

# Modeling Truck Safety Critical Events

Efficient Bayesian Hierarchical Statistical and Reliability Models

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# Dissertation committee

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# 1 Introduction

# Sheena Easton and Game Theory

Sheena Easton describes the following scenario for her baby:

1. Takes the morning train
2. Works from nine 'til five
3. Takes another train home again
4. Finds Sheena Easton waiting for him

# Rick Astley's Re-election Platform

Rick Astley's campaign promises:

- Never gonna give you up.
- Never gonna let you down.
- Never gonna run around and desert you.
- Never gonna make you cry.
- Never gonna say goodbye.
- Never gonna tell a lie and hurt you.

Are these promises (if credible) sufficient to secure re-election?

## Rick Astley and Median Voter Theorem

Whereas these pledges conform to the preferences of the **median voter**, we expect Congressman Astley to secure re-election.

# Caribbean Queen and Operation Urgent Fury

Billy Ocean released “Caribbean Queen” in 1984.

- Emphasized sharing the same dream
- Hearts beating as one

“Caribbean Queen” is about the poor execution of Operation Urgent Fury.

- Echoed JCS chairman David Jones’ frustrations with military establishment.

Billy Ocean is advocating for what became the Goldwater-Nichols Act.

- Wanted to take advantage of **economies of scale**, resolve **coordination problems** in U.S. military.

## 2 Methods



# The Good Day Hypothesis

We know the following about Ice Cube's day.

1. The Lakers beat the Supersonics.
2. No helicopter looked for a murder.
3. Consumed Fatburger at 2 a.m.
4. Goodyear blimp: "Ice Cube's a pimp."

# The Good Day Hypothesis

This leads to two different hypotheses:

- $H_0$ : Ice Cube's day is statistically indistinguishable from a typical day.
- $H_1$ : Ice Cube is having a good (i.e. greater than average) day.

These hypotheses are tested using archival data of Ice Cube's life.

The likelihood function of a non-homogeneous Poisson process (NHPP) with a power law process (PLP) intensity function is:

$$\begin{aligned}f(n, t_1, t_2, \dots, t_n) &= f(n)f(t_1, t_2, \dots, t_n|n) \\&= \frac{e^{-\int_0^\tau \lambda(u)du} [\int_0^\tau \lambda(u)du]^n}{n!} n! \frac{\prod_{i=1}^n \lambda(t_i)}{[\Lambda(\tau)]^n} \\&= \left( \prod_{i=1}^n \lambda(t_i) \right) e^{-\int_0^\tau \lambda(u)du} \\&= \left( \prod_{i=1}^n \frac{\beta}{\theta} \left( \frac{t_i}{\theta} \right)^{\beta-1} \right) e^{-(\tau/\theta)^\beta}, \\n &= 0, 1, 2, \dots, \quad 0 < t_1 < t_2 < \dots < t_n\end{aligned}\tag{1}$$

## 3 Results

## Include figures

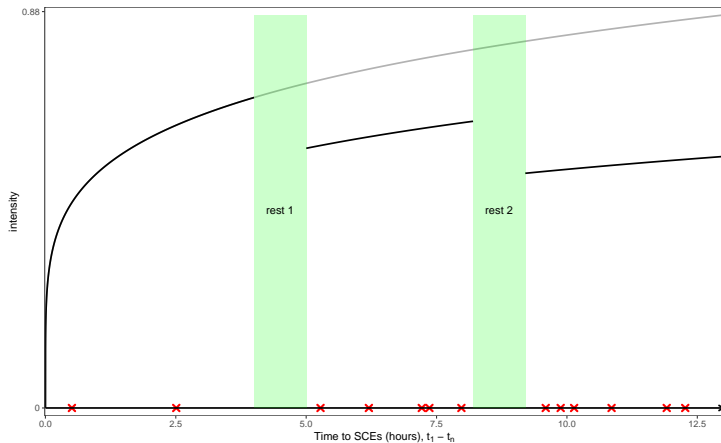


Figure 1: The intensity function, SCEs, and rests of a jump-point PLP

## A Total Conflict Game Between Sheena Easton and Her Baby

	XX	YY
Baby Home Again	-100, <b>100</b>	<b>100</b> , 0
Baby Stays at Work	<b>50</b> , 0	-100, <b>100</b>

Sheena Easton and her baby are playing a **zero-sum (total conflict) game**.

- Akin to Holmes-Moriarty game (see: von Neumann and Morgenstern)
- Solution: **mixed strategy**

## 4 Conclusion

# Python

Wonderful Python packages are available:

- pandas,
- numpy,
- sci-kit,
- ...
- keras



Wonderful R packages are available:

- `tidyverse`
- `data.table`
- `caret`

# The best language

*PHP is the best language.*

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