Course Description

After completing Statistical Thinking in Python (Part 1), you have the probabilistic mindset and foundational hacker stats skills to dive into data sets and extract useful information from them. In this course, you will do just that, expanding and honing your hacker stats toolbox to perform the two key tasks in statistical inference, parameter estimation and hypothesis testing. You will work with real data sets as you learn, culminating with analysis of measurements of the beaks of the Darwin's famous finches. You will emerge from this course with new knowledge and lots of practice under your belt, ready to attack your own inference problems out in the world.

1 Parameter estimation by optimization FREE

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When doing statistical inference, we speak the language of probability. A probability distribution that describes your data has parameters. So, a major goal of statistical inference is to estimate the values of these parameters, which allows us to concisely and unambiguously describe our data and draw conclusions from it. In this chapter, you will learn how to find the optimal parameters, those that best describe your data.

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2 Bootstrap confidence intervals

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To "pull yourself up by your bootstraps" is a classic idiom meaning that you achieve a difficult task by yourself with no help at all. In statistical inference, you want to know what would happen if you could repeat your data acquisition an infinite number of times. This task is impossible, but can we use only the data we actually have to get close to the same result as an infinitude of experiments? The answer is yes! The technique to do it is aptly called bootstrapping. This chapter will introduce you to this extraordinarily powerful tool.

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3 Introduction to hypothesis testing

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You now know how to define and estimate parameters given a model. But the question remains: how reasonable is it to observe your data if a model is true? This question is addressed by hypothesis tests. They are the icing on the inference cake. After completing this chapter, you will be able to carefully construct and test hypotheses using hacker statistics.

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4 Hypothesis test examples

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As you saw from the last chapter, hypothesis testing can be a bit tricky. You need to define the null hypothesis, figure out how to simulate it, and define clearly what it means to be "more extreme" in order to compute the p-value. Like any skill, practice makes perfect, and this chapter gives you some good practice with hypothesis tests.

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5 Putting it all together: a case study

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Every year for the past 40-plus years, Peter and Rosemary Grant have gone to the Galápagos island of Daphne Major and collected data on Darwin's finches. Using your skills in statistical inference, you will spend this chapter with their data, and witness first hand, through data, evolution in action. It's an exhilarating way to end the course!

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