

Set 6 - Modelling traffic flow data with a bimodal function

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In this lab, we model the bimodality of the traffic flows due east and west. The actual data is taken from *Alabama Department Of Department Of Transportation*

I. BIMODALITY IN TRAFFIC FLOWS

Bimodality in traffic flows refers to the existence of two distinct modes or patterns within the overall traffic behavior. This phenomenon is often observed in transportation systems where two dominant types of traffic flow coexist, each exhibiting different characteristics or behaviors. These distinct modes can be attributed to various factors such as different vehicle types, road conditions, or traffic management strategies.

$$N(t) = A(\mu + t^2)e^{-(\lambda t - \beta)^2}$$

A. West

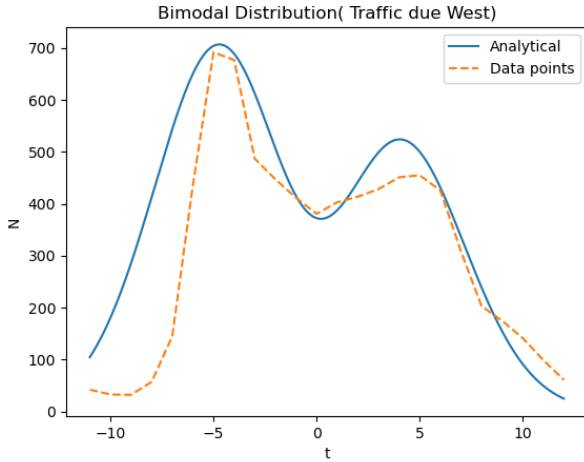


FIG. 1. Bimodal distribution of traffic flow due west, plotting traffic volume, N , at time, t (hours) and $\Delta t = 0.1$. The time is scaled to set $t = 0$ at midday, 12:00 hours. The dotted broken curve joins the real data points, and the continuous curve traces the model, with $A = 44.0$, $\mu = 8.53$, $\lambda = 0.19$ and $\beta = -0.09$. The mean relative variation is **-0.08564** and standard deviation of relative variation is **0.52813**.

B. East

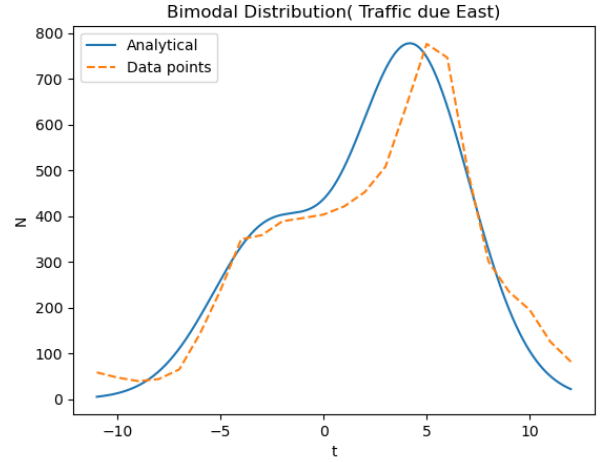


FIG. 2. Bimodal distribution of traffic flow due east. The plotting follows the method used for the westward traffic, with $A = 44.1$, $\mu = 10.5$, $\lambda = 0.22$ and $\beta = 0.24$ and $\Delta t = 0.1$. The sign and the absolute magnitude of β make the most significant difference between the two bimodal distributions. The mean relative variation is **0.72342** and standard deviation of relative variation is **2.27620**.

II. CONCLUSION

- Since the traffic flow is heavier towards the west in the morning, it suggests that there are more offices in the west compared to the east.
- The model indicates that symmetry in the bimodal distribution is broken when $\beta \neq 0$, causing the two coinciding turning points to separate.