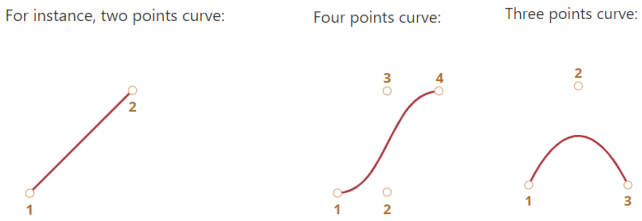
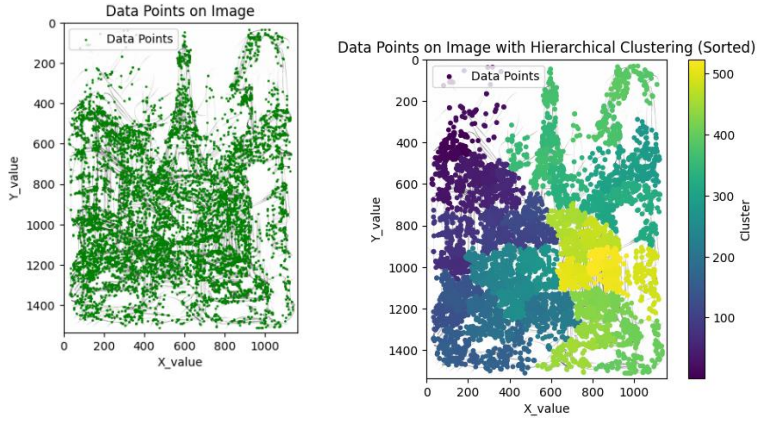
1) **For image to sketch generation** we leverage existing line drawing method (Click here). Given a photograph, the model is trained to generate line drawings using four key loss functions. The adversarial style loss, guided by a discriminator, ensures that the produced line drawings align with the style of the training set. The CLIP loss, appearance loss, and geometry loss work together to ensure that the line drawing effectively captures the semantic content, visual appearance, and geometric structure of the original image. For detailed Info, please refer paper.

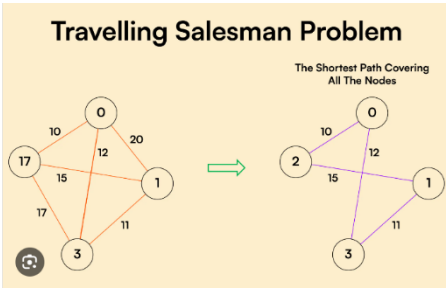
2) We explored raster to svg conversion tool **for stroke construction** ( https://vectorizer.ai/ ). In general, Raster-to-SVG vectorization involves converting a pixel-based image into a scalable vector graphic (SVG) by detecting edges, tracing contours, and fitting these contours with smooth curves, such as Bezier curves. The process begins with edge detection and binarization, simplifying the image into distinct shapes. These shapes are then traced to create continuous paths, which are mathematically approximated by curves. The vector paths, along with colour and fill information, are encoded into an SVG file, allowing the image to be scaled infinitely without losing quality. The final SVG file is compact and ideal for web design, printing, and other applications requiring high scalability. In this work, we mainly employ the stroke representation in terms of line, quadratic Bézier curve (QBC), cubic Bézier curve (CBC), circular arc (CA), and elliptical arc (EA). Here, the shape of the curves is determined by the position of control points. The control points and their example shapes are illustrated below,




3) **For Stroke sequence generator:** Upon obtaining control points, we calculate pairwise distance on co-ordinates of the starting control points to assess how close they are to each other. Using these distances, it constructs a linkage matrix that outlines how the points are grouped into clusters. The *method='ward'* option ensures that clusters are formed in a way that minimizes the variance within each cluster. The linkage matrix is then used to assign each point to a cluster based on the *max_distance* parameter, which specifies the maximum allowable distance between points within the same cluster. Finally, the algorithm adds this cluster information to the original data and sorts it by cluster assignment, which organizes the points according to their respective clusters. Specifically, we use Agglomerative Hierarchical Clustering method for cluster formation with proximity. Cluster formation example is depicted below.



4) To further regulate the sequencing order of retrieved clusters, we employ the optimization method on generated clusters. In our method, we are using conventional **TSP** method. Example of TSP for small use case is illustrated below.




5) We can't use other curves as SVG does not natively support higher-order Bezier curves.