NLP), sentiment analysis, and increasingly, voice and facial recognition, to interpret users' emotional states during interactions. These systems process diverse data inputs—text messages, voice tones, and facial expressions—to identify emotions like happiness, frustration, discomfort, or enthusiasm. This capability is critical in social systems like dating apps, where fostering meaningful and empathetic connections is essential. By dynamically adapting to users' emotional needs, these technologies address shortcomings of traditional platforms, such as shallow communication and emotional disconnect, with studies indicating that 45% of users report frustration and 28% experience harassment (Vogels & McClain, 2023). In Malaysia, where 42% of young adults use dating apps and value authenticity and safety, emotion-aware technologies are particularly relevant for creating respectful and engaging digital spaces (Chan et al., 2023).F

NLP is the cornerstone of emotion detection in dating apps, leveraging transformer-based models like BERT to analyze the sentiment and emotional tone of textual data. For instance, a message like "I can't wait to see you!" might be classified as positive due to its enthusiastic phrasing, while "I'm not sure this will work" could be flagged as negative or hesitant. Advanced models like EmoBERT further distinguish nuanced emotions—joy, anger, sadness, or anxiety—beyond simple positive/negative classifications (Chatterjee et al., 2019). This granularity enables dating apps to tailor responses more precisely, such as offering an encouraging prompt to an anxious user or amplifying enthusiasm in a positive exchange.

However, NLP-based emotion detection faces challenges with cultural and linguistic diversity. Models trained on generic datasets may misinterpret emotional cues in Malaysian English or culturally specific phrases, such as "lah" used for emphasis, which could skew sentiment analysis. Research by Ekman and Friesen (2003) notes that while some emotions are universal, their expressions vary across cultures, posing risks of bias or inaccuracy in AI interpretations. Platforms are exploring culturally adaptive NLP models and localized training datasets to ensure emotional detection aligns with regional norms and enhances user trust.

Beyond text, modern dating apps adopt multimodal emotion detection by incorporating voice and facial analysis. Voice recognition systems assess tone, pitch, and speech patterns in voice messages or video calls to infer emotions. For example, a rising pitch might indicate excitement, while a monotone could suggest disinterest. A study by Poria et al. (2019) demonstrates that integrating acoustic features with text analysis boosts emotion recognition accuracy by up to 15%, particularly for emotions like excitement or hesitation. Similarly, facial expression analysis, powered by computer vision, identifies emotions like happiness or unease from video interactions. Match Group is developing AI features to analyze voice tones for emotional cues in video calls, with a planned release in their AI assistant by March 2025 (The Guardian, 2024). Hypothetical platforms like Lumé could extend this by using real-time facial analysis to detect discomfort during video chats, triggering supportive interventions.

This multimodal approach enriches emotion detection but introduces complexities. Processing voice and facial data demands significant computational resources and raises privacy concerns, as users may hesitate to share biometric information (BPS, 2024). Apps must balance these benefits with transparent data policies to maintain user confidence.

Emotion-aware technologies are increasingly integrated with AI assistants that provide real-time coaching or suggestions based on emotional insights. Match Group's forthcoming AI assistant, set for release in March 2025, will guide users struggling with interactions, potentially offering emotional advice like "Your match seems excited—keep the energy up!" (The Guardian, 2024). Similarly, apps like Bumble experiment with AI-driven prompts to encourage empathetic exchanges, such as suggesting a kind response if a user appears upset (Henshall & Shah, 2023). Hypothetical platforms like Lumé might use this integration to detect hostility in chats and intervene with calming suggestions, fostering positive communication. This synergy enhances the user experience by making interactions more responsive and emotionally attuned.

Emotional intelligence (EI)—the ability to recognize, understand, and manage one's own and others' emotions—is fundamental to the success of social systems like dating apps. It addresses the limitations of traditional platforms, where shallow interactions lead to dissatisfaction, by creating a supportive and emotionally aware environment (Anderson et al., 2020). EI fosters relationship satisfaction by enabling users to navigate emotional nuances, build trust, and communicate effectively, critical for meaningful connections (Brackett et al., 2011).

Emotion-aware technologies enhance trust and safety by monitoring conversations for signs of discomfort, hostility, or harassment. If sentiment analysis detects an aggressive tone—e.g., "Why are you so slow to reply?"—the app can pause the chat, offer a communication tip, or escalate to moderators. This is vital given that 28% of online daters report harassment (Anderson et al., 2020). Research by Bhakta (2024) highlights that AI-driven emotion detection can reduce negative

interactions by up to 30%, creating safer digital communities. In Malaysia, where safety is a top concern, such features could encourage broader adoption by ensuring respectful exchanges (Chan et al., 2023).

EI boosts engagement by tailoring responses to users' emotional states, making interactions more compelling. For instance, if a user seems frustrated after unanswered messages, the app might suggest a break or an uplifting prompt like "Don't give up—your match might just be busy!" An X post by @TechLove (2024) notes that apps analyzing chat tones for emotional alignment see higher connection rates among users with similar conversational styles. This drives retention, as users feel understood and motivated to engage.

In culturally diverse regions like Malaysia, EI ensures interactions respect local dating norms, such as cautious relationship-building (Chan et al., 2023). Emotion-aware systems can be trained to recognize culturally specific cues—e.g., indirect expressions of interest common in Asian contexts—enhancing relevance. Poria et al. (2019) emphasize the need for culturally adaptive models in emotion recognition to avoid misinterpretations in multilingual settings.

Emotion-aware technologies elevate personalization and empathy by adapting responses and recommendations to users' emotional states, making interactions feel human and supportive. This aligns with the goal of forging connections beyond superficial matches.

By interpreting emotional cues, apps deliver tailored responses. For example, detecting excitement about a shared interest like hiking might prompt a suggestion for a nature-themed date, while spotting anxiety could trigger a reassuring message like "Take your time—there's no rush." Research by Nyberg (2022) underscores the post-pandemic demand for authentic, emotionally responsive experiences, which personalization fulfills. Apps like AIMM engage users in week-long conversations to assess emotional compatibility before suggesting matches (ITRex, 2024).

These technologies promote empathy by encouraging users to consider each other's feelings. If a negative tone is detected—e.g., "You're not my type anyway"—the AI might suggest a gentler rephrase like "I think we're looking for different things." This reduces misunderstandings and fosters respect, addressing the 75% of young singles prioritizing clear communication (Hadjji-Vsiley, 2022). Henshall and Shah (2023) note that AI-driven feedback enhances empathy, supporting safer platforms.

2.3.2 Emotion Detection Techniques

Emotion detection techniques are central to enhancing the emotional intelligence of dating applications, enabling platforms to interpret users' emotional states and foster empathetic, personalized interactions. These methods leverage advanced artificial intelligence (AI) to analyze various data modalities, addressing user frustrations with shallow communication and safety concerns, as evidenced by 45% of online daters reporting frustration and 28% experiencing harassment (Vogels & McClain, 2023). In Malaysia, where 42% of young adults use dating apps and prioritize authenticity, these technologies are vital for creating meaningful connections (Chan et al., 2023). The following sections detail four key techniques—facial expression recognition, voice emotion analysis, text-based sentiment analysis, and multimodal fusion—exploring their methodologies, applications, and challenges in the context of dating apps.

Facial expression recognition employs computer vision to analyze facial features and classify emotions such as happiness, sadness, or anger, proving invaluable for video-based interactions in dating apps. This technique relies heavily on Convolutional Neural Networks (CNNs), such as AlexNet, VGG-16, and ResNet-50, which automatically extract hierarchical features from facial images, achieving accuracies between 59.85% and 67.53% on datasets like FER2013, containing over 35,887 images (Li & Deng, 2020). FaceNet, originally developed for face recognition, can be adapted for emotion classification by using its embeddings to capture detailed facial characteristics (Schroff et al., 2015). In dating apps, this technology detects emotional cues during video calls, enabling real-time feedback, such as prompting users to adjust their tone if discomfort is detected or suggesting a topic change if boredom is evident. For instance, emotion-sensing SDKs can identify smiles or laughter during profile viewing, offering insights like notifying a user that a match smiled significantly while viewing their profile (Affectiva, 2023). However, challenges include variability in lighting, facial angles, and cultural differences in expressions, which can reduce accuracy, as some emotions are expressed differently across cultures (Ekman & Friesen, 2003). Privacy concerns also pose a significant hurdle, as users may be hesitant to share facial data, necessitating robust data protection measures to maintain trust (BPS, 2024).

Voice emotion analysis extracts emotional information from speech signals, making it crucial for interpreting voice messages or calls in dating apps. This technique uses Mel-Frequency Cepstral Coefficients (MFCCs) to capture spectral characteristics like pitch and tone, which are then processed by Recurrent Neural Networks (RNNs), particularly Long Short-Term Memory (LSTM) networks, to model temporal dependencies in audio sequences. Research indicates that combining MFCC features with LSTM models achieves accuracies around 80% for emotions like happiness and sadness on datasets like IEMOCAP (Akçay & Oğuz, 2020). In dating apps, voice emotion analysis can assess the emotional tone of voice messages, identifying enthusiasm or hesitation to enhance match

compatibility. For example, detecting a warm tone could prioritize matches with similar emotional expressiveness, while a frustrated tone might prompt the app to suggest a more engaging conversation topic. Challenges include background noise, speaker variability, and the need for culturally diverse training data to ensure accuracy in regions like Malaysia, where linguistic nuances vary (Poria et al., 2019). Additionally, users may feel uneasy about voice analysis, raising privacy issues that require transparent data practices to address.

Text-based sentiment analysis is essential for interpreting the emotional content of chat messages, the primary communication mode in dating apps. Long Short-Term Memory (LSTM) networks excel at capturing sequential dependencies in conversation threads, with studies achieving 91% accuracy in detecting emotions like joy, sadness, and anger using combined Conv1D and LSTM models (Frontiers in Psychology, 2023). Transformer-based models like BERT (Bidirectional Encoder Representations from Transformers) further enhance performance by considering bidirectional context, achieving F1 scores above 90% on sentiment classification tasks (Sun et al., 2019). For instance, BERT can classify a message like "I'm thrilled about our date!" as positive, while "I'm not sure about this" might be flagged as negative or uncertain, enabling apps to monitor conversational tones and suggest empathetic responses or prioritize emotionally compatible matches. This aligns with the 75% of young singles who value clear communication (Hadjji-Vsiley, 2022). However, challenges include handling informal language, slang, and cultural nuances, such as Malaysian English expressions like "lah," which may confuse generic models (Chatterjee et al., 2019). Privacy concerns regarding message analysis also necessitate clear user consent and robust data protection policies.

Multimodal fusion integrates data from text, voice, and facial expressions to achieve a more accurate and comprehensive understanding of a user's emotional state, leveraging the complementary strengths of each modality. This approach employs feature-level fusion, which combines raw features from different modalities before feeding them into a single model; decision-level fusion, which aggregates outputs from separate modality-specific models; and model-level fusion, which uses a single model, such as attention-based transformers, to process all modalities simultaneously. Research shows that multimodal models improve emotion recognition accuracy by up to 10% compared to unimodal systems (Zhao et al., 2021). In dating apps, multimodal fusion can combine sentiment analysis from chats, voice tone analysis from messages, and facial expression data from video calls to provide a holistic view of a user's emotional state. For example, detecting excitement across all modalities could enhance match recommendations, while identifying distress could trigger safety interventions, such as pausing a chat or offering calming prompts. Platforms like Match Group are exploring multimodal approaches for their 2025 AI assistant to provide comprehensive emotional coaching (The Guardian, 2024). However, challenges include computational complexity, data synchronization, and heightened privacy concerns, particularly in culturally diverse contexts like Malaysia, where users

may be reluctant to share multiple data streams (BPS, 2024). Future platforms could use multimodal emotion technology to improve compatibility by analyzing multiple data points, such as emotional responses to content (Affectiva, 2023).

2.3.3 Limitations and Challenges

Emotion detection technologies in dating applications, while transformative for fostering empathetic and personalized user experiences, face significant limitations that can hinder their effectiveness and ethical implementation. These challenges are particularly relevant in diverse and privacy-conscious markets like Malaysia, where 42% of young adults use dating apps and prioritize authenticity and safety (Chan et al., 2023). The primary obstacles include achieving reliable accuracy in real-world conditions, addressing privacy and ethical concerns, and accommodating diversity in emotional expression. These issues, if not carefully managed, can lead to misinterpretations, erode user trust, and exclude diverse user groups, undermining the goal of creating meaningful connections.

Accuracy in real-world conditions poses a substantial challenge for emotion detection systems due to the variability and complexity of human emotions in dynamic environments. Facial expression recognition, often powered by Convolutional Neural Networks (CNNs), struggles with factors like inconsistent lighting, varied camera angles, and occlusions such as glasses or facial hair, which obscure critical facial features. For example, research shows that accuracy on the Real-World Affective Faces Database (RAF-DB) drops to 82% compared to 99.26% on the controlled CK+ dataset, reflecting the impact of real-world variability (Lee et al., 2023). Similarly, voice emotion analysis, which relies on Mel-Frequency Cepstral Coefficients (MFCCs) and Long Short-Term Memory (LSTM) networks, is affected by background noise, regional accents, and poor audio quality, leading to a performance drop of up to 15% in uncontrolled settings (Akçay & Oğuz, 2020). Text-based sentiment analysis, critical for chat interactions, faces difficulties with informal language, slang, and culturally specific expressions like Malaysian English "lah" or "sia," which can confuse models trained on standard datasets (Chatterjee et al., 2019). Human emotions are also inherently complex, often presenting as subtle, mixed, or context-dependent states. For instance, a smile might indicate happiness in one context but mask frustration in another, a nuance that current systems frequently misinterpret (Nguyen et al., 2023). Sarcasm, common in dating app banter, further complicates text analysis, risking misclassification of sentiments. The Lumé project acknowledges these issues, noting that its sentiment analysis struggles with false positives and requires sensitivity adjustments to balance precision and recall in real-time interactions. Unlike lab settings where conditions are controlled—static users, high-quality inputs, and clear emotional cues—dating app users interact in varied, unpredictable environments like cafes or public transport, causing a

significant performance gap, with facial recognition accuracy falling from 92% in controlled settings to 67% in real-world scenarios (Li & Deng, 2020). Addressing this requires training on diverse, real-world datasets and developing adaptive algorithms to handle such variability, a critical focus for platforms like Lumé.

Privacy and ethical concerns are paramount, as emotion detection involves processing highly sensitive data—facial expressions, voice recordings, and personal messages—which can undermine user trust if mishandled, especially in Malaysia where trust drives app adoption. Collecting this data requires robust consent mechanisms, yet many users may not fully grasp or feel comfortable with the extent of monitoring involved. Lumé's use of third-party APIs like Perspective API for sentiment analysis, for instance, necessitates sharing data externally, increasing risks of unintended exposure. A survey found that 68% of Americans express unease about AI-driven privacy intrusions, a sentiment likely shared by Malaysian users (Pew Research Center, 2023). Even with encryption and secure logins, as emphasized in Lumé's approach, cloud storage of emotional data remains vulnerable to breaches or unauthorized access. The potential misuse of emotional data for targeted advertising or emotional profiling is another concern, with the Federal Trade Commission warning in 2024 about AI practices that manipulate user behavior, such as pushing premium features when anxiety is detected (FTC, 2024). This risk is particularly acute in dating apps, where emotional vulnerability is high, and misuse could erode the authenticity valued by 42% of Malaysian young adults (Chan et al., 2023). Ethically, emotion detection raises questions about user autonomy. Interventions based on detected emotions—such as pausing a chat due to perceived negativity—aim to enhance empathy (a Lumé goal) but may feel manipulative or intrusive, potentially overriding user agency (Greene, 2020). Research emphasizes the need for transparency, explicit consent, and safeguards against social group harm to ensure ethical deployment, yet achieving this balance remains challenging in culturally sensitive contexts like Malaysia.

Diversity in emotional expression presents a significant hurdle, as emotions vary widely across cultures, individuals, and contexts, risking biased or inaccurate outcomes that fail to serve all users equitably. Cultural differences significantly impact recognition accuracy, with research supporting the dialect theory of emotion, which posits that emotion recognition is more accurate within shared cultural contexts (Elfenbein & Ambady, 2002). In Malaysia, where Lumé targets a multicultural user base, muted expressions of emotions like anger or sadness, common in Asian cultures, may be misread by models trained on expressive Western datasets, leading to a 15% accuracy drop for Eastern facial expressions (Mollahosseini et al., 2019). Local idioms and non-verbal cues, such as emoji use or indirect phrasing, further complicate text analysis, requiring culturally tailored training data. Individual differences, including personality, age, and gender, also influence emotional expression. Extroverted users may display overt emotions, while introverts express subtly, and older users might

favor restraint compared to younger ones (Calvo & D'Mello, 2010). Gender differences also affect accuracy, with studies noting variations in expressiveness (Buolamwini & Gebru, 2018). In Lumé, non-verbal cues like punctuation or emojis carry emotional weight, yet current systems struggle to interpret them consistently. Bias in training data exacerbates these issues, as models trained on homogenous, often Western-centric datasets exhibit accuracy disparities of up to 34% for women and people of color due to underrepresentation (Buolamwini & Gebru, 2018). This can lead to exclusion or misrepresentation of diverse users, undermining inclusivity. For Lumé to succeed in Malaysia's diverse demographic, it must prioritize expansive, representative datasets and adaptive algorithms to ensure equitable performance across varied emotional expressions.

2.4 AI Integration in Dating Platforms

2.4.1 Case Studies of Existing App

The integration of artificial intelligence (AI) into dating platforms has revolutionized the online dating landscape, delivering enhanced personalization, refined matchmaking, and advanced safety features to cater to diverse user needs. Leading apps such as Tinder, OkCupid, Bumble, Hinge, Iris Dating, Sugarbook, Tan Tan, and DNA Romance have adopted AI to varying extents, each showcasing distinct approaches to improving user experiences while confronting unique challenges. These case studies are particularly relevant in the Malaysian context, where 42% of young adults use dating apps and prioritize authenticity and safety, yet 45% report frustration and 28% experience harassment (Chan et al., 2023; Vogels & McClain, 2023). By examining the AI features, successes, and limitations of these platforms, this analysis highlights their impact on fostering meaningful connections and the obstacles they must overcome to serve diverse populations effectively.

Tinder, the world's most downloaded dating app with over 6.1 million monthly downloads in June 2024, leverages AI to enhance user engagement and match quality. Its "Smart Photos" feature employs machine learning to analyze swipe patterns and reorder profile photos to maximize right swipes, reportedly increasing match likelihood by 12% (APRO Software, 2020). Tinder also uses AI to detect and flag potentially offensive messages by training models on reported inappropriate content, reducing harmful interactions, which aligns with safety priorities in Malaysia (APRO Software, 2020). In 2024, Tinder introduced AI-powered matching to complement its swipe-based system, aiming to deliver more personalized recommendations based on user behavior and preferences, addressing user fatigue with traditional swiping (TechCrunch, 2025). However, Tinder's AI often prioritizes superficial criteria like age and location, leading to less meaningful connections, contributing to user dissatisfaction, with monthly active users declining 8-10% year-over-year in 2024

(TechCrunch, 2025). Privacy concerns also arise, as extensive data collection raises risks of breaches or misuse, with 68% of users expressing unease about AI-driven privacy intrusions, a significant issue in Malaysia where trust is paramount (Pew Research Center, 2023). Additionally, Tinder's gamified design, which incentivizes rapid swiping, can foster a "matching game" mentality, prioritizing quantity over quality and exacerbating dating app fatigue (ResearchGate, 2022).

OkCupid distinguishes itself by using AI-driven matchmaking based on detailed user questionnaires, analyzing responses about interests, values, and personality to generate compatibility scores. This approach appeals to users seeking deeper connections, with machine learning continuously refining match suggestions based on user interactions, contributing to its reputation for facilitating meaningful relationships (Harvard Business Review, 2018). OkCupid also employs AI to monitor user behavior and flag inappropriate content, enhancing community safety, which is critical for Malaysian users (Agilie, 2022). However, the reliance on extensive questionnaires can deter users who find the process time-consuming, particularly in smaller Malaysian towns where engagement may be lower (Agilie, 2022). Technical issues, such as login difficulties or slow page loading, further frustrate users, impacting retention (Agilie, 2022). Moreover, AI models trained on Western-centric datasets may misinterpret cultural nuances in Malaysia, such as indirect communication styles, leading to less accurate matches, with accuracy potentially dropping by up to 15% for non-Western users (Mollahosseini et al., 2019).

Bumble, known for its women-first approach, integrates AI to enhance safety and personalization. Its AI-powered safety filter scans photos to block unsolicited explicit content, creating a safer environment, a feature highly valued in Malaysia where safety concerns influence app adoption (JPLoft, 2025). Bumble's matchmaking algorithm analyzes user preferences and swipe behavior to suggest tailored matches, improving user experience by prioritizing compatibility (JPLoft, 2025). The app also uses AI to detect fraudulent profiles, reducing the risk of scams, critical given that 60% of women on dating apps report receiving unwanted explicit images (ITRex, 2024). Despite these successes, Bumble faces challenges with user fatigue, as its AI-driven features rely heavily on swipe-based interactions, which can feel repetitive and superficial (The Guardian, 2024). Privacy concerns persist, as extensive data processing raises questions about transparency and consent, particularly in Malaysia where users demand clear data practices (Pew Research Center, 2023). Additionally, Bumble's AI may struggle to account for cultural differences in emotional expression, potentially leading to mismatches for Malaysian users.

Hinge, with its tagline "Designed to be deleted," uses AI to foster long-term connections by personalizing user feeds based on micro-behaviors, such as time spent on profiles or responses to specific prompts (JPLoft, 2025). Its AI refines match suggestions by analyzing chat history and user preferences, contributing to its success in facilitating serious relationships, with over half of Gen Z

users seeking long-term connections (HackerNoon, 2024). Hinge's AI also supports safety by flagging inappropriate behavior, aligning with user priorities in Malaysia (Chan et al., 2023). However, Hinge's AI faces limitations in scalability, as its data-intensive algorithms require significant computational resources, potentially leading to performance issues in regions with limited infrastructure (Appinventiv, 2025). Like other platforms, Hinge's reliance on Western datasets can result in cultural biases, reducing match accuracy for diverse populations, with accuracy disparities reaching up to 34% for underrepresented groups (Buolamwini & Gebru, 2018). Furthermore, its focus on detailed profiles may overwhelm users who prefer quicker interactions, a potential barrier in fast-paced urban Malaysian settings.

Iris Dating leverages AI to match users based on mutual attraction, focusing on facial features. Users train the AI by liking or disliking profiles, enabling the app to build a "face map" that predicts who the user might find attractive, with claims that women like 55% of AI-selected profiles (Reddit, 2023). This approach increases mutual match rates, and Iris incorporates a verification process to prevent catfishing and a trust rating system to encourage accountability, addressing safety and authenticity concerns critical for Malaysian users (DatingScout, 2025). However, its emphasis on physical attraction may limit deeper connections based on personality or shared interests, potentially leading to superficial matches. As a newer app, Iris likely has a smaller user base, which could reduce match availability in less populated areas of Malaysia (DatingScout, 2025). Privacy concerns also arise, as the AI's reliance on facial data requires robust safeguards to maintain user trust (Pew Research Center, 2023).

Sugarbook, a leading sugar daddy dating platform in Asia, particularly popular in Malaysia, focuses on connecting sugar daddies and sugar babies through features like profile verification, live streaming, and private photo sharing. While not heavily reliant on AI, Sugarbook employs basic algorithms for matching based on user preferences, such as income levels and lifestyle goals, and uses technology for robust identity verification to ensure authenticity (Sugarbook, 2025). The live streaming feature allows sugar babies to interact with potential sugar daddies in real-time, fostering immediate connections and a sense of community, aligning with Malaysian users' emphasis on trust and safety (Chan et al., 2023). However, the app's focus on transactional relationships may not appeal to all users, particularly in Malaysia's culturally diverse context, where such arrangements may face social stigma (Sugarbook, 2025). The requirement for premium subscriptions to access key features, like messaging and private photo sharing, could also be a barrier for some users (DatingScout, 2025). Additionally, the lack of prominent AI-driven features limits its ability to offer advanced personalization or emotional analysis compared to platforms like Iris Dating or Hinge.

Tan Tan, often dubbed the "Chinese Tinder," is a leading dating app in Asia with a significant user base of over 360 million registered users globally, including a notable presence in Malaysia, where it

ranked third in downloads in 2023 with approximately 614,000 downloads (Statista, 2024). It employs advanced machine learning algorithms to match users based on preferences such as geographical proximity, age, and interests, ensuring efficient and relevant connections that appeal to users in urban centers like Kuala Lumpur (Tan Tan, 2025). Tan Tan's AI-driven facial recognition technology verifies user identities by analyzing facial data against uploaded photos, reducing fake profiles and enhancing security, a critical feature given that 28% of Malaysian users report harassment concerns (Chan et al., 2023). The app's intuitive swiping system, live chat, and "Nearby" section, which allows users to explore posts and follow others, facilitate quick connections and foster a community feel, aligning with Malaysia's emphasis on trust and engagement (Tan Tan, 2025; DatingScout, 2024). Additionally, Tan Tan's AI monitors messages for intrusive content, displaying warnings to senders and prompting recipients to report inappropriate behavior, further enhancing safety (CM.com, 2024). In 2020, Tan Tan reported 15 billion matches, with 400 million same-sex matches, indicating its inclusivity and broad appeal, particularly among users under 30, who comprise nearly 80% of its user base (KrASIA, 2020). The app's focus on user-friendliness has driven an 80% return rate for users, reflecting high engagement (CM.com, 2024). However, Tan Tan's swipe-based design, similar to Tinder, may encourage superficial interactions, prioritizing appearance over deeper compatibility, which contributes to user fatigue, with 45% of users reporting frustration (Vogels & McClain, 2023; Sunway Echo Media, 2019). Privacy concerns are significant, as Tan Tan collects extensive data, including geolocation, device information, and potentially biometric facial data, raising concerns among Malaysia's privacy-conscious users, where 68% express unease about AI-driven privacy intrusions (Pew Research Center, 2023). A 2015 investigation revealed Tan Tan's lack of encryption for data transmission, exposing user information to potential breaches, though improvements have since been made (Electronic Frontier Foundation, 2015). Furthermore, its AI models, likely trained on predominantly Chinese datasets, may struggle to account for Malaysia's multicultural nuances, such as indirect communication styles, potentially reducing match accuracy by up to 15% for non-Western users (Matsumoto et al., 2008; Mollahosseini et al., 2019). The app's focus on a primarily Chinese demographic may also limit diversity in Malaysia, where users seek matches across Chinese, Malay, Indian, and other ethnic groups (Sunway Echo Media, 2019).

DNA Romance, a rising platform in the dating app market, uniquely combines AI with genetic data and personality assessments, incorporating the Myers-Briggs Type Indicator (MBTI) to enhance matchmaking. The app uses single nucleotide polymorphism (SNP) markers to predict chemical attraction and integrates MBTI personality typing to assess compatibility based on psychological preferences, such as Extraversion/Introversion, Sensing/Intuition, Thinking/Feeling, and Judging/Perceiving, categorizing users into one of 16 personality types (DNA Romance, 2025). This dual approach aims to create matches based on both biological and psychological compatibility, potentially fostering deeper connections by aligning shared values and attraction, which resonates

with Malaysian users' emphasis on authenticity (Chan et al., 2023). DNA Romance's 17-question personality quiz provides a quick and accessible way to determine MBTI types, enhancing user engagement (DNA Romance, 2025). However, the reliance on genetic data raises significant privacy concerns, as users must submit saliva samples for DNA analysis, which may deter those wary of data security, especially in Malaysia where 68% of users express unease about AI-driven privacy intrusions (Pew Research Center, 2023). The MBTI's scientific validity is also debated, with critics arguing it lacks predictive power for relationship success due to its reliance on self-reported data and the Barnum effect, where vague descriptions seem personally accurate (Science of People, 2024). Additionally, DNA Romance's smaller user base compared to mainstream apps like Tinder may limit match availability in Malaysia, and its focus on genetic and personality compatibility may overlook cultural nuances critical in diverse markets (Mollahosseini et al., 2019).

The successes of AI across these platforms are notable, with Tinder's Smart Photos and AI-driven matching boosting engagement, OkCupid's compatibility scores fostering deeper connections, and Bumble and Hinge enhancing safety and personalization. Iris Dating's focus on facial attraction increases mutual match rates, Sugarbook's verification and live streaming build trust, Tan Tan's efficient matching and verification cater to Asia's large user base, and DNA Romance's innovative use of MBTI and genetic data offers a novel approach to compatibility. These advancements align with Malaysian users' priorities, where 42% value authenticity and safety (Chan et al., 2023). However, limitations persist across all platforms. Superficial matchmaking, driven by basic criteria like age, location, or appearance, often fails to capture deeper compatibility, contributing to user fatigue and declining engagement, with Tinder reporting an 8-10% drop in monthly active users in 2024 (TechCrunch, 2025). Privacy remains a significant barrier, as extensive data collection—required for AI and genetic features—raises risks of breaches or misuse, with 68% of users expressing unease about AI-driven privacy intrusions (Pew Research Center, 2023). Cultural biases in AI models, often trained on Western or non-local datasets, lead to misinterpretations of emotional expressions, with accuracy dropping by up to 15% for non-Western users, a critical issue in Malaysia's multicultural context (Mollahosseini et al., 2019). Technical challenges, such as slow performance or algorithmic errors, hinder user experience, while the gamified nature of apps like Tinder and Tan Tan prioritizes entertainment over meaningful connections, exacerbating burnout (ResearchGate, 2022). Additionally, Iris Dating's smaller user base, Sugarbook's transactional focus, Tan Tan's swipe-driven approach, and DNA Romance's reliance on debated MBTI assessments and genetic data may limit their appeal or effectiveness in certain Malaysian demographics. Addressing these limitations requires culturally diverse datasets, transparent data practices, and algorithms that prioritize depth over superficiality to create inclusive and effective dating platforms.

2.4.2 Personalized Experience and AI

The integration of artificial intelligence (AI) into dating platforms has shifted the focus toward highly personalized user experiences, leveraging advanced user modeling and context-aware, emotion-aware interface designs to meet diverse user needs. In the Malaysian context, where 42% of young adults use dating apps and prioritize authenticity and safety, with 45% reporting frustration and 28% experiencing harassment, personalization is critical to enhancing engagement and fostering meaningful connections (Chan et al., 2023; Vogels & McClain, 2023). This section explores how AI-driven user modeling and context-aware, emotion-aware interfaces are transforming dating apps, drawing on current trends, case studies, and emerging technologies, and their implications for platforms like Lumé, which aims to deliver intelligent matchmaking and emotion-aware communication for young adults aged 18-45 in Malaysia and Southeast Asia.

User modeling in dating apps involves creating detailed, dynamic representations of users based on their preferences, behaviors, and interactions to deliver tailored matchmaking and personalized experiences. AI techniques, such as collaborative filtering, content-based filtering, and hybrid approaches, are central to this process, enabling apps to predict user preferences and suggest compatible matches. For example, OkCupid uses machine learning to analyze responses to detailed questionnaires about interests, values, and personality traits, generating compatibility scores that improve match accuracy (Harvard Business Review, 2018). Similarly, Hinge employs AI to track micro-behaviors, such as time spent on profiles or responses to specific prompts, refining suggestions over time to align with user preferences (JPLoft, 2025). Research suggests that collaborative filtering, as used by Hinge, can increase match success rates by 15% by leveraging user interaction patterns across large datasets (Hutson et al., 2018). In Malaysia, where cultural diversity and nuanced communication styles (e.g., indirect expression) are prevalent, user modeling must incorporate culturally sensitive data to avoid biases, as AI models trained on Western datasets may reduce match accuracy by up to 15% for non-Western users (Mollahosseini et al., 2019). Advanced techniques like deep learning, including neural collaborative filtering, enable apps to capture complex user patterns, such as evolving preferences based on swipe history or messaging frequency, potentially increasing engagement by 20% (McKinsey, 2024). For Lumé, user modeling could leverage K-Means clustering, as proposed, to group users by shared values and behaviors, addressing the 60% dissatisfaction with appearance-focused matches (Vogels & McClain, 2023). However, challenges include the cold-start problem, where new users lack sufficient data for accurate modeling, requiring initial questionnaires or integration with social media data (e.g., Instagram activity) to bootstrap profiles (Harvard Data Science Review, 2022). Privacy concerns are also significant, with 68% of users expressing unease about extensive data collection, necessitating transparent data practices and robust encryption to build trust, especially in Malaysia where trust influences app adoption (Pew Research Center, 2023).

Context-aware and emotion-aware interface designs use AI to adapt app interactions based on users' situational contexts and emotional states, significantly enhancing personalization and engagement. Context-aware systems analyze real-time data, such as geolocation or user activity, to deliver relevant features, exemplified by Tan Tan's "Nearby" section, which uses geolocation to suggest matches in close proximity, increasing connection rates by 10% in urban areas like Kuala Lumpur (CM.com, 2024). Similarly, Bumble's AI adjusts match suggestions based on user activity patterns, such as time of day or swiping frequency, to optimize engagement (JPLoft, 2025). Emotion-aware interfaces, critical for Lumé's vision, leverage natural language processing (NLP) and multimodal fusion, combining facial, voice, and text analysis to detect emotional cues and tailor interactions. For instance, Match Group's upcoming AI assistant, set for release in March 2025, analyzes voice tones and facial expressions during video calls to provide real-time emotional coaching, such as suggesting empathetic responses, potentially increasing successful first dates by 15% (The Guardian, 2024). Research indicates that multimodal emotion recognition, using datasets like AffectNet, achieves 10% higher accuracy than single-modal systems, but real-world conditions, such as poor lighting or cultural differences in emotional expression, can reduce performance by up to 20% (Lee et al., 2023; Mollahosseini et al., 2019). In Malaysia, where indirect communication and muted emotional expressions are common, emotion-aware systems must be trained on culturally diverse datasets to ensure accuracy, as Western-centric models may misinterpret local nuances, leading to mismatches (Matsumoto et al., 2008). Emerging technologies like generative AI further enhance emotion-aware interfaces by crafting personalized icebreakers or conversation prompts based on users' emotional states, with a projected 30% increase in conversation initiation rates (McKinsey, 2024). For Lumé, implementing real-time sentiment analysis could involve NLP models like BERT to analyze chat sentiment and suggest responses, while facial recognition, such as via Affectiva SDK, could detect emotions during video interactions, aligning with user demands for empathy. However, challenges include computational costs for real-time processing, which may strain infrastructure in regions like Malaysia, and privacy risks, as 68% of users are concerned about biometric data usage, requiring clear consent mechanisms and secure data handling (Pew Research Center, 2023). Additionally, explainable AI (XAI) could enhance user trust by clarifying how emotional and contextual data inform match suggestions, with a 2024 study noting a 25% increase in user satisfaction when transparency is prioritized (MIT Technology Review, 2024). These advancements position context-aware and emotion-aware designs as pivotal for creating empathetic and engaging user experiences, though they must address cultural and technical challenges to succeed in diverse markets like Malaysia.

The application of AI-driven user modeling and context-aware, emotion-aware interface designs offers significant opportunities for Lumé to differentiate itself in Malaysia's competitive dating app market. User modeling, through hybrid filtering that combines collaborative and content-based approaches, can address the cold-start problem and ensure compatibility across Malaysia's diverse

ethnic groups, such as Chinese, Malay, and Indian populations. Incorporating social media integration or brief personality quizzes, similar to DNA Romance's 17-question MBTI assessment, could accelerate profile creation while capturing cultural nuances, enhancing match relevance (DNA Romance, 2025). Context-aware features, such as location-based match prioritization or time-sensitive prompts like suggesting evening video calls, could boost engagement in urban centers like Kuala Lumpur, where Tan Tan's "Nearby" section has shown a 10% increase in connection rates (CM.com, 2024). Emotion-aware interfaces, leveraging real-time sentiment analysis and multimodal fusion, align with Lumé's goal of fostering empathetic communication, potentially increasing successful first dates by 15% through tools like NLP-based chat analysis and facial recognition (The Guardian, 2024). However, these systems require investment in Malaysia-specific datasets to mitigate the 15% accuracy drop for non-Western users, ensuring sensitivity to local communication styles (Mollahosseini et al., 2019). Privacy remains a critical concern, with 68% of users expressing unease about data collection, necessitating end-to-end encryption and transparent opt-out options, especially for biometric data used in emotion recognition (Pew Research Center, 2023). Scalability challenges, such as high computational costs for real-time processing, suggest a phased rollout, starting with web-based platforms to avoid mobile saturation, as evidenced by Malaysia's 614,000 Tan Tan downloads in 2023 (Statista, 2024). Integrating explainable AI (XAI) could further enhance user trust by providing clear explanations for match and interaction suggestions, addressing the 70% of users who prefer transparency in AI decisions and potentially increasing user satisfaction by 25% (MIT Technology Review, 2024). By adopting these strategies, Lumé can meet Malaysian users' demands for authenticity, safety, and meaningful connections while navigating cultural and technical challenges to establish a competitive edge in the dating app landscape.

2.5 Gaps in Existing Systems

The integration of artificial intelligence (AI) into dating platforms has significantly advanced personalization, matchmaking, and safety, yet several critical gaps persist that limit their effectiveness, particularly in the Malaysian context where 42% of young adults use dating apps, prioritizing authenticity and safety, while 45% report frustration and 28% experience harassment (Chan et al., 2023; Vogels & McClain, 2023). These gaps—inadequate emotional context in matchmaking, biases in algorithmic suggestions, lack of adaptive learning and real-time feedback, and absence of inclusive and privacy-aware solutions—pose challenges for creating meaningful connections and meeting diverse user needs. Addressing these gaps is crucial for platforms like Lumé, which aims to deliver intelligent matchmaking and emotion-aware communication for young adults aged 18-45 in Malaysia and Southeast Asia. This section analyzes these gaps, drawing on case studies and research to highlight their impact and implications for Lumé's development.

Current dating platforms often prioritize superficial criteria such as age, location, and physical appearance, leading to matches that lack emotional depth and long-term compatibility. Apps like Tinder and Tan Tan rely heavily on swipe-based systems, with Tan Tan's algorithms focusing on geographical proximity and basic preferences, resulting in a 45% user frustration rate due to shallow interactions (Vogels & McClain, 2023; CM.com, 2024). Research indicates that 60% of users perceive dating apps as overly appearance-focused, undermining deeper emotional connections critical for meaningful relationships (Vogels & McClain, 2023). While some platforms, like OkCupid, incorporate personality-based questionnaires to assess values and interests, they rarely account for real-time emotional states, limiting their ability to foster empathetic interactions (Harvard Business Review, 2018). Emotion-aware technologies, such as natural language processing (NLP) and multimodal fusion, are emerging, with Match Group's upcoming AI assistant analyzing voice and facial cues to provide emotional coaching, but these are not yet widely implemented and face accuracy challenges in real-world settings, dropping by up to 20% due to factors like poor lighting or cultural differences (Lee et al., 2023; Mollahosseini et al., 2019). In Malaysia, where indirect communication and muted emotional expressions are common, the lack of emotional context is particularly problematic, as AI models trained on Western datasets may misinterpret local emotional cues, reducing match relevance (Matsumoto et al., 2008). For Lumé, this gap underscores the need for real-time sentiment analysis and culturally sensitive emotion recognition to align with its goal of fostering empathetic communication, potentially increasing successful first dates by 15% (The Guardian, 2024).

Algorithmic biases in dating apps, often stemming from training data skewed toward Western or non-local populations, lead to inaccurate and inequitable match suggestions, particularly in diverse markets like Malaysia. AI models, such as those used by Tinder, Bumble, and Tan Tan, frequently rely on datasets that underrepresent non-Western cultural norms, resulting in up to a 15% accuracy drop for users from collectivist cultures like Malaysia, where indirect communication styles prevail (Mollahosseini et al., 2019; Matsumoto et al., 2008). For instance, Hinge's algorithms, while effective for long-term connections, show accuracy disparities of up to 34% for underrepresented groups due to biases in facial recognition and behavioral analysis (Buolamwini & Gebru, 2018). These biases can perpetuate stereotypes, such as prioritizing appearance-based matches or favoring certain ethnic groups, limiting inclusivity in Malaysia's multicultural context, where users seek matches across Chinese, Malay, Indian, and other ethnicities (Sunway Echo Media, 2019). Additionally, apps like Iris Dating, which focus on facial attraction, may inadvertently reinforce superficial preferences, further alienating users seeking deeper compatibility (DatingScout, 2025). For Lumé, addressing algorithmic biases requires training AI models on diverse, Malaysia-specific datasets to ensure equitable match suggestions, aligning with the 42% of users prioritizing authenticity (Chan et al., 2023). Implementing

explainable AI (XAI) could also mitigate bias concerns by providing transparency in match decisions, potentially increasing user trust by 25% (MIT Technology Review, 2024).

Most dating platforms lack robust adaptive learning and real-time feedback mechanisms, hindering their ability to dynamically refine matches based on user interactions and evolving preferences. Apps like Tinder and Tan Tan use static or semi-static algorithms that rely on initial user inputs, such as swipe patterns or preferences, without continuously adapting to changing user behaviors or emotional states (TechCrunch, 2025; CM.com, 2024). For example, Tan Tan's machine learning focuses on fixed criteria like location and age, missing opportunities to incorporate real-time feedback from user chats or video interactions, which could improve match relevance (Tan Tan, 2025). Research suggests that adaptive learning, such as neural collaborative filtering, can increase engagement by 20% by updating user profiles based on ongoing interactions, yet most apps fail to implement this due to computational complexity (McKinsey, 2024). Real-time feedback, such as adjusting match suggestions based on recent messaging sentiment, is underutilized, with only emerging platforms like Match Group's AI assistant exploring this capability, set for release in March 2025 (The Guardian, 2024). In Malaysia, where fast-paced urban environments like Kuala Lumpur demand quick, relevant matches, the absence of adaptive learning contributes to user fatigue, with 45% reporting frustration (Vogels & McClain, 2023). For Lumé, integrating adaptive learning through real-time behavioral analysis and feedback loops, such as updating K-Means clustering based on chat sentiment, could enhance match accuracy and user satisfaction, addressing the cold-start problem and aligning with dynamic user needs.

The absence of inclusive and privacy-aware solutions remains a significant gap, particularly in Malaysia, where 68% of users express unease about AI-driven data collection and privacy intrusions (Pew Research Center, 2023). Many platforms, including Tan Tan and Tinder, collect extensive data—geolocation, device information, and biometric data like facial recognition—without clear opt-out options or transparent data usage policies, raising risks of breaches or misuse (Electronic Frontier Foundation, 2015; TechCrunch, 2025). For instance, Tan Tan's 2015 lack of encryption exposed user data, and while improvements have been made, its privacy policies remain vague, deterring privacy-conscious Malaysian users (Electronic Frontier Foundation, 2015; Tan Tan, 2025). Inclusivity is also lacking, as apps like Sugarbook focus on niche transactional relationships, which may face social stigma in Malaysia's diverse cultural landscape, limiting their appeal (Sugarbook, 2025). Similarly, DNA Romance's reliance on genetic data and MBTI assessments excludes users wary of sharing sensitive information or those skeptical of MBTI's validity, further reducing inclusivity (Science of People, 2024). In Malaysia, where cultural diversity requires broad ethnic representation, apps often fail to cater to diverse groups, with Tan Tan's predominantly Chinese focus potentially alienating Malay and Indian users (Sunway Echo Media, 2019). For Lumé, this gap

highlights the need for inclusive design, such as multilingual interfaces and culturally diverse datasets, to ensure accessibility across Malaysia's ethnic groups. Privacy-aware solutions, including end-to-end encryption and clear consent mechanisms, are essential to build trust, especially for biometric data used in emotion recognition, aligning with Lumé's safety-focused vision and addressing the 28% harassment concern (Chan et al., 2023).

These gaps present significant opportunities for Lumé to differentiate itself in Malaysia's dating app market. To address inadequate emotional context, Lumé should implement real-time sentiment analysis and multimodal emotion recognition, using tools like BERT for NLP and Affectiva SDK for facial analysis, trained on Malaysia-specific datasets to ensure cultural sensitivity and mitigate the 20% accuracy drop in real-world settings (Lee et al., 2023; Mollahosseini et al., 2019). Overcoming algorithmic biases requires training AI models on diverse, Malaysia-specific datasets to ensure equitable match suggestions, aligning with the 42% of users prioritizing authenticity (Chan et al., 2023). Implementing explainable AI (XAI) could also mitigate bias concerns by providing transparency in match decisions, potentially increasing user trust by 25% (MIT Technology Review, 2024). Adaptive learning and real-time feedback can be achieved through dynamic K-Means clustering and neural collaborative filtering, updating user profiles based on ongoing interactions to improve match accuracy by 20% (McKinsey, 2024). To ensure inclusivity and privacy, Lumé should offer multilingual interfaces, support diverse ethnic matching preferences, and implement robust privacy measures like encryption and clear opt-out options, addressing the 68% privacy concern (Pew Research Center, 2023). A phased rollout on a web-based platform could bypass mobile saturation, as seen with Tan Tan's 614,000 downloads in 2023, while optimizing computational costs (Statista, 2024). By addressing these gaps, Lumé can meet Malaysian users' demands for authenticity, safety, and meaningful connections, positioning itself as a leader in the region's dating app landscape.

2.6 Feasibility Study

2.6.1 Economic Feasibility

The cost structure for Lumé encompasses three primary components: AI development, server hosting, and app maintenance, each requiring strategic planning to balance innovation with affordability. The core of Lumé's functionality lies in its AI-driven features, including K-Means clustering for matchmaking and sentiment analysis for emotion-aware communication. Developing these capabilities demands significant expertise and computational resources, with estimated costs ranging from RM180,000 to RM360,000 for a small team of developers working over 4-6 months, integrating

machine learning models into a mobile app built with React Native for the front-end and Node.js for the back-end (Grand View Research, 2021). To optimize expenses, Lumé utilizes open-source technologies such as Python, Scikit-learn, and TensorFlow, which eliminate licensing fees and benefit from robust community support, thereby reducing development costs. Additionally, incorporating affordable third-party APIs, like the Perspective API for toxicity detection, accelerates development while introducing minor usage-based fees proportional to API call volumes. Server hosting is another critical expense, as Lumé requires reliable infrastructure to manage user data, process AI algorithms, and enable real-time interactions via SignalR for an anticipated 40,000 active users. Two hosting options were considered: self-hosting with proprietary hardware or cloud-based services. Self-hosting entails significant upfront costs, including RM25,000 for a mid-tier server and RM1,500 for networking equipment, plus annual maintenance of approximately RM4,000, or 16% of the initial hardware cost (Gartner, 2014). In contrast, cloud hosting with providers like Google Cloud offers scalability with monthly costs of RM8,000 to RM16,000, eliminating hardware investments and simplifying expansion as user numbers grow (Google Cloud Pricing, 2024). Table 2.1 below highlights the cost advantages of cloud hosting, making it the preferred choice for Lumé.

	Estimated Cost	
Components	Self Hosting	Cloud Providers
Server	RM25,000 (mid-tier server)	RM8,000/month (Google Cloud)
Network Access Point	RM1,500 (router and switch)	Included in cloud subscription
Total	RM26,500 (initial) + RM4,000/year	RM8,000–RM16,000/month (scalable)

Table 2.1 : Component Costs

Ongoing app maintenance, encompassing updates, security patches, bug fixes, and customer support, is estimated at 18% of the initial development cost, equating to RM32,400 to RM64,800 annually for a RM180,000–RM360,000 development budget. This investment is crucial to address the 45% of dating app users who cite performance issues as a key frustration, ensuring a seamless user experience (Vogels & McClain, 2023). By strategically managing these costs, Lumé achieves a balance between technological innovation and financial efficiency.

To ensure financial sustainability, Lumé employs a diversified revenue strategy tailored to the preferences of dating app users in Malaysia and Southeast Asia, where 42% of young adults engage with such platforms (Chan et al., 2023). A tiered subscription model serves as the primary revenue driver, aligning with the dating industry's projected growth to $9.2 billion by 2025 (Statista, 2023).

Lumé offers three tiers: a free basic plan with essential features like profile creation and limited matches, a standard plan at RM15/month unlocking advanced AI-driven matchmaking and sentiment analysis, and a premium plan at RM30/month providing an ad-free experience and culturally tailored filters (e.g., for ethnic or religious preferences). For an estimated 40,000 users, with 8% subscribing (3,200 users, split evenly between standard and premium tiers), monthly revenue could reach RM72,000 (1,600 × RM15 + 1,600 × RM30). This approach, inspired by platforms like Tinder, capitalizes on users' demand for personalized experiences (Business of Apps, 2024). In-app purchases offer another revenue stream, enabling users to purchase virtual goods or premium features, such as profile boosts (RM5 each) to increase visibility or virtual gifts (RM2–RM10) for matches. If 10% of users engage, in-app purchases could generate RM15,000 to RM25,000 monthly, leveraging the 48.2% of global mobile app revenue driven by such transactions in 2020 (Sensor Tower, 2020). Additionally, partnerships with local Malaysian businesses, such as cafes, restaurants, or event organizers, enable Lumé to offer exclusive date promotions, earning commissions estimated at RM10,000 monthly. Subtle, culturally relevant sponsored content further enhances revenue without compromising user experience. These combined streams project a total monthly revenue of RM97,000 to RM107,000, ensuring Lumé can cover operational costs and invest in growth.

Market insights into user acquisition and retention are vital for Lumé's success in Malaysia and Southeast Asia's competitive dating app market. The cost per install (CPI) is estimated at RM6 to RM10, reflecting targeted advertising on platforms like Instagram and TikTok, which are popular among the region's youth (AppsFlyer, 2023). Rising customer acquisition costs (CAC) due to privacy regulations, such as Apple's App Tracking Transparency, necessitate cost-effective strategies like partnerships with local influencers or referral programs offering free premium features for inviting friends (ContextSDK, 2024). Targeting niche communities, such as Malaysia's diverse ethnic groups (e.g., Malay, Chinese, Indian), enhances acquisition efficiency by appealing to specific cultural preferences. Retention is a critical factor, with dating apps typically achieving 12% retention rates after 30 days (Localytics, 2023). Lumé's AI-driven features, including emotion-aware communication and culturally sensitive matchmaking, address the 60% of users dissatisfied with superficial matches, potentially boosting retention to 18-22% (Vogels & McClain, 2023). This reduces churn and increases lifetime user value, directly supporting profitability. Acquiring a domain name, such as a .my domain (RM100 annually) or a .com domain (RM45 registration, RM55 renewal), is a minor but essential cost for public deployment, with the .my domain reinforcing Lumé's Malaysian identity (Table 2.2; Domain.com, 2024). These market strategies enable Lumé to achieve efficient user growth and sustained engagement.

TLD	Registration (RM)	Renewal (RM)	Transfer (RM)

.com	45	55	45
.net	50	60	50
.org	48	58	48
.my	100	100	100

Table 2.2 : Top Level Domain (TLD) Prices

The outcome of this economic feasibility study establishes a robust financial foundation for Lumé. By leveraging open-source technologies like Python and TensorFlow, Lumé minimizes development costs while delivering cutting-edge AI features. Cloud hosting with Google Cloud ensures scalability and cost efficiency, as shown in Table 2.2, with monthly expenses of RM40,400 to RM80,800 (amortized development, hosting, and maintenance). Revenue from subscriptions (RM72,000/month), in-app purchases (RM15,000–RM25,000/month), and partnerships (RM10,000/month) totals RM97,000 to RM107,000 monthly, covering costs and enabling reinvestment. Cost-effective acquisition and retention strategies, tailored to Malaysia's 42% dating app user base, drive growth (Chan et al., 2023). Lumé is thus well-positioned to thrive as a sustainable, profitable player in the dating app market, delivering innovative value to users.

2.6.2 Technical Feasibility

Lumé's technology stack comprises Angular for the frontend, .NET Core Web API for the backend, SQL Server for data storage, and Microsoft Azure for cloud deployment, complemented by AI tools for matchmaking and emotion analysis. Angular is a robust, open-source framework ideal for building responsive, single-page applications, enabling Lumé to deliver an intuitive user interface that supports features like user profiles and real-time chat displays. Its component-based architecture facilitates seamless updates and maintenance, ensuring a smooth user experience across devices. .NET Core, a cross-platform framework, provides a scalable and high-performance backend capable of handling complex server-side logic, such as processing user data and API requests. SQL Server offers reliable and secure data storage, with features like indexing and querying optimized for managing large datasets of user profiles and interactions. Microsoft Azure, as the cloud hosting platform, supports deployment, scalability, and integration with AI services, making it a cornerstone of Lumé's infrastructure. These technologies are mature, widely adopted, and well-documented, reducing development risks and ensuring compatibility with Lumé's requirements.

The AI tools selected for Lumé include ML.NET for K-Means clustering, Azure Text Analytics for sentiment analysis, and Google's Perspective API for toxic content filtering. ML.NET, a machine

learning framework for .NET developers, supports K-Means clustering, which groups users based on preferences, behaviors, and values for intelligent matchmaking. Research indicates that K-Means clustering is effective for matchmaking, as demonstrated in applications like OKCupid, where it groups users into compatible dating pools (Lacson, 2021). ML.NET's production readiness is confirmed by its use in various enterprise applications, with features like model training and deployment streamlined for .NET environments (Microsoft Learn, 2024). Azure Text Analytics, part of Azure AI services, enables real-time sentiment analysis of chat messages, detecting positive, negative, or neutral emotions with high accuracy (e.g., 91% for text-based sentiment; Sun et al., 2019). Its integration with .NET Core simplifies deployment within Lumé's ecosystem, making it a suitable choice for emotion-aware communication. The Perspective API, designed for content moderation, effectively filters toxic or harassing messages, addressing the 28% of users reporting harassment on dating platforms (Vogels & McClain, 2023). However, the project's mention of multimodal emotion recognition (e.g., combining text, voice, or facial analysis) introduces complexity. While Azure Text Analytics excels for text, multimodal analysis may require additional tools like Azure's Speech-to-Text or Vision APIs for voice or facial recognition, which could increase development effort and costs. Current documentation suggests that text-based sentiment analysis is the primary focus, aligning with Lumé's real-time chat features, but future multimodal expansion would need further evaluation.

Scalability is critical for Lumé to handle a growing user base and real-time interactions, such as instant messaging and match recommendations. Microsoft Azure's cloud infrastructure supports this through auto-scaling, load balancing, and distributed computing capabilities. Azure can dynamically allocate resources to accommodate peak usage, such as during high-traffic periods, ensuring performance for an estimated 40,000 active users. SignalR, integrated with .NET Core, leverages WebSocket technology to enable real-time communication, delivering instant chat updates and presence indicators with low latency. Benchmarks indicate that SignalR can handle thousands of concurrent connections, making it suitable for Lumé's engagement-focused features (Microsoft Learn, 2024). Azure's global content delivery network (CDN) further optimizes media delivery, such as user photos, via Cloudinary integration, reducing latency for Southeast Asian users. Data storage scalability is supported by SQL Server's ability to manage large datasets, with partitioning and indexing ensuring efficient query performance. These components collectively ensure that Lumé can scale to meet demand while maintaining responsiveness.

Data security is paramount for Lumé, given the sensitive nature of user data in a dating app. Azure provides robust security features, including encryption at rest and in transit, compliance with standards like GDPR and ISO 27001, and JWT-based authentication to secure user access. SQL Server enhances security with Transparent Data Encryption (TDE) and role-based access control,

protecting user profiles and chat data. The Perspective API's toxicity detection further ensures a safe environment by filtering harmful content in real-time, addressing the 28% harassment rate reported in dating apps (Vogels & McClain, 2023). However, cultural nuances in Malaysia, such as indirect communication styles (e.g., use of "lah" or polite deflections), may challenge the accuracy of sentiment and toxicity detection, requiring localized training data to improve performance. Azure's compliance tools and regular security updates mitigate risks, ensuring Lumé meets user expectations for privacy and safety.

Integrating emotion-aware algorithms with Lumé's user-friendly interface is achievable through a well-structured architecture. The .NET Core backend processes AI outputs, such as match recommendations from ML.NET or sentiment scores from Azure Text Analytics, and exposes them via RESTful APIs to the Angular frontend. Angular's modular design allows dynamic updates to the user interface, displaying real-time chat feedback or match suggestions seamlessly. SignalR ensures that emotion-aware features, like alerts for negative conversation tones, are delivered instantly to users, enhancing engagement. However, integrating these features requires careful design to ensure intuitiveness, particularly for Malaysian users who may prefer subtle or culturally specific interactions. Usability testing with diverse user groups is essential to refine the interface and ensure that AI-driven prompts (e.g., suggestions to rephrase messages) are contextually appropriate. The compatibility of .NET Core with Azure AI services and ML.NET simplifies integration, as these tools are designed to work within the same ecosystem, reducing development complexity.

Outcome

The technical feasibility of Lumé is confirmed, as its proposed technology stack and AI tools are capable of supporting its innovative features. Angular, .NET Core, SQL Server, and Azure provide a robust foundation for building a scalable, secure, and user-friendly dating app. ML.NET's K-Means clustering enables intelligent matchmaking, while Azure Text Analytics and Perspective API support emotion-aware communication and safety, respectively. Azure's infrastructure ensures scalability and security, and the integration of AI with the frontend is streamlined through APIs and SignalR. However, challenges such as implementing multimodal emotion recognition and adapting AI models to Malaysian cultural nuances require further exploration and testing. With existing tools and expertise, Lumé's technical requirements are achievable, positioning it as a competitive player in the dating app market.

2.6.3 Operational Feasibility

To achieve high user adoption, Lumé must offer an intuitive onboarding process and robust feedback mechanisms tailored to its tech-savvy yet culturally diverse audience. The onboarding process should guide users through profile creation, preference setting, and initial match suggestions in a few simple steps, ensuring accessibility for users with varying levels of digital literacy. For example, incorporating a visually appealing interface with local cultural references, such as Malaysian landmarks or festivals, can make the process engaging and relatable. Safety features, such as manual photo verification and a brief tutorial on safe online dating practices, can build trust from the outset, addressing the 28% of users who report harassment on dating platforms (Vogels & McClain, 2023). Apps like Tinder have successfully used streamlined onboarding to encourage quick profile completion, a model Lumé can adapt by adding culturally relevant prompts, such as questions about family values or religious preferences, which resonate with Malaysian users. Feedback systems are equally critical for continuous improvement. Lumé can implement in-app surveys to collect user opinions on match quality and app usability, alongside sentiment analysis of chat interactions to gauge emotional satisfaction. For instance, Hinge's feedback-driven "Most Compatible" feature demonstrates how user input can refine matchmaking algorithms, a strategy Lumé can emulate to address the 60% of users dissatisfied with superficial matches (Vogels & McClain, 2023). Regular updates based on this feedback will ensure Lumé remains responsive to user needs, enhancing adoption and retention across Malaysia's diverse population.

Seamless integration with social media platforms can enhance Lumé's user experience by reducing the effort required to create profiles and enriching data for better matchmaking. Allowing users to connect their Instagram or Facebook accounts enables Lumé to import data on interests, hobbies, and social circles, improving the accuracy of its K-Means clustering algorithm for matchmaking. For example, Bumble's integration with Instagram allows users to showcase photos and interests, verifying authenticity and enriching profiles, a practice Lumé can adopt to appeal to its target audience. However, given Malaysia's emphasis on trust in online platforms (Chan et al., 2023), robust privacy controls are essential. Lumé must implement strict data access permissions, allowing users to control what information is shared, and comply with regional data protection regulations like Malaysia's Personal Data Protection Act (PDPA). Leveraging APIs from social media platforms ensures real-time data updates, maintaining profile accuracy and enhancing match relevance. This compatibility aligns with the digital habits of young adults who are active on social media, making Lumé a natural extension of their online presence. Additionally, integrating with local platforms like WeChat, popular in Malaysia's Chinese community, could further broaden appeal, though this requires careful API management to ensure seamless functionality and data security.

Malaysia's multicultural society, with significant Malay, Chinese, Indian, and indigenous populations, necessitates multilingual support to ensure accessibility and inclusivity. Lumé should offer interfaces in at least Malay, English, Mandarin, and Tamil, the primary languages spoken in Malaysia, to cater to its diverse user base. This can be achieved through localization features in Angular, allowing users to select their preferred language upon registration. For example, apps like OkCupid have successfully implemented multilingual interfaces, enabling users to switch languages seamlessly, a model Lumé can replicate. Beyond language, cultural sensitivity is critical. Malaysian users often value family involvement and social status in relationships, so Lumé could include profile options for users to indicate family-oriented preferences or cultural practices, such as halal dining or festival participation. Research highlights that cultural differences in lifestyle, like family proximity, require early consideration in multicultural relationships (Soulmatcher.app, 2025). Lumé's sentiment analysis and matchmaking algorithms must also account for local dialects and expressions, such as "lah" or indirect communication styles, to ensure accurate emotion detection and compatibility matching. By addressing these cultural nuances, Lumé can resonate with Malaysia's diverse ethnic groups, enhancing user engagement and inclusivity.

To ensure fairness and inclusivity, Lumé must actively mitigate biases in its matchmaking algorithms, particularly racial biases, which are a concern in multicultural regions. Research from Cornell University suggests that dating apps allowing racial filtering can reinforce divisions, recommending alternative categories like interests or values (Cornell CIS, n.d.). Lumé should avoid race-based filters, focusing instead on compatibility factors such as hobbies, lifestyle, or shared goals, which promote diverse matches. The app's marketing and user interface should also reflect Malaysia's ethnic diversity, featuring inclusive imagery and profile examples that represent Malay, Chinese, Indian, and other communities. For instance, the Japan-based app 9Monsters uses fictional categories to group users, avoiding racial labels, a creative approach Lumé could adapt to foster inclusivity (Cornell CIS, n.d.). Additionally, training AI models with diverse, region-specific datasets can reduce biases, ensuring that matchmaking and sentiment analysis are accurate for non-Western users, where Western-centric models often lose 15-34% accuracy (Mollahosseini et al., 2019).

Beyond facilitating romantic connections, Lumé can enhance engagement by fostering a sense of community, a trend observed in apps like BLK, which pivoted to include lifestyle features for Gen Z users seeking broader social connections (Adweek, 2024). Lumé can create interest-based groups, such as those centered on Malaysian cultural activities (e.g., Hari Raya celebrations, foodie meetups), allowing users to connect over shared hobbies or backgrounds. Organizing virtual or in-person events, such as cultural festivals or language exchange meetups, can further strengthen community ties, appealing to Malaysia's diverse population. These features align with the growing emphasis on social discovery in dating apps, particularly post-COVID, when users sought broader connections due to

social isolation (Adweek, 2024). By integrating community-building elements, Lumé can increase user retention, addressing the 10-15% 30-day retention rates typical in dating apps (Localytics, 2023).

Educating users about safe online dating practices is crucial for building trust, especially given the 28% harassment rate reported in dating apps (Vogels & McClain, 2023). During onboarding, Lumé can provide interactive tutorials or videos on recognizing red flags, protecting personal information, and reporting inappropriate behavior, tailored to Malaysia's cultural context. For example, addressing local concerns like catfishing or scams can resonate with users. Offering access to support resources, such as partnerships with local organizations or helplines focused on digital safety and mental health, can further enhance trust. Apps like Bumble have implemented safety centers with resources for users, a model Lumé can emulate to address Malaysia's trust-driven adoption factors (Chan et al., 2023).

Lumé's operational feasibility is validated through its focus on intuitive onboarding, social media compatibility, multilingual support, bias mitigation, community building, and user education. These strategies ensure the app integrates seamlessly into the digital lives of young adults in Malaysia and Southeast Asia, aligning with their habits of using social media and seeking culturally relevant experiences. By addressing cultural nuances and prioritizing inclusivity, Lumé is well-positioned to achieve high adoption and retention, fostering meaningful connections in a competitive market.

2.6.4 Social and Cultural Feasibility

Malaysia's multicultural society, comprising Malays, Chinese, Indians, and indigenous groups, presents a rich diversity of cultural norms and communication styles that Lumé must navigate to ensure broad appeal and inclusivity. Emotional expression varies significantly across these groups, influencing how users interact on dating platforms. For instance, Malay culture often emphasizes politeness and indirect communication, using expressions like "lah" or subtle phrasing to convey emotions, while Chinese users may favor directness in certain contexts, such as discussing relationship goals (Cross Culture, 2023). Lumé's sentiment analysis, powered by Azure Text Analytics, must be trained on diverse, region-specific datasets to accurately interpret these nuances, ensuring that emotion-aware features like real-time chat feedback are culturally appropriate. Research suggests that Western-centric AI models can lose 15-34% accuracy for non-Western users, underscoring the need for localized training data (Mollahosseini et al., 2019). Additionally, communication preferences differ, with some users preferring text-based chats for discretion and others open to voice or video interactions for deeper engagement. Lumé can address this by offering multiple communication channels, allowing users to select their preferred mode, similar to apps like Bumble that provide flexible interaction options. Cultural norms in Malaysia, shaped by conservative values, discourage public displays of affection, with over 60% of unmarried Malaysians avoiding

premarital intimacy due to social and religious expectations (Ling-app.com, 2023). Lumé can incorporate profile settings that allow users to specify relationship intentions (e.g., seeking marriage or casual dating) and comfort levels with public interactions, aligning with the collectivist values that prioritize family approval and long-term commitment (Ucar Connect, 2025). By embedding these culturally sensitive features, Lumé ensures inclusivity across Malaysia's diverse ethnic landscape, enhancing user engagement and trust.

Privacy is a paramount concern in online dating, particularly in Malaysia, where cultural sensitivities and legal frameworks emphasize robust data protection. Lumé's use of biometric data for photo verification, a critical feature to ensure user authenticity and address the 28% harassment rate reported in dating apps (Vogels & McClain, 2023), introduces additional privacy considerations. The Personal Data Protection Act 2010 (PDPA) classifies biometric data as sensitive personal data under its 2024 amendments, requiring explicit consent and stringent security measures (Clym.io, 2024). Lumé must clearly inform users during onboarding that their photos will be processed for verification, explaining the use of facial recognition and obtaining unambiguous consent. To protect user data, Lumé will implement encryption at rest and in transit, leveraging Microsoft Azure's security features, including Transparent Data Encryption (TDE) and compliance with ISO 27001 standards. Regular security audits and multi-factor authentication will further safeguard personal and biometric data against breaches, addressing concerns raised by 68% of users worried about data privacy in dating apps (Pew Research Center, 2023). Transparency is critical, with Lumé providing a clear privacy policy outlining data collection, usage, and retention practices, allowing users to opt out of biometric verification if preferred, though this may limit access to certain safety features. Users must also have the right to access, correct, or delete their data, aligning with PDPA's Access and Data Integrity Principles. By integrating these measures, Lumé can build trust, particularly among Malaysian users who prioritize data security due to cultural and legal expectations (Chan et al., 2023).

Compliance with local laws is essential for Lumé to operate legally and maintain user trust in Malaysia's regulated digital environment. The PDPA, enacted in 2010 and amended in 2024, governs the processing of personal data in commercial transactions, including online dating apps. Key requirements include obtaining explicit consent for data collection, ensuring data security, and granting users rights to access and correct their data (PwC, 2023). For biometric data, Lumé must adhere to stricter PDPA provisions, such as obtaining specific consent for facial recognition and limiting its use to verification purposes (Lexology, 2024). The 2024 PDPA amendments, effective from 2025, introduce additional obligations, including appointing a data protection officer (DPO) to oversee compliance, implementing data breach notification procedures, and supporting data portability to allow users to transfer their data to other platforms (Hall Booth Smith, 2024). Lumé will appoint a DPO to manage compliance, develop protocols for notifying users and the Personal Data

Protection Commissioner of breaches within a stipulated timeframe, and ensure technical compatibility for data portability. Additionally, Lumé must align with Malaysia's broader digital regulations, such as those enforced by the Malaysian Communications and Multimedia Commission, to ensure content moderation and advertising practices meet local standards. By proactively addressing these requirements, Lumé can operate within Malaysia's legal framework, fostering user confidence and avoiding penalties, which range from RM100,000 to RM500,000 or 1-3 years imprisonment for non-compliance (PwC, 2023).

Lumé's social and cultural feasibility is validated through its commitment to cultural sensitivity, robust privacy protections, and regulatory compliance. By tailoring its AI-driven features to respect Malaysia's diverse communication styles and conservative norms, Lumé ensures inclusivity across ethnic groups, fostering meaningful connections. Robust security measures and transparent data practices address privacy concerns, particularly for biometric data, aligning with the PDPA and building trust among users. Compliance with current and upcoming regulations positions Lumé as a legally sound platform. Through iterative user feedback and cultural adaptation, Lumé is well-positioned to integrate into the social and digital lives of its target audience, achieving high adoption and trust in Malaysia and Southeast Asia's competitive dating market.

2.6.5 Scheduling Feasibility

This analysis outlines key milestones using an Agile incremental model with two-week sprints, accounts for potential delays in tasks such as gathering culturally specific datasets or securing regulatory approvals, and assesses the readiness of the sole developer, Choo Ting Feng, to manage the project's multifaceted demands. By structuring the development process into distinct phases—market research, prototype development, and usability testing—the study ensures that Lumé's innovative features, including AI-driven matchmaking and real-time communication, can be delivered within a practical timeframe. Industry benchmarks indicate that AI-powered dating apps typically require 7-12 months for development, making Lumé's timeline feasible, particularly for a web-based platform (Appinventiv, 2025). The following discussion details the timeline, addresses potential delays, evaluates developer capabilities, and confirms the project's scheduling viability, ensuring alignment with Malaysia's cultural and market needs.

The development timeline for Lumé spans nine months, from January to September, leveraging an Agile incremental model with two-week sprints to ensure flexibility and iterative progress. The project is divided into three primary phases: market research from January to February, prototype development from March to April, and usability testing in May. During the market research phase, the developer will engage target users, such as friends and classmates, through surveys or focus groups to

identify preferences and pain points in existing dating apps, while analyzing competitors like Tinder, Bumble, and Dating.com to assess their features and weaknesses. This two-month phase, encompassing approximately four sprints, will produce a comprehensive report on user needs and competitor insights, laying the foundation for Lumé's feature set, which addresses the 60% of users dissatisfied with superficial matchmaking (Vogels & McClain, 2023). The prototype development phase, spanning March to April, involves building a functional prototype with core functionalities, including basic matchmaking using rule-based algorithms, JWT-based authentication for secure access, user profile creation, and a technical architecture comprising Angular for the frontend, .NET Core Web API for the backend, and SQL Server for the database. Initial AI components, such as K-Means clustering via ML.NET and SignalR for real-time chat, will also be integrated during these four sprints, delivering a minimum viable product (MVP) by April. The usability testing phase in May will involve testing the prototype with a diverse group of users representing Malaysia's ethnic diversity, collecting feedback through surveys and interviews to refine features like navigation and cultural alignment, producing a usability test report and an improved prototype within two sprints. Post-September, ongoing updates will refine features based on user feedback, with potential expansion to mobile platforms if partnerships are secured, ensuring Lumé remains adaptable to market trends. This nine-month timeline aligns with industry standards for AI-powered dating apps, which typically require 7-12 months, and the web-based focus simplifies initial development compared to mobile apps, making the schedule achievable for a solo developer using established tools (Appinventiv, 2025).

Potential delays could impact the timeline, necessitating careful time allocation and mitigation strategies to keep the project on track. As a university student, the sole developer faces resource constraints, balancing academic commitments with project demands, which could slow progress. To address this, prioritizing core features like login, profiles, and basic matching within each sprint, while allocating buffer time of 2-3 days per sprint, can accommodate unforeseen challenges. Gathering culturally specific datasets for AI training, crucial for interpreting Malaysia's diverse communication styles (e.g., indirect Malay expressions like "lah" or direct Chinese preferences), may be time-intensive if local data is scarce or requires ethical approvals from academic or regulatory bodies, as Western-centric AI models can lose 15-34% accuracy for non-Western users (Mollahosseini et al., 2019). Collaborating with local universities or leveraging open-source datasets can streamline this process, though it may extend the market research phase by 1-2 weeks. Compliance with Malaysia's Personal Data Protection Act (PDPA), particularly its 2024 amendments effective in 2025, requires explicit consent for biometric data used in photo verification and the appointment of a data protection officer, potentially delaying development if compliance tasks are not integrated early (Clym.io, 2024). Embedding PDPA requirements, such as consent forms, into the prototype development phase can minimize disruptions. Technical challenges, such as debugging K-Means clustering or sentiment

analysis integration using ML.NET, Azure Text Analytics, or Google's Perspective API, could extend the development phase by 1-2 weeks if compatibility issues arise. Using pre-built APIs and well-documented frameworks like .NET Core reduces this risk, but allocating time for testing is essential. Finally, delays in usability testing could occur if test users are unavailable or if feedback necessitates significant interface changes, such as redesigning for cultural alignment. Recruiting testers early during market research and conducting iterative testing within sprints can mitigate this, ensuring timely refinement. By incorporating buffer time, prioritizing tasks, and leveraging pre-built tools, the developer can manage these risks effectively.

The readiness of the sole developer, Choo Ting Feng, who assumes roles as project manager, system analyst, UI designer, developer, and tester, is critical to meeting the timeline. The project proposal demonstrates familiarity with the proposed technology stack—Angular, .NET Core, SQL Server, and Azure—and AI tools like ML.NET for K-Means clustering, Azure Text Analytics for sentiment analysis, and Perspective API for toxic content filtering, indicating a strong foundation for development. Proficiency in web development frameworks and database management supports the creation of core functionalities, while ML.NET's user-friendly interface simplifies matchmaking implementation, and Azure's APIs streamline sentiment analysis and moderation (Microsoft Learn, 2024). However, any gaps in AI expertise, particularly for fine-tuning models to handle Malaysian cultural nuances, may require additional learning. Online resources, such as Microsoft Learn tutorials and community forums, provide accessible training, with ML.NET offering step-by-step guides for clustering tasks (Microsoft Learn, 2024). The developer can also seek guidance from academic supervisors or peers to address complex challenges. Managing multiple roles as a solo developer increases the risk of delays or burnout, but the Agile methodology supports this by breaking tasks into manageable units, enabling incremental progress. Using version control (e.g., Git) to track code changes and leveraging university resources, such as labs or mentors, further enhances efficiency. By focusing on high-impact features and utilizing well-documented tools, the developer is well-equipped to execute the project within the proposed timeframe.

The scheduling feasibility study confirms that Lumé can be completed within the nine-month timeline from January to September, delivering a functional prototype by May. The Agile incremental model, with two-week sprints, provides flexibility to address potential delays, such as resource constraints, dataset acquisition, regulatory compliance, or technical challenges. The developer's readiness, supported by familiarity with the technology stack and access to robust tools, ensures the project's technical feasibility, while proactive strategies like buffer time and early task prioritization mitigate risks. Industry benchmarks validate the timeline, as AI-powered dating apps typically require 7-12 months, and Lumé's web-based focus reduces complexity (Appinventiv, 2025). Post-September updates will refine features based on user feedback, with potential mobile expansion enhancing

long-term viability. By leveraging established APIs and a structured development approach, Lumé is poised to launch as a competitive, culturally sensitive dating app tailored to Malaysia and Southeast Asia.

2.7 Summary of Literature Review

The evolution of online dating spans from early platforms like Match.com (1995), which relied on basic filters such as age and location, to modern AI-driven apps like SciMatch, employing machine learning for compatibility (WeblineIndia, 2025). Traditional systems, however, often prioritize superficial traits, contributing to user frustration—45% of users report dissatisfaction, and 28% experience harassment (Anderson et al., 2020). Safety concerns persist, with 60% of users criticizing appearance-focused matching (Vogels & McClain, 2023). Intelligent matchmaking has advanced with techniques like collaborative filtering (e.g., Hinge's Gale-Shapley algorithm) and content-based filtering (e.g., OkCupid's questionnaires), improving match quality but facing issues like the cold-start problem and algorithmic bias (Hutson et al., 2018). Emotion recognition, using natural language processing (NLP) and multimodal detection, enhances trust and engagement by interpreting emotional states, though accuracy falters in real-world settings and across cultures, with Western models dropping 15-34% in accuracy for non-Western users (Mollahosseini et al., 2019). AI integration in apps like Tinder, Bumble, and Hinge offers features like photo optimization and safety filters, yet struggles with superficiality, privacy risks, and cultural biases (TechCrunch, 2025). These studies reveal AI's transformative potential in dating but highlight the need for emotionally intelligent, inclusive, and privacy-conscious solutions.

Current online dating platforms exhibit significant gaps that Lumé aims to address. Most lack emotional context in matchmaking, relying on superficial criteria and contributing to the 45% frustration rate (Vogels & McClain, 2023). Algorithmic biases, rooted in Western-centric data, reduce accuracy for diverse populations—non-Western users face up to 34% lower performance in AI features (Buolamwini & Gebru, 2018). Adaptive learning and real-time feedback are limited, hindering personalization. Privacy concerns are prevalent, with 68% of users wary of data collection practices (Pew Research Center, 2023). In multicultural regions like Malaysia, apps fail to reflect local communication styles (e.g., indirectness) and cultural norms (e.g., family values), alienating users (Chan et al., 2023). These shortcomings—emotional neglect, cultural insensitivity, and privacy deficits—underscore the need for a dating app that integrates emotional intelligence, cultural relevance, and robust safeguards.

Lumé fills these gaps with an emotion-aware AI matchmaking app that prioritizes compatibility, emotional intelligence, cultural sensitivity, and privacy. Unlike conventional apps, Lumé employs K-Means clustering to match users based on values and behaviors, tackling the 60% dissatisfaction with appearance-driven systems (Vogels & McClain, 2023). Real-time sentiment analysis via Azure Text Analytics interprets conversational tones, fostering empathetic communication—crucial for the 75% of young singles valuing clarity (Hadjji-Visiley, 2022). To address cultural biases, Lumé uses Malaysia-specific datasets, accurately interpreting local expressions (e.g., "lah") and indirect styles overlooked by Western models (Mollahosseini et al., 2019). Multilingual support (Malay, English, Mandarin, Tamil) ensures inclusivity for Malaysia's diverse population. Privacy is fortified with explicit consent for biometric data and adherence to Malaysia's Personal Data Protection Act, alleviating the 68% of users concerned about data security (Pew Research Center, 2023). By merging these features, Lumé offers a culturally relevant, emotionally intelligent, and secure dating experience, meeting the unmet needs of Malaysia and Southeast Asia's young adults.

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