

Bayesian Modeling and PyMC

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01 Introduction

Evan
PyMC (the OSS)
PyMC Labs (the company)

04 PyMC Advanceds

Examples
Documentation
Community

02 Bayes

Refresher on Bayesian concepts
Why Bayes matters to companies
Why it matters to you!

05 CLOSING

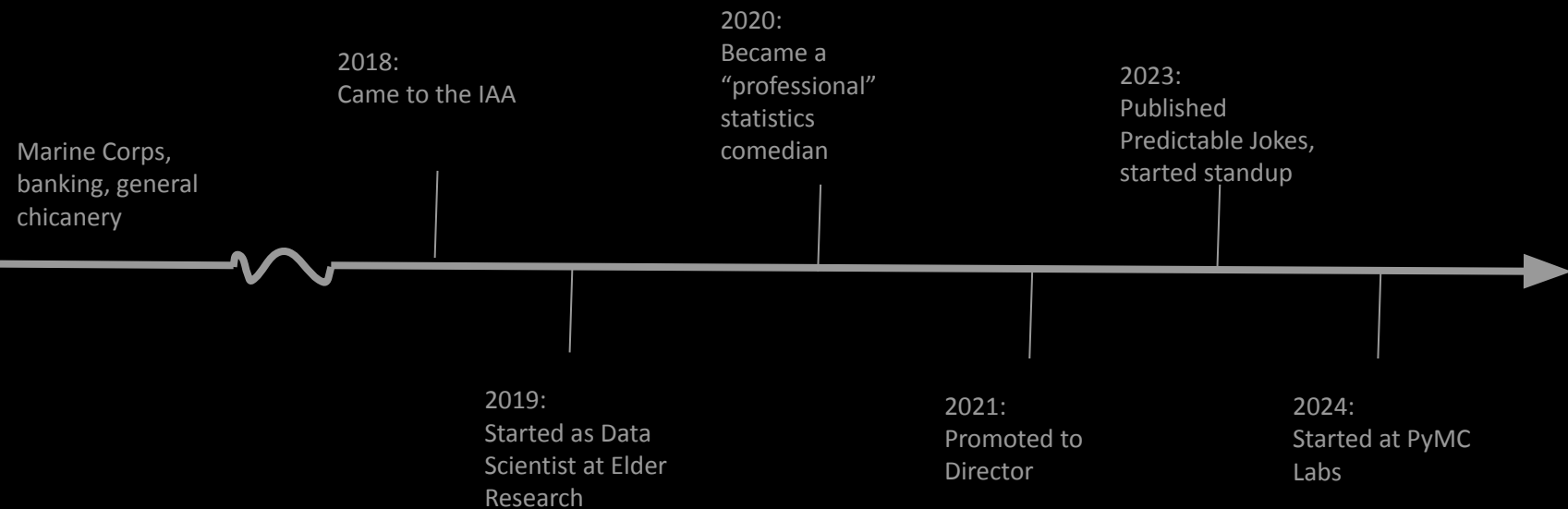
Questions
Jokes
Thank You

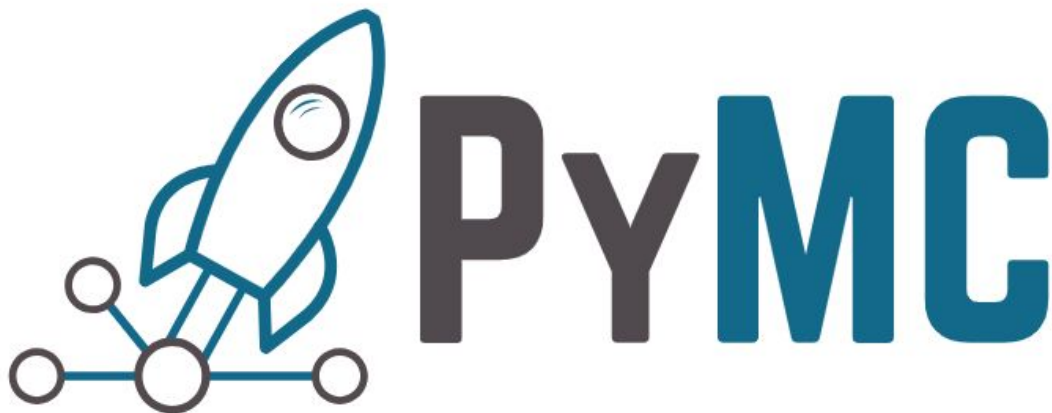
03 PyMC Basics

Getting Started
Modeling
Other Modeling
More Modeling

01

Introduction





[PyMC](#) is a probabilistic programming library for Python that allows users to build Bayesian models with a simple Python API and fit them using Markov chain Monte Carlo (MCMC) methods.



PyMC
Labs

THE BAYESIAN CONSULTANCY

www.pymc-labs.com

02

Bayes

A refresher?

What do we do here in “data science”

Throw stuff at an LLM?

Throw data into XGBoost?

What do we do here in “data science”

~~Throw stuff at an LLM?~~

~~Throw data into XGBoost?~~

Statistical Analysis!

1. Parameters
2. Data
3. Models

Frequentist Statistical Analysis

Data are random.

Parameters are
fixed (even though
they are unknown)

$$P(y|\theta)$$

Probability of our
data conditional on
some unknown
parameters.

Bayesian Statistical Analysis

Data are fixed
(once we collect them).

Parameters are random.

$$P(\theta|y)$$

Probability of
parameters given
some data
(like we think!)

Bayes Formula

$$P(\theta|y) = \frac{P(y|\theta) \times P(\theta)}{P(y)}$$

Posterior
Probability

Data Likelihood

Prior
Probability

Normalizing
Constant (the
thing that
makes this a
pain in the

Quantifying Uncertainty

- For each parameter, or jointly across parameters, know how “sure” the model is
- Smarter, risk based decisions

Modular Model Building

- Must explicitly formulate a model
- Easier to explain and communicate
- Can add and subtract and transform and anything!

Incorporating Prior Knowledge

- Most orgs know *something* that isn't in the data

Small data, big data, all good

- Works well with any data size
 - No “statistical significance” arbitrary tests, just wider estimates
-

Who uses Bayes?

- Marketing
- Risk (insurance, banking)
- Hard Sciences
- Economic modeling
- Image classification
- Hard math problems (like ODEs)
- Manufacturing optimization
- Maritime and weather
- Securities pricing
- Sports analytics
- Cybersecurity
- Everything, basically

Evan's Intuition

- Lost in Geneva
- Flipping a Coin
- Gummy Vitamins

03

PyMC Basics

04

PyMC Advanceds

Resources

1. Go here for more:

<https://www.pymc.io/welcome.html>

1.1 Go here for less:

<https://bambinos.github.io/bambi/>

2. Be part of the Discourse here:

<https://discourse.pymc.io/>

3. Read "Statistical Rethinking"

4. Listen to "Learning Bayesian Statistics"



CausalPy



PyMC-Marketing

Questions?

THANK YOU

Evan Wimpey
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predjokes



PredictableJokes



Evan Wimpey

PredictableJokes.com

