Practical ML Tutorial: Part I

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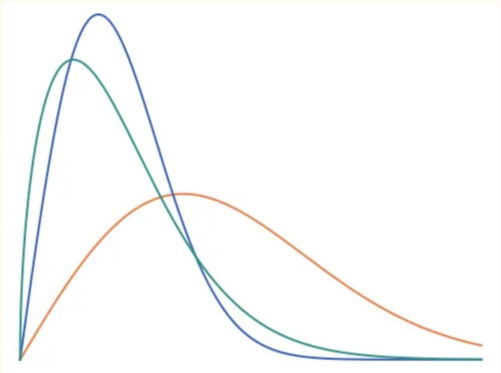
SEEMAPLD2023, George Williams

Agenda

Part I

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



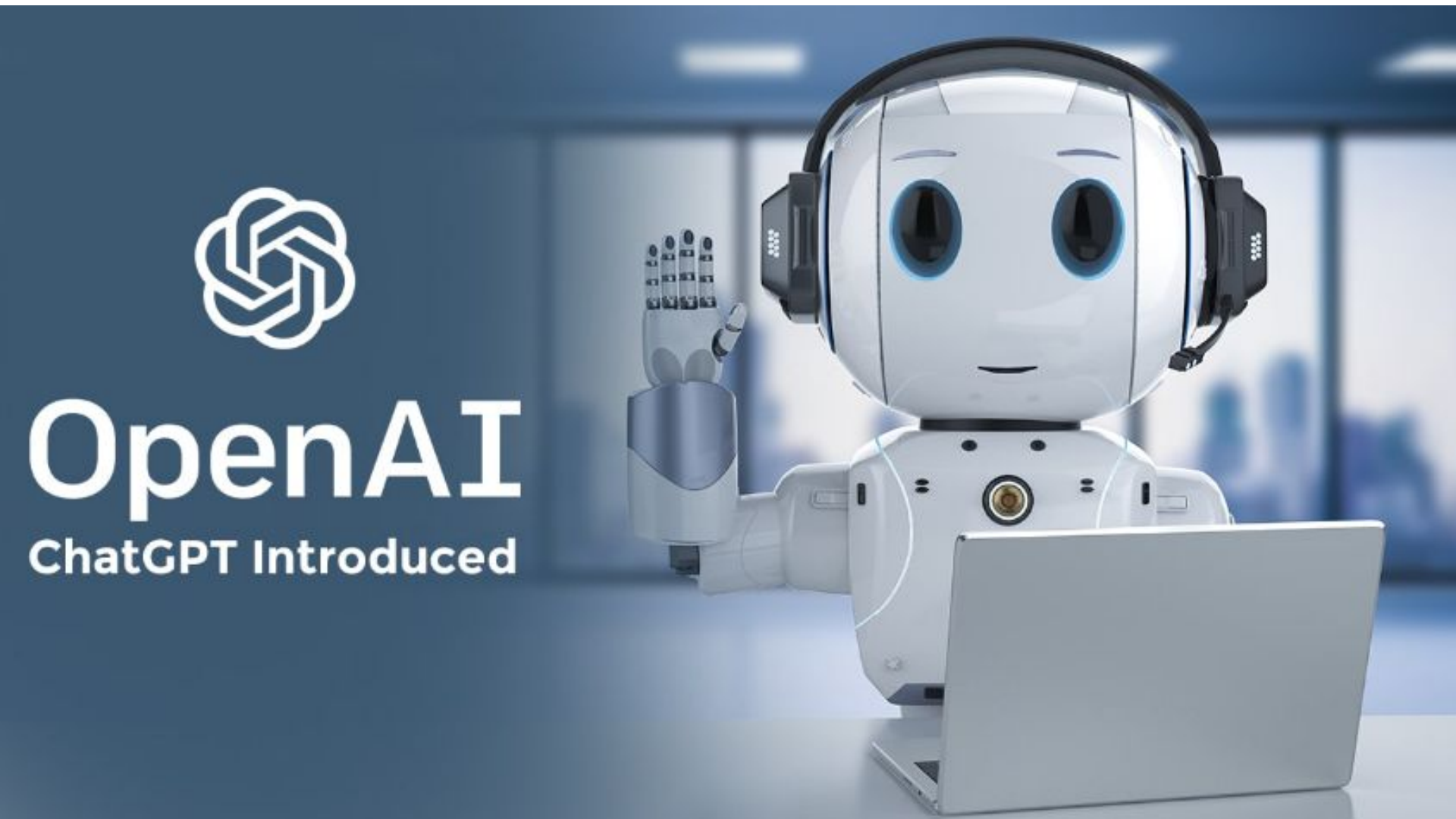
Part II

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

AI Trends

Have You Been Living Under A Rock Recently?

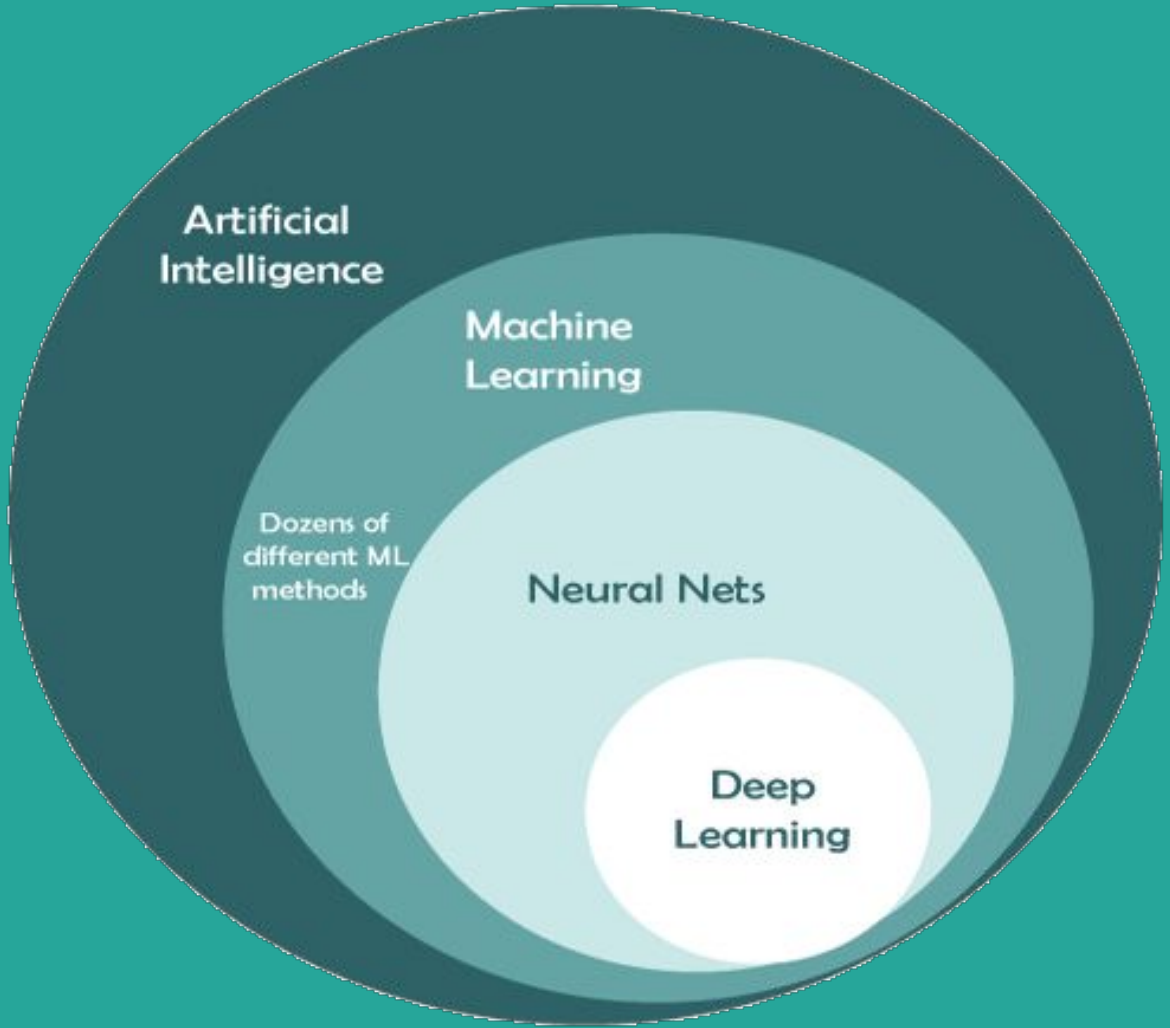
- ChatGPT
- Stable Diffusion
- Deep Fakes
- Alpha Fold
- Foundation Models


OpenAI
ChatGPT Introduced

STABLE DIFFUSION
DALLE 2
MIDJOURNEY

nature
DeepMind

Machine Learning Basics

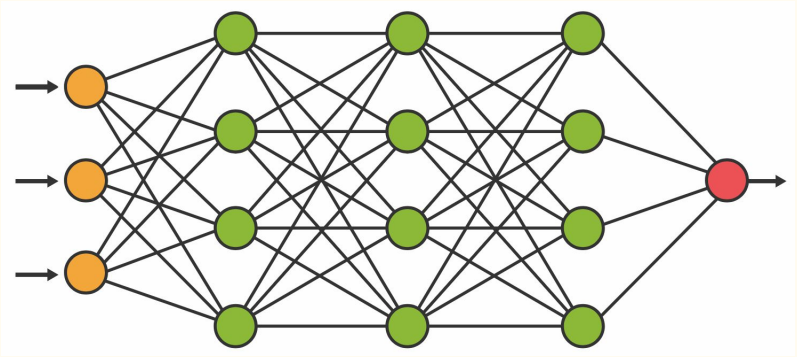

Artificial Intelligence
Machine Learning
Dozens of different ML methods
Neural Nets
Deep Learning

Machine Learning Basics

Data

Machine Learning Basics

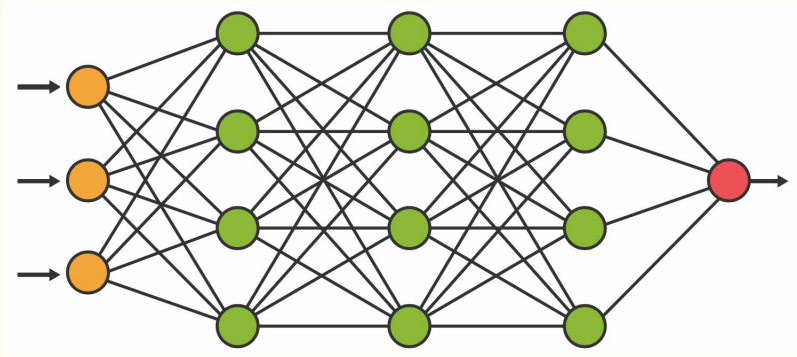
Data



Model

Machine Learning Basics

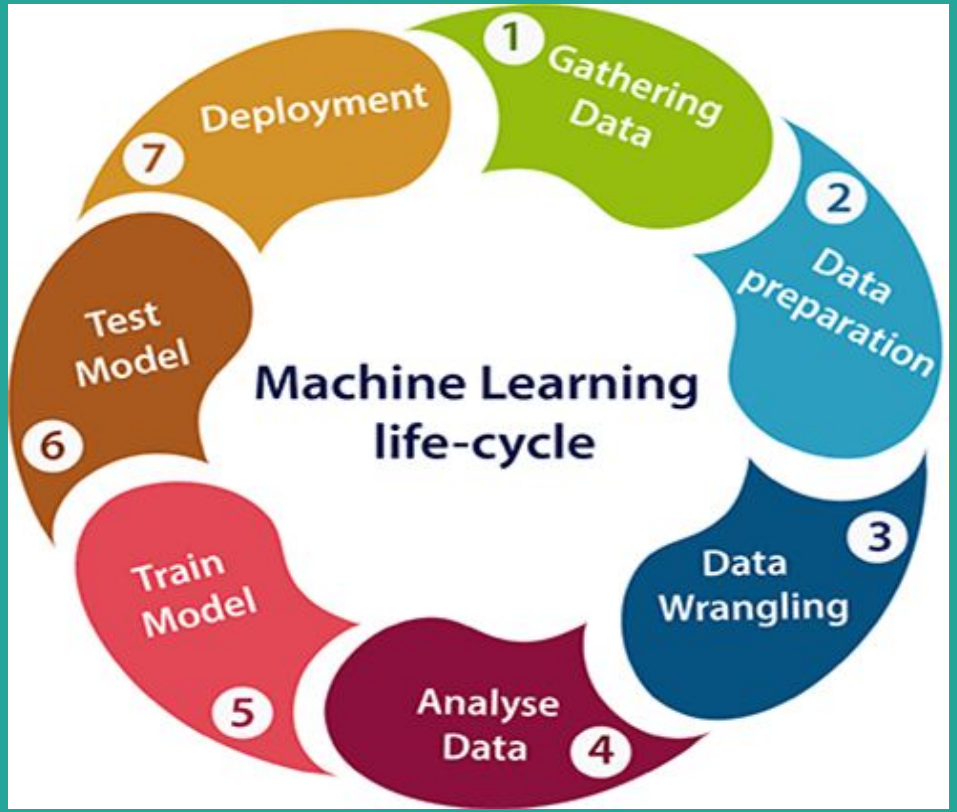
Data



Model

Eval

Machine Learning “In The Wild”

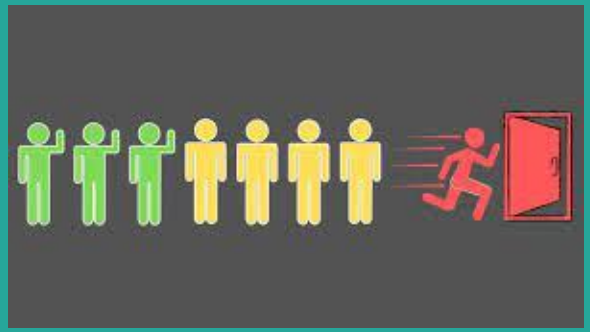


Survival Analysis

When Will It End?

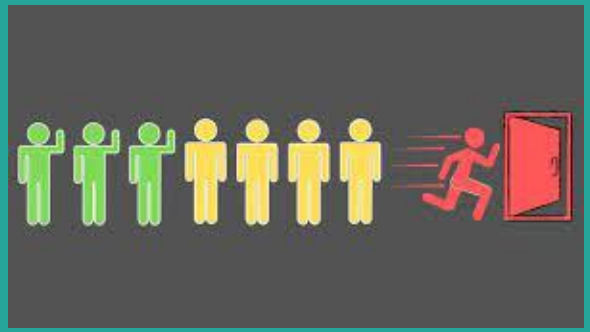
When Will *It* End?

When Will *It* End?



Customer Churn

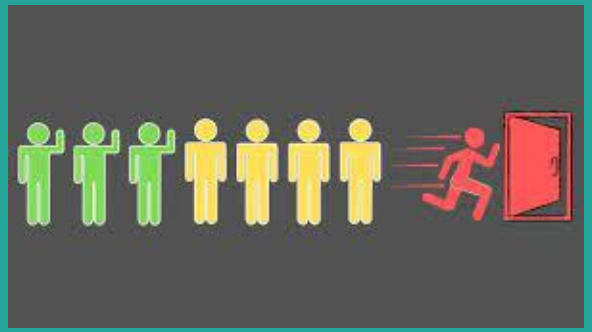
When Will *It* End?



Customer Churn

Health Outcomes

When Will *It* End?

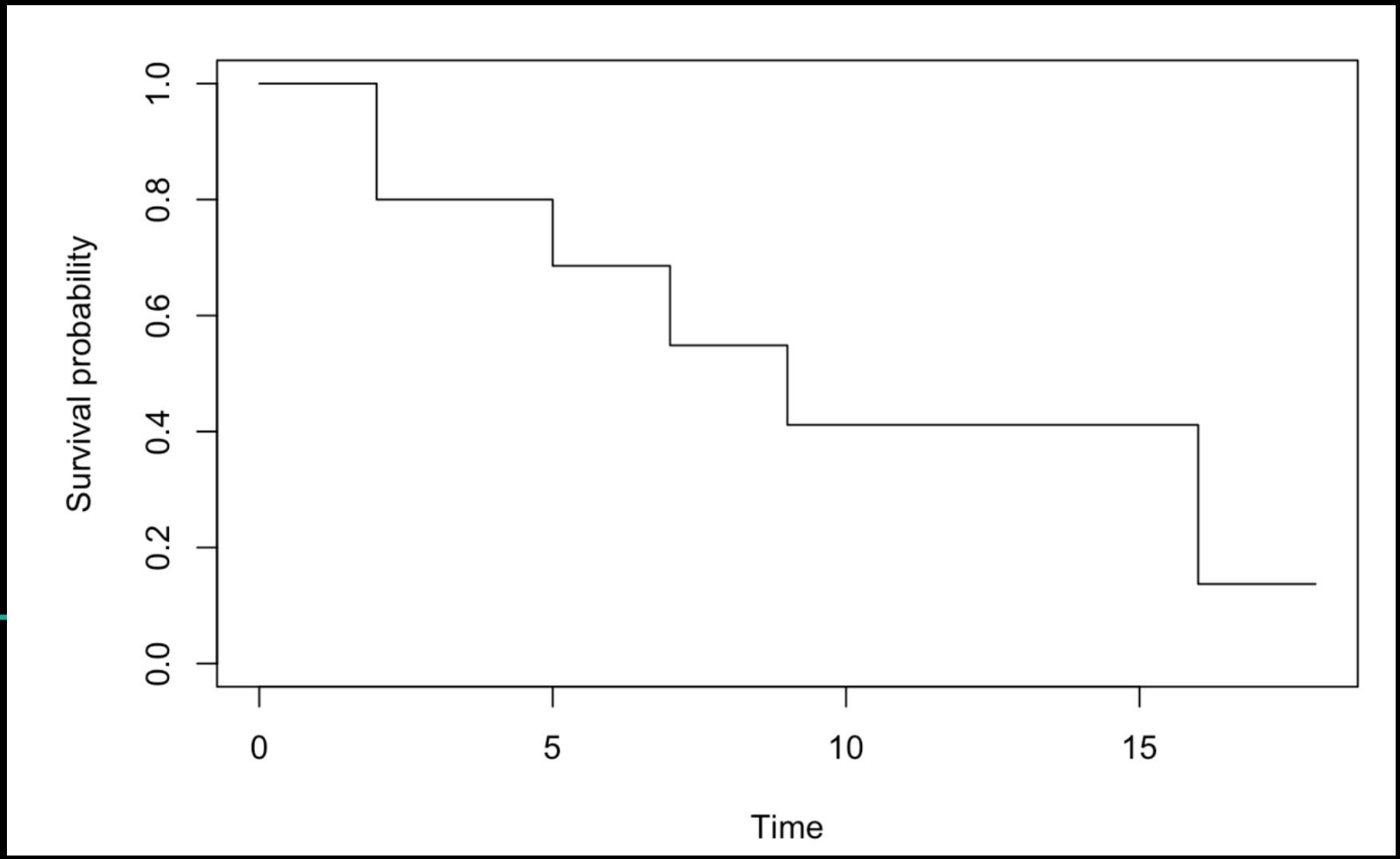


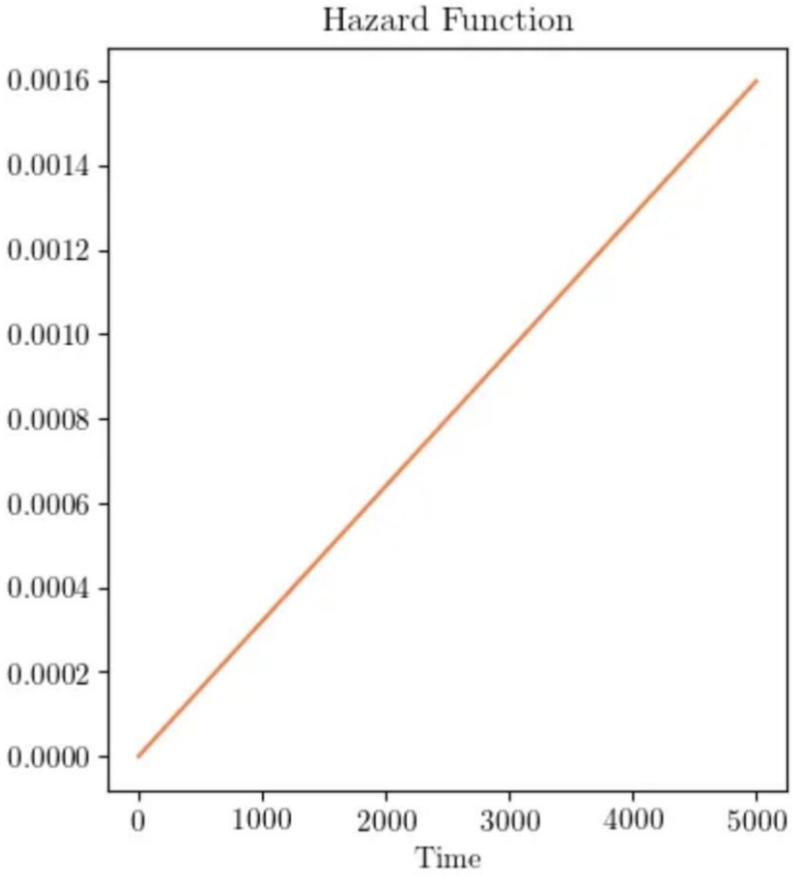
Customer Churn

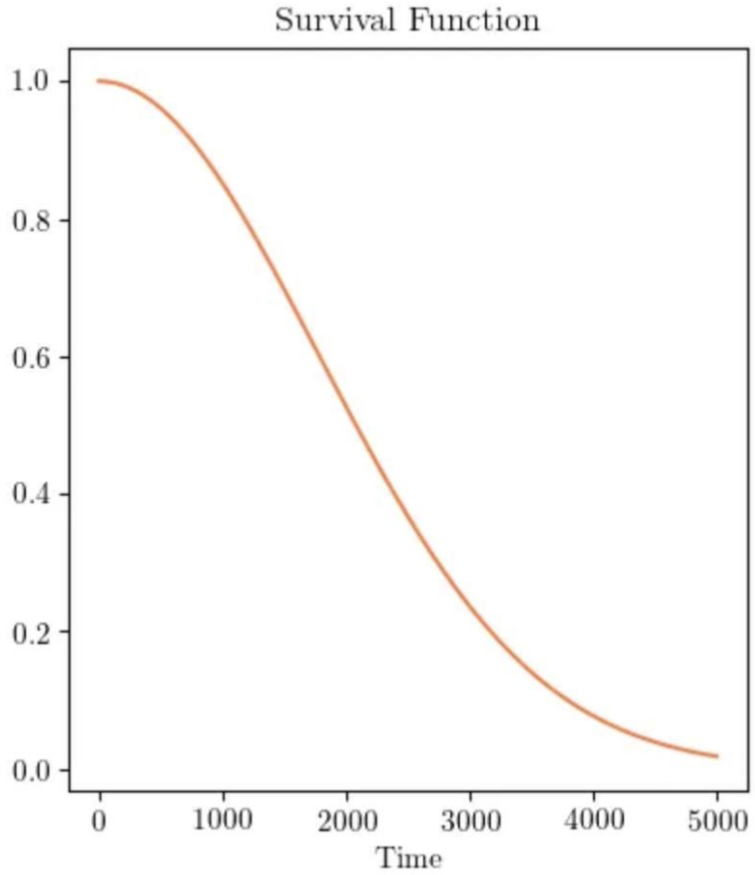
Health Outcomes

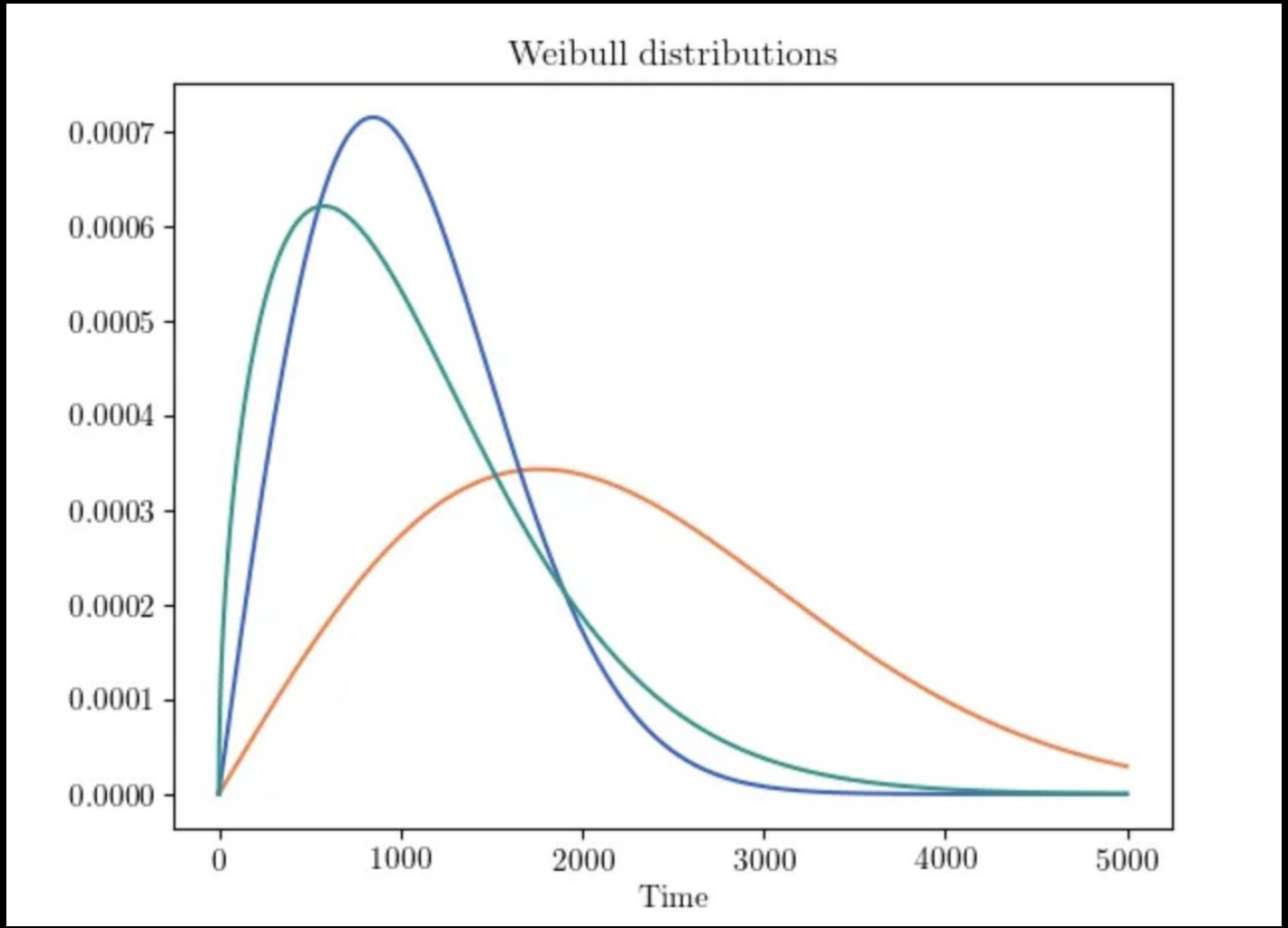
Machine Failure

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


Survival probability
1.0
0.8
0.6
0.4
0.2
0.0
0
5
10
15
Time

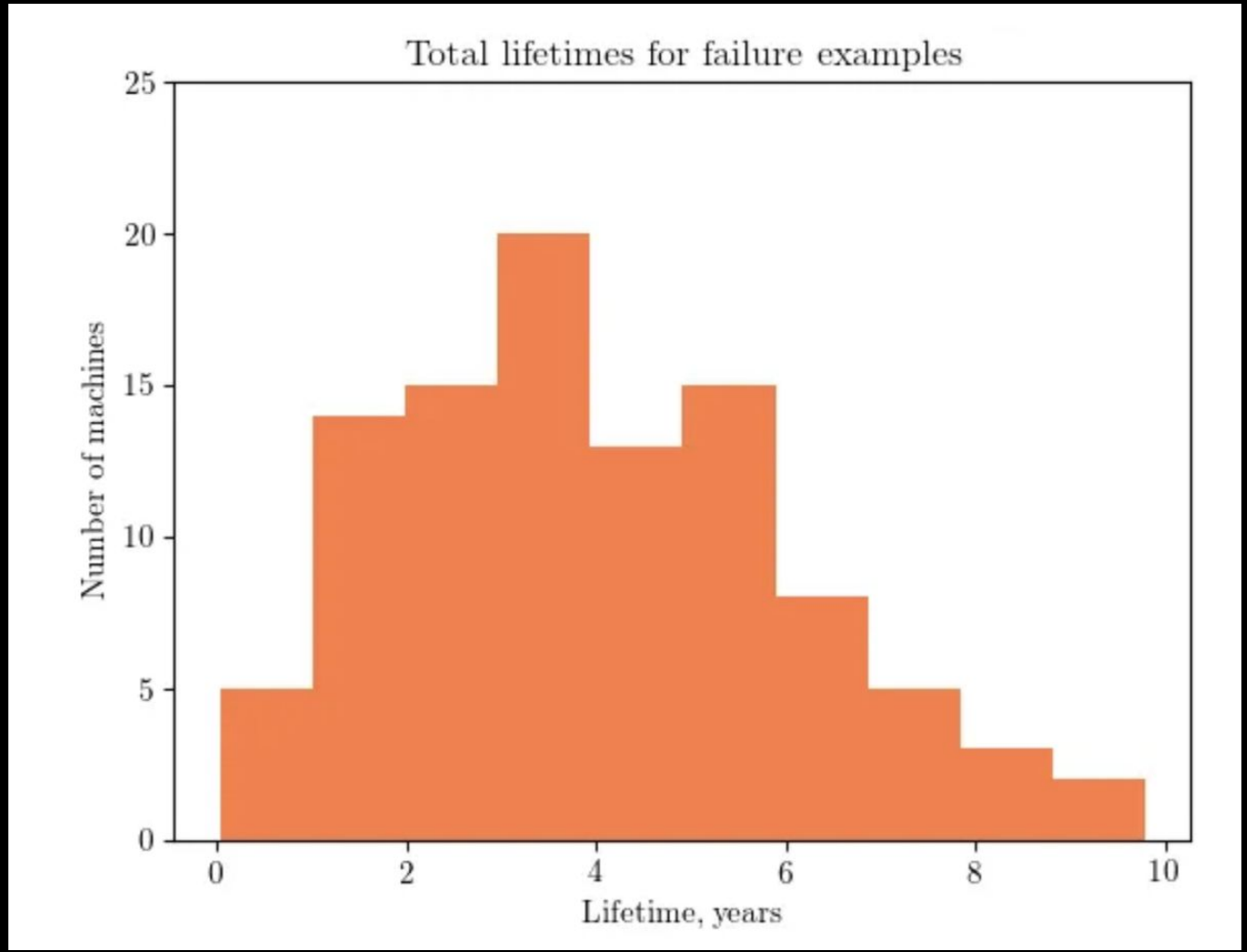

Hazard Function
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
0
1000
2000
3000
4000
5000
Time

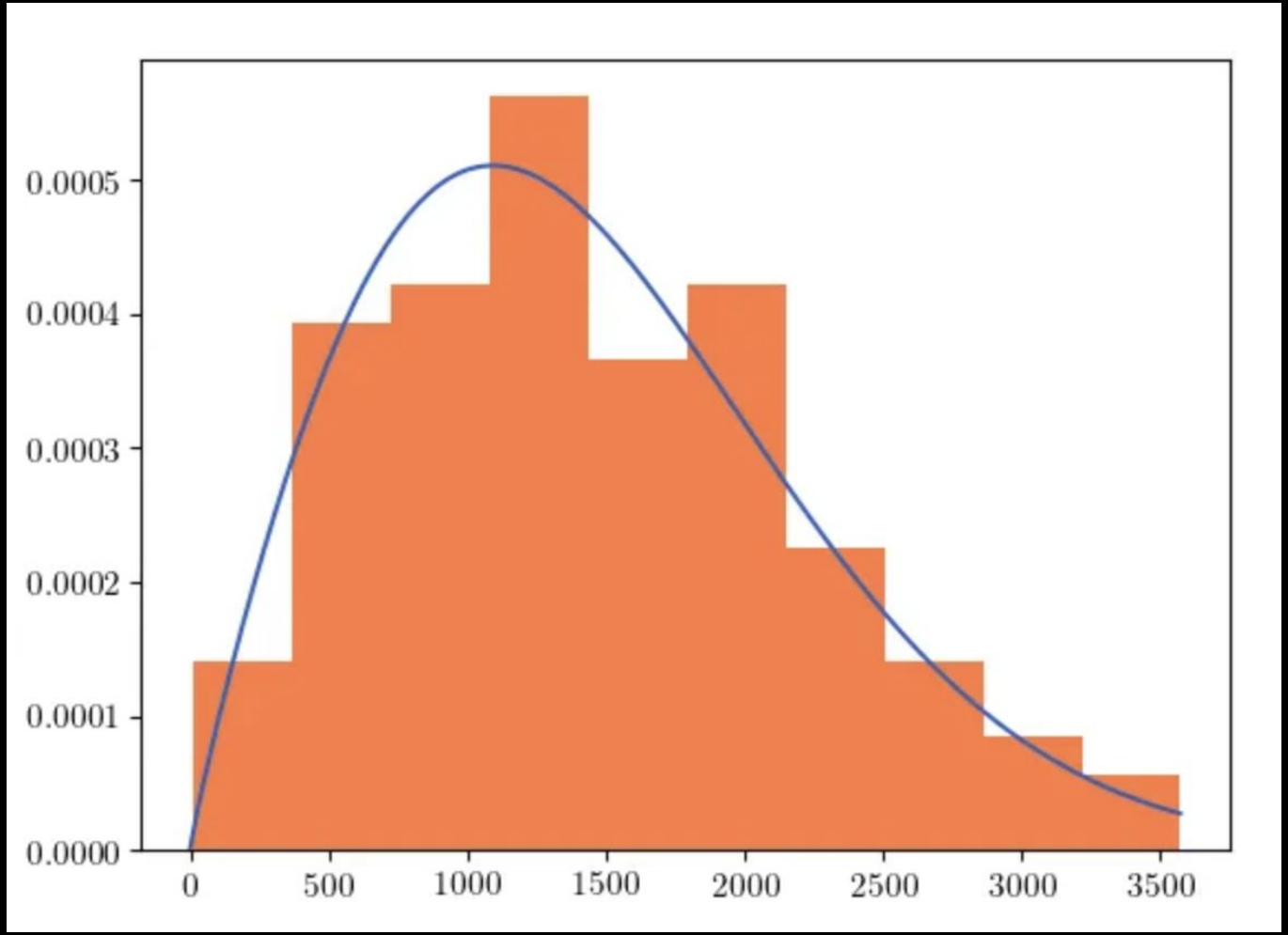

Survival Function
1.0
0.8
0.6
0.4
0.2
0.0
0
1000
2000
3000
4000
5000
Time


Weibull distributions
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0.0000
0
1000
2000
3000
4000
5000
Time

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

- Handle real-world data
- Multiple underlying distributions
- Censored data
- Best of both worlds: distribution-driven + data-driven

Let’s Start Coding!