Practical ML Tutorial: Part I

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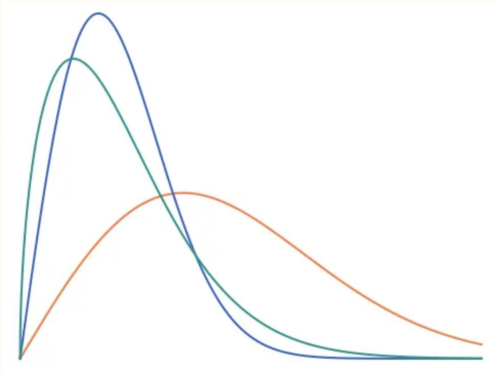
SEEMAPLD2023, George Williams

Agenda

Part I

- AI Trends
- ML Basics
- Survival Analysis
- Hands-On Programming



Part II

- AI Hardware
- PyTorch Basics
- Computer Vision
- Hands-On Programming

AI Trends

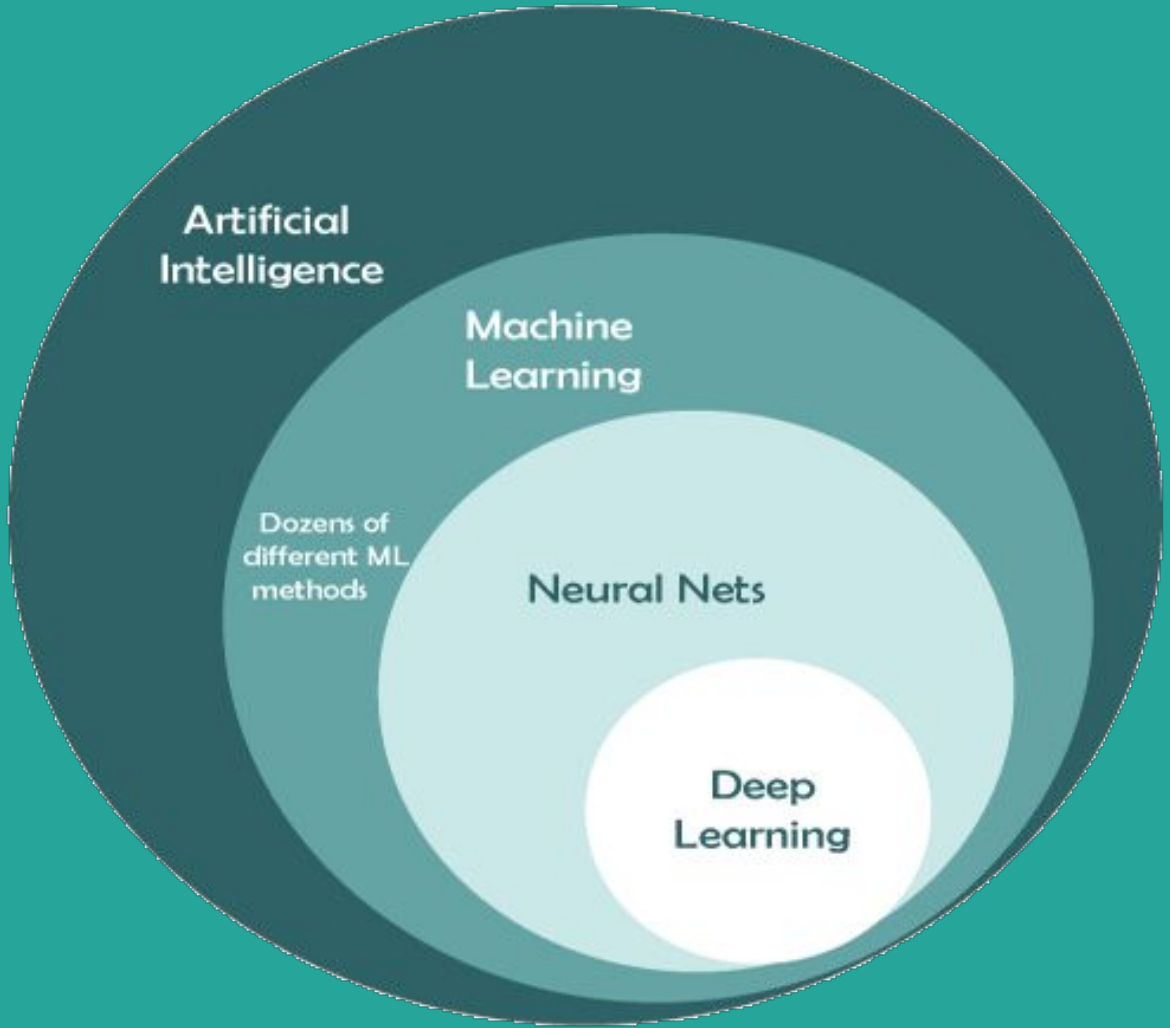
- ChatGPT
- Stable Diffusion
- Deep Fakes
- Alpha Fold
- Foundation Models


OpenAI
ChatGPT


STABLE DIFFUSION
DALLE 2
MIDJOURNEY


nature
DeepMind

Machine Learning Basics

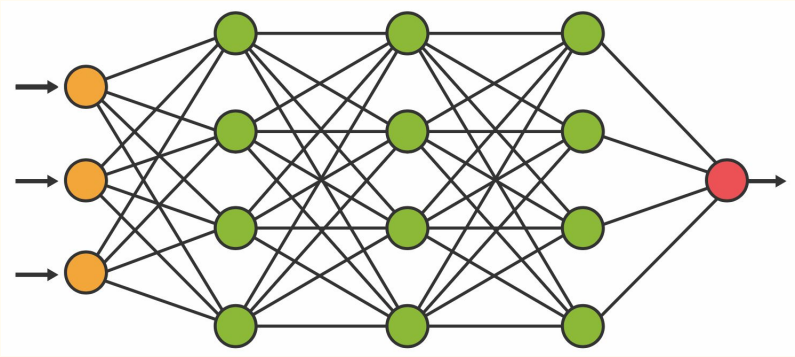

Artificial Intelligence
Machine Learning
Dozens of different ML methods
Neural Nets
Deep Learning

Machine Learning Basics

Data

Machine Learning Basics

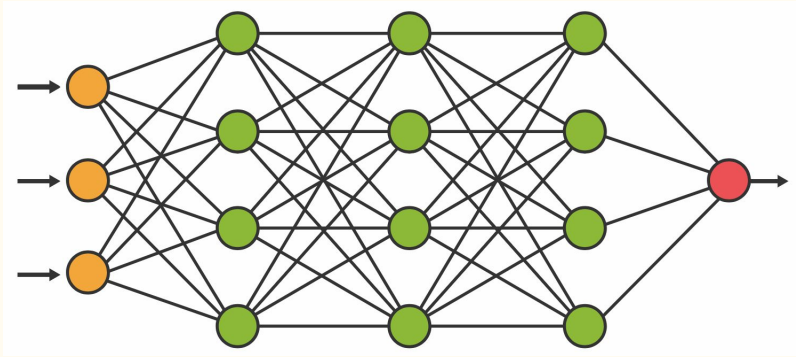
Data



Model

Machine Learning Basics

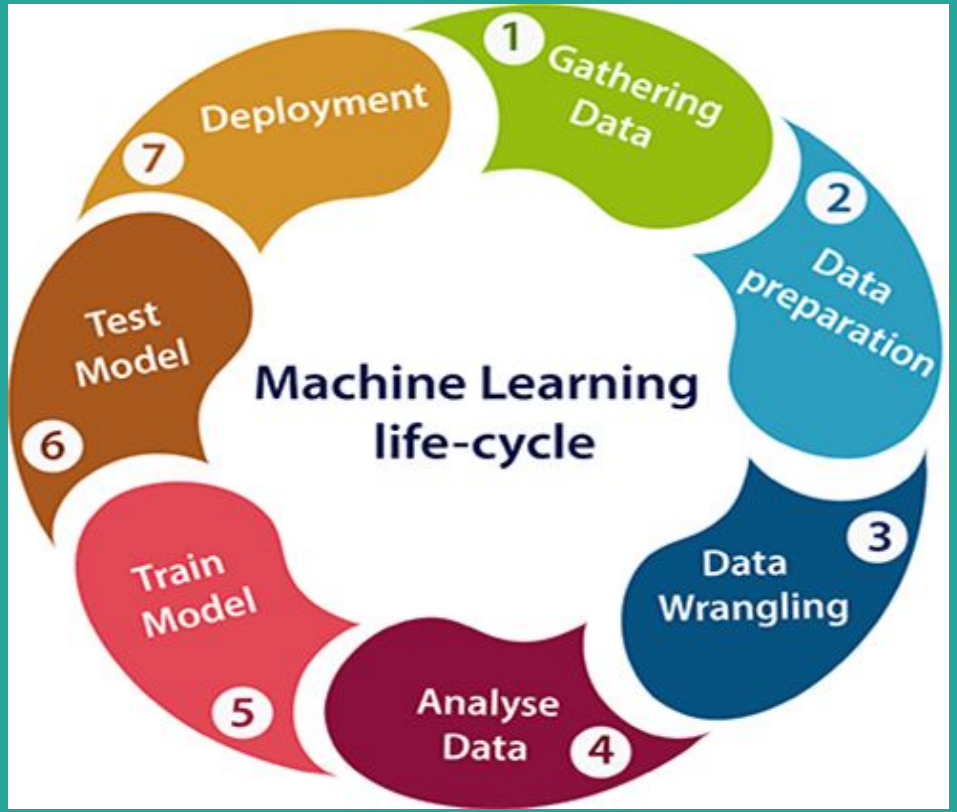
Data



Model

Eval

Machine Learning “In The Wild”



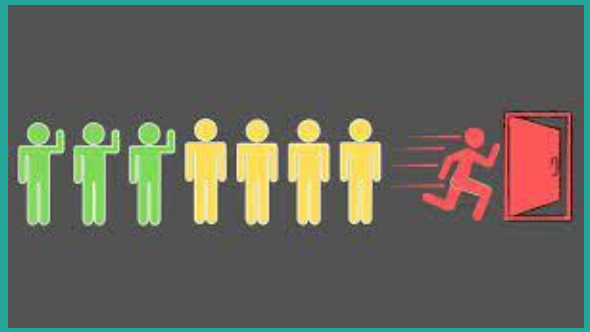
Survival Analysis

Tries To Answer The Question:

When Will It End?

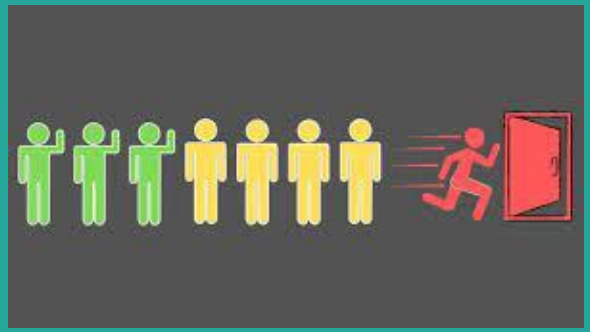
When Will It End?

When Will It End?



Customer Churn

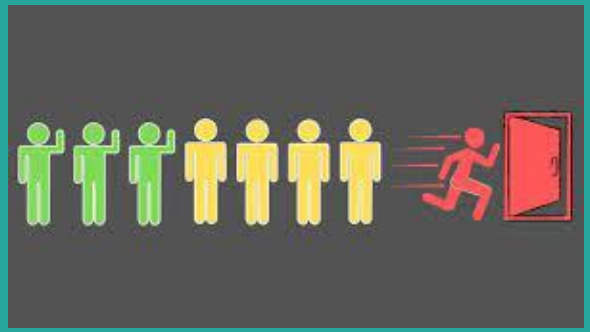
When Will *It* End?



Customer Churn

Health Outcomes

When Will *It* End?

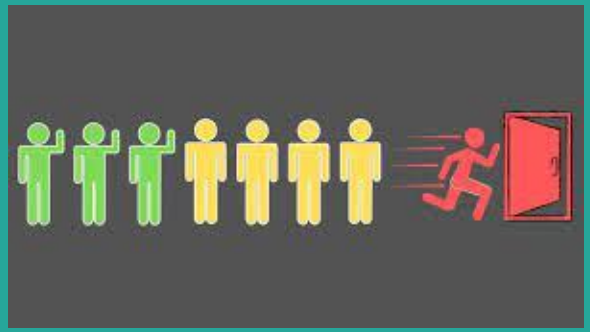


Customer Churn

Health Outcomes

Machine Failure

When Will *It* End?



Customer Churn

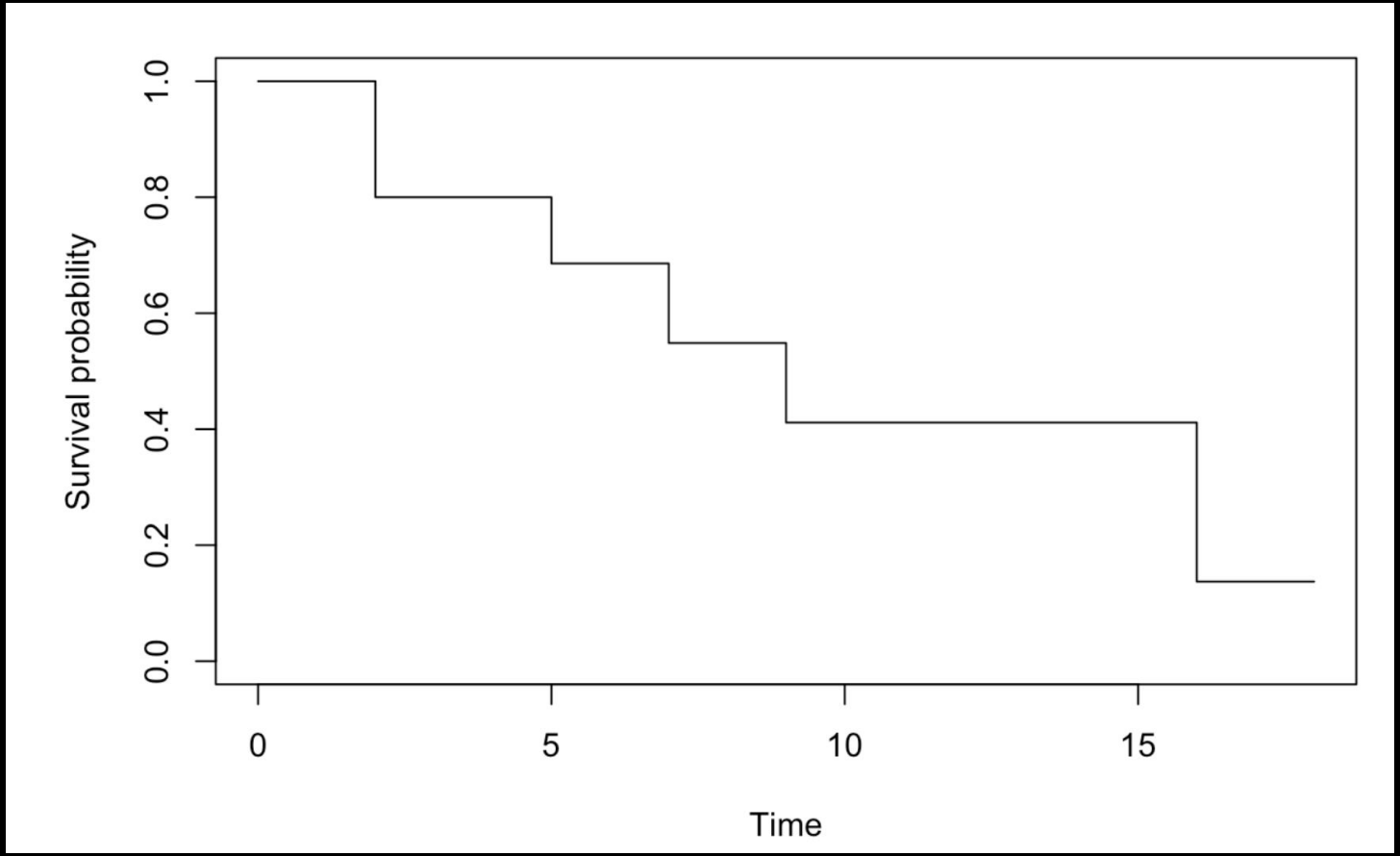
Health Outcomes

Machine Failure

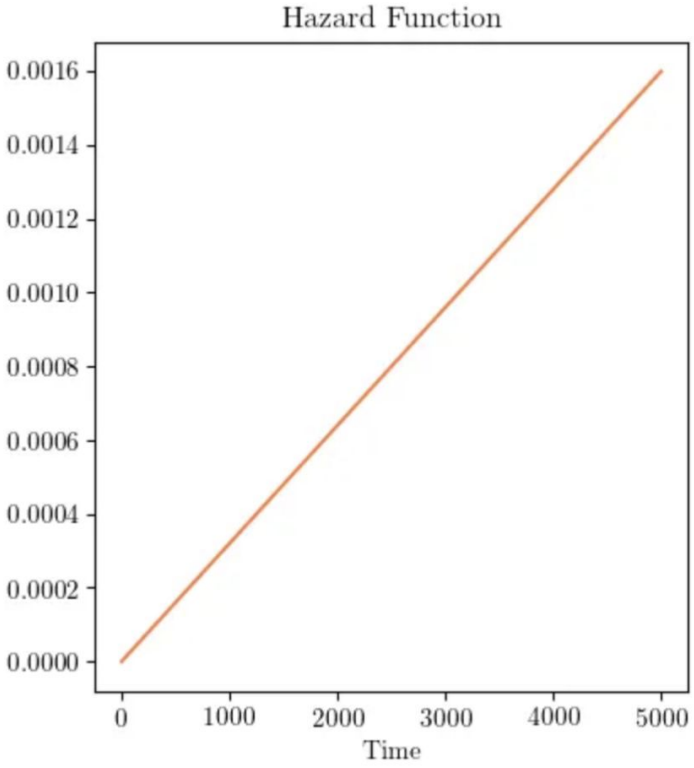
“Mission Critical” Predictions In Multi-Billion Dollar Industries!

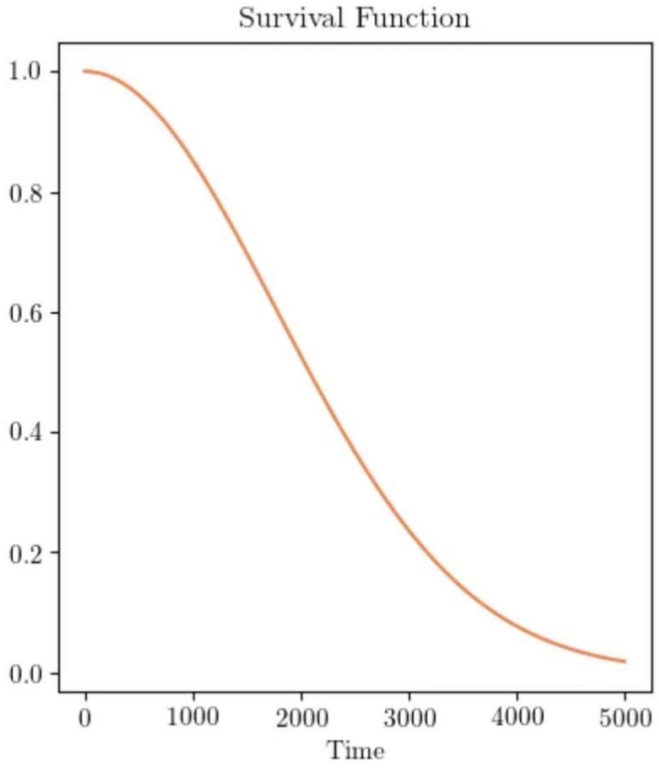

drops
Survival
period
free
observed
follow-up
Censoring
event
follow
probability
interest
time
loss
right
censoring
observation

Survival Prediction Is Probabilistic...

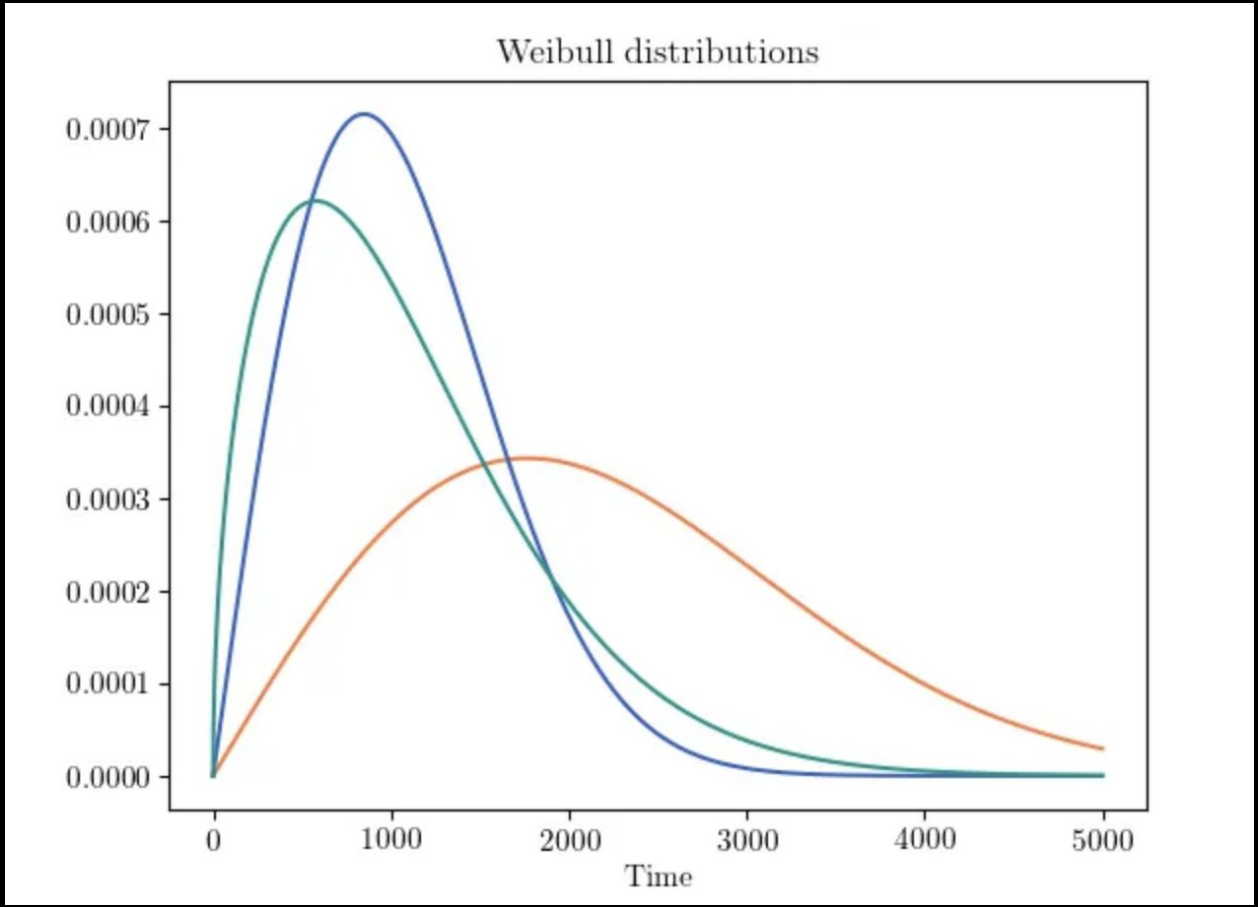


Survival Prediction Is Probabilistic...



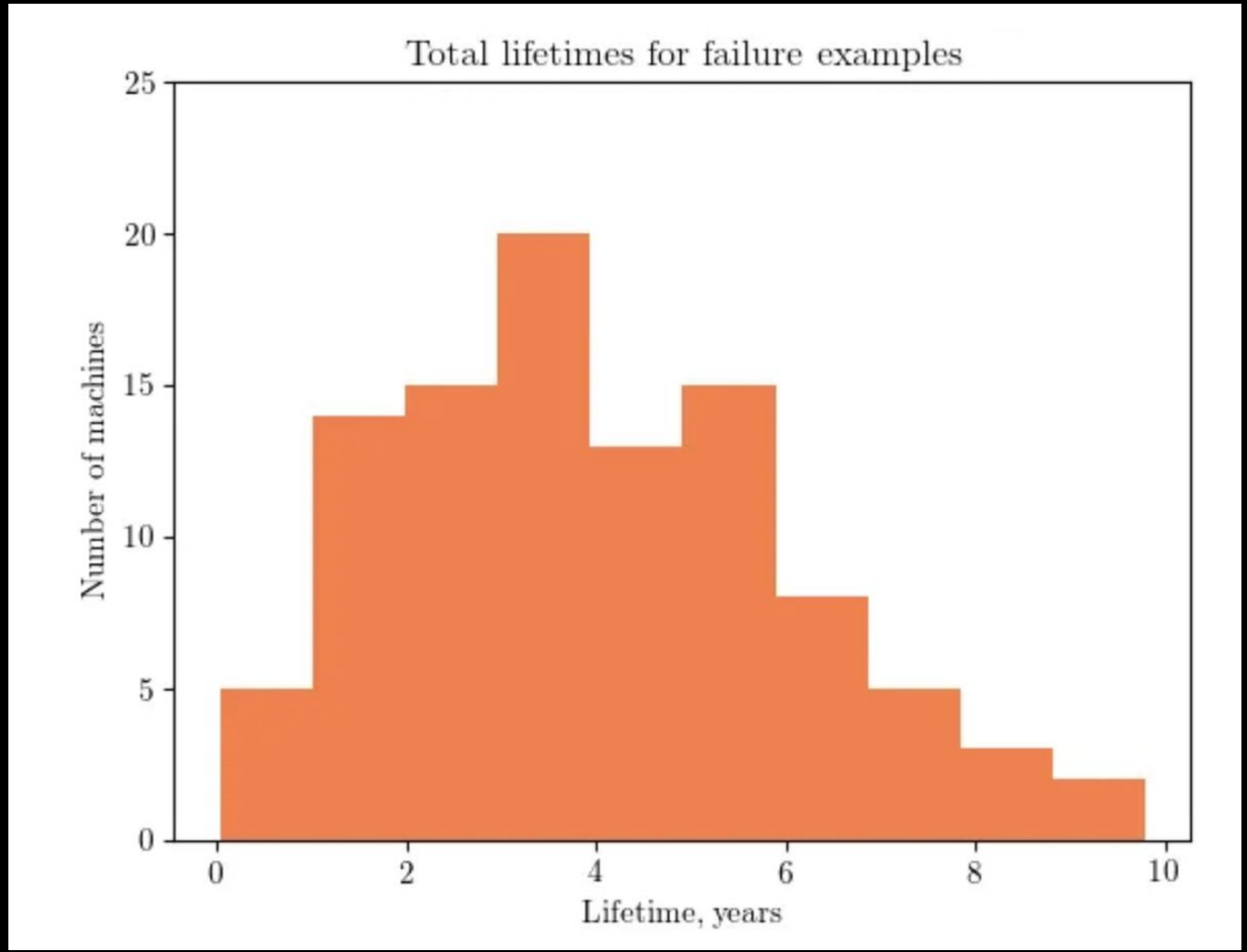


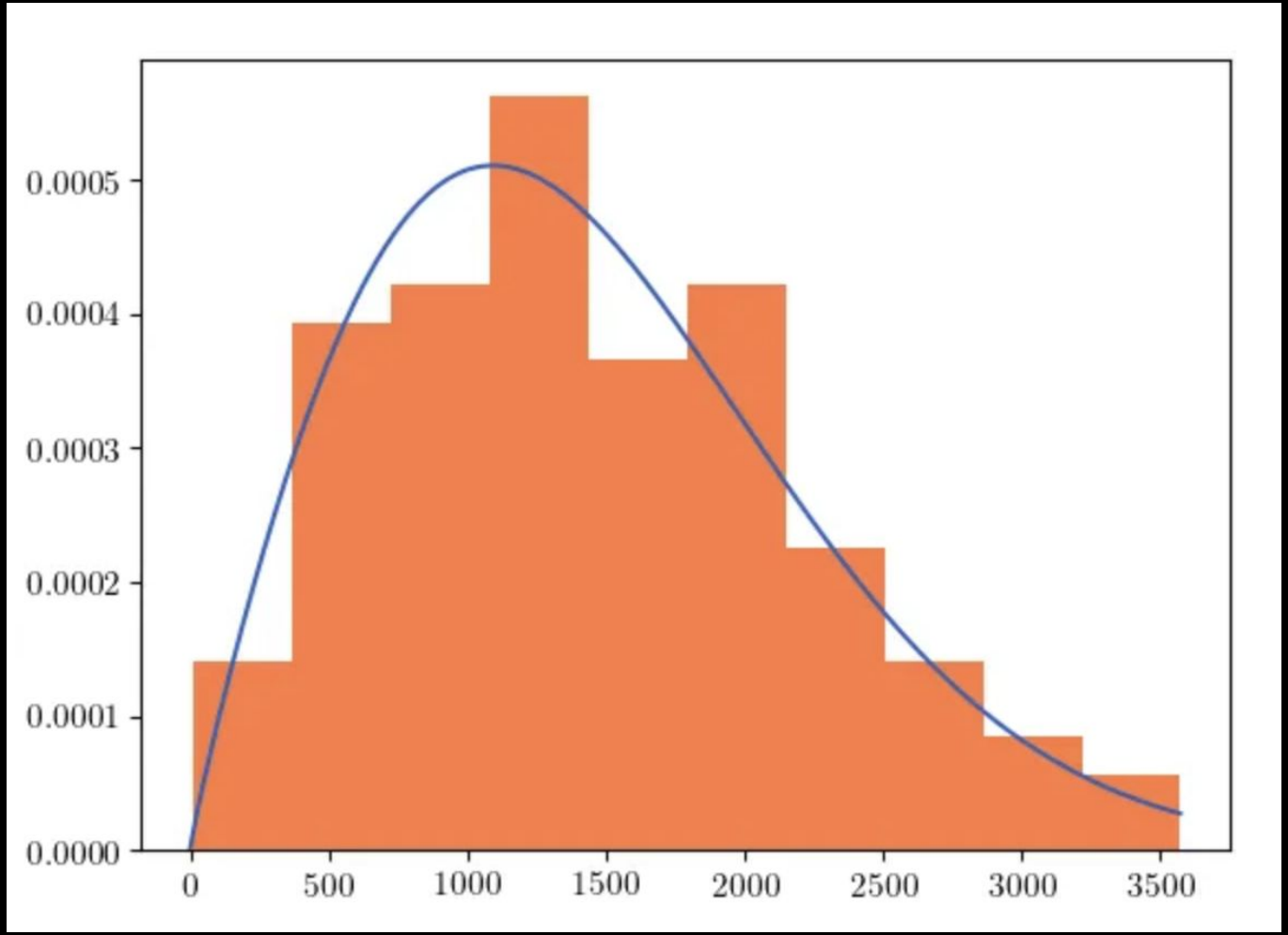
Survival Prediction Is Probabilistic...



Shape

Scale


Total lifetimes for failure examples
Number of machines
Lifetime, years
0
5
10
15
20
25
0
2
4
6
8
10


0.0005
0.0004
0.0003
0.0002
0.0001
0.0000
0
500
1000
1500
2000
2500
3000
3500

Machine Learning Approach

Beyond Curve-Fitting

- Instead of just fitting curves, can we learn from data?
- There may be multiple underlying distributions
- Data may be “censored”
- Best of both worlds: distribution-driven + learning-driven

Let’s Start Coding!