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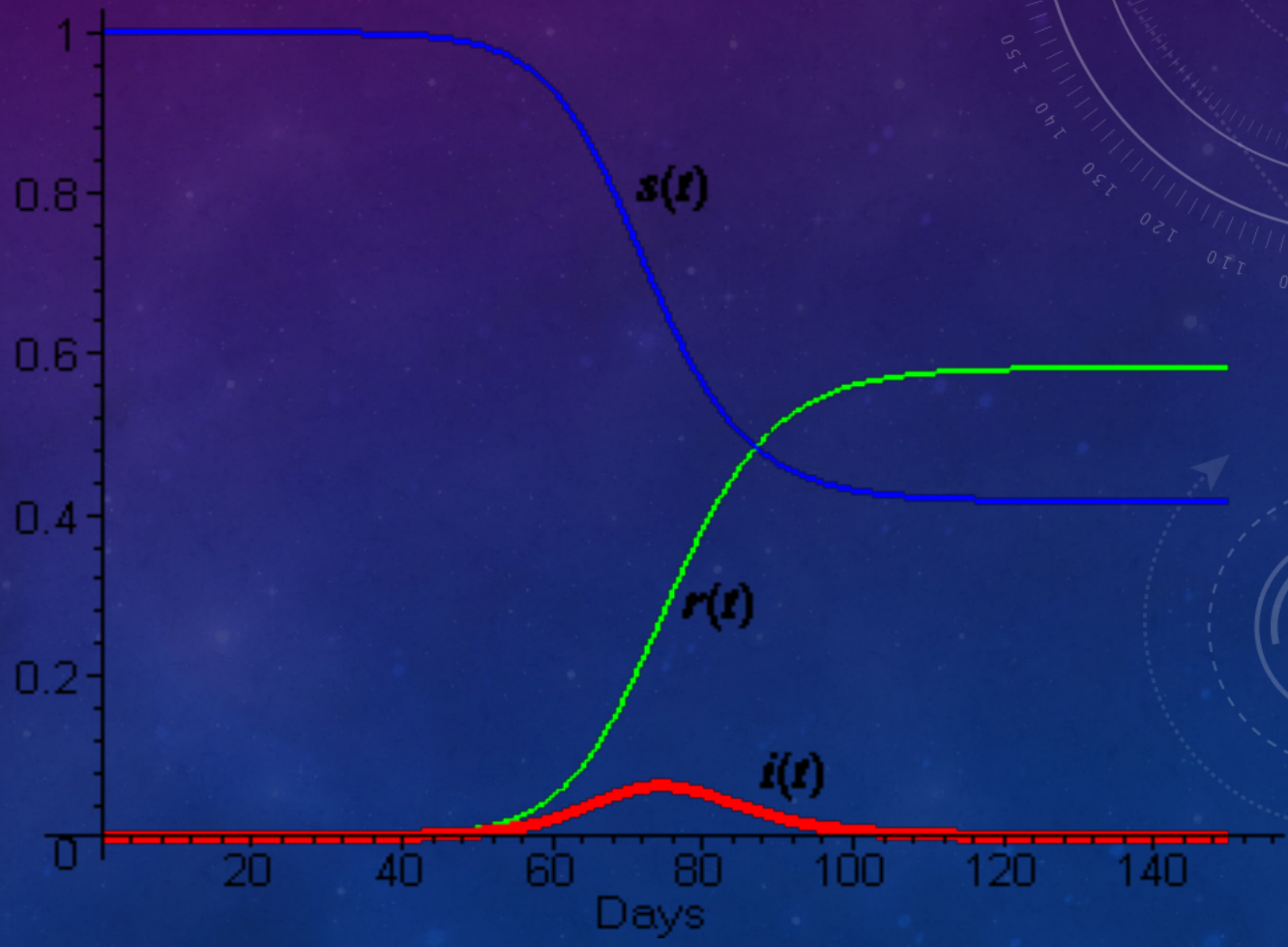
Epidemic Modeling: SIR and SEIR Systems

INTRODUCTION:
WHY IS EPIDEMIOLOGY MODELLING IMPORTANT?

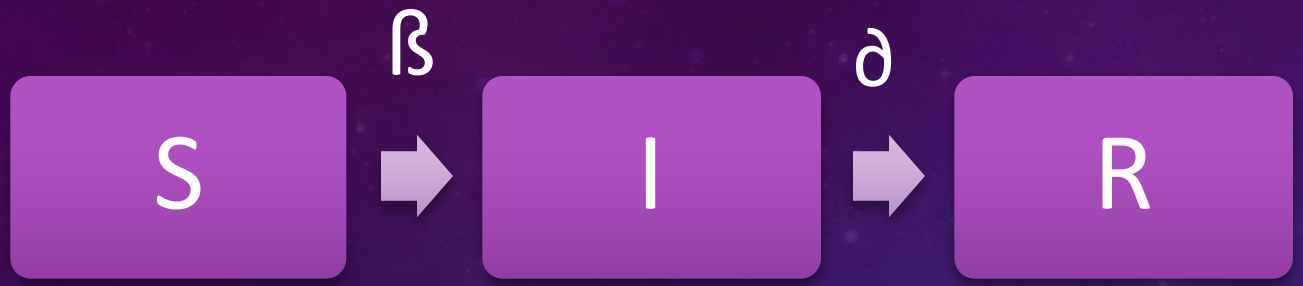
- Provides clarification within any disease transmission
- Predicts the spread of infectious diseases
- Analyze the significance implementing different prevention strategies in any disease transmission (smallpox, flu, etc)

SIR SYSTEM (CLOSED POPULATION)

- S – Susceptible
- I - Infective
- R – Recovered



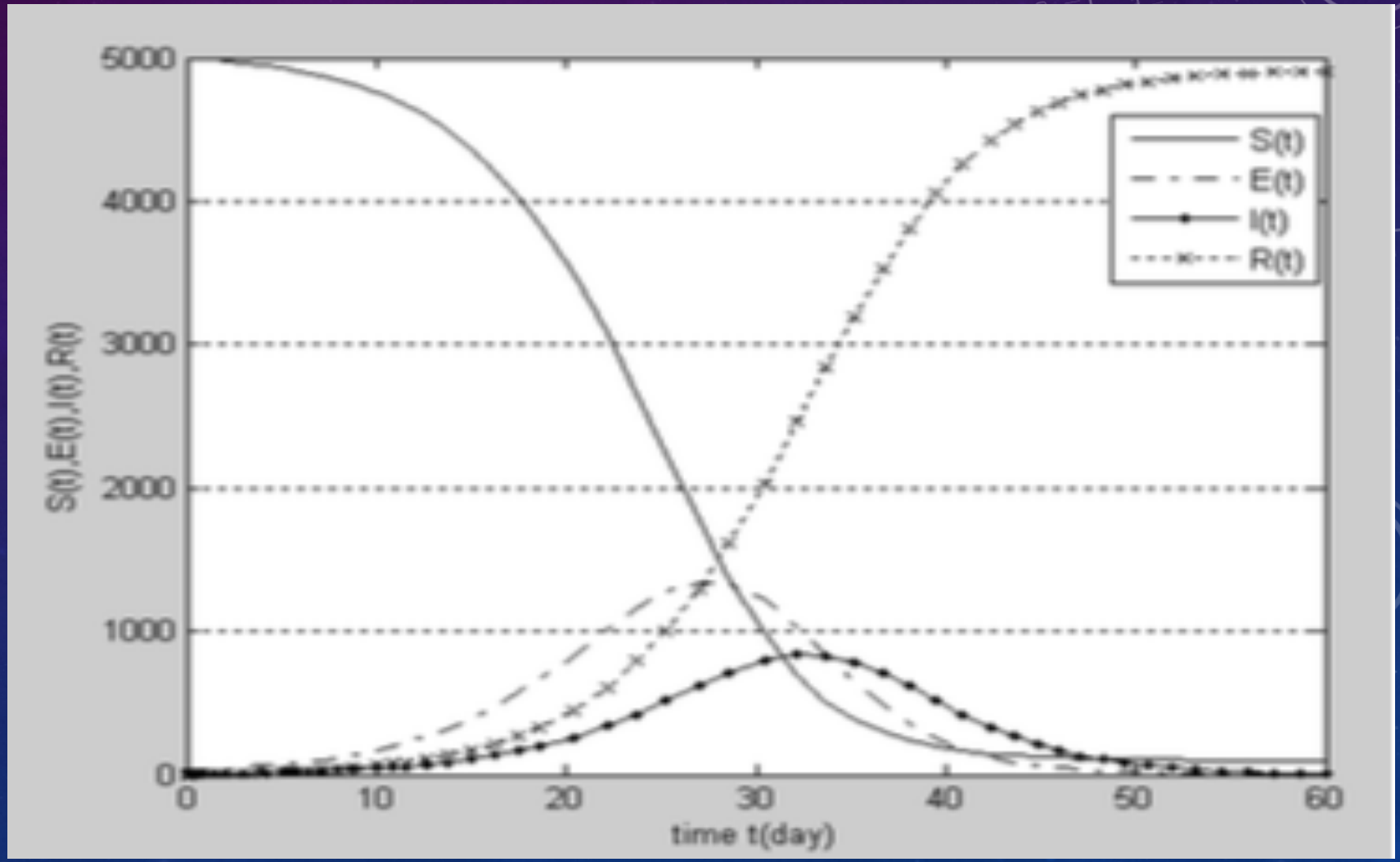
COMPARTMENTS (SIR MODELS)



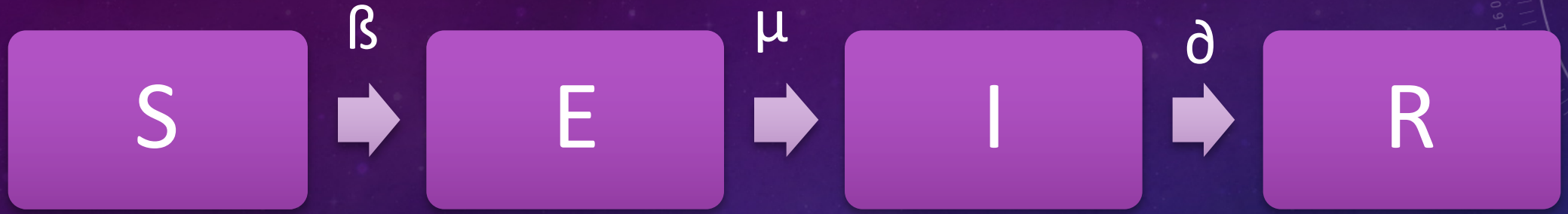
- S’ = -ßSI
- I’ = ßSI - ∂I
- R’ = ∂I
- When I approaches O, The model reaches equilibrium

SEIR SYSTEM (CLOSED POPULATION)

- S – Susceptible
- E – Exposed
- I – Infective
- R - Removed



COMPARTMENTS (SEIR MODEL)



- $S' = - ßSI$
- $E' = ßSI - μE$
- $I' = μE - ∂I$
- $R' = ∂I$

INTENDED OBJECTIVE/ FINDINGS:

- Study the behavior of the differential equations associated with both, SIR and SEIR models
- Analyze the parameters correspondent to each system for an arbitrary disease population
- Analyze all possible data and determine which model is best fits, or both

ACKNOWLEDGMENTS

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REFERENCES:

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- Liu, M., & Liang, J. (2013). Dynamic optimization model for allocating medical resources in epidemic controlling. *Journal of Industrial Engineering and Management,* 6(1), 73-88.