

Finch beaks and the need for statistics

STATISTICAL THINKING IN PYTHON (PART 2)

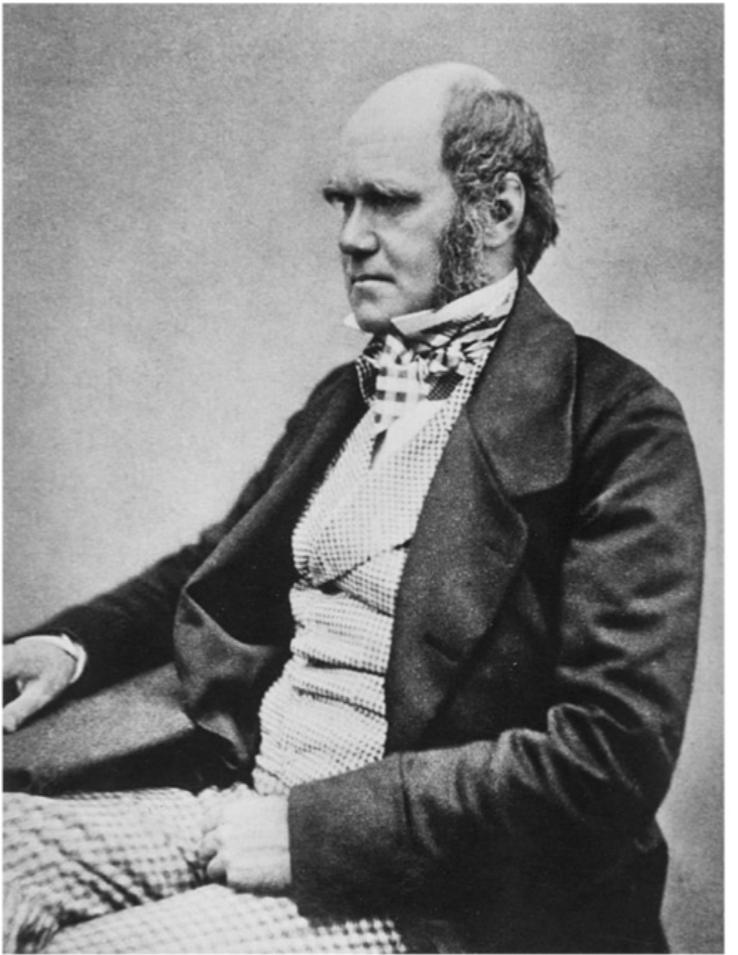
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Your well-equipped toolbox

- Graphical and quantitative EDA
- Parameter estimation
- Confidence interval calculation
- Hypothesis testing



¹ Image: Public domain, US



¹ Image: NASA

The island of Daphne Major



¹ Image: Grant and Grant, 2014

The finches of Daphne Major



Geospiza fortis



Geospiza scandens

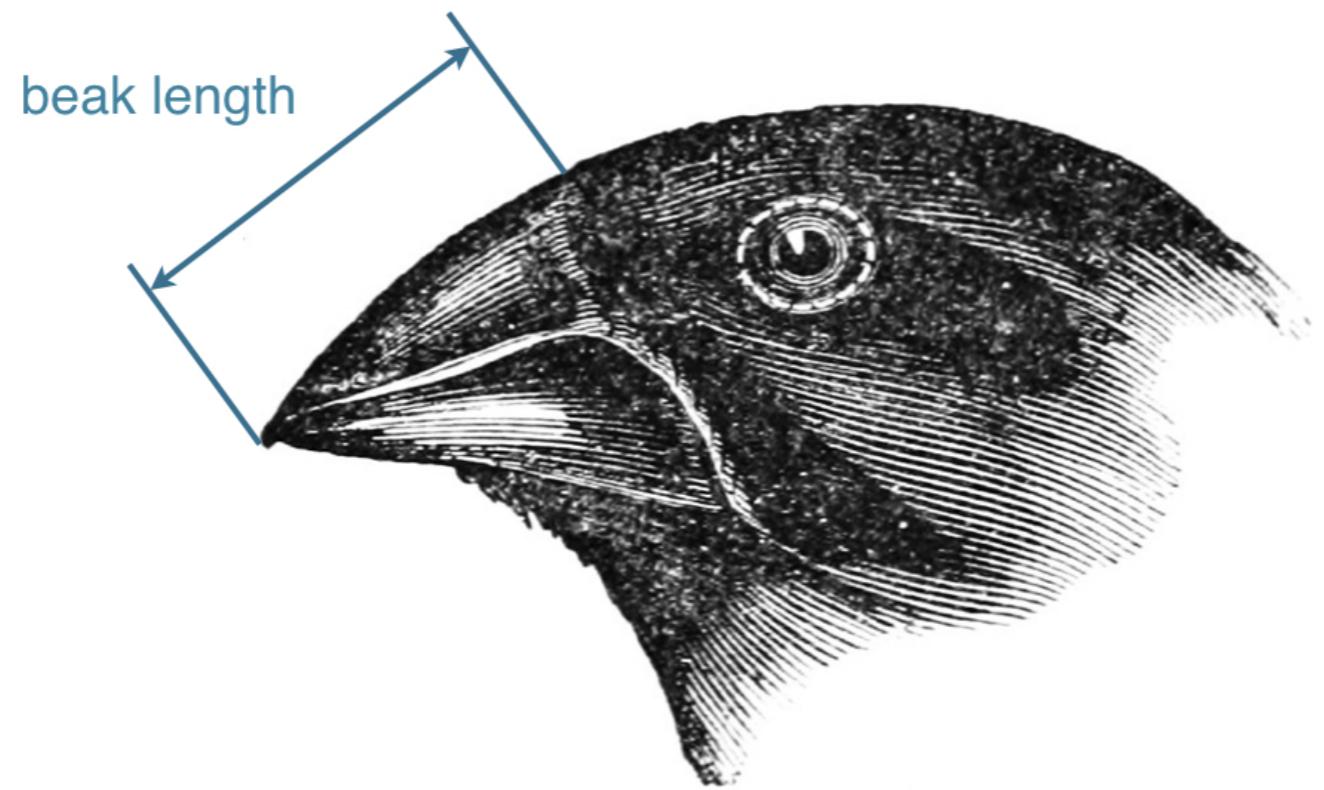
¹ Source: John Gould, public domain

Our data source

- Peter and Rosemary Grant
 - 40 Years of Evolution: Darwin's Finches on Daphne Major Island
 - Princeton University Press, 2014
- Data acquired from Dryad Digital Repository
 - <http://dx.doi.org/10.5061/dryad.g6g3h>

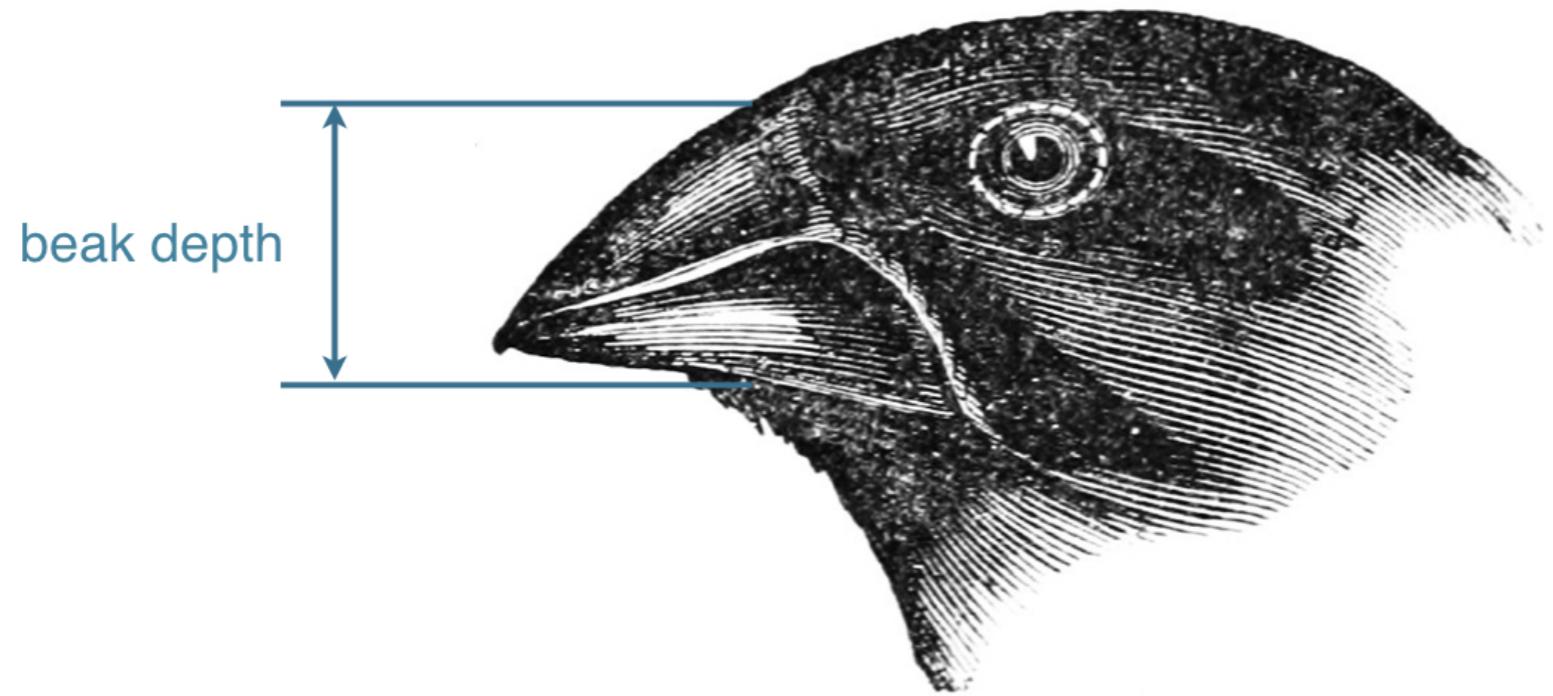


The dimensions of the finch beak



¹ Source: John Gould, public domain

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Investigation of *G. scandens* beak depth

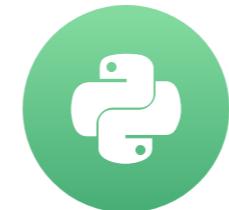
- EDA of beak depths in 1975 and 2012
- Parameter estimates of mean beak depth
- Hypothesis test: did the beaks get deeper?

Let's practice!

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Variation in beak shapes

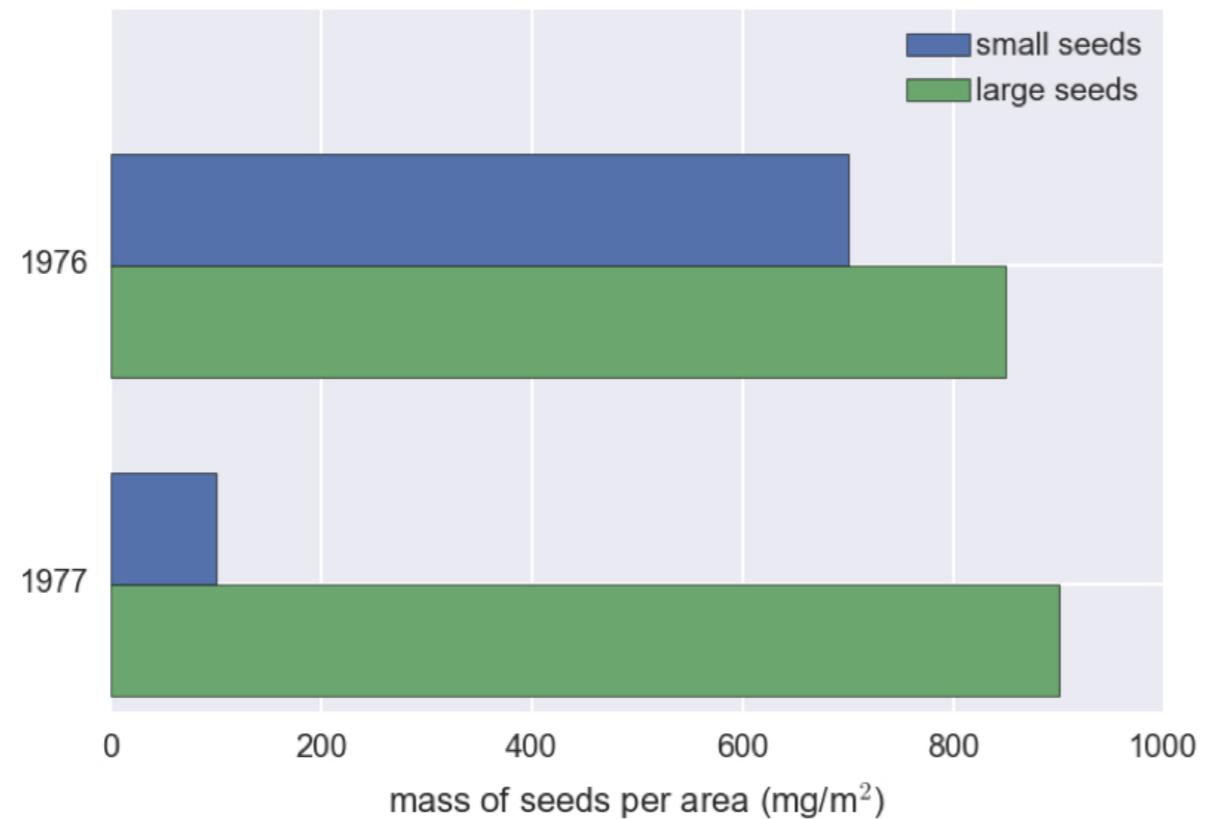
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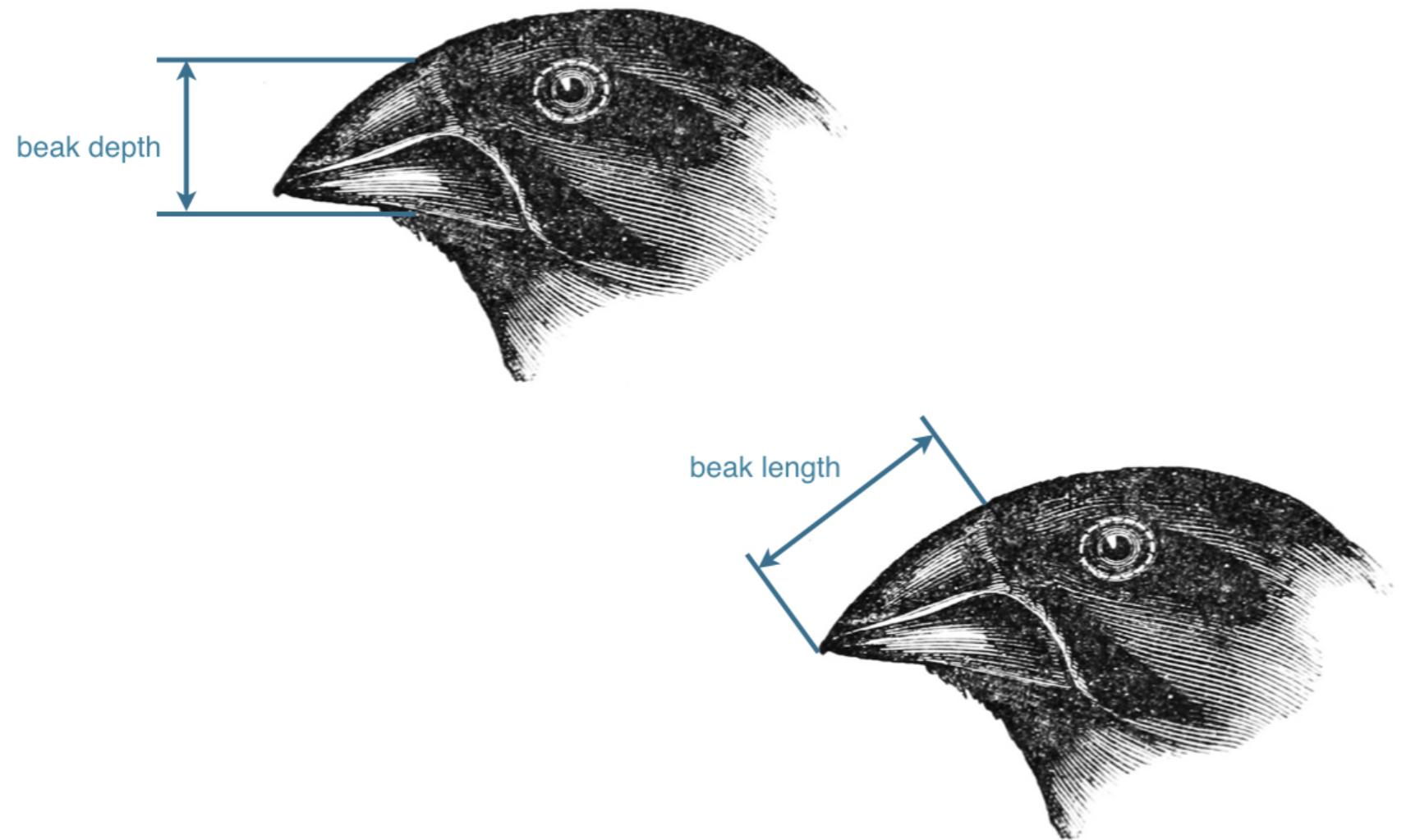
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The drought of winter 1976/1977



¹ Source: Grant and Grant, 2014

Beak geometry



¹ Source: John Gould, public domain

Hint

- `draw_bs_pairs_linreg()` will come in handy

Let's practice!

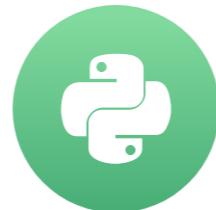
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Calculation of heritability

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The finches of Daphne Major



Geospiza fortis



Geospiza scandens

¹ Source: John Gould, public domain

Heredity

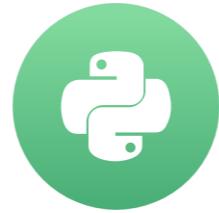
- The tendency for parental traits to be inherited by offspring

Let's practice!

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Final thoughts

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Your statistical thinking skills

- Perform EDA
 - Generate effective plots like ECDFs
 - Compute summary statistics
- Estimate parameters
 - By optimization, including linear regression
 - Determine confidence intervals
- Formulate and test hypotheses

Let's practice!

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