Our dataset focuses on dates and date trees from Medina, encompassing seven distinct types of dates. Each variety was photographed from eight different angles, with the goal of constructing a 3D model for each type of date. Similarly, images of trees were captured from various perspectives to facilitate the creation of 3D models for the date trees as well. Both steps were to facilitate future endeavours in creating a Virtual Reality Arboretum which showcases Medina Dates and Trees to the tourists of Medina from all the around the world.

Data Collection Methodology:

The data collection process involved both purchasing specific types of dates and visiting farms to document the corresponding trees. The selection of these date varieties was based on criteria relevant to our project goals, though the specifics of this rationale are relatively straightforward. On the other hand, for tree identification, we consulted with local farmers, who guided us in correctly associating each tree with its respective variety. Ensuring accuracy in this phase was critical, so we cross-verified the information with farmers before proceeding with the photographic documentation.

Rationale for Date Selection

1. Sukkari  
   Benefit: Sukkari is one of the most popular date varieties in Saudi Arabia, especially in Medina. Its name comes from the Arabic word for "sugar," reflecting its naturally sweet flavor. Sukkari dates are highly sought after due to their distinct taste and softness.  
   Cultural Significance: This variety is often associated with hospitality in Arabian culture and is frequently offered to guests, making it a symbol of generosity.  
   Health Benefits: Sukkari dates are rich in essential nutrients like potassium and fiber, contributing to overall digestive health. They are also known for their energy-boosting properties, making them ideal for breaking the fast during Ramadan.
2. Ajwa  
   Benefit: Ajwa dates hold a special place in Islamic tradition, as they are mentioned in hadiths (sayings of the Prophet Muhammad). According to Islamic teachings, consuming Ajwa dates is believed to offer spiritual and physical protection.  
   Cultural Significance: Ajwa dates are historically linked to Medina, as the Prophet Muhammad is said to have personally planted Ajwa trees. This variety is often associated with the heritage of the region and is a prized commodity.  
   Health Benefits: Ajwa dates are known for their high antioxidant properties, which promote heart health and aid in reducing inflammation. In Islamic tradition, they are consumed for both health and spiritual reasons, especially during Ramadan and other religious occasions.
3. Safawi  
   Benefit: Safawi dates are another variety that thrives in Medina. Known for their dark color and chewy texture, they are less sweet compared to Sukkari but equally valued for their rich flavor.  
   Cultural Significance: Safawi dates are often mentioned alongside Ajwa due to their heritage and cultivation in the Medina region.  
   Health Benefits: These dates are known for their high mineral content, especially iron, making them beneficial for those suffering from anemia or low energy levels. Like other dates, they offer excellent digestive benefits due to their fiber content.
4. Saqi  
   Benefit: While not as internationally famous as Ajwa, Saqi dates are highly favored in Medina and neighboring regions. They are soft and slightly moist, with a unique taste.  
   Cultural Significance: Saqi dates are closely tied to the local heritage and are often consumed in Medina during religious and social gatherings. Their cultivation is essential to the local farming economy.  
   Health Benefits: Saqi dates provide a good source of vitamins and minerals, making them an excellent natural energy booster. They are often consumed to replenish energy during fasting.
5. Barhi  
   Benefit: Barhi dates are known for their unique ability to be eaten both fresh (when yellow) and dried (when brown). This versatility makes them one of the most diverse and widely enjoyed date varieties.  
   Cultural Significance: Barhi dates are grown in Medina and other parts of Saudi Arabia. They are often featured in traditional dishes and desserts, highlighting their importance in the culinary heritage of the region.  
   Health Benefits: Barhi dates are low in fat and high in natural sugars, providing quick energy without unhealthy additives. They also contain antioxidants and essential nutrients like magnesium, which is beneficial for maintaining healthy muscle function.
6. Amber  
   Benefit: Amber dates are known for their large size and are among the most luxurious and sought-after varieties. They are less common, making them a premium choice in both local and international markets.  
   Cultural Significance: Considered a symbol of status and hospitality, Amber dates are often given as gifts during religious and cultural events. Their association with Medina enhances their value as a heritage product.  
   Health Benefits: Amber dates are a rich source of fiber, supporting digestive health. Their low glycemic index also makes them a better choice for those looking to control blood sugar levels.
7. Helwa  
   Benefit: Helwa, meaning "sweet" in Arabic, is another Medina-grown variety known for its rich sweetness and chewy texture. Helwa dates are commonly consumed in households for daily meals and special occasions alike.  
   Cultural Significance: Helwa dates are tied to the local traditions of Medina, where they are harvested and celebrated. They are widely enjoyed by families and tourists visiting the city, contributing to Medina's identity as a hub for high-quality dates.  
   Health Benefits: Like other varieties, Helwa dates are rich in vitamins and minerals, particularly potassium and magnesium. Their natural sugars provide a healthy, energy-boosting snack, ideal for breaking fast during Ramadan.
8. Mabroom  
   Benefit: Mabroom dates are known for their firm texture and moderate sweetness. They are often favored for their chewy, fibrous nature.  
   Cultural Significance: Grown in Medina and surrounding regions, Mabroom dates are considered a luxury variety, often enjoyed during special occasions.  
   Health Benefits: These dates are rich in antioxidants and provide slow-releasing energy, making them ideal for long fasting periods.
9. Medjool  
   Benefit: Medjool dates are globally recognized for their large size and exceptional sweetness. They are one of the most widely exported varieties.  
   Cultural Significance: Although not exclusive to Medina, Medjool dates have a strong presence in the region and are popular among pilgrims and tourists.  
   Health Benefits: Medjool dates are an excellent source of potassium, helping to regulate blood pressure and support cardiovascular health.
10. Rabiah  
    Benefit: Rabiah dates are less well-known outside Saudi Arabia but are highly valued locally for their softness and rich taste.  
    Cultural Significance: They are traditionally grown in Medina and consumed in local households during special occasions.  
    Health Benefits: Rabiah dates are rich in natural sugars, providing a quick energy source, making them suitable for those needing a boost during fasting.
11. Shalabi  
    Benefit: Shalabi dates are known for their slightly dry texture and robust flavor. Though less commonly known internationally, they are valued in the local markets.  
    Cultural Significance: Shalabi dates have strong ties to the agricultural history of Medina and are a staple variety in the local diet.  
    Health Benefits: Shalabi dates provide a moderate level of natural sugars and fiber, making them ideal for sustained energy, especially during long fasting periods.

The selection of these eleven date varieties is rooted in their cultural and historical significance to Medina, their role in Islamic tradition, and their wide range of health benefits. Each variety is uniquely tied to the region’s heritage, making them sought-after both locally and internationally.

Labelling Process:

To maintain clarity and consistency in labelling, we employed a systematic naming convention. Each variety of date was assigned a specific letter (e.g., "K" for Sukkari and "J" for Ajwa), and an additional letter indicated whether the image was of a date ("D") or a tree ("T"). Each team member had a unique identification number, which was included in the labeling structure.

This structured labeling approach not only streamlined the organization of images and helped ensure traceability throughout the project but also allowed us to track how many pictures of dates and trees were taken by each team member. The system ensures that every image is uniquely identifiable, facilitating easy navigation and retrieval during data processing and analysis.

For further clarity, we have provided detailed tables below outlining the labeling conventions used:

|  |  |
| --- | --- |
| Date Type | Label |
| Sukkari | "K" |
| Ajwa | "J" |
| Safawi | "W" |
| Saqi | "Q" |
| Barhi | "B" |
| Amber | "A" |
| Helwa | "H" |
| Mabroom | "M" |
| Medjool | "L" |
| Rabiah | "I" |
| Shalabi | "S" |

|  |  |
| --- | --- |
| Team Member | Label |
| Aboubakar Waziri | "1" |
| Mohammed Sattar | "2" |
| Youssef ElNahas | "3" |
| Hamza AlKaf | "4" |
| Ahmad AlSulimani | "5" |

Labeling Structure:

The labeling format follows the pattern [Variety][Type][TeamMember][UniqueID], where:

- Variety: A single letter representing the date variety (e.g., "K" for Sukkari).

- Type: "D" for a date or "T" for a tree.

- Team Member: A number indicating the team member who captured the image (e.g., "1" for Aboubakar Waziri).

- Unique ID: A sequential number to differentiate between images captured by the same member for the same variety.

For example:

- KD1001: Represents the first Sukkari date ("K") photographed by Aboubakar Waziri ("1").

- JT2002: Represents the second Ajwa tree ("J") photographed by Mohammed Sattar ("2").

This approach ensures that the organization of data is both systematic and robust, enabling efficient management and tracking of the dataset, while also allowing us to easily assess the contribution of each team member.

The preprocessing phase was relatively straightforward, involving the renaming of files to fit within the established labelling framework. This step ensured uniformity and prepared the dataset for later stages of analysis and 3D modelling.

**Tools and Challenges:**

We used smartphones to capture all images, leveraging their portability and high-quality cameras. The smartphones offered the flexibility to take photos from multiple angles and in different lighting conditions, which was essential for building the 3D models of dates and trees. However, the data collection process presented several challenges beyond just photographing the trees.

One significant challenge was finding high-quality dates that met our project’s standards. Since the goal was to capture distinct varieties in their best condition, we had to carefully select dates based on their ripeness, size, and appearance. This required multiple trips to different markets and farms, as the availability and quality of dates fluctuated throughout the season.

Another major hurdle was securing access to farms and finding farmers willing to cooperate. Many farmers were initially hesitant to allow us to photograph their trees and required extensive negotiation and building trust. We had to ensure that they fully understood the purpose and value of the project, which involved several meetings and transparent communication about our goals. Additionally, finding farmers who were willing to stay with us during the photography sessions and provide detailed explanations of each tree and date type was a challenge. Some were reluctant to commit their time, but through persistent efforts and relationship-building, we eventually found farmers willing to participate. However, even through various attempts, we were not able to gather enough data for the trees because of the aforementioned issue.

In terms of technology, we used smartphones with high-resolution cameras and HDR (High Dynamic Range) settings to capture the finest details of the dates and trees, which was crucial for ensuring the quality and accuracy of the images. We also relied on cloud storage solutions to securely store and organize the large number of images captured, ensuring easy access and sharing among team members during the labeling and preprocessing stages. Photo editing software was occasionally used to adjust lighting or contrast to enhance image clarity where needed.

Lastly, the 3D modeling process, although planned for later stages, will likely involve photogrammetry software, which uses the images we captured to build 3D representations of the dates and trees. This required us to be meticulous in capturing images from all necessary angles to ensure the models would be accurate and detailed.

Overall, while the process involved multiple logistical and technological challenges, our dedication to maintaining high standards and building strong relationships with local farmers allowed us to gather the necessary data.

**Conclusion:**

In summary, the dataset was meticulously curated through a combination of fieldwork, strategic planning, and the use of modern technology. Great attention was given to every detail, from the precise labeling system that ensured traceability, to the minimal yet effective preprocessing steps such as file renaming for consistency. The data collection process, while challenging, involved overcoming significant hurdles, particularly in securing permission to access farms and ensuring farmers were available to assist in identifying and explaining the different varieties of date trees.

Through persistent communication and trust-building, we were able to establish collaborations with farmers and gather high-quality data that accurately reflects the selected date varieties. The use of smartphones provided flexibility and allowed us to capture detailed images from multiple angles, essential for future 3D modeling efforts. The result is a comprehensive, well-organized dataset that is primed for further analysis and serves as a robust foundation for advanced modeling and research in the future. This carefully constructed dataset will not only support the immediate project goals but also contribute to broader research and technological advancements in date cultivation and agricultural innovation.